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Translation and cross-cultural adaptation of the Detailed Assessment of Speed of Handwriting 17+ to Brazilian Portuguese: conceptual, item and semantic equivalence

Tradução e adaptação transcultural do Detailed Assessment of Speed of Handwriting 17+ para o português brasileiro: equivalência conceitual, de itens e semântica

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ABSTRACT

Purpose: Perform a cross-cultural adaptation of the Detailed Assessment of Speed of Handwriting 17+ (DASH 17+) for Brazilians. **Methods:** Evaluation of (1) conceptual, item and (2) semantic equivalence, with assistance of four translators and application of a pilot study to 36 students. **Results:** (1) The concepts and items are equivalent in the British and Brazilian cultures. (2) Adaptations were made concerning the English language pangram used in copying tasks and selection of the lower-case, cursive handwriting in the alphabet-writing task. Application of the pilot study verified acceptability and understanding of the proposed tasks by the students. **Conclusion:** The Brazilian Portuguese version of the DASH 17+ was presented after finalization of the conceptual, item and semantic equivalence of the instrument. Further studies on psychometric properties should be conducted with the purpose of measuring the speed of handwriting in youngsters and adults with greater reliability and validity to the procedure.

RESUMO

Objetivo: Realizar a adaptação transcultural do *Detailed Assessment of Speed of Handwriting 17+* (DASH 17+) para brasileiros. **Método:** (1) Avaliação de equivalências conceitual e de itens e (2) Avaliação da equivalência semântica, sendo necessários quatro tradutores e aplicação do estudo piloto em 36 estudantes. **Resultados:** (1) Os conceitos e os itens são equivalentes na cultura britânica e brasileira. (2) Foram realizadas adaptações quanto à frase classificada como pangrama na língua inglesa utilizada nas tarefas de cópia e a escolha pela letra cursiva minúscula na tarefa de escrita do alfabeto. Com a aplicação do pré-teste, constatou-se aceitabilidade e compreensão dos estudantes nas tarefas propostas. **Conclusão:** Com a finalização da Equivalência conceitual, de itens e semântica do DASH 17+, apresentou-se a versão em português brasileiro. Como continuidade, novos estudos sobre as propriedades psicométricas devem ser realizados, a fim de mensurar a velocidade de escrita de jovens e adultos com maior confiabilidade e validade ao procedimento.

Study carried out at the Departamento de Fonoaudiologia, Faculdade de Filosofia e Ciências, Universidade Estadual Paulista “Júlio de Mesquita Filho” – UNESP - Marília (SP), Brazil.

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INTRODUCTION

One of the most complex and dynamic tasks of the manual function consists in writing^(1,2). This is because writing requires an efficient motor response, as well as integration of the perceptual-cognitive functions and efficient coordination of the movement of the pencil and / or pen in a specific direction^(3,4). According to the literature, it is the most elaborate form of communication, since it is the transcription of concepts and ideas through symbols⁽⁵⁾.

Since 1960, handwriting has been periodically investigated by different sciences, due to its relevance to daily life⁽⁶⁾. Although the use of handwriting is currently declining due to technological advances, it still remains grounded in the individual's progression in educational settings⁽⁷⁾.

Although in some cases young students use portable electronic devices to make notes during classes⁽⁸⁾ in Brazil, the students' academic knowledge, from elementary school to higher education, are measured, in most cases, by means of tests / examinations which involve proficient writing.

However, there is a great concern by the researchers, who study calligraphic ability, when addressing the theme "measuring academic performance", since deficits in handwriting may have a negative impact on the academic performance^(9,10), spelling^(11,12) and also on textual composition^(13,14). This negative impact can easily be evidenced when the student is asked to write a text with good quality (i.e. coherent, cohesive and respecting the linguistic and communicative norms).

The writer first idealizes the message he wants to communicate, then encodes it, retrieving the syntactic, morphological, and orthographic properties of words in the mental lexicon⁽¹⁵⁾. This coding process is mediated by the prefrontal cortex, which is responsible for fine motricity and control of isolated hand and finger movements⁽¹⁶⁾, and by many other structures which measure strength, speed, agility, providing visual, tactile and hearing *feedback*, enabling the constant movement adjustment⁽¹⁷⁾, favoring legibility (quality of letter formation, alignment and spacing of letters and words, and scaling of letters) and writing speed (production rate).

In the case of young and adult students, the mental demands and time pressure to carry out the proposed activities are high, considerably compromising their textual composition⁽¹⁸⁾, since they must be able to transfer their ideas to the paper quickly, while attempting to keep their thoughts for a certain time⁽¹⁹⁾. In this way, students with slower writing speed will be at disadvantage⁽⁸⁾, for example, during assessments / tests or even while taking notes during a lecture. This fact occurs because the brain activation of good writers differs from writers with writing difficulties, since they are more efficient in engaging working memory, thus facilitating the process of idea / thought generation⁽²⁰⁾.

In the United Kingdom, researchers⁽²¹⁾ developed the *Detailed Assessment of Speed of Handwriting 17+* (DASH 17+), which has been used to identify students aged 17-25 with writing difficulties due to inadequate speed, providing a measure reliability

of age-appropriate writing speed and performance, and also the control of therapeutic efficacy of intervention programs.

The procedure provides a writing overview through five tasks which are often used by young students in educational settings. They are: two copy tasks, an alphabet writing task, a text production induced by a theme, and a task for measuring perceptual-motor competence. This procedure can be administered in a group of students or individually, not exceeding 30 minutes.

Because it is an instrument based on normality criteria in the United Kingdom, it has been widely used by different professionals, such as speech therapists, teachers, psychologists, psychotherapists and occupational therapists, since they assist on the evaluation of the writing quality, on the delayed development, as well as in the differential diagnosis of other motor and learning disorders.

However, in Brazil, there are no studies investigating the manual writing speed of young students, which, consequently, becomes difficult to investigate difficulties related to this subject. In view of the lack of specific evaluation tools in Brazil, this study aimed to translate and adapt DASH 17+⁽²¹⁾ to the Brazilian population.

METHODS

Initially, this work was approved by Pearson Assessment Editing company, a division of Pearson Education Ltd., which granted the authorization for translation, adaptation and validation of the procedure for the Brazilian population.

Afterwards, it was submitted to the Research Ethics Committee of the Faculty of Philosophy and Sciences, São Paulo State University "Júlio de Mesquita Filho" - UNESP-Marília (SP), and obtained approval, by protocol number 0893/2013.

The DASH 17+

The procedure consists of five tasks, four of them are writing tasks and a task of perceptual-motor competence measurement, described below:

Task 1 – Copy Best: The student should write a sentence using his/her best handwriting, during two minutes. This task provides an initial estimate of the student's ability, when trying his/ her best.

Task 2 – Alphabet Writing: The student should write, in lowercase, the sequence of the alphabet, continuously, for one minute. This task provides an insight of how fast he/she can generate the issues which have already been learned previously. It can also be used as a means of determining how well the student knows the sequences of movements necessary to form each letter accurately - especially when the test is done individually.

Task 3 – Copy Fast of a sentence: The student should write the same sentence of the first assignment, as quickly as possible, but legibly, for two minutes. This task checks if he/she can change the writing speed, without great effort for readability. The justification for including two tasks with identical content and identical time constraints, consists on providing a directly comparable contrast between speed and performance.

Task 4 – Graphic Speed: It is an optical task requiring the student to do a series of “X” inside circles, focusing more specifically on the fine motor coordination, that is, on precision aspects, when making a mark. This task should be performed for one minute. The authors of the original procedure justify the existence of this task because it represents a “pure” measure of perceptual-motor competence, uncontaminated by anything related to language. As when the student is to write one of the simplest letters, such as “c”, he/she needs a good control of the pencil or pen, so that a line with a smooth curve must be produced in the right direction and orientation; the movement must be done in the correct place, often in a row, which requires spatial judgment as well as control. Therefore, this task was considered essential, in order to obtain a measure of the speed of the movement of the hands, outside the language domain.

Task 5 - Free thematic writing: The theme chosen, “my life”, was carefully selected by the authors of the original procedure, justifying as being a theme which allows the students to create written material easily, without thinking much. In this task, the student must “tell a story,” exercise the grammar of each sentence and the spelling of each word, and letters and words must be expressed through the movement of the hand, so that a permanent record emerges. There is no doubt that a task like this, is the very similar a student should do in an examination environment. This task should be done within 10 minutes, however, every two minutes the student should make a mark on the text, which allows us to monitor the frequency of textual production in different periods of time. For educational and clinical purposes, these data can be very informative. For example, they allow us to distinguish the student who is always slow throughout the 10-minute period and the one who writes a lot during one minute, and then simply runs out of ideas. These two students could have the same overall score of 11 words per minute (wpm) during the 10 minute time period.

To calculate the writing speed, in tasks 1, 3 and 5, the total of legible words divided by the time of the test is counted. In task 2, the legible letters are counted and in the correct sequence. In task 4, the speed is counted by the correct number of “X” inside the circles.

The methodological procedure

The methodological procedure followed five steps, as described in the literature⁽²²⁾, as follows: (1) Evaluation of conceptual and item equivalences and (2) Evaluation of the semantic equivalence, involving the steps: (2a) Translation, (2b) Backtranslation, (2c) Review by the judges committee and (2d) Pre-test. Figure 1 illustrates these steps.

(1) Evaluation of conceptual and item equivalences:

This stage consisted on examining whether there was relevance and correspondence between the concepts, in a similar way, in both cultures, British and Brazilian. It was carried out through bibliographical reviews and discussions with the members of the Laboratory

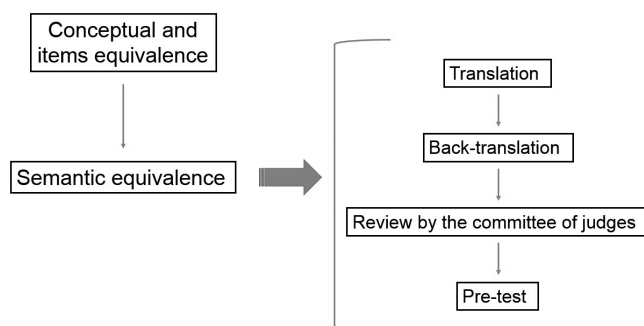


Figure 1. Methodological procedure for the first stages of cross-cultural adaptation of the DASH 17+

of Investigation of Learning Deviations (LIDA) - Department of Speech and Hearing Therapy, Faculty of Philosophy and Sciences, São Paulo State University “Júlio de Mesquita Filho” - UNESP- Marília (SP), forming, therefore, a committee of *expert* judges, composed of speech therapists, occupational therapists and pedagogues.

(2) Evaluation of semantic equivalence:

This stage evaluated the transfer of meanings between languages, in the expectation of obtaining a similar effect from the respondents of the target population. Attention was paid to specificities of referential and connotative meaning. It was subdivided into four stages:

(2a) Translation:

It was carried out by two professionals, one of them graduated in Letters, with specialization in English, and the other specialized in Translation, with postgraduate degree in English Language. Both had prior knowledge and explanation of the instrument and acknowledged the purpose of the research. They carried out translations of the original procedure from English into Portuguese, independently, generating two translations.

The committee of *expert* judges confronted the original instrument with the two versions in Portuguese. To compose the synthetic version, the translations of one of the versions, either entirely or modified by the committee, or translations originated from the combination of the two versions, were selected. The result of this combination was sometimes modified by the professionals of the committee, to better meet the criteria of semantic equivalence, maintaining the meaning and the impact that certain words or expressions have in the Brazilian cultural context.

(2b) Back-translation:

The synthetic version in Portuguese was delivered to two other translators in order to translate it back into the original language (*back-translation*). Due to the lack of consensus in the literature to request native translators, or translators fluent in the language, we chose to require fluent and bilingual translators for this study, since it was not possible to contact English language native translators. One of the translators was Master in Computer Science in Software Engineering and fluent in English because he had lived in New Zealand. The other translator was graduated in Translation, with postgraduate degree in Revision of Texts, also fluent in English. Neither of them had prior knowledge or explanation about the instrument, nor information about the concepts and purposes of the research.

(2c) Committee of judges:

The two versions retranslated into English, the synthetic version in Portuguese and the original procedure were analyzed by the committee of *expert* judges, to evaluate the items related to the semantic equivalences (meaning of words), idiomatic (formulation of colloquial expressions equivalent to the original language), cultural (terms and everyday situations which are different between cultures) and conceptual (words that have different cultural meanings) and composed the adapted version of DASH 17+, to be submitted to a pre-test.

(2d) Pre-test:

This stage aimed to ensure if the adapted version was equivalent to the original one, besides detecting errors, evaluating not only the quality of the translation, as well as the practical aspects of its application. To that end, the adapted version of DASH 17+ was applied to 36 students, 18 females and 18 males, divided into age groups, as proposed in the original procedure, as follows:

- Twelve students aged 17 to 18 years and 11 months.
- Twelve students aged 19 to 21 and 11 months.
- Twelve students aged 22 to 25 years and 11 months.

To participate in this stage, the students delivered the Free and Informed Consent Form, signed by parents or guardians or by themselves, in case of legal age. These students were attending the third-year of high school, a pre-college entrance course and two undergraduate courses, all located in the same city.

As inclusion criterion, they could not present in their student medical records, observations regarding the presence of sensory, motor or cognitive impairment, auditory, visual or motor complaints, psycho-affective problems or speech-language diagnoses (for example, autism, ADHD, dyslexia, among others), being, in these cases, excluded from the data sample of this study.

The selection of the students was done through a convenience sample (taking into account age and gender) and data collection in groups, comprising 12 participants, in a single session, not exceeding 50 minutes.

At the end of the application, all participants were asked to make comments about the procedure and report any difficulties they might have had to understand the proposed tasks, or even suggest alternative words or terms which could be easily understood. These comments and suggestions were applied to develop the final version of the procedure in Brazilian Portuguese.

RESULTS

During the evaluation of conceptual and item equivalences (the first stage of the cross-cultural adaptation of DASH 17+), it was verified, through a bibliographic review on the subject and discussions with the members of the *expert* judges committee, that the underlying concepts to evaluate manual writing were pertinent to the Brazilian culture, that is, they are equivalent in both cultures (British and Brazilian).

In the second step, semantic equivalence evaluation, were realized the translations (T1 and T2), a synthetic version, the retranslations (R1 and R2) and the adapted version, which was applied in the pre-test (Table 1).

During the translation stages, it was observed that in tasks 1 and 3 of the original procedure, a phrase was classified as a pangram in the English language, that is, a sentence (with as few letters as possible), composed by all the alphabet letters. Example: *The quick brown fox jumps over the lazy dog*. Also in this step, it was noticed that in task 2 (alphabet writing), lower case letters were required, but without differentiation between cursive letters and print letters.

As the researchers involved in the adaptation of DASH 17+ are the ones who have adapted DASH (for schoolchildren from 9 to 16 years of age), the measures taken were the same as previously described⁽²³⁾. The phrase “pangram” in English translated literally, is not configured as pangrama in Portuguese language; so, it was elaborated by the researchers, a phrase - *That day Max played soccer with his neighbor Pedro* - in which the letters K, W and Y were excluded, since they are letters used in foreign words or for proper names and, consequently, are not frequently used by the student. Like the original phrase in English, an action phrase was created with two characters, with short words, of frequent use and without many syllabic complications.

Another adaptation was performed in task 2, requesting the use of cursive handwriting. Faced with this change, the orientation given to the students in this task was modified in the version adapted to Brazilian Portuguese (Table 1).

In the stage of analysis by the committee of judges, the *experts* reviewed all versions (translations, synthetic version and

Table 1. Original version, translations, synthetic version, back-translations and adapted version of DASH 17+

Original Version	Translations	Synthetic Version	Back-translations	Adapted Version
1. Copying a sentence in "best" handwriting for 2 minutes	T1. Copiar uma frase com a sua "melhor" caligrafia por dois minutos	1. Copiar uma frase com a melhor caligrafia durante dois minutos	R1. Copying a sentence with the best handwriting for two minutes	1. Copiar uma frase com a melhor caligrafia durante dois minutos
	T2. Copiar uma frase com a melhor caligrafia durante dois minutos		R2. Copying a phrase with the best handwriting for two minutes	
2. Writing the alphabet in lower case for 1 minute	T1. Escrever o alfabeto com letras minúsculas por um minuto	2. Escrever o alfabeto com letras minúsculas por um minuto	R1. Writing the alphabet in lowercase letters for a minute	2. Escrever o alfabeto com letras minúsculas e cursivas por um minuto
	T2. Escrever o alfabeto em letra minúscula durante um minuto		R2. Writing the alphabet in lowercase letters for a minute	
3. Copying a sentence quickly for 2 minutes	T1. Copie uma frase bem rapidamente por dois minutos	3. Copiar uma frase rapidamente durante dois minutos	R1. Copying a sentence quickly for two minutes	3. Copiar uma frase rapidamente durante dois minutos
	T2. Cópia de uma frase rapidamente durante dois minutos		R2. Copying a sentence quickly for two minutes	
4. Drawing Xs in circles for 1 minute	T1. Desenhe Xs em círculos por um minuto	4. Desenhar "X" em círculos durante um minuto	R1. Draw "X" in circles for a minute	4. Desenhar "X" em círculos durante um minuto
	T2. Desenhar "X" em círculos durante um minuto		R2. Drawing "X" in circles for a minute	
5. Writing on the topic of "My Life" for 10 minutes	T1. Escrever sobre o tema "Minha vida" por 10 minutos	5. Escrever sobre o tema "Minha Vida" durante 10 minutos	R1. Writing on "My Life" theme for ten minutes	5. Elaborar uma redação sobre o tema "Minha Vida" durante 10 minutos
	T2. Redação sobre o tema "Minha Vida" durante 10 minutos		R2. Writing on "My Life" theme for 10 minutes	

back-translation) comparing to the original procedure, which confirmed and approved the adaptations made, also requesting the modification of task 5 orientation, altering the word "write" by "writing a composition".

With the translated and adapted version of DASH 17+ completed, the pre-test was made possible. Questions were asked about comprehension of the tasks proposed to the students, requesting the modification of any sentence to facilitate the comprehension, if necessary. None of the participants reported any problems concerning understanding the instrument and, therefore, did not suggest any changes.

DISCUSSION

When taking into account the differences in the sociocultural context for adaptation of a procedure, this study selected the cross-cultural adaptation model, as described in the literature⁽²²⁾.

The first step performed, comprised the conceptual and item equivalence, since, according to the literature⁽²⁴⁾, it becomes necessary to evaluate whether the construct to be measured is pertinent to the new culture, before translating the procedure into different languages. Thus, only after verifying that the underlying concepts in DASH 17+ to evaluate handwriting were equivalent in both cultures (British and Brazilian), the adaptation was continued.

At the evaluation stage of semantic equivalence, the concern is about understanding the procedure to all the intended population members⁽²⁵⁾. It is observed that choosing different *expert* translators for the procedure thematic to be adapted for Brazil, has been a concern of the researchers⁽²⁶⁾. With this in mind, for this study, four different translators were chosen, and in the composition of the committee of judges, only professional *experts* in manual writing were selected, so that the versions could then be compared and discussed, thus generating an adapted version, very close to the original one.

The application of the pre-test with students from different age groups and levels of education, guaranteed not only the verification of the comprehension of the items, but has also allowed the discussion of the instrument application feasibility to the Brazilian population, for whom DASH 17+ is intended.

Literacy skills, inferior to the expected to the age, related to legibility (quality of letter formation, alignment and spacing of letters and words, and scaling of letters) and to low speed (production rate), characterize what the Diagnostic and Statistical Manual of Mental Disorders⁽²⁷⁾ classifies as “specific learning disability with deficiency in written expression”, being coded as 315.2 (F81.81), in other words, dysgraphia. And, according to the literature⁽²⁸⁾, this dysgraphic disorder is usually underestimated and belatedly diagnosed.

The use of DASH 17+ would not only help in detecting signs of dysgraphia diagnosis, but would also be useful for obtaining suggestive difficulties with fine motor skills, since they make the student take more time to complete activities involving writing⁽²⁹⁾, and would still be a tool to complement the evaluation of students with learning problems, since the international literature has already shown that dyslexics produce fewer letters / words per minute, both in alphabet writing tasks and in composition tasks, when compared to students without school complaints⁽³⁰⁾.

After these steps, it can be stated that the Portuguese version of DASH 17+ met the criteria of conceptual and item equivalence and semantic equivalence, however, so that it can be appropriately used in clinical and research contexts, future psychometric studies involving the steps of Operational Equivalence and Measurement, assessment of reliability and validation of the procedure are being carried out, aiming to complement the process of cross-cultural adaptation of this Portuguese version.

CONCLUSION

The process of cross-cultural adaptation of DASH 17+ to Brazil followed the procedures recommended by the literature, reinforcing the value of the evaluation stages as conceptual equivalence, of items and semantics, as well as the accomplishment of the pre-test in the intended target population. These steps are extremely important when adapting an instrument elaborated in another cultural context.

The findings presented in this article indicate that this Brazilian version of DASH 17+ for students aged 17 to 25 years seems promising. However, future psychometric studies should be performed aiming greater reliability and validity of the procedure, complementing the process of cross-cultural adaptation.

Thus, the Brazilian version of DASH 17+ can be used in adequate clinical and research contexts for collecting useful and complementary information on the writing quality of young students.

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Author contributions

MHC principal researcher, elaboration of the research, elaboration of the schedule, literature survey, data collection and analysis, article writing, submission and paperwork of the article; SAC guiding, elaboration of the research, elaboration of the schedule, data analysis, correction of article writing, final version approval.