



## ORIGINAL ARTICLE

## Cross-cultural adaptation, validation, and reproducibility of the Alusti Test for the evaluation of physical and functional capacity in Brazilian older adults



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## ABSTRACT

**Introduction:** The Alusti Test is a Spanish scale for the multidimensional assessment of functionality in older adults. Nevertheless, it has not yet been cross-culturally adapted to the Portuguese language.

**Objective:** To carry out the cross-cultural adaptation of the Alusti Test in Brazilian Portuguese and to evaluate its psychometric properties.

**Method:** The cross-cultural adaptation process into Brazilian Portuguese followed international recommendations. The test was applied to 100 individuals of both sexes aged 60 or over. Anthropometric, demographic data, education level, and Charlson Comorbidity Index were collected. The intraobserver reproducibility of the Alusti Test was evaluated twice, at an interval of 7–10 days (test–retest) using the intraclass correlation coefficient (ICC). Internal consistency was assessed using Cronbach's alpha coefficient. Finally, the validation of the Alusti Test in relation to the Barthel Scale and the Short Physical Performance Battery (SPPB) was verified using Spearman's correlation coefficient.

**Results:** The Brazilian version showed an excellent intraclass correlation coefficient (ICC = 0.997 [0.996–0.998]). Internal consistency showed a Cronbach's alpha value of 0.96. There was a positive, strong and significant correlation between the Alusti Test and the Barthel Scale ( $r = 0.93$ ) and Short Physical Performance Battery (SPPB) ( $r = 0.94$ );  $p < 0.0001$  for both.

**Conclusion:** The Portuguese version of the Alusti Test has demonstrated both validity and reproducibility for assessing physical and functional capacity in older adults. This establishes it as a valuable tool for evaluating the geriatric population, contributing to improved understanding and management of their health and functional needs.

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### Adaptación transcultural, validación y reproducibilidad del Alusti Test para la evaluación de la capacidad física y funcional en adultos mayores Brasileños

## RESUMEN

**Introducción:** El Test Alusti es una escala española para la evaluación multidimensional de la funcionalidad de las personas mayores. Sin embargo, aún no ha sido adaptada transculturalmente al idioma portugués.

**Objetivo:** Realizar la adaptación transcultural del Test Alusti al portugués de Brasil y evaluar sus propiedades psicométricas.

## Palabras clave:

Anciano  
Estado Funcional  
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**Método:** El proceso de adaptación transcultural siguió las recomendaciones internacionales. La prueba se aplicó a 100 individuos de ambos sexos de 60 años o más. Se evaluaron datos antropométricos, demográficos, nivel educativo e Índice de Comorbilidad de Charlson. La reproducibilidad intraobservador del Test Alusti se analizó en dos ocasiones, con un intervalo de 7 a 10 días (test-retest), utilizando el coeficiente de correlación intraclase (CCI). La consistencia interna se determinó mediante el coeficiente alfa de Cronbach. Finalmente, la validez del Test Alusti en relación con la Escala de Barthel y la Batería de Desempeño Físico Breve (SPPB) se verificó mediante el coeficiente de correlación de Spearman.

**Resultados:** La versión brasileña mostró un coeficiente de correlación intraclase excelente (CCI=0.997 [0.996 – 0.998]). La consistencia interna presentó un valor de alfa de Cronbach de 0.96. Se encontró una correlación positiva, fuerte y significativa entre el Test Alusti y la Escala de Barthel ( $r=0.93$ ) y la SPPB ( $r=0.94$ );  $p<0.0001$  para ambas.

**Conclusión:** La versión en portugués del Test Alusti ha demostrado validez y reproducibilidad para la evaluación de la capacidad física y funcional en adultos mayores, estableciéndose como una herramienta valiosa para la evaluación geriátrica y la mejora en la comprensión y manejo de su salud y necesidades funcionales.

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## Introduction

The aging process is understood to be a complex and individualized process, characterized by morphological, metabolic, psychological and physical changes.<sup>1</sup> These changes can generate loss of muscle mass, strength and physical performance, which would be related to sarcopenia, decreased functional capacity, level of physical activity, functionality and independence.<sup>2,3</sup>

Considering the dizzying increase in the number of older individuals around the world, coupled with the high prevalence of chronic degenerative diseases that contribute to functional decline, in addition to concerns related to quality of life, morbidity and mortality, it is necessary to assess functional capacity to determine the profile of these individuals, in order to develop strategies and guidelines for planning appropriate conduct for this population.<sup>4-6</sup>

To ascertain the capabilities and potential of the older population, there are operational functional assessment models, such as the Katz Index, which assesses an individual's functional capacity to perform six basic functions of daily living: bathing, dressing, using the bathroom, transferring, continence and nutrition.

The classification as independent, partially or totally dependent to carry out these activities is based on the interpretation of the results, which demonstrate the functionality still present in the individual being evaluated and helps with the creation of an action plan to improve the individual's quality of life.<sup>7</sup>

Another instrument used in clinical practice is the Lawton and Brody Scale, which seeks to evaluate instrumental activities of daily living, such as preparing one's own meals, using the telephone, shopping, taking medication, performing light household tasks, performing demanding household tasks and managing money.<sup>8</sup> In addition to specific tests for certain activities, there are other options that are more focused on physical and functional performance, such as the 4-meter gait speed test,<sup>9</sup> the Timed Up and Go test,<sup>10</sup> and the sit and stand test,<sup>11</sup> among others.

Nevertheless, there are limitations among the available assessment methods, mainly related to the impossibility of application to the entire geriatric population, due to their physical, functional and psychological conditions.

Meanwhile, the Alusti test, designed by physiotherapist Josu Alustiza Navarro, is an instrument that was developed in Spain in 2018, which allows for the multidimensional assessment of the functionality of an older individual. For each function evaluated, the individual receives a score according to their performance. There are two versions (full and abbreviated), with the abbreviated version assessing only five aspects which is recommended for individuals with a higher degree of dependence.<sup>12</sup> The full version is applied progressively according to the capabilities of the individ-

ual being tested and evaluates 10 aspects: (1) Passive mobility; (2) Active mobility; (3) Transfer from the supine position to the sitting position; (4) Trunk in sitting position; (5) Transfer from sitting to standing position; (6) Standing; (7) Gait; (8) Distance traveled; (9) Tandem with the eyes closed; (10) Single leg support with the eyes closed.

From a complexity standpoint, the Alusti Test can cover situations in which the subjects are fully cooperative (variables 1–10) to situations with insufficient cooperation or even no cooperation at all. Regarding scoring and classification, it is categorized into seven classification ranges: 0–30 (totally dependent); 31–40 (severe dependence); 41–50 (moderate dependence); 51–60 (light dependence); 61–75 (Good mobility); 76–90 (Very good mobility); 91–100 (Excellent mobility).

Currently, an increasing number of assessment instruments are being developed across many different cultures in numerous countries. As such there is no doubt of the importance of carrying out cross-cultural adaptation and investigating the psychometric properties of each instrument that is to be used, so that it can be applied on a large scale.

In view of the above, it seems plausible to state that the cross-cultural adaptation and validation of the Alusti Scale for the Brazilian Portuguese language will be of great value for therapeutic clinical practice, considering that it is a scale that is easy and quick to apply, enabling an assessment of multidimensional functional capacity in older individuals, whether they are dependent or independent when it comes to activities of daily living.

The objective of this work was to carry out the cross-cultural adaptation of the Alusti Test in Brazilian Portuguese, as well as to evaluate its psychometric properties in older adults.

## Materials and methods

### Type of study design

This is a methodological study that involves the cross-cultural adaptation and evaluation of the psychometric properties of the Alusti Test, which was approved by the Research Ethics Committee of the State University of Londrina, Paraná (Opinion 5.514.670, CAAE 58613022.3.0000.5231) and authorized by the author of the original Alusti Test.

### Population

In regard to the sample size, for the validation process, in accordance with the checklist on reliability quality, the Consensus-based Standards for the selection of health status Measurement Instru-

ments (COSMIN),<sup>13</sup> it is recommended that this varies between five and seven patients per sample, and at least 100 individuals in total. Therefore, a final sample of 100 older people were chosen for the validation phase of the Alusti Test.<sup>12</sup>

Individuals of both sexes, aged sixty or over, residing in the community or in long-term institutions in different regions of the city of Londrina, Paraná, were included.

For the cross-cultural adaptation stage, 30 individuals were evaluated. Furthermore, 100 older people were included in the validation and reproducibility process. Older people from the community were recruited through advertisements which were placed at local health centers and by way of the snowball system. Institutionalized individuals were recruited by way of invitation, sent to the long-term care institutions (ILP) located in Londrina and the metropolitan region. No pre-selection was carried out at ILP. All older people who agreed to participate were evaluated, except those in respiratory isolation. The exclusion criteria included the occurrence of an adverse event that made it impossible to complete the evaluation tests or the individual's decision to stop participating in the study.

### Procedures

#### Translation and cross-cultural adaptation

The cross-cultural adaptation process into Brazilian Portuguese was developed according to the guidelines proposed by Beaton et al.,<sup>14</sup> international standards to maintain equivalence between the original version and the one adapted into Brazilian Portuguese. The steps in this process are described below.

#### Stage I and II: initial translation into Brazilian Portuguese and synthesis version

The first phase was the translation of the instrument from Spanish to Brazilian Portuguese. To this end, two bilingual translators whose native language is Brazilian Portuguese, made two independent translations (T1 and T2). The translators developed written reports on the difficulties and justifications for translation choices.

A meeting between the translators and the researcher was held with the aim of achieving a common version of the translation (T12), a synthesis version, based on the analysis of the independent translations, in which consensus was sought between the translators rather than personal opinion. A written report was also prepared to document the entire synthesis version process.

#### Stage III: Back-translation

After obtaining the translation and synthesis version in Portuguese, the instrument was converted back into Spanish by two other translators who are native Spanish speakers and who are also fluent in Brazilian Portuguese. These translators had no knowledge of the concepts involved in the research and also produced a written report on the difficulties and justifications for choices in the reverse translation or back-translation process.

#### Stage IV: Review by a committee of experts

A meeting was organized with a committee of experts, made up of: two doctors, a physical education professional, a physiotherapist and a nurse, in addition to the researchers responsible for the project. All of these professionals are specialists and work in the field of Gerontology. Before the meeting, everyone had access to the translations, the summary version and the original version of the questionnaire for analysis and discussion.

In the two meetings held, we sought to meet the four equivalences suggested by Beaton et al.: semantic, idiomatic, experimental and conceptual equivalence. The role of the expert committee was to consolidate all versions of the questionnaire and

develop the pre-final version for field testing, in the so-called pre-test phase.

#### Step V: Pre-test

The pre-test was applied to randomly selected older people from the local community and to older residents of long-term care institutions, who met the research inclusion criteria. The older individuals were tested using the assessment instruments and were then questioned about difficulties in understanding the prompts, as well as misunderstanding of any of the words and or clarity in response options. There was no need to reformulate the assessment, as all participants understood the assessment in question.

#### Stage VI: Sending documentation to authors

Finally, all documentation in relation to the cross-cultural adaptation process was sent to the author of the Alusti Scale for consideration.

#### Additional reviews

An initial assessment questionnaire with personal, anthropometric, demographic data, education level and comorbidities was completed.

For physical and functional assessment, in addition to the Alusti Test, the Barthel Scale<sup>15</sup> was also administered once, measuring functional independence in personal care, mobility, locomotion, and elimination, along with the Short Physical Performance Battery (SPPB),<sup>16</sup> which evaluates physical capacity in older adults across three dimensions: balance, gait speed, and strength. The Charlson Comorbidity Index<sup>17</sup> was employed to identify comorbidities.

#### Assessment of the psychometric properties of the Alusti Test in Brazil

The psychometric validation and reproducibility properties of the Alusti Scale followed the guidelines of the Consensus-based Standards for the selection of health status Measurement INstruments (COSMIN).<sup>13</sup> It is a consensus based on standards in the area of psychometrics, providing a guide for the validation process in measurement instruments in the health field.

For validation, Alusti Test results were compared with the Barthel Scale<sup>15</sup> and the Short Physical Performance Battery (SPPB).<sup>16</sup> The application order of the assessments (Alusti Test, Barthel Scale and Short Physical Performance Battery (SPPB)) was done randomly, by way of a draw.

The reproducibility of the Alusti Test was verified by applying this test at two different times, with an interval of 7–10 days between the assessments.

#### Statistical analysis

The statistical software packages, Statistical Package for the Social Sciences (SPSS) 26.0 (SPSS Inc., Chicago, USA) and GraphPad Prism® 3.0 (GraphPad Software Inc., San Diego, USA) were employed for the analysis. Data normality was assessed using the Shapiro–Wilk test. Specifically, for the scales and the Alusti Test, non-parametric statistical analysis was utilized due to the ordinal nature of the data. The intraclass correlation coefficient (ICC) was used to determine the intraobserver reproducibility and reliability of the Alusti Test (test–retest). Bland and Altman graphical analysis was conducted to visually assess the agreement between the Alusti Test and the Short Physical Performance Battery (SPPB) and Barthel Scales. Internal consistency of the Alusti Test was evaluated using Cronbach's alpha coefficient. Finally, validation of the Alusti Test in relation to the Barthel Scale and the Short Physical Performance

**Table 1**  
General characteristics of the sample.

Variables	Pre-test (n = 30)	Validation (n = 100)	P
Sex, M/F, n (%)	14/16 (47/53)	48/52 (48/52)	0.898
Age (years)	75 [66–81]	78 [69–88]	0.103
<b>Age range</b>			
60–70, n (%)	9 (30)	30 (30)	1.000
71–80, n (%)	13 (43)	24 (24)	0.040
81–90, n (%)	5 (17)	29 (29)	0.178
> or =91, n (%)	3 (10)	17 (17)	0.351
Weight (kg)	70 [68–65]	70 [60–72]	0.095
Height (m)	1.60 [1.57–1.70]	1.60 [1.60–1.68]	0.297
BMI (kg/m <sup>2</sup> )	27 [24–29]	26 [23–28]	0.342
Malnutrition, n (%)	–	1 (1)	0.582
Normal, n (%)	11 (37)	37 (37)	0.974
Overweight, n (%)	13 (43)	48 (48)	0.653
Obese, n (%)	6 (20)	14 (14)	0.424
<b>Education</b>			
Uneducated, n (%)	1 (3)	3 (3)	0.926
EE incomplete, n (%)	3 (10)	19 (19)	0.249
EE complete, n (%)	13 (43)	43 (43)	0.974
HS incomplete, n (%)	2 (7)	11 (11)	0.488
HS complete, n (%)	5 (17)	14 (14)	0.717
Higher education, n (%)	6 (20)	9 (9)	0.098
Post graduate, n (%)	–	1 (1)	0.582

Categorical data was described in absolute (relative) frequency. Numerical data was described as average ± standard deviation or median [interquartile range 25–75%]. M: male; F: female; n: absolute number; BMI: body mass index; kg: kilograms; m: meters; EE: elementary education; HS: high school.

Battery was examined through the Spearman correlation coefficient. A significance level of  $p < 0.05$  was considered statistically significant.

**Results**

The cross-cultural adaptation process produced the Brazilian version of the Alusti Test. Versions T1 and T2 presented few divergences, which were resolved in the synthesis version, prioritizing the use of terms and expressions that are more familiar to the Brazilian population. In the back translation version, there was a lot of similarity to the original and only small changes in grammatical structures were necessary.

Furthermore, guidelines suggested by the committee of experts were followed to adapt to the Brazilian cultural context, thus obtaining the pre-test version based on consensus among the team. When applying the pre-test version with the 30 older people, there was no need for reformulations, as everyone understood the assessment. Table 1 presents the general characteristics of the sample in the pre-test and validation phases of the Alusti Test.

Table 2 presents the functionality assessment scores the scores and classification obtained using the Alusti Test, Barthel Scale and Short Physical Performance Battery (SPPB).

Regarding comorbidities, these were identified using the Charlson Index; the score was 1 [1–2] and 2 [1–3]; and  $p = 0.868$  in the pre-test and validation groups, respectively.

For the reproducibility and intra-rater reliability test, an excellent intraclass correlation coefficient was obtained (ICC = 0.997 [0.996–0.998]). Internal consistency was checked by obtaining a Cronbach’s alpha value of 0.96.

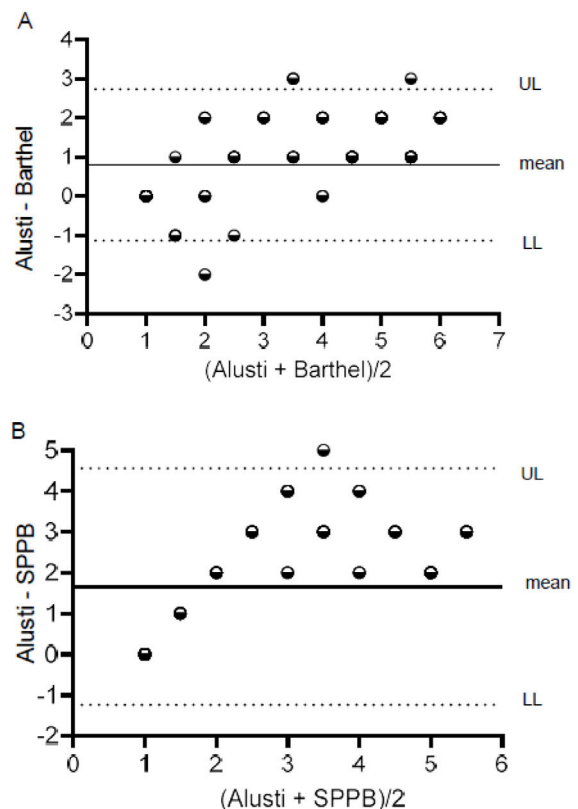
Bland and Altman’s graphical analysis shows the agreement between the Alusti Test and the Short Physical Performance Battery (SPPB) and Barthel Scales (Fig. 1).

When performing the variable correlation test using Spearman’s correlation coefficient, a positive, strong and significant correlation

**Table 2**  
Functional performance of the sample.

Variables	Pre-test (n = 30)	Validation (n = 100)	P
<b>SPPB</b>			
Total (points)	3 [0–11]	1 [0–7]	0.204
Bad, n (%)	16 (53)	62 (62)	0.395
Low, n (%)	3 (10)	12 (12)	0.764
Moderate, n (%)	3 (10)	8 (8)	0.730
Good, n (%)	8 (8)	18 (18)	0.298
<b>BARTHEL</b>			
Total (points)	72 [20–100]	35 [5–95]	0.059
Total dependent, n (%)	6 (20)	37 (37)	0.083
Serious dependency, n (%)	3 (10)	15 (15)	0.487
Moderate dependency, n (%)	3 (10)	9 (9)	0.868
Light dependency, n (%)	10 (33)	21 (21)	0.164
Totally independent, n (%)	8 (27)	18 (18)	0.298
<b>ALUSTI</b>			
Total (points)	75 [33–84]	54 [24–80]	0.093
Totally dependent, n (%)	7 (23)	38 (38)	0.139
Severe dependency, n (%)	2 (7)	5 (5)	0.723
Moderate dependency, n (%)	0 (0)	6 (6)	0.170
Light dependency, n (%)	3 (10)	8 (8)	0.730
Good mobility, n (%)	3 (10)	15 (15)	0.487
Very good mobility, n (%)	14 (47)	21 (21)	0.005
Excellent mobility, n (%)	1 (3)	7 (7)	0.464

Categorical data was described in absolute (relative) frequency. Numerical data was described as average ± standard deviation or median [interquartile range 25–75%]. n: absolute number; SPPB: Short Physical Performance Battery.



**Fig. 1.** Bland and Altman diagram. A: AlustixBarthel; B: AlustixSPPB; UL: upper limit; LL: lower limit.

( $p < 0.001$ ) was found between the Alusti Test and the Barthel Scale and between the Alusti Test and Short Physical Performance Battery (SPPB), ( $r = 0.93$ ) and ( $r = 0.94$ ), respectively (Fig. 2).

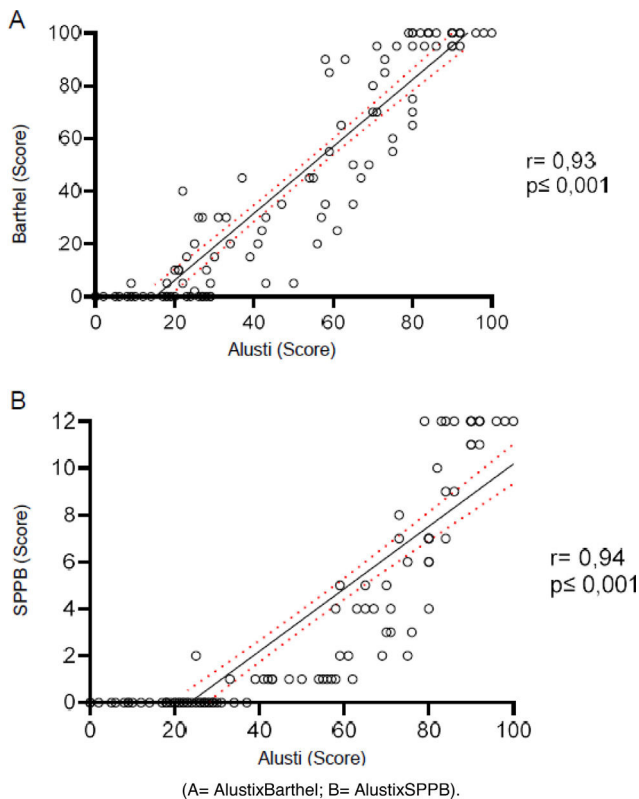


Fig. 2. Spearman correlation. A: AlustixBarthel; B: AlustixSPPB.

## Discussion

There is great concern on the part of researchers to develop questionnaires that assess health status in different populations.<sup>18</sup> Scales and instruments are developed and used; however, many are not available in different countries and languages. These instruments are often found in a foreign language, requiring a process of cross-cultural adaptation, in addition to the need to analyze their measurement properties.<sup>19</sup>

The process of cross-cultural adaptation of the Alusti Test into Brazilian Portuguese was carried out in accordance with the recommendations proposed by Beaton et al.,<sup>14</sup> as it is a complete method, of excellent quality, and is the most accepted and used internationally, including in recent systematic reviews of studies on cross-cultural adaptations and evaluation of measurement properties.<sup>20,21</sup>

The work of the committee was fundamental in the acquisition of semantic, idiomatic, conceptual and experimental equivalence. The current study showed that the proposed Portuguese version of the Alusti Test is reproducible. The internal consistency of the Brazilian version of the Alusti Test presented a value of  $\alpha = 0.96$ . Cronbach's alpha measures the correlation between responses in a questionnaire by analyzing the answers given by respondents, calculating the variance of individual items and the variance of the sum of the evaluator's items.<sup>22</sup> Thus, the high value found for Cronbach's alpha ensures that the adaptations made maintained the homogeneity of the instrument's components. Assessment instruments must be reproducible over time, that is, they must reproduce the same or similar results, in two or more assessments of the same patient, as long as the patient's clinical status has not changed.<sup>23</sup> Analyzing the intra-rater reproducibility of the Alusti Test, an excellent intraclass correlation coefficient was obtained (ICC = 0.997 [0.996–0.998]).

Although many reliability studies only present the ICC, this data alone does not provide sufficient information for this type of study, and therefore, the use of the Bland and Altman Diagram<sup>24</sup> is recommended. This makes it possible to interpret the visual agreement of two different methods that seek to evaluate the same outcome.<sup>25</sup> In the current study, the Bland and Altman graph showed that the agreement between the methods was within acceptable limits, both when comparing the Alusti Test with the Barthel Scale, as well as with the Short Physical Performance Battery (SPPB). From this perspective, the proposed test also proved to be valid, according to the correlations observed between the Alusti Test and the Barthel Scale and between the Alusti Test and Short Physical Performance Battery (SPPB). It is important to highlight that the aforementioned scales are widely used and internationally accepted for the functional assessment of older people and have already been validated in Brazil for use within this population.<sup>26,27</sup>

Nevertheless, among the instruments available for the functional assessment of older people, whether direct or indirect, all have limitations when applied, especially when considering certain conditions found within this population, such as sequelae due to brain diseases, dementia and other comorbidities related to the aging process.<sup>27</sup> Considering the observed results, the practicality of the test, and its interdisciplinary applicability, it is noteworthy that the Alusti Test allows for multidimensional assessment, reflecting functional capacity in all older individuals, whether they are independent or more frail and dependent on assistance to perform their activities of daily living (ADLs).

The current study has some limitations though. Firstly, the analysis of inter-rater reproducibility was not carried out, however, statistically significant results show that it was possible to positively evaluate the intra-rater reproducibility and the validity of the Alusti Test. Furthermore, the responsiveness of the Brazilian version of the Alusti Test, that is, changes observed after an intervention program, were also not tested. Therefore, future research is necessary to evaluate this psychometric property.

It is worth highlighting the fact that the current study presents the Alusti Test as a new, valid, useful tool that is ready to be used by Portuguese-speaking professionals and/or researchers in their clinical practice and in studies to evaluate the functional capacity of the geriatric population. Furthermore, the multidisciplinary appeal of the test is also positive, as different health professionals, such as: physiotherapists, doctors, physical educators, occupational therapists, nurses and psychologists, can apply the test to learn more about the physical and functional conditions of an older person, which will contribute to more efficient treatment that specifically focuses on the particularities of each individual.

## Conclusion

The process of cross-cultural adaptation of the Alusti Test into Portuguese for the Brazilian older population was successfully carried out, following internationally accepted methodological standards. The Brazilian version of the Alusti Test maintained semantic, idiomatic, cultural and conceptual equivalence, and demonstrated to be valid and reproducible, thus becoming a useful instrument for physical and functional assessment in Brazilian older adults.

## Conflict of interests

The authors declare no conflict of interests.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found in the online version available at <https://doi.org/10.1016/j.regg.2026.101742>.

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