

Test of health Literacy for Portuguese-speaking Adults

Teste de letramento em saúde em português para adultos

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ABSTRACT: *Introduction:* Health literacy has been evaluated in several countries by tools developed for local language and culture. This study aimed to adapt and to validate the Health Literacy Test (TLS) for the Brazilian Portuguese language based on the Test of functional health literacy in adults (TOFHLA). *Method:* The TLS, translated and adapted to the Brazilian scenario based on the Test of functional health literacy in adults, was administered to 302 users of a clinic of a University in Santa Catarina from September to October 2013. Cronbach's Alpha coefficient, Spearman's correlation and Analysis of Variance were used to assess the internal consistency, the correlation between the parts of the test and association between sociodemographic variables and the score of the Test, respectively. *Results:* The average score of the test was 72.2, and 54.6% of participants had adequate health literacy, 19.2% had marginal health literacy and 26.2% had inadequate health literacy. The average score of the test was inversely related to the age of the participants and directly related to the level of education. There was no significant difference in the other sociodemographic characteristics. The internal consistency (Cronbach's alpha) was 0.953. The coefficients for the numerical and reading passages were 0.808 and 0.951, respectively. All the sections correlated positively and significantly with the Test, and also with each other. *Conclusion:* The validation of this test provides a new instrument to determine the literacy level in Brazilian adults.

Keywords: Health education. Health literacy. Validation studies.

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RESUMO: *Introdução:* O letramento em saúde é avaliado em diversos países por instrumentos adaptados ao idioma e à cultura locais. O objetivo deste trabalho foi realizar a adaptação transcultural para a língua portuguesa do Brasil e validar o Teste de Letramento em Saúde (TLS), a partir do Test of Functional Health Literacy in Adults (TOFHLA). *Método:* O TLS, traduzido e adaptado à realidade brasileira a partir do original em inglês, foi administrado a 302 usuários de uma clínica universitária em Santa Catarina, entre setembro e outubro de 2013. Coeficiente alfa de Cronbach, correlação de Spearman e análise de variância foram utilizados para verificar a consistência interna, a correlação entre suas partes e a associação entre as variáveis sociodemográficas e a pontuação do teste, respectivamente. *Resultados:* A pontuação média do teste foi de 72,2, e 54,6% dos participantes apresentaram letramento em saúde adequado, 19,2%, limitado e 26,2%, inadequado. A pontuação média do teste diminuiu com o aumento da idade e aumentou com a elevação da escolaridade. Não houve diferença significativa para as demais características sociodemográficas. O coeficiente alfa de Cronbach foi de 0,953. Para a parte numérica e para os trechos de leitura, os coeficientes apresentados foram de 0,808 e 0,951, respectivamente. Todos os trechos correlacionaram-se positiva e significativamente com o teste, e também entre si. *Conclusão:* A validação do TLS oferece um instrumento para a determinação do nível de letramento em adultos brasileiros.

Palavras-chave: Educação em saúde. Alfabetização em saúde. Estudos de validação.

INTRODUCTION

Since 1995, Parker et al. has described basic reading, writing and numeracy skills as especially important factors in the field of health, whereby the participation of patients in the therapeutic plan is a critical point for the success of the treatments¹. However, an impressive number of patients do not participate effectively in their treatment because they do not have such skills². According to the Functional Literacy Indicator, 27% of Brazilians between 15 and 64 years of age are considered to be functionally illiterate, i.e., while knowing how to read and write, they do not have the reading, writing and calculation skills necessary for their personal and professional development³. When these individuals use health services, they are prone to additional difficulties due to the type of reading required in this environment⁴. To aggravate the problem, health professionals use specialized language that is often not understood by the laity².

The term health literacy is used in English to indicate the extent to which individuals are able to obtain, process and understand basic health information and services necessary to make appropriate decisions involving the ability to effectively use and interpret texts, documents and numbers⁵. In Brazil, there is no consensus on the best translation for this English expression. In this article, we use the term health literacy (HL), since literacy is used in the educational environment³.

HL is indicated as an important factor for the promotion and improvement of health^{6,7}. Inadequate HL is associated with an increased risk of hospitalization⁸, reduced use of preventive services⁹, delays in diagnosis¹⁰, less knowledge about health¹¹, higher costs¹² and greater risk of mortality^{8,13}.

Researchers have been developing instruments for the assessment of HL in several countries, and reviews which compile these instruments have been published^{14,15}. The most used instruments are the Rapid Estimate of Adult Literacy in Medicine (REALM)¹⁶ and the Test of Functional Health Literacy in Adults (TOFHLA)¹. TOFHLA is one of the most cited¹⁷, developed in English and Spanish and translated into other languages and / or adapted to other cultures, such as Spanish, Danish, Chinese, Serbian, Turkish and Hebrew¹⁴.

Instruments directed to the Brazilian reality that evaluate HL in its different domains are scarce. Carthey-Goulart et al.¹⁸ developed an instrument based on S-TOFHLA⁴, a reduced version of TOFHLA, applied to a sample with over representation of individuals with high levels of schooling, when compared to the profile of the Brazilian population. Apolinário et al.¹⁹ developed a Brazilian version of the SAHLSA (Short Assessment of Health Literacy for Spanish-speaking Adults),²⁰ which evaluates HL based on the pronunciation or comprehension of the isolated meaning of the words. Based on an instrument produced and tested in Switzerland, Quemelo et al.²¹ developed a Brazilian version tested in university students from the healthcare area as well as other areas of knowledge, with an average age of 22.7 years. These latter instruments do not evaluate numeracy skills^{19,21}.

The aim of this study was to perform the cross - cultural adaptation to the Brazilian Portuguese language and to validate the Health Literacy Test (TLS) based on TOFHLA.

METHOD

The HL assessment instrument for the Brazilian Portuguese language resulting from the process of cross-cultural adaptation²² was denominated the Health Literacy Test (TLS), adapted from TOFHLA with prior authorization from the authors²³. The complete TLS instrument can be accessed at www.ufrgs.br/tls. HL was defined as the degree of ability of an individual regarding reading and numeracy skills related to health. Numeracy is the individual's ability to make numerical calculations or interpret information that involves notions of quantity and time.

The first stage of the TLS preparation consisted of the translation of TOFHLA from English into Brazilian Portuguese, performed by a bilingual translator with experience in the health field, followed by back translation by another translator into the original language. In the second stage, the technical review and the semantic equivalence were performed, independently, by a medical professional and a linguistics specialist, respectively. At this stage, semantic equivalence between the first and second translations was observed, in addition to the need for cultural adaptation. It was necessary to change items that were not valid for the Portuguese language or items which were not relevant to the Brazilian health system.

Among the 17 numerical items, the last two (questions 9 and 10) were changed because they were related to the American social security context and did not fit with the Brazilian reality. These items were replaced by questions of similar reasoning. Question 9 was replaced by a numerical interpretation regarding maternity leave and question 10, with a question

regarding calculation of the correct dose for oral administration of a paediatric medicinal product. The other issues in this domain involved instructions on medication administration, interpretation of laboratory examinations, and attendance at a previously scheduled medical appointment.

The texts used in the three reading sections of TOFHLA were selected from instructions of a radiography exam of the gastrointestinal tract (text A), rights and responsibilities of *Medicaid* patients (text B) and a consent form (text C) by a literacy specialist. In the adaptation, text A was adapted to Portuguese based on the instructions used in a Brazilian teaching hospital for a radiography procedure of the gastrointestinal tract. Due to the differences between the health systems of the United States and Brazil, text B was replaced by the initial text of the Brazilian legislation that provides for the Unified Health System (SUS). Text C was adapted from a hospital consent form for surgical procedures also used in a Brazilian teaching hospital. In the texts, the modified Cloze procedure was applied, in which every fifth, sixth and seventh word of the text are omitted. The reader must fill in the gaps by selecting the most appropriate word for the text from four possibilities. At the end, text A totalled 16 items, text B, 20 items and text C, 14 items.

In the first version evaluated by Maragno²⁴, the instrument worked accordingly, however the sample had higher education levels when compared to the Brazilian reality. The authors decided to perform a new analysis of the instrument, this time using a sample that contemplated all schooling levels, according to the distribution verified in the Brazilian population. In this analysis, issue 10 of the numerical part, which referred to the *Bolsa Família* program, was replaced by a question regarding interpretation about the correct dose of a paediatric medicine.

The comprehension part was completed by the participant himself, while the numerical part was applied by an interviewer, who presented cards with information related to the items described in the previous paragraphs, followed by verbally applied questions evaluating the comprehension of the numerical information.

The score was calculated by the sum of correct answers by each individual. 1 was assigned to each correct answer and 0 to each incorrect answer. When the participant declared that he / she did not know how to respond, a value of 0 was assigned. The participant could score from 0 to 17 in the gross score of the numerical section. The weighted score table used in the original TOFHLA²³ was used to calculate the weighted score, which transforms the score to a scale from 0 to 50.

1 was assigned for each correct answer and 0 for each incorrect answer in the comprehension/reading part of the test. When the participant left the question blank or marked more than one alternative, it was assigned a value of 0. Thus, the participant could score from 0 to 16 in the reading segment A, 0 to 20 in reading segment B and 0 to 14 in reading segment C. There was no weight for reading scores, thus, in the end the participant scored between 0 to 50 points in that area of the instrument.

The scores obtained in the two parts of the instrument were added up, whereby the individual could score from 0 to 100. The total TLS score was divided into three categories,

according to TOFHLA: inadequate literacy (0-59), when individuals are unable to read and interpret health texts; marginal literacy (60-74), when individuals have difficulty reading and interpreting health texts; and adequate literacy (75-100), when individuals can read and interpret most health texts.

Data on sex, age, skin colour or self-reported race and schooling were collected. Reading frequency was measured by means of a scale that indicates the frequency which individuals read diverse materials such as newspapers, magazines and work materials. The time taken to respond to each part of the instrument was recorded in minutes.

The sample consisted of individuals 18 years of age or older who could read and write and who used the services of a university clinic located in Criciúma, in the south of Santa Catarina. We excluded individuals with visual or auditory limitations that prevented them from reading the instruments or listening to the interviewer, patients with serious diseases and those who did not speak Portuguese.

The sample of the participants was for convenience, with schooling level quotas, in order to represent the different strata of schooling levels found in the Brazilian population. Participants were invited to participate in the survey while they waited for the clinic service. All participants were interviewed only after giving their permission, by means of signing the Informed Consent Form (TCLE), signed twice by the researcher and the participant.

The internal consistency of TLS was determined by Cronbach's alpha coefficient. The association between the TLS score and the sociodemographic variables was analyzed by the analysis of variance. Spearman correlation was performed to verify the correlations between the parts of the TLS.

TLS was compared with schooling level and reading frequency, throughout the sample for the construct analysis. The Spearman correlation was used to analyse the schooling levels, measured in years of study. The reading frequency, categorized as "read little" or "read a lot", was analysed by the biserial correlation coefficient.

The analyses were performed on the SPSS software, version 18.0 for Windows (SPSS Inc., Chicago, IL, United States). The project was approved by the Research Ethics Committee of the *Universidade do Extremo Sul Catarinense* (opinion no. 260,137).

RESULTS

A total of 302 individuals were interviewed between September and October 2013, with a mean age of 46.6 years, of which 72.5% were female and self-declared themselves as white (94.0%) (Table 1). Regarding schooling levels, 170 participants had incomplete primary school education (56.3%), 30, complete primary school education (9.9%) and 102, secondary or higher education (33.8%). This distribution is close to that observed in the Brazilian population, according to the IBGE (Brazilian Institute of Geography and Statistics) 2010²⁴, which is 50% for illiterate individuals or with incomplete primary school education, 17% for individuals with complete primary school education and incomplete secondary school

education and 33% for those with complete secondary school education and incomplete third level education.

The mean TLS score was 72.25 ± 20.20 , corresponding to the sum of the numeracy section (50 points) and reading (section A: 16 points, section B: 20 points, section C: 14 points).

Table 1. Sociodemographic characteristics of the study population (n = 302).

Variables	N*	%
Age (years)		
19-24	37	12.3
25-44	90	29.8
45-64	129	42.7
> 64	46	15.2
Sex		
Male	83	27.5
Female	219	72.5
Skin colour or self-declared race		
White	281	94.0
Not white	18	6.0
Schooling (in years of study)		
1 - 3	58	19.3
4 - 7	112	37.3
8 - 11	103	34.3
≥ 12	27	9.0

* For the variables "color / race" and "schooling", n does not total 302 because data were not reported.

Table 2. Average Score of the Health Literacy Test (TLS), of each part and of each level of health literacy (n = 302).

	Average(\pm SD)	Median	Minimum	Maximum
TLS	72.25 (20.20)	77.50	15	100
Numeracy	37.15 (10.77)	39.00	5	50
Section A	12.45 (3.56)	14.00	0	16
Section B	12.21 (5.18)	13.00	0	20
Section C	10.43 (3.87)	12.00	0	14

SD: standard deviation.

The mean scores for each part of the instrument, the median, the minimum, and the maximum are shown in Table 2.

Among the participants, 26.2% had inadequate HL, 19.2%, marginal and 54.6%, adequate (Table 3). There was no statistically significant difference in the mean TLS score between men and women ($p = 0,488$) and among individuals who self-declared as being white or having a non-white skin colour ($p = 0.569$). The mean TLS score decreased with increasing age ($p < 0.0001$) and increased with higher education ($p < 0.0001$) (Table 3).

Table 3. Average score of the Health Literacy Test and distribution of participants in health literacy levels according to gender, age, race and schooling (n = 302).

Variables	Average (\pm SD)	Inadequate n (%)	Marginal n (%)	Adequate n (%)	Total
	72.25 (20,2)	79 (26.2)	58 (19.2)	165 (54.6)	302 (100)
Sex					
Male	70.94 (18,89)	25 (30.1)	19 (22.9)	39 (47.0)	83 (100)
Female	72.75 (20,69)	54 (24.7)	39 (17.8)	126 (57.5)	219 (100)
	$p = 0.488$	$p = 0.256$			
Age (years)					
19–24	87.81(12.86)	2 (5.4)	0 (0.0)	35 (94.6)	37 (100)
25–44	78.85 (17.57)	12 (13.3)	17 (18.9)	61 (67.8)	90 (100)
45–64	68.01 (19.32)	43 (33.3)	29 (22.5)	57 (44.2)	129 (100)
> 65	58.72 (19.96)	22 (47.8)	12 (26.1)	12 (26.1)	46 (100)
	$p = 0.000$	$p = 0.000$			
Color of skin or self-declared race					
White	72.81 (19.58)	71 (25.3)	56 (19.9)	154 (54.8)	281 (100)
Not white	70.05 (24.57)	5 (27.8)	2 (11.1)	11 (61.1)	18 (100)
	$p = 0,569$	$p = 0.656$			
Schooling (years)					
1 - 3	64.57 (19.89)	24 (41.4)	14 (24.1)	20 (34.5)	58 (100)
4 - 7	63.14 (20.25)	43 (38.4)	31 (27.7)	38 (33.9)	112 (100)
8 -11	81.74 (14.12)	10 (9.7)	12 (11.7)	81 (78.6)	103 (100)
≥ 12	91.89 (6.57)	0 (0.0)	1 (3.7)	26 (96.3)	27 (100)
	$p = 0.000$	$p = 0.000$			

SD: standard deviation.

The mean time to respond to the TLS was 25 minutes (± 7.5), with a minimum of 12 minutes and a maximum of 48 minutes. The numerical part was completed in 9.5 minutes (± 3.3) (3-25 minutes), section A, in 5.5 minutes (± 2.9) (1-20 minutes), section B, in 5.9 minutes (± 2.8) (1-22 minutes) and section C, in 4.5 minutes (± 2.7) (1-17 minutes).

The internal consistency measured by Cronbach's alpha coefficient, considering the 67 questions (total numerical questions and 3 texts), was 0.953. When calculated separately for the numerical part and the reading passages, the coefficients presented were 0.808 and 0.951, respectively. All TLS passages were positively and significantly correlated with TLS, as well as with each other (Table 4). The sum of the three reading segments presented a higher correlation with the TLS (0.900), followed by the numerical section (0.886) and the B section (0.861).

The TLS presented a positive correlation with the schooling level (0.549) and reading frequency (0.256), with statistical significance ($p < 0.001$) in both analyses. Individuals who reported reading little had a significantly lower score (66.85 ± 21.02) than those who reported reading a lot (75.25 ± 18.98) ($p < 0.001$).

DISCUSSION

In the present study, we present the TLS, a Portuguese instrument adapted from TOFLHA and adapted to the Brazilian conditions, in order to measure the reading comprehension and numeracy skills related to health information. TOFHLA was chosen for the adaptation by assessing HL based on reading comprehension and numeracy. Of the 19 literacy assessment instruments reviewed by Jordan et al.²⁵, TOFHLA presented the best psychometric properties among those that include numeracy²⁵. The choice for the complete TOFHLA rather than S-TOFLHA - the fastest application instrument - is justified by the fact that the adaptation of one instrument to another reality from a reduced version in another language and culture can introduce errors. For the elaboration of a reduced version, it is desirable to perform the analysis of the main components in order to identify which items of the complete instrument should remain in the reduced instrument.

Table 4. Correlation between the different parts of the Health Literacy Test (TLS) (n = 302).

	Section A	Section B	Section C	Numeracy	Reading**	TLS
Section A	1.00	0.766	0.723	0.551	0.878	0.796
Section B	-	1.00	0.818	0.578	0.960	0.861
Section C	-	-	1.00	0.571	0.900	0.823
Numeracy	-	-	-	1.00	0.612	0.886
Reading*	-	-	-	-	1.00	0.900
TLS	-	-	-	-	-	1.00

* All correlations were significant ($p < 0.001$); ** sum of the three reading passages.

The adaptation and validation of instruments presents difficulties when the country of origin and the target country have significant cultural and language differences, making modifications inevitable. In the TLS, the main changes were due to differences between the health systems of the United States and Brazil. In the numerical part, two questions were modified because they did not fit the Brazilian reality. At the reading comprehension stage, texts were replaced by similar texts used in Brazilian health services. The most significant change was related to section B, as it addresses the rights and responsibilities of Medicaid patients. The TLS version for this section was developed based on the initial text of the Brazilian legislation that regulates SUS (Law No. 8,080). However, despite the changes required for the adaptation of the test, we maintained the original instrument format, in which only part of the numerical evaluation used oral interaction. The texts that make up the reading comprehension part were read by the actual participant. We identified two instruments that were developed to evaluate the HL of Brazilians based on the adaptation of international instruments. The first, tested in 312 individuals in the city of São Paulo by Carthery-Goulart et al.¹⁸, used the short version of TOFHLA, the S-TOFHLA. The schooling level of the sample was high (37.1% of the interviewees had 12 years or more of study), distancing themselves from the Brazilian reality^{18,26}. Apolinário et al.¹⁹ evaluated the HL of 226 elderly people with an instrument developed based on the SAHLSA²⁰ that evaluates HL based on the pronunciation or understanding of the isolated meaning of the words.

The internal consistency of TLS was satisfactory (Cronbach's alpha coefficient = 0.95) and similar to that verified in the original instrument (0.98)¹ and in other instruments adapted from TOFHLA (0.95 for the Spanish version and 0.94 for the Danish and Serbian versions). The internal consistency of the numerical part was slightly lower than that of the reading part, which is in line with the original TOFHLA²⁰ and with other validation studies of this instrument²⁷⁻²⁹.

The correlation analysis between the parts of the TLS shows that each one of them (reading segments A, B, C and numeracy) presented high correlation with the complete instrument, revealing excellent internal consistency of the TLS. The reading comprehension section had the highest correlation with the complete instrument, a result similar to that verified by the authors of TOFLHA²³. The numeracy part showed a slightly higher correlation than the reading sections A, B and C, different from that reported by Nurss²³, who verified that the reading sections had higher correlations than the numeracy part (0.92 for the A section, 0.97 for part B, 0.88 for part C and 0.86 for the numeracy part)²³.

The results verified in the present study reveal that approximately half of the individuals had inadequate or marginal literacy, i.e., they did not present the basic reading or comprehension skills necessary to understand health information. These values are similar to the results of a meta-analysis of 85 studies conducted in the United States, where the prevalence of inadequate literacy was 26% (95%CI 22-29) and marginal literacy was 20% (95%CI 16-23)³⁰. By using S-TOFLHA, Carthery-Goulart et al.¹⁸ estimated inadequate or marginal literacy levels in 32.4%. The authors justify that the proportion of individuals with this level of literacy is possibly due to the high schooling level presented by the sample, which does not reflect the schooling level of the Brazilian population. Through a Brazilian version of

SAHLSA applied in 226 elderly individuals with a mean age of 74.4 (± 6.9) years, Apolinário et al. identified an inadequate literacy level in 66%, attributed by the authors to the socio-demographic composition of the sample¹⁹.

The older and less formally educated individuals presented lower TLS scores when compared to the younger ones with higher schooling levels, respectively. These results are consistent with those of other studies^{4, 8, 18}, highlighting the population subgroups that may present greater difficulty in understanding the information received in the health services. Elderly individuals in particular are more susceptible to multiple health problems, more complex treatment regimens and more frequent use of health services¹⁹.

We did not observe differences in the average score obtained between the numeracy part and the reading passages, suggesting that the degree of difficulty for the reading comprehension of health texts does not differ significantly from the degree of difficulty in interpreting numbers or performing calculations necessary for the understanding of medical prescriptions and laboratory test results, for example. In this sense, it is possible to suggest that the two domains are necessary for the evaluation of literacy in the Brazilian population.

The study has limitations. Firstly, the difficulty of accessing the national instruments that evaluate the general literacy made it impossible to compare the performance of the TLS with such tests.

Secondly, the TLS application time (25 minutes on average) was close to the mean time to respond to TOFHLA (22 minutes). Compared to other literacy assessment instruments, TOFLHA and TLS require longer application time, making it difficult for healthcare professionals with limited time for patient care.

Despite this, the TLS evaluates two domains of literacy (reading comprehension and numeracy), unlike most other instruments, that evaluate only one domain²⁵. Numeracy is an essential skill for the proper interpretation of medical prescriptions, laboratory test results, and other health information involving numbers and mathematical operations. Thirdly, when compared to the Brazilian population, women were overrepresented as well as white skinned individuals and those aged 45-64 years. The predominance of the white race reflects the profile of residents in Criciúma, a city colonized by Europeans, and women, the population group that most frequently uses health services. However, the schooling level resembles the distribution observed in the 2010 Census, different from that indicated in the study by Carthery-Goulart et al.¹⁸.

CONCLUSION

The international literature on HL is vast, unlike the one observed in Brazil, where the concept is still unexplored in the academic and professional milieus, resulting in the scarcity of studies on the subject. Thus, TLS contributes to the health communication area in Brazil, offering a validated instrument for the determination of literacy levels in adults in the Brazilian population, as well as identifying patients who need special instructions when using health services.

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