Brazilian Journal of Physical Therapy 25 (2021) 78–85

abrapg·ft
Associação Brasileira de Pesquisa e Pós-Graduação em Fisioterapia

Brazilian Journal of Physical Therapy

https://www.journals.elsevier.com/brazilian-journal-of-physical-therapy

ORIGINAL RESEARCH

Cross-cultural adaptation and reliability of the Functional Gait Assessment in older Brazilian adults

Renata Noce Kirkwood[a,b,*], **Natália Cristina Lisboa Batista**[c], **Larissa Bragança Falcão Marques**[b], **Juliana de Melo Ocarino**[b], **Lucas Lobo Alcântara Neves**[c], **Bruno de Souza Moreira**[d]

[a] *School of Rehabilitation Sciences, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada*
[b] *Graduate Program in Rehabilitation Science, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil*
[c] *Graduate Program in Health Science, Faculdade Ciências Médicas de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil*
[d] *Graduate Program in Public Health, Faculty of Medicine, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil*

Received 2 July 2019; received in revised form 20 February 2020; accepted 21 February 2020
Available online 28 February 2020

KEYWORDS
Older adults;
Cultural adaptation;
Reliability;
Postural balance;
Gait;
Rehabilitation

Abstract
Background: The Functional Gait Assessment (FGA) is a standardized instrument for assessing postural stability during various walking tasks. It was developed to increase the reliability and to decrease the potential ceiling effect observed with the Dynamic Gait Index (DGI).
Objective: To translate and cross-culturally adapt the FGA into Portuguese-Brazilian, and to evaluate its reliability in community-dwelling Brazilian older adults.
Methods: The process of translation and cross-cultural adaptation followed the recommendations of international guidelines. The pre-final version was applied to a sample of 55 older adults of both sexes living independently in the community. For the assessment of reliability (i.e. inter- and intra-rater reliability, standard error of measurement (SEM), and internal consistency), 70 older adults aged 60–87 years were evaluated.
Results: There was a conceptual equivalence between the original and the translated versions. All FGA items that used measurements in inches and feet were modified to use matching values in centimeters to reflect the measurement unit used in Brazil. The FGA-Brazil showed excellent inter- and intra-rater reliability ($ICC_{2,1}$ > 0.90), low SEM (ranging from 1.03 to 1.52), and good internal consistency (Cronbach's alpha = 0.858).
Conclusion: The FGA-Brazil is a semantically and linguistically valid and reliable instrument to assess walking balance among community-dwelling older adults.

* Corresponding author at: School of Rehabilitation Science, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada.
E-mail: kirkwor@mcmaster.ca (R.N. Kirkwood).

https://doi.org/10.1016/j.bjpt.2020.02.004

Introduction

Falls in older adults is a leading public health problem worldwide. Balance impairment is widely recognized as one of the most critical modifiable risk factors for falls, and; therefore, is a key target of fall prevention interventions.[1] The major consequences of falls among older adults are fractures, disability, dependency, fear of falling, social isolation, anxiety, activity avoidance, and institutionalization that can negatively impact an individual's quality of life.[2,3] Therefore, timely identification of individuals at risk for falls is an important goal for physical therapists to plan effective strategies to avoid or decrease the occurrence of falls in the older population.

Many instruments have been developed to screen and identify older adults at risk for falling, including the Performance-Oriented Mobility Assessment (POMA),[4] Timed Up and Go (TUG),[5] Berg Balance Scale,[6] and Dynamic Gait Index (DGI).[7] However, these clinical tests show a ceiling effect in older adults living in the community.[8] Consequently, Wrisley et al.[9] modified the DGI and developed an instrument called the Functional Gait Assessment (FGA) to increase the reliability and to decrease the potential ceiling effect observed with the DGI in individuals with vestibular problems. Furthermore, the authors noted that the instructions of the DGI items were ambiguous and wanted to improve the operational definitions and add more challenging items.[9] Thus, the FGA is a tool that evaluates the individual's postural stability during tasks that require change in gait patterns. In other words, it is a clinical outcome measure that assesses balance while walking.[10]

Developing new country-specific instruments is costly and time-consuming, as well as making it difficult to compare data between populations from different countries or cultures. Thus, it is recommended to adapt and validate existing instruments for the desired culture.[11] The translation, cross-cultural adaptation, and evaluation of the clinimetric properties of an instrument is essential to ensure that the new instrument is culturally accepted and equivalent to the original version.[12] Therefore, the objective of this study was to describe the process of translation to Portuguese-Brazilian and cross-cultural adaptation of the FGA for community-dwelling older adults. We also evaluated the following selected clinimetric properties of the translated version: inter- and intra-rater reliability, standard error of the measurement (SEM), and internal consistency.

Methods

Functional Gait Assessment (FGA)

The FGA consists of 10-items: gait on level surface, changes in gait speed, gait with horizontal head turns, gait with vertical head turns, gait and pivot turn, step over obstacles, gait with narrow base of support, gait with eyes closed, ambulating backwards, and steps. The test is conducted on a 6 m long and 30 cm wide walkway and requires minimal equipment, consisting of a chronometer, two 11 cm high shoeboxes, and a set of steps with handrail. The quality of performance on each item is graded on a four-point ordinal scale ranging from 0 (severe impairment), 1 (moderate impairment), 2 (mild impairment), to 3 (normal), with a maximum score of 30 points. The higher the score, the better the individual's postural stability during gait tasks. Prior analysis showed inter- and intra-rater reliability (intraclass correlation coefficient – ICC) of the FGA, in individuals with vestibular disorders, of 0.84 and 0.83, respectively.[9] In addition, kappa values, indicating inter-rater agreement of the total items was 0.50 (% agreement = 58%) and the lowest kappa values were found for item 5 (0.34) and item 2 (0.37). Kappa values for intra-rater agreement of the total items was 0.50 (% agreement = 67%) and the lowest kappa values were found for item 8 (0.16) and item 7 (0.30). Internal consistency of the FGA scores was 0.79.[9]

Translation and cross-cultural adaptation

After obtaining permission for translation and adaptation of the FGA by the authors of the original instrument, we followed the recommendations proposed by Beaton et al.[13] to guarantee semantic, idiomatic, and conceptual equivalence between the original and translated versions. In the first stage, two bilingual translators with different backgrounds, for whom English was their native language, translated the original version of the FGA to Portuguese-Brazilian, producing two translated version, T1 and T2. Subsequently, a committee composed of two physical therapists and a research professor, whose Portuguese was their native language, met to discuss the discrepancies between translations T1 and T2 and produce one common translated document (T-12). In stage three, the T-12 document was individually back translated to English by two persons, once again with different backgrounds, whose English was their native language. One of the back translators was a physical therapist and the other a software engineer. Two versions in English were created (B1 and B2) through this process.

An expert committee was then assembled and gathered to consolidate all versions (T1, T2, B1, and B2) and create a pre-final version of the translated document. The participants were asked about the difficulties in understanding the items of the FGA-Brazil and further adjustments, change in terms, and need to give examples, were discussed with the potential to be incorporated in a final version of the FGA-Brazil. The final stage of the adaptation process consisted of submitting all the reports and translated versions to the original authors of the FGA for their final approval.

Testing pre-final version of the FGA-Brazil

The pre-final version was used in a sample of 55 community-dwelling older adults, of both sexes, selected at the ambulatory care of the Faculdade Ciências Médicas de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil where data collection took place. Potential participants at the waiting room of the ambulatory care were approached by the principal investigator who provided information about the study and invited participation. Data were collected from May to September 2018. The sample size was based on the recommendations by Beaton et al.[13] Inclusion criteria were: 60 years or older, living independently in the community, able to stand up for at least one minute, and a minimum score of 17 on the Mini-Mental State Examination.[14]

Older adults with history of recent fractures, surgeries in the lower limbs, cardiac and neurologic diseases, or taking prescription medicine that could affect balance were excluded from the study. The study was approved by the Ethical Research Committee of Faculdade Ciências Médicas de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil (CAEE: 71178417.8.0000.51240) and all participants signed the consent form.

Two physical therapists and one research assistant were responsible for data collection. Initially, sociodemographic and clinical information, including sex, age, body mass, height, chronic diseases, falls in the previous year, physical activity investigated by a dichotomous response ''yes'' or ''no'', fear of falling evaluated by the Brazilian version of the Falls Efficacy Scale – International (FES-I-Brazil),[15] and gait speed evaluated with the 4-meter walk test, were obtained from the participants. Subsequently, the participants were asked to walk over a delimited area of 6 m in length by 30 cm in width. The commands were conducted alternately by the two physical therapists. The three raters were distributed on either side of the walkway, 2 m apart. The entire set of tests was performed twice with a resting interval of 30 min between the first and second set. Each rater had a chronometer and a paper copy of the pre-final version of the FGA-Brazil.

After completion, each rater was asked to assess the adequacy of the 10 items of the FGA-Brazil by describing any difficulties while applying the test, and by reporting the perceived difficulties from the participants to perform the tasks. According to the guidelines adopted, items with 15% or more negative responses would indicate the need to revise the translation.[13]

Reliability properties

Clinimetric properties included inter- and intra-rater reliability analysis, SEM, and internal consistency of the final version of the FGA-Brazil. The reliability assesses the consistency of the measurements and the SEM indicates the amount of variability in the test. Internal consistency evaluates the extent of the interrelation among the items of the FGA. Three raters, two physical therapists with 10 years of experience and one research assistant (fourth-year physical therapy student) applied the final version of the FGA-Brazil to a group of 40 older adults. Data from 30 participants of the 55 that participated in the pre-final phase were also used, totalizing 70 adults. To avoid combining different data sets, the first 25 participants of the pre-final phase were eliminated because of the wording changes made to clarify some of the items of the FGA-Brazil to the participants. Data collection took place at the same ambulatory and the same selection criteria were applied to this group. The sample size was based on recommendations of the COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) that considers 50–99 participants a good sample size.[16]

Data analysis

Sample characteristics were described using absolute frequency and percentage for categorical variables, and mean and standard deviation for continuous variables. Intra- and inter-rater reliability of the total FGA-Brazil score were evaluated using $ICC_{2,1}$ with a two-way random-effects model. The ICC was interpreted as follows: poor (<0.50), moderate (0.50 to 0.75), good (0.76 to 0.90), and excellent reliability (>0.90).[17] For the reliability of the single items we used weighted kappa. The following criteria were used to interpret the kappa results: <0, poor; 0.0 to 0.20 slight; 0.21 to 0.40 fair; 0.41 to 0.60 moderate; 0.61 to 0.80 substantial; and 0.81–1.00, almost perfect.[18,19] Intra-rater reliability was obtained using the total score and item score collected by the three raters in two measurements performed within a 30-min rest interval. Inter-rater reliability was determined by comparing the total score and items between raters. Raters refrained to talk about their scores throughout the study.

The SEM was obtained by the square root of the mean square error from the ANOVA test conducted.[20] Internal consistency of the FGA-Brazil was assessed using Cronbach's alpha. The ''corrected item-total correlation'' are the correlations between each item and the total score from the FGA-Brazil. Correlations below 0.30 indicated a low degree correlation between the item and the remaining items.[21] Analyzes were conducted using SPSS 25 with a 95% confidence level.

Results

Participants included 70 older adults, consisting of 51 females and 19 males, aged 60–87 years. The sociodemographic and clinical characteristics of the participants are shown in Table 1. The mean time to complete the FGA-Brazil was 35 min.

Synthesis of the translations

During the conciliation meeting following the initial translations T1 and T2, few items diverged between the pair of translators, and the main divergences are described in Table 2.

Pre-testing phase

The following are the changes made to wording to clarify some of the items of the FGA-Brazil to the participants:

Item 3 - Gait with horizontal head turns: participants had difficulties understanding and performing the task of turning the head to the right and after three steps turning the head to the left without stopping walking. To overcome that, we demonstrated to the participants how to execute the task before the beginning of the task.

Item 4 - Gait with vertical head turns: as in the prior item, participants had difficulties understanding and performing the task of moving the head up and after three steps move the head down without stopping walking. To overcome that, we demonstrated to the participants how to execute the task before the beginning of the task.

Item 10 - Steps: some participants had problems understanding ''walk up these stairs'', because in Portuguese we usually say ''walk up the steps of the stairs'' or ''*subir os*

Table 1 Sociodemographic data, chronic diseases and health-related variables of the participants (N = 70).

Variables	Total sample	Female	Male
Sociodemographic data			
Sex[a]	70 (100)	51 (72.9)	19 (27.1)
Age (years)	70.0 ± 7.8	69.8 ± 7.3	71.2 ± 8.9
Body mass (kg)	69.1 ± 11.2	67.3 ± 11.1	73.4 ± 10.7
Height (m)	1.63 ± 0.1	1.61 ± 0.1	1.68 ± 0.1
BMI (kg/m^2)	25.8 ± 3.8	25.7 ± 4.2	26.1 ± 2.2
Schooling[a]			
No education	2 (2.9)	2 (3.9)	–
Elementary School	55 (77.5)	40 (78.4)	15 (78.9)
High School	11 (14.2)	7 (13.7)	4 (21.1)
Incomplete University	2 (2.9)	2 (3.9)	–
Chronic Diseases[a]			
Hypertension	49 (70.0)	37 (72.5)	12 (63.2)
Diabetes mellitus	16 (22.9)	14 (27.5)	2 (10.5)
Health-related variables			
Falls in the previous 12 months[a]			
0	46 (65.7)	28 (54.9)	18 (94.7)
1	11 (15.7)	10 (19.6)	1 (5.3)
2	7 (10.0)	7 (13.7)	–
≥ 3	6 (8.5)	6 (11.9)	–
FES-I (score)	24.8 ± 8.6	25.9 ± 7.8	21.9 ± 9.9
Physical Activity[a]			
No	50 (71.1)	36 (70.6)	14 (73.7)
Yes	20 (28.6)	15 (29.4)	5 (26.3)
Gait speed (m/s)	1.04 ± 0.5	0.95 ± 0.2	1.26 ± 0.8

[a] Numbers indicate absolute frequency and relative frequency (%) in each category, other values are mean ± standard deviation; BMI: body mass index; FES-I Falls Efficacy Scale – International.

degraus da escada''. Therefore, we adapted the question to facilitate understanding.

Intra- and inter-rater reliability and internal consistency

Table 3 describes the intra- and inter-rater reliability of the total score and kappa values for the 10 items of the FGA-Brazil. Intra- and inter-rater reliability of the three raters for the total score were excellent ($ICC_{2,1}$ > 0.90), with 95% confidence intervals ranging from 0.905 to 0.974 and from 0.930 to 0.986, respectively. Kappa values for the intra-rater reliability of the single items ranged from fair (items 3 and 4) to substantial (items 6, 7, 9, and 10) for rater 1; from fair (item 3) to substantial (items 1, 5, 6, 7, and 10) for rater 2; and from fair (items 3, 4, 8, and 9) to substantial (items 6, 7, and 10) for rater 3. The inter-rater reliability showed kappa values ranging from moderate to almost perfect, with item 9 showing the lowest reliability when the results were compared between rater 1 and rater 3.

Cronbach's alpha for the total items combined was 0.858, showing that the FGA-Brazil has good internal consistency (Table 4). The total correlations between the items and the total score of the FGA-Brazil were above 0.30, highlighting that all the items correlated very well with the overall scale. As showing in Table 4, for every single item deleted, the Cronbach's alpha value was less than the value with the 10 items together.

Discussion

The original version of the FGA was successfully translated and cross-culturally adapted for use with the Brazilian population. The FGA-Brazil is a reliable instrument; that could be used in both research and clinical settings. The instrument is easy to administer and requires minimal equipment. Previous study conducted in older adults reported that participants completed the FGA in approximately 10 min.[10] However, in the current study, the average completion time for the FGA-Brazil was 35 min. The low educational level of our sample (for 77.5% of participants the highest level of education was elementary school) might explain the increased time of application. Most of the participants needed a visual demonstration of how to complete some tasks in addition to the instructions. Traditionally, the FGA has been used as an assessment instrument, but we believe that it can also help physical therapists in their interventions. For example, if the patient demonstrates difficulty performing a specific item of the scale, that task could be specifically targeted and trained during rehabilitation sessions.

Divergences between the translated versions (T1 and T2) were identified in few items of the instrument, which were discussed among the members of the expert committee during the reconciliation meeting to establish solutions. For example, in item 5, there were two different translations proposed for the wording ''gait and pivot turn'': ''caminha

Table 2 Divergences observed during the reconciliation meeting of the translated versions (T1 and T2) and proposed solutions.

Original Item	Divergence	Solution	Final Wording
1. Gait level surface	a. Translation proposed for the word ''gait'': *caminha* Translation of the word ''gait'' omitted b. Translation proposed for the word ''impairment'' in the classification system used in the FGA: *prejuízo* and *insuficiência*	a. Change the word ''*caminha*'' to ''*andar*'' *the word ''*caminha*'' was changed to ''*andar*'' throughout the text b. Change the word ''*prejuízo*''and ''*insuficiência*'' to ''*deficiência*''	a. *Andar em uma superfície plana* b. *Deficiência leve, Deficiência moderada; Deficiência grave* *these words were used throughout the classification system of the FGA-Brazil
3. Gait with horizontal head turns	a. Different translation proposed for the wording in the instruction part ''normal pace'': *passo normal* and *ritmo normal* b. Translation proposed for the wording ''(eg, staggers 38.1 cm [15 in. outside 30.48-cm (12-in) walkway width, loses balance, stops, or reaches for wall)'': *(ex. Cambaleia 38,1 cm [15 in. fora do comprimento da pista de 30,48 cm (12 in., perde o equilíbrio, para, ou toca a parede)*	a. The committee opted for the expression ''*ritmo normal*'' b. The committee opted for the expression: understands ''*tropeça para fora da largura da pista de 30 cm*	a. *Comece a andar no seu ritmo normal* b. *(ou seja, tropeça para fora da largura da pista de 30 cm, perde o equilíbrio, para ou toca a parede)*
4. Gait with vertical head turns	Translation proposed for the wording ''vertical head turns'': *cabeça inclinada para cima e para baixo* Translation proposed for the wording ''vertical head turns'': *movimento vertical da cabeça*	The committee opted for the expression''*movimento vertical da cabeça para cima e para baixo*''	*Marcha com movimento vertical da cabeça para cima e para baixo*
5. Gait and pivot turn	Translation proposed for the wording ''gait and pivot turn'': *caminha e gira* and *marcha e vira*	The committee opted for the expression ''*marchar e girar*''	*Marchar e girar*
7. Gait with narrow base of support	Translation proposed for the wording ''narrow base of support'': *base estreita e limitada* and *menor base de suporte*	The committee opted for the expression ''*base de suporte estreita*''	*Marcha com base de suporte estreita*
Initial instructions and unit measures	All the items that had measurements in inches and feet, the respective number was transformed into centimeters and rounded. Example: Requirements: A marked 6-m (20-ft) walkway that is marked with a 30.48-cm (12-in) width.	Rounded the numbers and omitted the unit measurements in inches and feet.	*Exigências: uma pista marcada com 6 metros de comprimento e 30 cm de largura.*

e gira'' and ''marcha e vira''. The committee opted for the expression ''marchar e girar''. The experts also changed the translation of some specific words to words that are more usual for the Brazilian population. For example, in item 1, the word ''gait'' was translated as ''caminha'', but the committee opted to use the word ''andar''. Similar solutions as mentioned above occurred for other items of the instrument (items 3, 4 and 7). In addition, it is important to highlight that all FGA items using measurements in inches and feet were changed to the equivalent values in centimeters to reflect the measurement unit used in Brazil.

Since the FGA was developed, several studies have been performed to evaluate the reliability of this instrument in individuals with diverse health conditions, such as vestibu-

Table 3 Intra- and inter-rater reliability of the FGA-Brazil single items and total score (N = 70).

FGA-Brazil	Intra-rater reliability			Inter-rater reliability		
	R1	R2	R3	R1xR2	R1xR3	R2xR3
[a]Score Total	0.941	0.957	0.947	0.967	0.956	0.978
Item 1	0.507	0.642	0.594	0.777	0.760	0.849
Item 2	0.477	0.524	0.538	0.662	0.554	0.709
Item 3	0.313	0.372	0.400	0.715	0.723	0.699
Item 4	0.312	0.583	0.396	0.657	0.630	0.710
Item 5	0.501	0.695	0.433	0.656	0.580	0.592
Item 6	0.752	0.807	0.691	0.915	0.773	0.735
Item 7	0.657	0.722	0.732	0.750	0.720	0.806
Item 8	0.416	0.573	0.383	0.657	0.642	0.864
Item 9	0.655	0.484	0.379	0.596	0.472	0.601
Item 10	0.746	0.807	0.793	0.883	0.922	0.876
SEM	1.50	1.36	1.52	1.17	1.33	1.03

R1 physical therapist 1; R2 physical therapist 2; R3 student; SEM standard error of measurement for the total score.
[a] $ICC_{2,1}$; single items determined with weighted kappa.

Table 4 Internal consistency and correlation of the FGA-Brazil items (N = 70).

FGA-Brazil Cronbach's alpha 10 items	0.858	
FGA-Brazil Items	Corrected item-total correlation	Cronbach's alpha if item deleted
Item 1	0.607	0.841
Item 2	0.436	0.854
Item 3	0.608	0.841
Item 4	0.489	0.850
Item 5	0.619	0.841
Item 6	0.588	0.842
Item 7	0.645	0.843
Item 8	0.510	0.849
Item 9	0.599	0.842
Item 10	0.637	0.838

lar disorders,[9] stroke,[22,23] Parkinson's disease,[24,25] and post total knee arthroplasty.[26] However, only one study examined the inter-rater reliability of the total score of the FGA in older adults.[27] Walker et al.,[27] in a group of 200 older adults, reported an ICC for the total score of 0.93. The ICC of our total score was greater and ranged from 0.956 (rater 1 and rater 3) to 0.978 (rater 2 and rater 3). To our knowledge, intra-rater reliability has not yet been studied in community-dwelling older adults and we are the first ones to investigate this clinimetric property in this population. For the total score, the intra-rater reliability of the FGA-Brazil ranged from 0.941 to 0.957 among the three raters, indicating excellent reliability and consistency of the measurements obtained within the same day.

The intra-rater reliability of the single items, expressed as weighted kappa, was especially low ($\leq$0.40) for items 3 (gait with horizontal turns), 4 (gait with vertical head turns), 8 (gait with eyes closed), and 9 (walking backward). These items were the most difficult for the older adults to perform and the lower reliability might be related to the differences in patient performance. Similar results have been reported by Wrisley et al. that showed that those items are more difficult to assess reliably.[9] Nevertheless, these findings show that the final Brazilian version of the instrument is reliable when assessed by different raters.

In relation to the kappa values for inter-rater reliability of the single items, the results ranged from moderate to almost perfect. Item 9 (ambulating backwards) showed the lowest kappa value (0.472) when comparing the scores between rater 1 and rater 3. Therefore, these results indicate greater consistency of the measurements between different raters than intra-raters when assessing the single items of the FGA in older Brazilian population. It is important to highlight that the intra-rater reliability values were based on the same raters rating the test performed on two separate occasions. Therefore, it reflects consistency of performance of the participant between test occasions in addition to the consistency of the rater. In contrast, the inter-rater reliability is based on the raters looking at the same test occasion, therefore reflective of consistency between raters. Poorer intra-rater reliability indicates that the performance of the participants varied substantially between test occasions. Therefore, this suggests that in clinical or research settings, individual components of the FGA may need to be performed on more than one occasion, if interpreting the score or changes in score for individual components.

Internal consistency (Cronbach's alpha) can be defined as the consistency of the elements of a scale, with higher values indicating greater internal consistency.[25] In our study, the Cronbach's alpha for the total FGA score was 0.858, which was higher than that found in the original version of the instrument in a study conducted in individuals with vestibular disorders (Cronbach's alpha = 0.79).[9] Therefore, this result demonstrates a good internal consistency of the FGA-Brazil when applied to community-dwelling Brazilian older adults.

The ''corrected item-total correlation'' is a measure that assesses if the homogeneity of the latent trait of the items to

be measured is similar to that of the remaining items.[25] It is expected that after the deletion of a scale's item, the Cronbach's alpha value of the remaining items should be smaller than that observed with all the scale's items. If the Cronbach's alpha value becomes greater after an item is omitted, there is no homogeneity between the latent trait of the item measured and the other scale's items.[25] In our study, the ''corrected item-total correlation'' ranged from 0.436 (item 2) to 0.645 (item 7), which is higher than 0.30, showing that there was good correlation between every single item and the remaining items of the FGA-Brazil. Moreover, all the Cronbach's alpha values calculated after deletion of a single item were lower than 0.858 (Cronbach's alpha of the total score), demonstrating that the same construct or concept was measured by each single item and the remaining items.

Some study limitations need to be addressed. First, we only included older adults living independently in the community and from a small geographical area, which limits the external validity of the study. It is uncertain whether the same results would be observed if the FGA-Brazil was applied to a different older adult population. Second, the use of walking-aid devices was allowed during tests with the FGA. However, none of the participants used those devices in the present study. Finally, the two measurements of the FGA were obtained within the same day, with a resting interval of 30 min between tests. Therefore, results may have been affected by fatigue of the participants and recall from the raters. Future studies should be conducted to determine other clinimetric properties of the FGA-Brazil, such as concurrent validity, discriminate validity, ability to predict falls, and responsiveness to change in community-dwelling older adults, as well as in other populations with specific health conditions.

Conclusion

The FGA in Brazilian-Portuguese language is semantically and linguistically valid as well as sufficiently reliable for evaluating postural stability during various walking tasks in the community-dwelling Brazilian older adults. The FGA-Brazil showed excellent intra- and inter-rater reliability and good internal consistency. Therefore, we strongly recommend that the FGA-Brazil should be used both in clinical setting and in research as assessment tool, but also to guide walking balance training in the Brazilian elderly population.

Conflicts of interest

The authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.bjpt.2020.02.004.

References

1. Muir SW, Berg K, Chesworth BM, Klar N, Speechley M. Modifiable risk factors identify people who transition from non-fallers to fallers in community-dwelling older adults: a prospective study. *Physiother Can*. 2010;62:358–367.
2. Kenny R, Romero-Ortuno R, Kumar P. Falls in older adults. *Medicine*. 2017;45:28–33.
3. Moreira BS, Sampaio RF, Diz JB, et al. Factors associated with fear of falling in community-dwelling older adults with and without diabetes mellitus: findings from the Frailty in Brazilian Older People Study (FIBRA-BR). *Exp Gerontol*. 2017;89:103–111.
4. Tinetti ME. Performance-oriented assessment of mobility problems in elderly patients. *J Am Geriatr Soc*. 1986;34:119–126.
5. Podsiadlo D, Richardson S. The timed ''Up & Go'': a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc*. 1991;39:142–148.
6. Berg K, Wood-Dauphinee S, Williams JI, Gayton D. Measuring balance in the elderly: preliminary development of an instrument. *Physiother Can*. 1989;41:304–311.
7. Shumway-Cook A, Woollacott M. Assessment and treatment of the patient with mobility disorders. In: Shumway-Cook A, Woollacott M, eds. *Motor control: theory and practical applications*. Baltimore, MD: Williams & Wilkins; 1995:315–354.
8. Wrisley DM, Kumar NA. Functional gait assessment: concurrent, discriminative, and predictive validity in community-dwelling older adults. *Phys Ther*. 2010;90:761–773.
9. Wrisley DM, Marchetti GF, Kuharsky DK, Whitney SL. Reliability, internal consistency, and validity of data obtained with the functional gait assessment. *Phys Ther*. 2004;84:906–918.
10. Beninato M, Ludlow LH. The Functional Gait Assessment in older adults: validation through Rasch modelling. *Phys Ther*. 2016;96:456–468.
11. Maher CG, Latimer J, Costa LOP. The relevance of cross-cultural adaptation and clinimetrics for physical therapy instruments. *Rev Bras Fisioter*. 2007;11:245–252.
12. Sartor CD, Oliveira MD, Campos V, Ferreira JSSP, Sacco ICN. Cross-cultural adaptation and measurement properties of the Brazilian version of the Michigan neuropathy screening instrument. *Braz J Phys Ther*. 2018;22:222–230.
13. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000;25:3186–3191.
14. Bertolucci PH, Brucki SM, Campacci SR, Juliano Y. The Mini-Mental State Examination in a general population: Impact of educational status. *Arq Neuropsiquiatr*. 1994;52:1–7.
15. Camargos FF, Dias RC, Dias JM, Freire MT. Cross-cultural adaptation and evaluation of the psychometric properties of the Falls Efficacy Scale-International Among Elderly Brazilians (FES-I-BRAZIL). *Braz J Phys Ther*. 2010;14:237–243.
16. Mokkink LB, Prinsen CA, Bouter LM, Vet HC, Terwee CB. The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) and how to select an outcome measurement instrument. *Braz J Phys Ther*. 2016;20:105–113.
17. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med*. 2016;15:155–163.
18. Kundel HL, Polansky M. Measurement of observer agreement. *Radiology*. 2003;228:303–308.
19. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33:159–174.
20. Weir JP. Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. *J Strength Cond Res*. 2005;19:231–240.
21. Field A. *Discovering statistics using SPSS*. 3rd ed. California: Sage Publications; 2009.
22. Thieme H, Ritschel C, Zange C. Reliability and validity of the functional gait assessment (German version) in subacute stroke patients. *Arch Phys Med Rehabil*. 2009;90:1565–1570.

23. Van BM, Bout W, Bus SA, Nollet F, Geurts AC, Beelen A. Validity and reproducibility of the Functional Gait Assessment in persons after stroke. *Clin Rehabil*. 2019;33:94–103.
24. Leddy AL, Crowner BE, Earhart GM. Functional gait assessment and balance evaluation system test: reliability, validity, sensitivity, and specificity for identifying individuals with Parkinson disease who fall. *Phys Ther*. 2011;91:102–113.
25. Yang Y, Wang Y, Zhou Y, Chen C, Xing D. Reliability of functional gait assessment in patients with Parkinson's disease: interrater and intrarater reliability and internal consistency. *Medicine (Baltimore)*. 2016;95:e4545.
26. Chan AC, Pang MY. Assessing balance function in patients with total knee arthroplasty. *Phys Ther*. 2015;95:1397–1407.
27. Walker ML, Austin AG, Banke GM, et al. Reference group data for the functional gait assessment. *Phys Ther*. 2007;87(11): 1468–1477.