ORIGINAL ARTICLE

Cross-cultural adaptation and evaluation of the psychometric properties of the Falls Efficacy Scale – International Among Elderly Brazilians (FES-I-BRAZIL)

Adaptação transcultural e avaliação das propriedades psicométricas da Falls Efficacy Scale – International em idosos brasileiros (FES-I-BRASIL)

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Abstract

Objectives: To culturally adapt the Falls Efficacy Scale – International (FES-I) and assess its psychometric properties in a sample of community-dwelling elderly Brazilians. **Methods:** The instrument was translated into Brazilian Portuguese and culturally adapted to the Brazilian population (FES-I-Brazil) as recommended by the Prevention of Falls Network Europe. FES-I-Brazil was applied to 163 elderly people (73.44±5.51 years), and the demographic data and history of falls were also collected. From this group, 58 participants were randomly distributed to evaluate reliability. The reliability was analyzed using the intraclass correlation coefficient (ICC) and the internal consistency, using Cronbach's alpha coefficient (α). The internal structure of FES-I-Brazil was evaluated by means of exploratory factor analysis. The logistic regression model was used to determine which tasks on the scale were more relevant for discriminating falls. To analyze the sensitivity and specificity of FES-I-Brazil, the receiver operating characteristic (ROC) curve was used. **Results:** The internal consistency of FES-I-Brazil was α=0.93, and the intra- and inter-examiner reliability were ICC=0.84 and 0.91, respectively. Factor analysis suggested two factors: concern about falling during social activities and activities of daily living (basic and instrumental), and postural control tasks. FES-I-Brazil scores ≥23 suggested an association with a previous history of sporadic falls, whereas scores ≥31 suggested an association with recurrent falls. **Conclusions:** FES-I-Brazil was shown to be semantically, linguistically and psychometrically appropriate to evaluate the fear of falling in the community-dwelling Brazilian elderly population.

Key Words: FES-I-Brazil; self-efficacy; falls; fear; elderly people; psychometry.

Resumo

Objetivos: Adaptar culturalmente a *Falls Efficacy Scale–International* (FES-I) e avaliar suas propriedades psicométricas em uma amostra de idosos brasileiros da comunidade. **Métodos:** Conforme recomendações da Rede Européia de prevenção às quedas, o instrumento foi traduzido para o português do Brasil e adaptado culturalmente para a população brasileira (FES-I-Brasil). A FES-I-Brasil foi aplicada em 163 idosos (73,44±5,51 anos), e foram coletados dados demográficos e relacionados à história de quedas. Dentre esses idosos, 58 foram distribuídos aleatoriamente para avaliação da confiabilidade. A confiabilidade foi analisada pelo Índice de Correlação Intraclasse (ICC) e a consistência interna pelo α de Cronbach. A estrutura interna foi da FES-I-Brasil foi avaliada pela análise fatorial exploratória. O modelo de regressão logística foi utilizado para identificar quais tarefas da escala eram mais relevantes para discriminar quedas. Para análise de sensibilidade e especificidade da FES-I-Brasil, empregou-se a curva *Receiving Operator Characteristic* (ROC). **Resultados:** A consistência interna da FES-I-Brasil foi α=0,93, e a confiabilidade foi ICC=0,84 e 0,91 (intra e interexaminadores, respectivamente). A análise fatorial sugeriu dois fatores que verificavam preocupação em cair durante atividades de socialização e de vida diária (básicas e instrumentais) e tarefas relacionadas ao controle postural. Uma pontuação ≥23 pontos na FES-I-Brasil sugeriu associação com histórico de queda esporádica, ao passo que uma pontuação ≥31 pontos ensejou uma associação com queda recorrente. **Conclusões:** A FES-I-Brasil apresentou-se semântica, linguística e psicometricamente adequada para avaliar o medo de cair na população de idosos brasileiros da comunidade.

Palavras-chave: FES-I-Brasil; autoeficácia; quedas; medo; idosos; psicometria.

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Introduction :::.

Falls represent one of the major problems in an elderly population. Approximately 30% of people aged 65 years or older fall each year and often suffer from serious fall-related injuries[1]. Fear of falling is one of the most common consequences of falls[1,2], but it can also be a cause of them[2-4]. The prevalence of fear of falling is high in community-dwelling elders, ranging from 41 to 61%[2-10]. The concern about the possibility of falling is a key factor related to older adults' health, since it may lead to reduced mobility, loss of balance confidence, restriction of activities, and others[3,6,7,10,11]. The assessment of fear of falling is complex and involves physical, behavioral and functional components. Therefore, it is difficult to develop an instrument that covers all aspects of fear of falling[12].

Fear of falling has been evaluated as a dichotomous outcome (be afraid or not)[3,6,13-15], by questions assessing the level of fear[11], or through scales assessing self-efficacy or loss of balance confidence[2,8,16-18]. The later two scales are based in the social cognitive theory described by Bandura[19,20] and evaluate falls-related self-efficacy, which represents the individual's level of confidence to perform activities of daily living without falling[2].

Tinetti, Richman and Powell[2] developed the first scale to assess falls-related self-efficacy, named the 'Falls Efficacy Scale' (FES). The Prevention of Falls Network Europe (PRoFaNE)[21] proposed a modified version of the FES, named the 'Falls Efficacy Scale – International' (FES-I)[18]. The FES-I contains the original FES items and an additional six items, which assess external activities and social participation since these are considered a major concern among older adults[8,17].

Several studies have supported the clinical relevance of fear of falling due to its association to adverse health outcomes in elderly subjects[2,5-7,9,17,22-24]. The concept of self-efficacy is useful to understand the reasons by which elderly subjects develop fear of falling and to guide preventive and therapeutic strategies[2]. In Brazil, the use of structured questionnaires to evaluate fear of falling in older subjects is not common in routine clinical practice. This scenario may be a reflection of the absence of instruments culturally adapted to Brazil's population.

The use of a validated and culturally adapted instrument is highly recommended because it simplifies the assessment procedure[25,26]. The FES-I would be an adequate instrument to measure fear of falling among community-dwelling elderly Brazilians because of its excellent measurement properties, such as internal consistency (Cronbach's alpha coefficient α=0.96) and test-retest reliability (ICC=0.96). In addition, the FES-I provides a more appropriate assessment of fear of falling among community-dwelling elders than the original FES[18]. Although the FES-I has been cross-culturally adapted in several countries, facilitating the comparison among studies at an international level[18,27], it has not yet been culturally adapted for use in Brazil. The objectives of the present study were to perform a cross-cultural adaptation and to assess the psychometric properties of the FES-I in a community-dwelling Brazilian elderly population.

Methods :::.

Study design

This is a methodological study with a cross-sectional design approved by the Ethics Committee of Research of the Universidade Federal de Minas Gerais, Belo Horizonte (MG), Brazil, number ETIC 442/05.

Phase 1 – Cultural adaptation of the FES-I

The FES-I contains questions that assess the concern about the possibility of falling during the performance of 16 activities. Each activity receives a score from one to four points, providing a total score ranging from 16 (absence of concern) to 64 (extreme concern).

The authors from this study received permission from PRoFaNE to proceed with the development of the Brazilian version of the FES-I. The entire process of cultural adaptation followed 10 phases of a standardized protocol[21], including the following procedures: translation, back-translation, pilot study, semantic and linguistic equivalence.

Phase 2 – Evaluation of the psychometric properties of the FES-I-Brazil

According to the sample calculation[28], 163 community-dwelling elders from Belo Horizonte (MG), Brazil, took part in this study. Participants were recruited from health centers, outpatient clinics, or from research, extension and physical activity projects for older adults. To be included, participants had to meet the following inclusion criteria: 65 years of age or more; to live independently in the community; to walk in the orthostatic position with or without ambulatory devices. The exclusion criteria were: mobility and/or vestibular impairments which restrained locomotion in the orthostatic position, such as the use of wheelchair; unstable or severe health conditions, such as sequels of cerebrovascular disease, Parkinson's disease, dementia (Alzheimer's type); or other neurological alterations or cognitive impairments. The Mini-mental State Exam[29] was administered to verify the presence of any cognitive impairment (cut-off scores recommended by Bertolucci et al.[29] were used).

Older adults who were eligible for inclusion received information about the research nature and objectives, and those who agreed to participate signed a free informed consent form.

After inclusion in the study, all participants underwent an individual interview administered by the first examiner (data were obtained through self-report). First, the culturally adapted FES-I was administered, and then demographic data and the history of falls were collected. Demographic data included age, gender, marital status and educational level. The frequency of falls was investigated, i.e. participants were asked to report if they had fallen once, twice or more times, or if they had not fallen in the year previous to the study.

In a second interview, the culturally adapted FES-I was administered to 58 participants, corresponding to an interval of approximately seven days from the initial interview (assessment of reliability). The occurrence of falls during this period was considered an exclusion criterion. The second interview was administered by the first examiner or by a second examiner in a random order to verify the intra- and inter-examiner reliability, respectively. Both examiners were physical therapists who have been previously trained to follow the procedures described in the original version of the scale[21]. The first and second interviews were previously scheduled and took place at the participant's residence or at the place of recruitment.

Statistical analysis

Descriptive statistics were calculated for all the variables in the study. Intra- and inter-examiner reliability were evaluated by the intraclass correlation coefficient (ICC) type II, which was calculated for each item on the scale as well as for its total score. Internal consistency was assessed for all the items through Cronbach's alpha coefficient α (Statistical Package for the Social Sciences 13.0). To evaluate construct validity, the 16 items from the scale were analyzed through an exploratory factor analysis in order to understand the pattern of conjunct variation of the items and the explained variance for each factor (Factor 5.0). It was observed that the data did not present a normal distribution through the tests Kolmogorov-Smirnov of normality ($p < 0.01$) and coefficient of multivariate kurtosis (Mardia coefficient, $p < 0.01$); therefore, polichoric correlations were used (Software PRELIS 2.3). For the factor analysis, the extraction by major components with orthogonal rotation (Varimax) was used. In order to establish the number of factors, we used the method for parallel analysis of the scree plot. A logistic regression model identified which variables of the FES-I were highly associated with the history of falls. A logistic model was created for two distinct outcomes: 1) to distinguish between elders who had fallen and elders who had not fallen in the previous year; 2) to distinguish between elders who had fallen

two or more times (recurrent falls) and elders who had not fallen or who had fallen only once in the previous year. Receiver operating characteristic (ROC) curves were used to calculate sensitivity and specificity in order to assess whether the total score of the culturally adapted FES-I would be able to accurately discriminate between fallers (regardless of the number of falls) and recurrent fallers.

Results

Phase 1 – Transcultural adaptation of the FES-I

In the process of cultural adaptation of the FES-I, three of its items were modified to address cultural differences and still preserve the equivalence with the original version. Item 4 was changed to "taking a bath", with no reference to whether it was in a shower or in a bath tub. In item 11, wet floor represented the slippery surface. In item 14, an uneven surface (i.e. rocky ground or poorly maintained pavement) was described as a surface full of holes. There were no changes to other items apart from those related to the translation, given that the items were applicable to the Brazilian culture. The culturally adapted version of the FES-I (FES-I-Brazil)[17] is described in Appendix 1.

Phase 2 – Assessment of the psychometric properties of the FES-I-Brazil

The average age of the participants was 73.44±5.51 years, 127 (77.91%) were women, 73 were married (44.79%), and the majority (54.60%) had completed eight years of school or more. One hundred and eight participants (66.26%) had not fallen in the previous year, while 33 (20.24%) were fallers and 22 (13.50%) were recurrent fallers. The average FES-I-Brazil score was 23.55±7.60, the median score was 21, and the first (Q1) and third (Q3) quartile were 19 and 25, respectively.

Internal consistency of the FES-I-Brazil was considered adequate ($\alpha = 0.93$). The intra-examiner reliability of the total score was ICC=0.84, and the average of the items was ICC=0.57 (0.34-0.80). The inter-examiner reliability of the total score was ICC=0.91, and the average of the items was ICC=0.70 (0.39-0.90).

The factorial analysis generated a structure with two factors that assessed the concern about falling during the performance of activities listed in the FES-I (Table 1). In general, tasks related to postural control and associated with a higher level of difficulty were listed under factor 2, whereas tasks related to daily activities (basic and instrumental) and socialization were listed under factor 1. The quality of the factor analysis showed

acceptable levels of explained variance (70.2%), internal consistency (factor 1 α=0.95; factor 2 α=0.89) and Kaiser-Meyer-Olkin (KMO=0.86). After an oblique solution, results showed a moderate correlation among the factors (r=0.39). Moreover, the factor analysis of second order identified that a single latent factor of second order (i.e. concern about falling) was able to explain 59% of the variance of the first order factors (i.e. tasks of postural control, daily living and socialization). Thus, one can conclude with relative confidence that the two factors represent distinct dimensions of the same construct.

The logistic regression model found the total score of the FES-I to be the most relevant variable to predict history of falls. The cut-off score to differentiate between fallers and non-fallers was 23 points, yielding sensitivity values of 47% (capacity to identify fallers among older adults who are actual fallers) and specificity values of 66% (capacity to identify non-fallers among older adults who are actual non-fallers). In the differentiation between recurrent fallers and non-recurrent fallers, extreme cases interfered considerably with the results. After the exclusion of these extreme cases (n=4), the cut-off score was raised to 31 points, yielding sensitivity values of 100% and specificity values of 87%. Educational level and high scores on item 10 of the FES-I were identified as predictors of the classification of extreme cases. Illiterate participants who scored up to two points on item 10 and participants who had completed 1 to 8 years of school who scored three or four points on item 10 were identified as outliers by the regression model (probability higher than 90%).

Discussion ::::

The evaluation of the psychometric properties of a cross-culturally adapted instrument is of great importance[25,26]. The findings of the present study confirm that the FES-I has been adequately adapted for use in community-dwelling elderly Brazilians. The analysis of internal validity of the FES-I-Brazil revealed that the scale items presented adequate internal consistency (α=0.93). This indicates that the scale presented the falls efficacy in a sample of older adults and is comparable to results of other studies that already used the FES-I, such as the original FES-I (α=0.96)[18], the abbreviated FES-I (α=0.92)[16] and the FES-I adapted to Holland (α=0.96) and Germany (α=0.90)[27]. The scale FES-I-Brazil also presented adequate intra- and inter-examiner reliability. These findings were similar to those of the other scales that evaluate falls-related self-efficacy, such as the original FES-I (ICC=0.96)[18], the abbreviated FES-I (ICC=0.83)[16], the FES-I adapted to Holland (ICC=0.82) and Germany (ICC=0.79)[27], ABC (r=0.92)[8] and FES (r=0.71)[2].

The analysis of the factorial structure of the FES-I-Brazil allowed the assessment of the internal structure of the scale to confirm if the concern about falling was assessed by tasks with different levels of difficulty. There were some differences between the results of the factor analysis in the original scale[18] and the present one, which can be explained by the variation between the cultures. The differences from the original scale were: item 7 was included under factor 1; items 8 and 9 were included under factor 2[18]. In the present study, items 4 and 8

Table 1. Exploratory factorial analysis of indicators on the FES-I-Brazil.

Items	Indicators	Factorial load		Comunality
		Factor 1	Factor 2	
Item 1	Cleaning the house	0.77	0.30	0.69
Item 2	Getting dressed or undressed	0.65	0.31	0.52
Item 3	Preparing simple meals	0.96	0.08	0.93
Item 4	Taking a bath	0.58	0.47	0.56
Item 5	Going to the shop	0.86	0.30	0.82
Item 6	Getting in or out of a chair	0.78	0.41	0.78
Item 7	Going up or down stairs	0.44	**0.65**	0.62
Item 8	Walking around the neighbourhood	0.58	0.53	0.62
Item 9	Reaching for something above your head or on the ground	**0.70**	0.40	0.65
Item 10	Going to answer the telephone before it stops ringing	0.63	0.52	0.66
Item 11	Walking on a slippery surface (e.g.wet)	0.16	**0.78**	0.63
Item 12	Visiting a friend or relative	0.86	0.32	0.84
Item 13	Walking in a place with crowds	0.64	0.63	0.80
Item 14	Walking on an uneven surface	0.24	**0.83**	0.74
Item 15	Walking up or down a slope	0.30	**0.76**	0.68
Item 16	Going out to a social event	0.77	0.36	0.72
Engein values		6.97	4.30	11.24
Explained variance		43.3%	26.9%	70.2%
Cronbach's alpha		0.95	0.89	

Factorial loads in bold: significant, if values>0.60. Adequated factorial solution: extracted variance >60% (odds between engein values and total variance); Cronbach's alpha: ≥0.80=good factorial solution; Comunality (explained variance of each factor variância): >0.40=acceptable.

could not be included neither under factor 1 nor under factor 2, since they presented a factorial load which was similar for both factors. In the original FES-I[18], item 4 demonstrated a similar characteristic. However, items 4 and 8 could not be excluded, since their communality (quantity by which these two factors explain the item) was superior to 0.40, a value which is considered acceptable. This analysis showed results compatible to those obtained by the authors of the original scale, suggesting a unitary factor (concern about falling) with two distinct dimensions: more basic and more complex tasks in the physical and social domains[18]. This indicates a relative homogeneity of the scale in both cultures and suggests that the results obtained in the Brazilian population can be compared to those from the British population.

The total score on the FES-I-Brazil presented the strongest association to the outcome "falls in the previous year". Thus, scores of 23 points or more would indentify an older adult who suffers sporadic falls, while scores above 31 points would indentify an older adult who suffers recurrent falls. It is important to note that the result for the association with recurrent falls assumes that extreme cases were absent.

The FES-I-Brazil is not an instrument that predicts falls, but a measure that provides an indication of the possible occurrence of falls. The FES-I-Brazil should be one of the components of a comprehensive geriatric assessment which includes biological, psychological and social factors, assisting health care providers to determine the risk of falling among older adults in their life context.

Future studies should be developed with the purpose of establishing normative data of fear of falling assessed through the FES-I-Brazil, and of evaluating the sensibility of this scale after interventions. Moreover, future longitudinal studies are needed to determine which factors are associated with reductions in self-efficacy and fear of falling.

One limitation of this study was the use of a convenience sample. It is possible that subjects with higher fear of falling are less keen to participate in studies with samples consisting of voluntary subjects. It is also important to acknowledge that outcomes in this study were collected by participants' self-report, thus it is possible that measurement bias could have influenced our results[30]. Nevertheless, the standardized procedures[21] used during the interviews are likely to have minimized the participant's attempt to overestimate their answers, reducing the possibility of measurement bias in this study.

Human behavior is complex and is associated with self-efficacy[19,20]. Due to the strong influence of self-efficacy in the adoption and maintenance of maladaptive health behaviors, the success of any strategy to avoid falls and maintain independence of older adults depends not only on improving physical functioning, but also in reducing fear of falling. Therefore, intervention programmes should contain specific strategies focusing on behavioral changes with the purpose of improving self-efficacy and reducing fear of falling, leading in turn to improved health-related outcomes[31]. This also justifies the necessity to assess fear of falling through fall-related self-efficacy scales.

The present study aimed to perform a cross-cultural adaptation and to assess the psychometric properties of the FES-I-Brazil, which is the first instrument culturally adapted to assess fear of falling in elderly Brazilians. The results of the study indicate that the FES-I-Brazil is adequate from a semantic and linguistic point of view and is applicable to community-dwelling elderly Brazilians. The FES-I-Brazil is an important instrument for the assessment of fear of falling both in research and clinical practice, as it enables the reproducibility of results, guides the planning of individualized interventions and allows for comparisons among different populations.

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Appendix 1

Escala de eficácia de quedas – Internacional – Brasil (FES-I-Brasil)

Agora nós gostaríamos de fazer algumas perguntas sobre qual é sua preocupação a respeito da possibilidade de cair. Por favor, responda imaginando como você normalmente faz a atividade. Se você atualmente não faz a atividade (por ex. alguém vai às compras para você), responda de maneira a mostrar como você se sentiria em relação a quedas se você tivesse que fazer essa atividade. Para cada uma das seguintes atividades, por favor, marque o quadradinho que mais se aproxima de sua opinião sobre o quão preocupado você fica com a possibilidade de cair, se você fizesse esta atividade.

	Nem um pouco preocupado 1	Um pouco preocupado 2	Muito preocupado 3	Extremamente preocupado 4
1. Limpando a casa (ex: passar pano, aspirar ou tirar a poeira)	1	2	3	4
2. Vestindo ou tirando a roupa	1	2	3	4
3. Preparando refeições simples	1	2	3	4
4. Tomando banho	1	2	3	4
5. Indo às compras	1	2	3	4
6. Sentando ou levantando de uma cadeira	1	2	3	4
7. Subindo ou descendo escadas	1	2	3	4
8. Caminhando pela vizinhança	1	2	3	4
9. Pegando algo acima de sua cabeça ou do chão	1	2	3	4
10. Indo atender o telefone antes que pare de tocar	1	2	3	4
11. Andando sobre superfície escorregadia (ex: chão molhado)	1	2	3	4
12. Visitando um amigo ou parente	1	2	3	4
13. Andando em lugares cheios de gente	1	2	3	4
14. Caminhando sobre superfície irregular (com pedras, esburacada)	1	2	3	4
15. Subindo ou descendo uma ladeira	1	2	3	4
16. Indo a uma atividade social (ex: ato religioso, reunião de família ou encontro no clube)	1	2	3	4