







# Cross-cultural adaptation of the Computer Proficiency Questionnaire (CPQ) and content validation for Brazilian Portuguese

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## Abstract

**Objective:** To cross-culturally adapt the "Computer Proficiency Questionnaire" (CPQ) into Brazilian Portuguese and validate its construct. **Method:** A methodological study was conducted following the steps recommended by internationally standardized procedures, including initial translation, synthesis of translations, back-translation and cross-cultural adaptation through semantic, idiomatic, experiential and conceptual equivalence, carried out by a committee of five experts in Gerontology. The pre-test was applied to 20 elderly people. **Results:** After evaluation by the experts, disagreements were identified in items that were not part of the Brazilian context, such as the use of trackballs and chat rooms. These items were replaced by items more suited to Brazilian culture, such as the use of a webcam and videoconferencing rooms. After the corrections, the questionnaire was considered easy to understand by the elderly participants. The questionnaire had excellent internal consistency with a Cronbach's alpha of 0.98. **Conclusion:** The CPQ can be a valuable tool for assessing the proficiency of older adults in using computers in Brazil. Its application can positively impact practices and policies aimed at older people, contributing to more relevant and personalized digital inclusion interventions.

**Keywords:** Healthy Ageing. Information Technology. Digital Inclusion. Validation Study.

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## INTRODUCTION

The adoption of technology by the older population has grown rapidly, driven by demographic shifts and advances in Gerontechnology, a field which promotes successful aging by integrating technology into the daily lives of older individuals. Gerontechnology focuses on the development and application of communication and information technology (CIT) to increase independence and social inclusion of the older population<sup>1</sup>.

Despite the growing use of technology resources among older adults, many continue to face major challenges<sup>2,3</sup>. This population of “digital immigrants” is obliged to quickly adapt to an increasingly digital world<sup>4-6</sup>. The COVID-19 pandemic highlighted the importance of technology, which became a key resource for keeping in touch socially and accessing essential services. During this period, videoconferencing tools, messaging apps and social media networks became an integral part of the routines of the older population<sup>5,7-9</sup>.

In Brazil, during the outbreak, there was a marked rise in technology use among older individuals, with internet access increasing from 44.8% in 2019 to 57.5% in 2021. This increase, however, does not necessarily reflect digital proficiency. The majority of older users adopted the technology out of necessity, often without adequate training. This leads to a problem of adaptation and digital exclusion, where a lack of basic knowledge can result in improper or unsafe use of the technology<sup>5,6,10-13</sup>.

Training courses for digital inclusion play an important role in improving digital proficiency among older individuals. This kind of training generally centers on the use of computers, smartphones and communication apps, such as social media networks and videoconferencing services. These programs confer benefits including greater independence, ability to communicate with family and friends, access to online services and participation in social and cultural activities. Nevertheless, in order to be effective, such training programs need to be continual and tailored to the specific needs of the older population<sup>13-16</sup>.

In spite of training efforts, no validated instruments are available in Brazil for measuring digital proficiency of the older population. The Computer Proficiency Questionnaire (CPQ), developed and validated in the United States, provides a comprehensive assessment of computing and internet skills. However, its adaptation for the Brazilian context is necessary to ensure the measure is culturally relevant and accurate. The adaptation of the scale is crucial to help identify the specific challenges faced by older Brazilian adults when using technology<sup>17</sup>.

Digital proficiency involves the use of technology to find, understand, assess, create and communicate digital information, requiring cognitive and technical skills essential for the digital society<sup>13,14,17</sup>. The CPQ stands out as an assessment tool which measures the proficiency of older adults in the use of computers and information technology. The questionnaire contributes to digital inclusion by helping to develop and tailor training programs that address individual needs. In addition, the CPQ can be used as a continual assessment tool for measuring the progress of participants on digital inclusion programs over time. Another strength of the CPQ is its ability to identify specific obstacles that older adults encounter when using digital technology, allowing specific measures to be devised that can help overcome these barriers<sup>17</sup>.

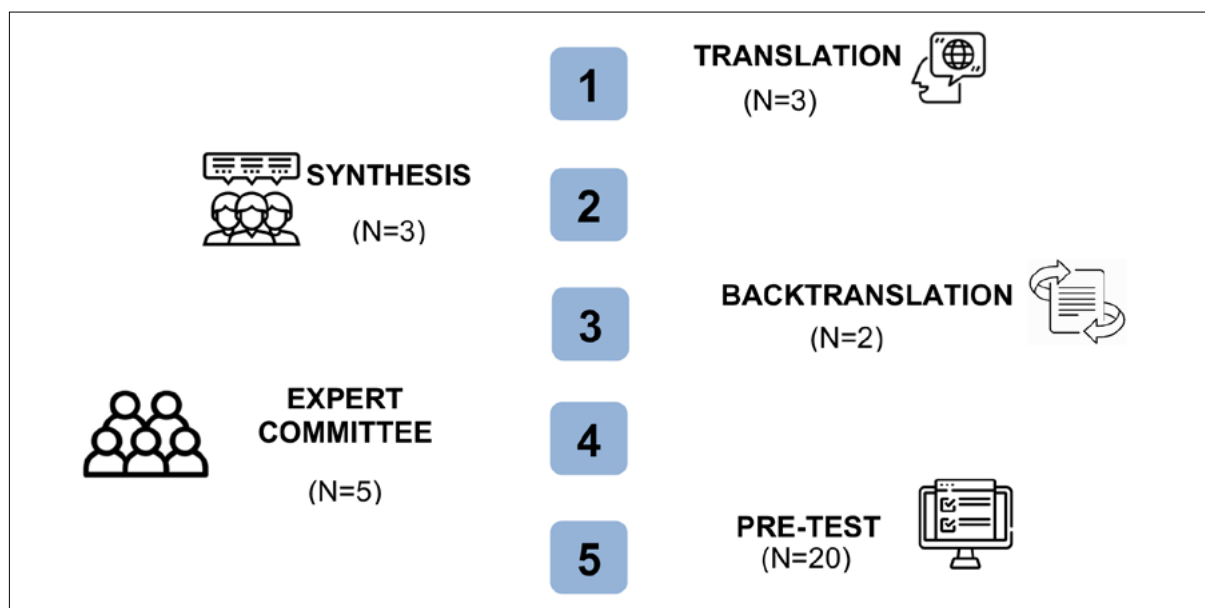
The aim of the present study was to carry out transcultural adaptation and content validation of the CPQ for Brazilian Portuguese, providing a reliable tool for assessing digital proficiency in the older Brazilian population.

## METHOD

A methodological study involving transcultural adaptation and content validation of the Computer Proficiency Questionnaire (CPQ) was conducted<sup>17</sup>. The scale is used for assessing the skills of older adults in the use of communication and information technology (CIT). Prior to study commencement, permission to perform the psychometric study was obtained via email from Dr. Walter Boot, one of the original authors of the CPQ.

The CPQ comprises 33 questions divided into 6 domains: Computer basics (6 items), Printer (5 items), Communication (9 items), Internet (7 items), Calendar (3 items), and Entertainment (3 items). Each question is rated by the respondent according to their ability to perform the task on a 5-point Likert-type scale, where 1 point is given for Never tried, 2 points for Not at all, 3 for Not very easily, 4 for Somewhat easily, and 5 for Very easily.

The process of adaptation and content validation of the CPQ was carried out according to the guidelines of Beaton et al.<sup>18</sup> and of Guillemin et al.<sup>19</sup>, with an emphasis on semantic, idiomatic, experiential and conceptual equivalence. This process involved the steps of translation, backtranslation, validation by experts and pre-test application. These steps, along with the number of participants involved in each, are outlined in Figure 1.



**Figure 1.** Steps of study. São Carlos, São Paulo state, 2023.

### First step - Adaptation and validation

Using the present approach, the notion of semantic equivalence implies the analysis of the match between the grammatical structures and vocabulary employed in the different languages, given that some words in a specific language can lack an exact translation of the equivalent word in another language. Idiomatic equivalence involves the complications inherent to translating colloquial expressions used in different nations. The experimental equivalence domain, also categorized as cultural equivalence, meticulously assesses the congruence of the translated terms with the experiences and perceptions of the target population. Lastly, the sphere of conceptual equivalence refers to the congruence of concepts regarding the terms and expressions used, given that their meanings may differ<sup>18</sup>.

The transcultural adaptation procedure includes seeking semantic equivalence by applying the techniques of translation, synthesis and backtranslation. First, the original questionnaire in English was independently translated into Portuguese by 3 Brazilian translators, all duly qualified and versed in the English language and the associated culture. Two of these translators were aware of the study, whilst the third was not. This step yielded Translations 1 (T1), 2 (T2) and 3 (T3), respectively.

Subsequently, the synthesis step occurred, in which translations T1, T2 and T3 were compared and combined by a group of 3 researchers involved in the present study. After adjustments and discussions which culminated in a consensus, the T123 version of the questionnaire was produced. In the next step, native speakers of North-American English and

fluent in Brazilian Portuguese, blind to the study were recruited to backtranslate the T123 version into the original source language. The purpose of this process was to check the similarity of the T123 version versus the original, as well as to allow the quality of the translation to be refined.

After completion of the backtranslation, the 3 authors of this study compared the versions against the original, identifying and remedying any inconsistencies or significant differences. In order to ensure the accuracy of the adaptation, a committee of expert judges was convened, comprising 5 experts in Gerontology and Gerontechnology, as per recommendation for psychometric studies<sup>18,19</sup>. These experts held doctorate degrees and had vast practical, technical and research experience in the area of digital literacy. The experts were also active members of Gerontology and Gerontechnology associations.

The experts were selected by convenience, with emphasis given to the relevance of their specialization in the field, publications in the area, and practical experience of at least 5 years with the older population in digital settings. The experts were invited by e-mail, receiving an explanatory form and the necessary materials for content validation, including the research project pertaining to the scale, the original questionnaire, the adapted questionnaire and clear instructions for filling out the form to be used to determine level of agreement.

With the aim of validating the content of each item of the scale, the judges were asked to rate the instructions, language and understanding of the items by answering a series of specific questions: “Do you think the title is formulated adequately?”, “Is the language used appropriate?”, “Are the expressions employed easily understandable for the older population?”, “Do you have any suggestions for improvements?”, and “Do you believe the instructions are well formulated?”. In response to the questions, the judges chose from the options “yes”, “no” or “partially”. This response structure was deliberately chosen to cover all possible suggestions of adaptations and refinements identified by the judges.

The method of percentage agreement, as defined by Polit and Beck<sup>21</sup>, was employed for data analysis,

taking into account the agreement threshold of 90% agreement among the committee members. Those questions whose agreement proved <90% were revised based on the suggestions of the judges. Following the necessary revisions and new consensus among the judges, the questionnaire reached 100% agreement, indicating that all questions were clear and satisfactory. This process yielded the final pre-test version to be applied to the sample of the target population.

## Second step – Pre-test Application

For the pre-test step, the study was conducted on a convenience sample containing 20 older adults (as per the original study and recommendations for psychometric studies<sup>17,19</sup>) from Curitiba city and the metropolitan region of Parana state and from Bariri city (São Paulo state) (convenience of first author). Of the total sample participants, 45% were drawn from a database associated with an extension project involving the older population, whilst the remaining 55% were recruited via instant messaging apps (WhatsApp). This sample included older individuals engaged with technology or otherwise, of both genders, different educational levels and ages, providing a broader representation of the older population in the study.

Half of the participants completed the questionnaire via online form sent by messaging app, 5% filled out the print copy, and 5% answered the questionnaire by telephone. Exclusion criteria included written and/or oral expression deficits, and significant cognitive decline precluding understanding and answering the questionnaire (based on self-reported diagnosis). Data collection took place between March and July 2023.

Sociodemographic data were collected to characterize participants, including personal details (sex, date of birth), general aspects (marital status, people sharing household, educational level, family income) and technology use (frequency).

The data underwent a comprehensive descriptive analysis to ensure sample representativeness. Statistical treatment included measures of central tendency (mean) and dispersion (standard deviation),

besides distributions of frequencies for categorical variables such as sex, educational level and marital status. Means and standard deviations were calculated for continuous variables (age, years of education) to express data centrality and variability. Frequency distribution tables were generated to show the proportion of participants in each category and the demographic composition of the sample.

Cronbach's alpha was determined to assess the reliability of the questionnaire used in the study. This statistic provides a measure of the internal consistency of a group of items of a questionnaire or scale. A Cronbach's alpha value  $>0.7$  indicates acceptable consistency of responses among items, suggesting the questionnaire reliably measures the construct in question<sup>20</sup>.

Data were keyed into a spreadsheet and all analyses were performed using statistical software. Data interpretation was carried out based on the study objectives and on critical review of the statistical results obtained.

During questionnaire application, participants were probed about the clarity of the questions and whether they had any suggestions for improvements. The questions were: "Are the questions you just read easily understandable?"; "Do you have any suggestions for improvements to make the questions easier to understand?"; and "Describe all suggestions you deem necessary for the questionnaire in this space". The feedback provided by the participants was collected and analyzed to refine the adapted version of the questionnaire, particularly with respect to semantic validation and ease of use. Moreover, the start and end times for answering the CPQ were logged to calculate the average duration of application of the questionnaire.

As a complementary step, the resultant version from the pre-test was submitted for the appreciation of two coordinators of digital inclusion projects for older adults, partners of the Laboratory of assistive technology for living and independence in aging, in the city of São Carlos (São Paulo state).

All participants were provided with information on the study goals and signed Free and Informed Consent Forms in accordance with the precepts of

research ethics stipulated in Ruling 466/2012 of the Ministry of Health. The study was approved by the Research Ethics Committee of the Universidade Federal de São Carlos (Permit no. 5.848.753).

## DATA AVAILABILITY

The complete dataset underpinning the results of the present study are available upon request from the corresponding author.

## RESULTS

### Questionnaire adaptation

After the steps of translation, backtranslation and rating by the experts, an in-depth analysis of the recommendations was carried out to perform semantic adaptation. The approach used enabled comprehensive content validation comparing the original English version against the version translated into Portuguese. The recommendations resulting from the process are listed in Chart 1 (available from <https://doi.org/10.6084/m9.figshare.26495857>).

The evaluation by the experts revealed that, out of the 33 questionnaire items, 8 exhibited a robust correspondence comparing the original against the translated version. For the remaining items, the judges identified varying degrees of agreement, suggesting changes to improve clarity and adapt to the Brazilian context. Most suggestions were related to problems of verb agreement, conjugation, and challenges involving the translation of specific terms.

To resolve these discrepancies, some items were replaced to improve comprehension, such as replacing the word "trackball", a piece of hardware not widely used in Brazil, with "*câmera (webcam)*". Specific examples, such as "*Direct no Instagram, Messenger no Facebook, Direct Message no Twitter, Whats.App Web, Telegram Web*", were added to improve understanding of the items. Furthermore, the Portuguese version of the questionnaire now includes the Portuguese terms "*passatempos*", "*calendário*" and "*alarme*". Minor changes were also made to the application instructions to render the questionnaire more accessible to the older population.

After discussions among the authors, an additional item "(3j) *Attach Documents*", was introduced, raising the number of items in the scale to 34. The maximum score increased, but the calculation formula based on the average of the subscales was retained, as per the original protocol. Following the corrections and revisions, 100% agreement among the judges was reached, culminating in the pre-test version.

### Pre-test application

The data characterizing the participants are presented in Table 1. The sample comprised predominantly individuals that were female, married, with mean age of 70.8 ( $\pm$  5.71) years, income of  $\geq$  5 minimum wages, mean education of 11.9 ( $\pm$  5.56) years, living with 1-3 others sharing the household and accessing the Internet.

The replies to the questions about the clarity and ease of understanding of the CPQ questions showed that most participants rated them as understandable. More specifically, 69.8% rated the questions as easily understandable, whereas 30.2% reported encountering some difficulties. Examination of specific areas of the questionnaire revealed that percentage comprehension was: 90% on Computer Basics and the Internet, and 85% on Printer, Communication, Diary/Calendar and Entertainment. Only 5.9% of participants suggested improvements.

The suggested improvements covered a range of aspects, often related to areas which do not necessarily

involve semantic validation, such as: identifying free applications, provision of advanced courses in technology which go beyond basic notions, inclusion of a specific course about printers, guidance on communication and regular use of e-mail, provision of an advanced course about the Internet, addressing security issues, inclusion of a course dedicated to the use of diary/calendar on computers, development of a specific device for older adults offering ease of use and large letters, and improvements in the layout of the questionnaire, including the description of the response on each item, instead of only at the beginning of the section.

With regard to the content of the questionnaire, as presented in Table 2, the domain "Basic notions about computer" had the highest rates of positive answers for the tasks "Turn a computer on and off" (70.0%) and "Use a mouse" (70.0%). Conversely, the lowest positive response rates were seen for the domain "Diary/Calendar", particularly on the activities "Use a computer to enter events and appointments into a diary/calendar" (15.0%), "Check the date and time of upcoming and prior appointments" (20.0%), and "Set up alerts/alarms to remind me of events and appointments" (20.0%).

Regarding time to fill out the CPQ, participants took an average of 16 minutes to answer the scale. For internal consistency of the questionnaire, the general coefficient of Cronbach's alpha was 0.98, indicating high internal consistency. The consistency values for each domain ranged from 0.80 to 0.96, as shown in Table 3.

**Table 1.** Sociodemographic characteristics of participants in pre-test. São Carlos, São Paulo state, 2023.

Variable	n (%)
Sex	
Male	9 (45)
Female	11 (55)
Marital Status	
Married	13 (65)
Widowed	4 (20)
Divorced	2 (10)
Single	1 (5)
Age (years)	
60-65	5 (25)
66-70	5 (25)
71-75	5 (25)
76-80	4 (20)
>80	1 (5)
Income (minimum wages)	
<1	1 (5)
1-2	4 (20)
2-3	2 (10)
3-4	2 (10)
4-5	5 (25)
>5	6 (30)
Living arrangement	
Lives alone	4 (20)
Lives with 1-3 others	16 (80)
Education (years)	
3	2 (10)
4	3 (15)
8	1 (5)
10	1 (5)
12	1 (5)
14	2 (10)
15	2 (10)
16	3 (15)
18	2 (10)
19	3 (15)
Has computer at home	
Yes	13 (65)
No	7 (35)
Frequency of internet use	
Has no internet access	1 (5)
Has internet access, but does not use	1 (5)
2-5 times per week	1 (5)
1 time a day	2 (2)
>1 time a day	15 (75)

**Table 2.** Results of applying pre-test of CPQ (transculturally adapted for Brazil) to 20 older adults. São Carlos, São Paulo state, 2023.

Questions from CPQ	Never tried (%)	I can't	I can with some difficulty	I can	I can easily
Turn a computer on and off	4 (20.0)	0 (0.0)	2 (10.0)	0 (0.0)	14 (70.0)
Use a computer keyboard to type	5 (25.0)	0 (0.0)	1 (5.0)	3 (15.0)	11 (55.0)
Use the camera (webcam) of the computer	8 (40.0)	0 (0.0)	3 (15.0)	1 (5.0)	8 (40.0)
Use a mouse	4 (20.0)	0 (0.0)	0 (0.0)	2 (10)	14 (70.0)
Adjust the volume of the computer speakers	7 (35.0)	0 (0.0)	1 (5.0)	1 (5.0)	11 (55.0)
Adjust size of the text on screen	8 (40.0)	0 (0.0)	2 (10.0)	1 (5.0)	9 (45.0)
Print documents	6 (30.0)	1 (5.0)	0 (0.0)	4 (20.0)	9 (45.0)
Print photographs	10 (50.0)	0 (0.0)	1 (5.0)	4 (15.0)	6 (30.0)
Load paper into the printer	6 (30.0)	0 (0.0)	0 (0.0)	2 (10.0)	12 (60.0)
Load ink into the printer	8 (40.0)	1 (5.0)	0 (0.0)	4 (20.0)	7 (35.0)
Fix the printer when paper jams	9 (45.0)	0 (0.0)	4 (20.0)	1 (5.0)	6 (30.0)
Open emails	4 (20.0)	0 (0.0)	1 (5.0)	3 (15.0)	12 (60.0)
Send emails	5 (25.0)	0 (0.0)	1 (5.0)	3 (15.0)	11 (55.0)
Send the same email to multiple people at the same time	6 (30.0)	0 (0.0)	2 (10.0)	1 (5.0)	11 (55.0)
Store email addresses in an email address book or contact list	8 (40.0)	0 (0.0)	1 (5.0)	5 (25.0)	6 (30.0)
View pictures sent by email	5 (25.0)	0 (0.0)	0 (0.0)	5 (35.0)	10 (50.0)
Send pictures by email	6 (30.0)	0 (0.0)	0 (0.0)	5 (25.0)	9 (45.0)
Use internet meeting rooms (e.g., Google Meet, Zoom, Microsoft Teams, Skype)	9 (45.0)	0 (0.0)	1 (5.0)	5 (25.0)	5 (25.0)
Chat using instant messaging (e.g., Direct on Instagram, Messenger on Facebook, DM on Twitter, WhatsApp Web, Telegram Web)	5 (25.0)	1 (5.0)	3 (15.0)	3 (15.0)	8 (40.0)
Post content (e.g., text, photos, videos) to the Internet (e.g., to blogs, Facebook, Twitter, online forums)	6 (30.0)	1 (5.0)	0 (0.0)	5 (25.0)	8 (40.0)
Attach files in e-mail	6 (30.0)	0 (0.0)	1 (5.0)	4 (20.0)	9 (45.0)
Use search engines (e.g., Google)	4 (20.0)	0 (0.0)	1 (5.0)	3 (15.0)	12 (60.0)
Find information about services available for my district/neighborhood using the Internet	4 (20.0)	0 (0.0)	2 (10.0)	4 (20.0)	10 (50.0)
Find information about my hobbies, pastimes, courses and interests on the Internet	6 (30.0)	0 (0.0)	0 (0.0)	4 (20.0)	10 (50.0)
Read the news on the Internet	3 (15.0)	0 (0.0)	1 (5.0)	3 (15.0)	13 (65.0)
Make purchases on the Internet	8 (40.0)	0 (0.0)	3 (15.0)	3 (15.0)	6 (30.0)
Bookmark websites to find them again later (e.g., make favorites)	6 (30.0)	0 (0.0)	3 (15.0)	5 (25.0)	6 (30.0)
Save text and images found on the Internet	4 (20.0)	0 (0.0)	1 (5.0)	7 (35.0)	8 (40.0)
Use a computer to enter events and appointments into a calendar/agenda	13 (65.0)	1 (5.0)	2 (10.0)	1 (5.0)	3 (15.0)
Check the date and time of upcoming and prior appointments	12 (60.0)	1 (5.0)	3 (15.0)	0 (0.0)	4 (20.0)
Set up alerts/alarms to remind me of events and appointments	10 (50.0)	1 (5.0)	4 (20.0)	1 (5.0)	4 (20.0)

to be continued



Continuation of Table 2

Questions from CPQ	Never tried (%)	I can't	I can with some difficulty	I can	I can easily
Use a computer to play games	9 (45.0)	1 (5.0)	0 (0.0)	5 (25.0)	5 (25.0)
Use a computer to watch movies or videos	4 (20.0)	2 (10.0)	2 (10.0)	4 (20.0)	8 (40.0)
Use a computer to listen to music	7 (35.0)	1 (5.0)	1 (5.0)	4 (20.0)	7 (35.0)

**Table 3.** Cronbach Alpha values for each domain of CPQ. São Carlos, São Paulo state, 2023.

Domain	Number of questions	Mean	Standard Deviation	Cronbach's Alpha
Computer Basics	6	3.58	1.79	0.95
Printer	5	3.14	1.83	0.94
Communication	10	3.48	1.72	0.96
Internet	7	3.64	1.64	0.95
Diary/Calendar	3	2.18	1.59	0.95
Entertainment	3	3.15	1.73	0.80

After revision of the suggestions in this step, the team of researchers incorporated the suggestions pertaining to the semantic validation in the pre-final version of the CPQ adapted for the Brazilian cultural context.

The pre-final version was submitted to the coordinators of digital inclusion projects for the older population for their appreciation. The suggestions made by the experts led to important changes, such as exclusion of the instruction “I can” preceding the response options, and keeping the CPQ acronym in English to preserve the association with the original scale. These changes, although not part of the standard transcultural adaption process, were deemed essential to ensure acceptance and comprehension of the questionnaire by the target population.

After finalizing the Brazilian version of the CPQ, the transculturally adapted questionnaire was sent by email for the appreciation of the authors of the original version, who felt that the scale had faithfully followed all the steps and was, thus, suitable for proceed to psychometric evaluation. The final version of the scale, after incorporation of the suggestions given by the target population

and coordinators of digital inclusion projects, is presented in Chart 2 (available from: <https://doi.org/10.6084/m9.figshare.26495866>).

## DISCUSSION

The objective of the present study was to perform the transcultural adaptation of the Computer Proficiency Questionnaire (CPQ) for the Brazilian context to yield the “*Questionário de Proficiência em Computador*” (CPQ). This adapted version of the scale represents an advance for assessing the digital proficiency of the older population in Brazil.

The process of transcultural adaptation of the CPQ into Brazilian Portuguese was conducted with a rigorous approach adopting international methodological guidelines, conferring a high standard for the validity and reliability of the adapted version. The academic literature consistently stresses that lack of equivalence between transculturally adapted instruments can compromise the validity of intercultural comparisons<sup>18</sup>. In the present study, this caveat was avoided, leading to improved validity of the adapted version.

Previously, the CPQ also underwent translation and validation in Spain (Cronbach's  $\alpha = 0.99$ )<sup>22</sup>. Given the scale's satisfactory psychometric proprieties and that its validity and utility hinge on cultural context, the study to transculturally adapt the CPQ for use in the Brazilian setting is of particular importance.

The valuable contribution of the expert judges in the area of Gerontology and Gerontechnology was pivotal to ensuring the validity and reliability of the adapted version of the CPQ. These professionals, whose experience stems from years of research and practice, endorse the integrity of the transcultural adaptation process, enriching this with a disciplined contextualized perspective of the psychometric and content properties of the scale. Rigorous adherence to the criteria applied by an expert panel<sup>18,23</sup> attests to the integrity of the methodological approach employed in this study.

Throughout the process of adaptation, close attention was dedicated to the idiomatic, semantic and grammatical aspects of the questionnaire, yielding a clear easily understandable version that is attuned to the culture and specific terms in Brazil. This approach is consistent with the goal of transcultural adaptation of assuring broad contextualized comprehension of the items contained in the scale.

Of the 33 items in the original version of the scale, two were replaced by items that were more fitting for Brazil, and a further item was added in response to recommendations by the experts, where this extra item was deemed essential for the questionnaire to better measure the knowledge held by older individuals. Consequently, the 34-item Brazilian version has a higher maximum score. Nevertheless, the formula used for calculating scores was still based on the mean scores of subscales as per the original protocol<sup>17</sup>. By contrast, during the adaptation process, the Spanish version of the scale underwent no inclusion or addition of new items, having a consequent impact on the consistency of its subitems, given that some items failed to fit the Spanish context<sup>22</sup>.

Following approval of the version produced, a pre-test involving 20 older adults was conducted, vouching for the study design which mirrored the original study. In the original, the instrument was

applied via a pilot test involving 15 older adults to assess the ease of comprehension of the CPQ<sup>17</sup>. In the Spanish CPQ adaption, however, no such pre-test was carried out. with the scale directly applied to a larger sample of 159 older adults<sup>22</sup>. The diverse approaches to conducting the pre-test in different languages highlights the importance of taking into account the cultural contexts, language abilities and the method of application when adapting scales for use in different languages and populations.

The Brazilian sample involved in the pre-test was notable for its diverse sociodemographic characteristics, encompassing sex, marital status, age group, income and number of individuals sharing the residence. While the Brazilian pre-test sample sought diversity in sociodemographic characteristics, participants were predominantly female, married, had mean age of 70.8 years, income of  $\geq 5$  minimum wages, mean education of 11.9 years, and were digitally engaged. These data are consistent with previous studies showing that the frequency of access to technology and of Internet use tends to be greater among older individuals with higher educational level and income<sup>28,29</sup>. Moreover, the fact that most participants accessed the Internet more than once daily reflects a growing trend toward digital inclusion among older adults seeking to stay well informed and connected<sup>13,28,30</sup>.

The pre-test results revealed that most participants rated the questionnaire as clear and easy to understand. However, the activities regarding the use of "Diary/Calendar" had the lowest rates of positive answers, suggesting these areas can be especially challenging for the older population and, therefore, require further training or specific support. Previous studies have confirmed these difficulties, showing that the adoption of more advanced technology, such as digital calendars, can be less intuitive for older individuals<sup>9</sup>.

The high internal consistency of the Brazilian version of the CPQ, evidenced by the Cronbach's alpha coefficient of 0.98, echoes the results obtained in the original study by Boot et al.<sup>17</sup>, consolidating the reliability of the transcultural adaptation.

The study results also corroborate the conclusions of Hsu et al.<sup>26</sup> and Aguirre & Abadía<sup>27</sup>, emphasizing

the importance of digital interfaces that incorporate simple and clear language that is accessible to diverse populations. Amid the lack of standardized tools for measuring digital proficiency of older adults in Brazil, the CPQ represents a valuable scale. The questionnaire's ability to assess a wide range of digital skills in both experienced users and beginners<sup>17</sup> fills a gap in the literature.

In line with the studies of Domingues et al.<sup>3</sup> and Alvaro et al.<sup>25</sup>, which also highlighted the importance of standardized instruments, the CPQ helps toward obtaining robust relevant quantitative data. This furthers research in the area of digital inclusion, guiding projects in this field aimed at formulating individualized methodologies with materials adapted to the target population. This approach promotes autonomy of learners, respecting their pace of learning.

Implementation of the Brazilian version of the CPQ can effectively foster the development of public policies and initiatives aimed at digital inclusion<sup>17</sup>. The assessment scale can be used to gain a broader understanding of the competencies in information technology and communication held by the older population. This is especially relevant in an increasingly technological environment, where digital inclusion becomes fundamental for active participation in society. International policies for digital inclusion and media literacy emphasize the need for technological inclusion for all age strata, particularly older adults, a population group which often encounters significant barriers in the use of technology. Training programs and adaptation of tools such as the CPQ are crucial to remain in step with these international guidelines and promote a more inclusive, digitally literate society<sup>31-33</sup>.

The present study has some limitations, such as the dearth of studies on scale validation in the Brazilian literature, despite the vast output on digital inclusion of older individuals. In addition, the sample comprised mainly digitally-engaged individuals. Thus, future validation studies should recruit a more diverse sample of older individuals, including those who are not digitally engaged, and provide a more comprehensive analysis of the psychometric properties of the scale. Also, follow-up studies to

refine the internal structure of the question and improve reliability are now warranted.

The rigorous execution of the validation steps, as outlined in the future plan to be carried out by the study author, will provide a solid basis for robustness and applicability of the CPQ in the assessment of digital competencies of older adults.

Despite the limitations mentioned, this study plays a key role in commencing the process of transcultural adaptation and validation of the CPQ for the older adult population in the Brazilian context. Implementation of the Brazilian version of the CPQ can effectively promote the development of initiatives for digital inclusion, given the assessment scale can make a significant contribution toward gaining a broader understanding of the competencies in information technology and communication among the older population.

## CONCLUSION

The Computer Proficiency Questionnaire: Assessing Low and High Computer Proficient Seniors, was transculturally adapted for Brazil and pre-tested on a target population, yielding a Cronbach alpha value of 0.98. The scale has potential as a useful tool for assessing computer proficiency in older Brazilians aged >60 years, taking into account the cultural and contextual specificities of the country. The resultant questionnaire proved satisfactory in terms of acceptance by the expert judges and ease of understanding by the older adults involved in pre-testing. The availability of this validated scale can positively impact practices and policies for older adults, playing a crucial role in developing digital inclusion interventions that are more pertinent and individualized. The transculturally adapted approach applied in the present study can provide a solid basis for future investigations to validate and analyze the scale's underlying psychometric components.

## AUTHOR CONTRIBUTIONS

- Gabrieli Pereira da Cruz – Responsible for all aspects of the study, vouching for any issues

related to the accuracy or integrity of any part of the study; conception and design; writing or critical review of article; approval of the version for publication.

- Taiuani Marquine Raymundo – Writing or critical review of article; approval of version for publication.

- Walter R. Boot – Author of the original scale adapted in this study; cooperation throughout the translation process; approval of the version for publication.
- Paula Costa Castro – Writing or critical review of article; approval of the version for publication.

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