

Validity of the evidence of the Health Literacy Scale and eHEALS for older people

Evidência de validade da Escala de Literacia em Saúde e eHEALS para idosos

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ABSTRACT This article aims to adapt cross-culturally two instruments (Health Literacy and Digital Health Literacy) for use with older people and to assess their psychometric properties, through a study with a descriptive, quantitative, and cross-sectional method, carried out with 379 older person participants, who answered the following questionnaires: a) sociodemographic, b) Health Literacy Scale and c) electronic Health Literacy Scale (eHEALS). The analyses performed were exploratory and confirmatory factor analysis, the convergent validity of the factors that were estimated through the Average Variance Extracted and Composite Reliability. The result was the presentation of instruments with adequate factor loadings (> 0.4), in addition to adequate reliability (> 0.7). The external validity tested by the correlation between the two instruments showed a statistically significant, positive, and moderate correlation ($r = 0.35$; $p < 0.001$), presenting evidence of validity and consistency in the Health Literacy Scale for use with older people and attesting to the eHEALS instrument adequate reliability and validity for this population.

KEYWORDS Health literacy. Health promotion. Aged. eHealth. Validity.

RESUMO O presente artigo busca apresentar evidências de validade de dois instrumentos, Literacia em Saúde e Literacia Digital em Saúde para utilização em idosos e avaliar suas propriedades psicométricas, por meio de um estudo com método descritivo, quantitativo e transversal, realizado com 379 participantes idosos, que responderam aos questionários: a) sociodemográfico, b) Escala de Literacia em Saúde e c) electronic Health Literacy Scale (eHEALS). Foram realizadas análises fatoriais exploratória e confirmatória, com validade convergente dos fatores que foram estimadas por meio da Variância Média Extraída e Confiabilidade Composta, tendo como resultados a apresentação dos instrumentos com cargas fatoriais adequadas (> 0.4), além de confiabilidade adequada (> 0.7). A validade externa testada pela correlação entre os dois instrumentos apresentou correlação estatisticamente significativa, positiva e moderada ($r = 0.35$; $p < 0.001$), indicando evidências de validade e consistência na Escala de Literacia em Saúde para uso em idosos, e atestando ao instrumento eHEALS confiabilidade adequada e válida para o público idoso brasileiro.

PALAVRAS-CHAVE Literacia em saúde. Promoção da saúde. Idosos. Saúde digital. Validade.

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Introduction

In the Brazilian context, the topics of publications have been disease prevention, health promotion, and education in Primary Health Care¹. Health Literacy (HL) is characterized by the ability to interpret, obtain, and process basic health information, stimulating individuals to make informed decisions².

HL comprises cognitive and social skills, which are related to the ability to seek and obtain information, and develop learning, so that this knowledge can enable the individual to take more appropriate measures for health, allowing greater autonomy, involvement, and accountability of the latter regarding the condition of their own health³, using, for this purpose, various types of materials, as well as new technologies in their various contexts⁴. On the other hand, neglecting economic, community, cultural, social, and organizational conditions⁵ can lead to negative health effects⁶. Several studies point to the need for HL for public health since results mention that low literacy has worse health outcomes⁷⁻⁹, leading to mortality^{7,9,10}. It is noteworthy, in this logic, the importance of HL for health professionals and society¹¹.

The scales for the evaluation of HL aim to estimate the knowledge of the population, as well as help to determine the interventions that may lead to improvements in health¹². Through access to health information, individuals increase their ability to read, interpret, write and use it effectively to promote and maintain good health⁸. In relation to Digital Health Literacy (DHL), it constitutes the individual's ability to seek, find health information in digital media, understand and evaluate such media, in order to interpret and classify them so that they can treat or solve a health-related problem^{13,14}.

It is worth noting that HL lacks a systemic approach that includes health and education policies involving the entire community¹⁵, since this term is little known and

discussed in Brazil¹⁶. DHL, understood as an extension of HL, with the use of technology, stands out as an important tool for better health outcomes¹⁷. Given the above, this article aimed to analyze the psychometric properties and validate two scales for use in elderly Brazilians.

Materials and methods

Design, location of the study and study period

This is a descriptive study, with a quantitative approach and cross-sectional design carried out with the elderly, between August and December 2019, in a city in the countryside of Paraná.

Population and sample: inclusion and exclusion criteria

It comprised a convenience sample of 379 people over 60 years old living in a municipality in the countryside of Paraná, who were recruited from the municipal hospital and the Basic Health Units (UBS). According to data from the Brazilian Institute of Geography and Statistics in 2010, the municipality has approximately 16,314 inhabitants, 2,230 of whom are over 60 years old. After performing a sample calculation, considering a confidence level of 95%, the sample consisted of 328 participants to carry out this research. Considering the sample losses, as well as the margin of error of 5%, the number of participants in the research was 379 elderly randomly selected according to their presence in the health services of the city in the study; having as inclusion criterion elderly people, as described in the status of the elderly with individuals aged over sixty years¹⁸. Elderly people who had difficulties in reading and understanding the questions were excluded from the study.

Ethical aspects

In compliance with Resolution N. 466/12 of the National Health Council¹⁹, this study was sent to the Research Ethics Committee of Unicesumar, with a favorable opinion under CAAE N. 13716719.1.0000.5539. The ethical aspects were respected by signing the Informed Consent Form (ICF) by all participants.

Study protocol

INSTRUMENTS

Health Literacy Scale: Scale validated for the Brazilian population by Quemelo, which contains eight items related to the individual's knowledge about obtaining and understanding health information, with the following questions: 'How much do you understand from the instructions in the medication package inserts?'; 'How much do you know about health information in brochures?'; 'When I have doubts about diseases or complaints, do I know where I can find the information?'; 'When I want to do something for my health without being sick, do I know where I can find the information?'; 'How often were you able to help your family or a friend if they had questions about health problems?'; 'When you have had doubts about health issues and problems, how many times have you been able to get advice and information from others (family and friends)?'; 'How do you believe you know how to choose the advice and recommendations that are best for your health?'; and 'Regarding health information on the internet, am I able to determine which sources are of high or low quality?'²⁰.

For the answers, a five-point Likert scale is used, in which the extremes of response options are indicated. In item one, the answers can vary from the options 'very poorly' to 'very well' and 'I do not read the package inserts'; in item two, the answer options range from the

extreme 'very poorly' to 'very well' and 'I do not read this information'. In items three and four, the response levels range from 'strongly disagree' to 'strongly agree' and 'I have no experience with this type of situation'. In items five and six, the answers show variation from the extremes 'never to 'always', in addition to an option 'never had this type of experience'. In item seven, the possibilities of answers range from 'very badly' to 'very well' or the option 'I am not interested in these subjects'. And in item eight, the answers are similar to those in items three and four, but the last option is 'I have no experience with this subject'²⁰.

eHEALS: The electronic Health Literacy Scale (eHEALS) is an instrument cross-culturally adapted to Brazil by Yamaguchi²¹, contemplating ten items that relate to the use of the internet in the search for health information. The first two items refer to the participant's opinion as to the usefulness and importance of using the internet in health issues; and the others mention: 'I am aware of the health content available on the internet'; 'I know where to find useful health content on the internet'; 'I know how to find useful health content on the internet'; 'I know how to use the internet to answer my health questions'; 'I can evaluate the health content I find on the internet'; 'I know how to differentiate reliable content from doubtful content on internet health', and 'I feel confident to use internet information to make health decisions'.

Their answers vary according to the Likert scale²². In item one, the answers can range from 'absolutely useless' to 'very useful' In item two, from 'absolutely unimportant' to 'very important'. Items three to ten can vary from 'totally disagree' to 'totally agree'. Thus, the first two items are not included in the factor analysis, considering that they were created only as screening items²¹.

Sociodemographic questionnaire: Used for surveys of sociodemographic data, such as gender, age, number of children, marital status, education, family income, individual income.

Translation and adaptation of instruments for the elderly

Initially, the two instruments were translated into Portuguese following the back-translation process. The first stage was the translation of the instrument into Portuguese by two independent, bilingual Portuguese-English researchers. Then, a committee composed of three researchers in the health area was created for the construction of a synthesis version of the two translations. Finally, in the back-translation stage, the synthesis version was independently translated into English by two professionals. These back-translations were compared with the synthesis version of the instrument, and no inconsistencies were found.

To adapt the Health Literacy Scale and eHEALS for the elderly population, the methodological process comprised the stages of content validity, questionnaire administration and factor analysis, which will be described below.

Content validity

The pilot study with a focus group consisted of seven people with characteristics that were similar to the research participants. Two meetings were held with this focus group, and, in the first meeting, the proposal, the purpose and the method were presented, followed by the guidelines and the ICF signing. In the second meeting, the group received the questions that make up the instruments 1 and 2, reading each of the questions aloud; then, the members of the group evaluated the quality of the questions of the instrument and the coherence of the language and content.

No item was changed, as there were no items with low level of comprehension. Then, content analysis carried out with judges, who were five doctors in the area of health promotion. The judges evaluated the instruments regarding language clarity, practical adequacy and theoretical relevance of the items. After the evaluation

of the judges, the evidence of content validity was estimated by means of the Content Validity Coefficient (CVC), which is able to evaluate the agreement between the judges²³. Values above 0.80²⁴ were considered adequate.

Evidence of the validity of instruments

To treat the instrument data, the Exploratory Factor Analysis (EFA) was performed to verify the structure that best suits the proposed age group, and the Confirmatory Factor Analysis (CFA) was used to adjust the model. The model fit was tested using the fit indices (expected reference values for each index): Chi-square (X^2 and p-value), Root Mean Square Error of Approximation (RMSEA < 0.08, I.C. 90%), Tucker-Lewis Index (TLI > 0.90), Comparative Fit Index (CFI > 0.95) and Normed Fit Index (NFI > 0.95). Convergent validity was accessed by the Average Extracted Variance (AVE), and values greater than 0.50 were considered acceptable indicators of convergent validity²⁵. Composite Reliability (CR) was calculated using CFA results, and values greater than 0.70 were considered indicators of adequate CR²⁶. Regarding the accuracy indicators of the instrument in question, Cronbach's alpha and McDonald's Omega coefficients were calculated, and values equal to or greater than 0.70 were considered satisfactory^{27,28}.

External validity

The external validity of the instruments was tested from the correlation between them. The software and R Language were used (R Core Team, 2018); and, in all tests, the maximum acceptable probability of 0.05 for the occurrence of Type I error was assumed.

Results

The study included 379 elderly people who attended public health services in a city in the countryside of Paraná. Their main

characteristics are the following: 53.82% were female and 46.17% male; regarding marital status, 56.72% are married, 32.71% separated/divorced/widowed, single represent 7.12%, and 3.43% reported being in a common-law partnership; regarding education, 48.28% have completed elementary school; 84.16% reported family income of up to 2 minimum wages; 79.68% have and use their own cell phones and 43.53% have access to the internet, however, 56.46% do not have access, and 57.52% do not use it even if they have access to it.

Internal validity and reliability

HEALTH LITERACY SCALE

To verify the evidence of structural validity of

the Health Literacy Scale, EFA was performed. The results of the factor loadings remained between 0.40 and 0.63 for all items, according to the analysis performed.

According to this analysis, the instrument has one-dimensional characteristics. The values of the factor loadings regarding the EFA of the instrument range from 0.40 to 0.63.

To verify the reliability of the instrument, Cronbach's alpha (0.76), Omega (0.78), and CR (0.738) values were measured. According to the preliminary studies carried out with the scale, the authors report that it is possible to use three forms, one-dimensional, with three factors and four factors. The EFA performed indicates the retention of only one factor. However, CFA was performed following information from previous studies, testing the three factorial structures shown in *table 1*.

Table 1. Reliability and confirmatory factor analysis (model fit indicators)

	One-dimension	Three factors	4 Factors
<i>Reliability</i>			
Cronbach's Alpha (95% CI)	0.76 (0.71;0.79)	0.67 (0.62;0.71) 0.56 (0.47;0.65) 0.36 (0.23;0.49)	0.81 (0.77;0.85) 0.70 (0.63;0.76) 0.56 (0.47;0.65) 0.36 (0.23;0.49)
Omega 6	0.78	0.70 0.39 0.22	0.68 0.53 0.39 0.22
KMO	0.74	0.55 0.50 0.50	0.50 0.50 0.50
Composite Reliability	0.738	0.796	0.885
CFA	21.675(15) / 0.117	91.620 (16) / 0.000	61.021 (14) / 0.000
X2 (df) / P-value	0.034 (0.000;0.064)	0.112 (0.090;0.135)	0.094 (0.071;0.119)
RMSEA (95% CI)	0.992	0.911	0.937
TLI	0.996	0.949	0.968
CFI	0.992	0.911	0.937
NFI	0.30	0.34	0.50
Average Variance Extracted			

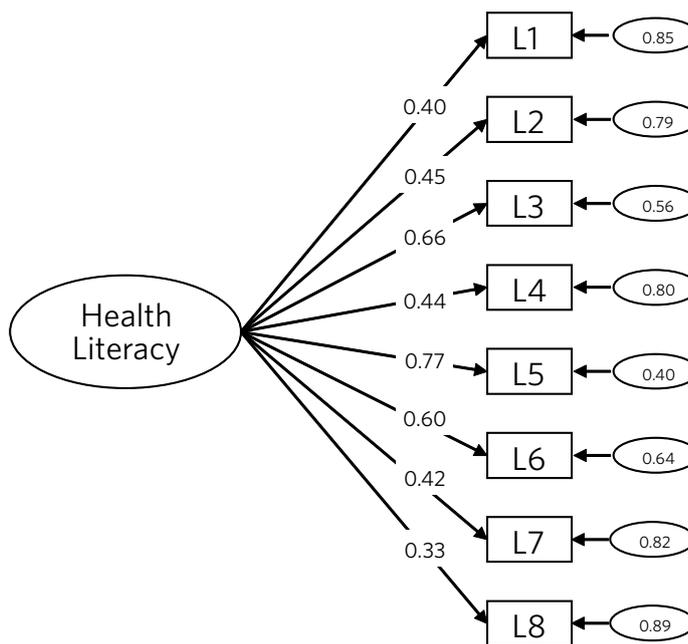
Source: Prepared by the authors.

KMO=Kaiser-Meyer-Olkin; X2 = Chi-square; df= Degrees and freedom; RMSEA=Root Mean Square Error of Approximation; TLI=Tucker-Lewis Index; CFI=Comparative Fit Index; NFI=Normed Fit Index.

The CFA results show that the adjustment values that best indicate the characteristic of the instrument were those of the scale with one-dimensional structure: $X^2(df) / P\text{-value} = 21.675(15) / 0.117$; TLI = 0.992; RMSEA = 0.034 (0.000;0.064); CFI = 0.996; and NFI = 0.992. Thus, the Health Literacy Scale, when applied to the elderly, presents a good configuration of one-dimensional structure, consistent with the theoretical hypothesis, and this structure is

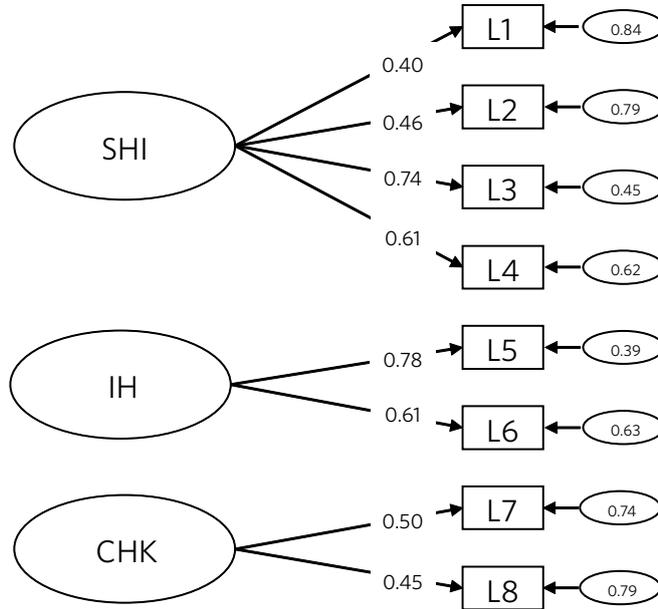
assumed in this study and used in later stages. To better illustrate the values of the factorial loads of the models tested, the figures referring to each factorial structure will be presented. *Figure 1* shows the one-dimensional structure of the scale with the factorial loads of the respective items that compose it; *figure 2* shows the structure with three factors, and *figure 3* shows the structure of the instrument with four factors.

Figure 1. Health Literacy Scale, one-dimensional structure



Source: Prepared by the authors.

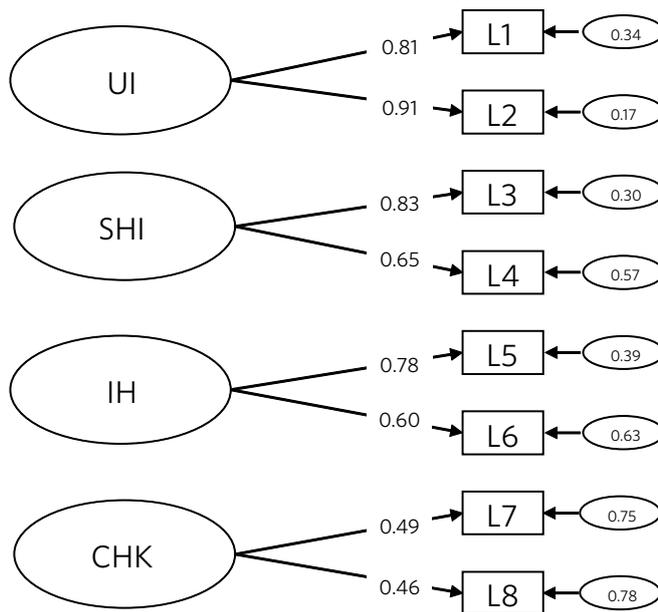
Figure 2. Health Literacy Scale, structure with three factors



Source: Prepared by the authors.

SHI: Search for Health Information; IH: Interactivity in Health; CHK: Critical Health Knowledge.

Figure 3. Health Literacy Scale, structure with four factors



Source: Prepared by the authors.

UI: Understanding of Information; SHI: Search for Health Information; IH: Interactivity in Health; CHK: Critical Health Knowledge.

eHEALS

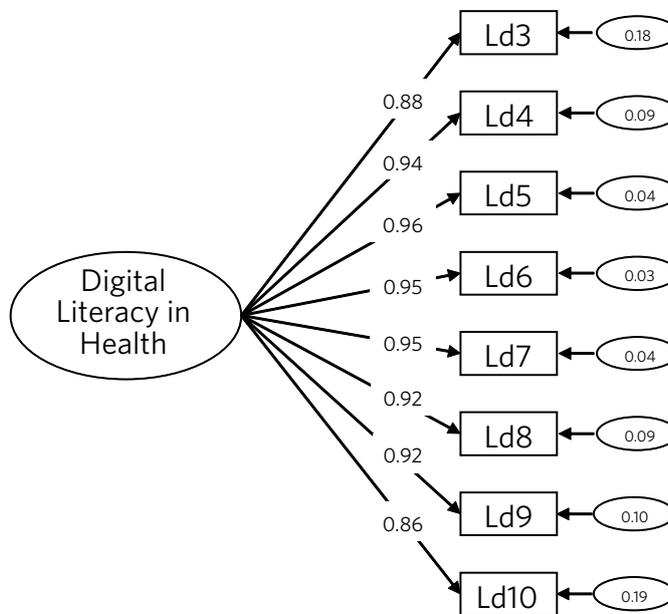
To evaluate the structural validity of instrument 2, eHEALS, EFA was performed, and the results of the factor loadings remained between 0.86 and 0.96.

To verify the reliability of the instrument, Cronbach’s alpha (0.98), Omega (0.98), and CR (0.98) values were measured. The EFA performed indicates the retention of only one factor. Thus, the CFA was performed following this one-dimensional configuration. For the CFA, the adjustment tests of the factorial model were evaluated, which presented as results the following indices: $\chi^2[df] / p$ -value

= 77.206 [16] / 0.000; TLI = 0.99; RMSEA = 0.101; Bentler’s CFI = 0.99; and NFI = 0.99.

From the results of the CFA of the eHEALS, it can be seen that the adjustment values of the scale with a one-dimensional structure were adequate, although the value of the RMSEA index was above that recommended by the literature²⁹. Thus, the Health Literacy Scale, when applied to the elderly, has a good configuration of one-dimensional structure, consistent with the theoretical hypothesis, and this structure is assumed in this study and used in later stages. *Figure 4* shows the one-dimensional structure of the scale with the factorial loads of the respective items.

Figure 4. Health Literacy Scale, one-dimensional structure



Source: Prepared by the authors.

External validity

The external validity of the scales was tested based on the correlation between them. The hypothesis is that the variables present moderate positive correlation. Thus, after the

analysis, the Health Literacy Scale presented a moderate correlation with the Digital Health Literacy Scale ($r = 0.35; p; 0.001$)³⁰.

The Health Literacy Scale was used to measure the level of literacy of the participants and their use of this information. Likewise, the

evaluation instrument of the Digital Health Literacy Scale was applied to assess the level of experience of the elderly with the use of the internet to access health information. The questions were asked, and the elderly answered them by saying what best reflected their opinion and experience on the subject.

Discussion

HL is a social determinant of health, which can influence decision-making and self-management in health^{31,32}, and it is necessary to measure and evaluate it in general populations, especially in vulnerable groups such as the elderly population³³. The instruments to assess HL enable the recognition of groups with limitations in this aspect³⁴, as demonstrated in the study of cross-cultural adaptation and evaluation of the psychometric properties of the Brazilian version of the 14-item Health Literacy Scale (HLS-14)³⁵, conducted in Piracicaba – São Paulo, validated for the adult and elderly population³⁶. Although instruments have been evaluated for validity and reliability, these properties are not fixed nor remain regardless of the circumstances; on the contrary, they may vary according to the type of study and population³⁷. Based on this premise, the concomitant validation of two HL assessment instruments was performed, one of them for DHL. This is the first study to validate the Health Literacy Scale and eHEALS for the elderly in Brazil.

The validation process was based on the cross-cultural validation of both instruments in previous studies, and the Health Literacy Scale was cross-culturally validated by Quemelo and collaborators²⁰, and the eHEALS, by Yamaguchi and others²¹.

Health Literacy Scale

When performing the EFA, it revealed a one-dimensional model with factor loadings in ideal values. However, in order to understand

which model was the best fit for this population, CFA was performed, indicating the model as adequate.

The factorial structure tested in Brazil by Quemelo²⁰ for this instrument was: four factors, three factors and one-dimensional, and the structure that best fit in its study with the sample of university students was the one of four factors. This same factorial structure was used in the original study in Switzerland, with participants aged 18 to 25 years³⁸. However, for the present study carried out with elderly participants, the CFA indicated that the best adjustment was made from the one-dimensional model, and even though the three-factor and four-factor models were tested, they showed weak adjustment indices. Thus, the appropriate adjustments in the indices of the one-dimensional model indicated the validity of the factorial structure for this model.

An important technique for the field of research is the focus group, which contributes to the formulation and adequacy of tests, scales, and instruments for quantitative research³⁹. Therefore, this technique was used to verify whether each item of the instrument is understandable to the elderly; therefore, by verifying positive results, content validation was obtained for this audience.

As for the convergent validity in the study conducted by Quemelo²⁰, inappropriate values were revealed in both CR and AVE, concluding that, due to the convergent validity suffered, the instrument should be used with caution. The present study presented the AVE value below the recommended; however, unlike the study mentioned above, the CRC value is adequate. Although this study demonstrated a suboptimal AVE value, its use in the elderly population was not invalidated since the CR index is within the parameters and the difference in AVE in relation to the appropriate value may have been affected by the sample size, and small samples may impair the analysis of this marker. Regarding reliability, this model presented Cronbach's alpha, Omega and

CR values within the range of ideal values²⁶, which indicate adequate internal consistency for the elderly.

EHEALS instrument

The factor analysis showed that, as in the Health Literacy Scale, the eHEALS has a one-dimensional factorial structure with factorial loads of adequate values. However, when performing the CFA, it was found that the chi-square test did not present the expected results. However, this test should be used with reservation, as it has been described that it is not useful when evaluated in a small sample size; if so, it is affected and compromises the index⁴⁰. Another factor to consider is that the adjustment of a model should always be guided by several indexes, and a single index should not determine the conclusions⁴¹⁻⁴³. Thus, when analyzing the factors mentioned, and when verifying that other adjustment indices – such as TLI, CFI, and NFI – demonstrated adequate values, this adjustment model was considered satisfactory for use in the elderly.

As for the HL instrument, the content validity of the eHEALS was confirmed through the focus group technique, since all items of this instrument were understandable to the elderly. Convergent validity was verified through the values of CR and AVE, which presented adequate values. Reliability is demonstrated by Cronbach's alpha, Omega and CR values, which presented values above the recommended ones, which identifies this instrument as reliable.

The Health Literacy Scale was used to measure the level of literacy of the participants and their use of this information. Likewise, the evaluation instrument of the Digital Health Literacy Scale was applied to assess the level of experience of the elderly with the use of the internet to access health information. The questions were asked, and the elderly

answered them by saying what best reflected their opinion and experience on the subject.

Study limitations

The study had limitations in relation to the sample and adherence to the study, in which it was possible to perceive the fear of many elderly to answer the questionnaire, because they thought that their answers could have influence on their retirement. Another limitation refers to face validity regarding the understanding of the results reported to the elderly after the study.

Conclusions

This study concluded that the Health Literacy Scale has validity and consistency to be used in the elderly. Regarding the instrument that evaluates the DHL, this study accepts that the reliability of the instrument is adequate for the elderly. The validation of HL instruments can contribute to advances in health promotion, resulting in health gains.

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Collaborators

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