

Transcultural translation of the *Minnesota Handwriting Assessment* for the Brazilian context¹

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Abstract: Introduction: Handwriting is a complex human hand skill and its assessment is one of the several challenges encountered by teachers in the literacy process. Objective: The present study aimed to validate and adapt transculturally, for the Brazilian context, the Minnesota Handwriting Assessment (*MHA*), an instrument developed by Judith Reisman. Method: A total of 448 children enrolled in the 2nd and 3rd school years from the public school system and two school teachers who served as examiners, participated in the present study. The validation method utilized was the “Cross-Cultural Adaptation” and it was applied for the validation of the D’Nealian style. Results: First, it was verified the equivalence of concepts, semantics and idiom resulting from translation and retranslation of the *MHA* to Portuguese language. Then, teachers were asked to use the adapted *MHA* instrument. The Intraclass Correlation Coefficient (ICC) for the test-retest reliability was 0.92 for legibility, 0.90 for form, 0.99 for alignment and 0.89 for spacing, being significant in all categories. About the inter-rater reliability, the ICC was 0.89 for legibility, 0.99 for alignment, 0.98 for size, and 0.90 for spacing, reaching level of significance in these categories. The ICC 0.53 for form category did not reach level of significance which could be related to variability of the handwriting pattern of the Brazilian children. Conclusion: The cross-cultural adaptation for the Portuguese language and the satisfactory results obtained from the validation of the D’Nealian print style for the handwriting assessment allows its use in the Brazilian System of Education with restriction to the category of form.

Keywords: *Handwriting, Cross-Cultural Adaptation, Validation.*

Tradução transcultural do *Minnesota Handwriting Assessment* para o contexto brasileiro

Resumo: Introdução: A escrita é uma habilidade manual complexa e sua avaliação é um dos desafios encontrados pelos professores que atuam no processo de alfabetização. Objetivo: O presente estudo teve como objetivo validar e adaptar transculturalmente, para o contexto brasileiro, o *Minnesota Handwriting Assessment (MHA)*, instrumento elaborado por Judith Reisman. Método: Participaram do estudo 448 crianças matriculadas nos 2º e 3º anos do sistema público de ensino e duas professoras de escola que serviram como examinadoras. O método de validação utilizado foi o “*Cross-Cultural Adaptation*”, e tal validação foi feita no estilo de escrita com letra bastão. Resultados: Em um primeiro momento, foi verificada a equivalência de conceitos, da semântica e a idiomática resultantes da tradução e retradução do *MHA*. A seguir, professoras aplicaram o instrumento traduzido e adaptado para a língua portuguesa. O coeficiente de correlação intraclasse (CCI) para fidedignidade teste-reteste foi 0,92 para legibilidade, 0,90 para forma, 0,99 para alinhamento e 0,89 para espaçamento, sendo significativo em todas as categorias. Com relação à fidedignidade entre avaliadores, o CCI foi 0,89 para legibilidade, 0,99 para alinhamento, 0,98 para tamanho e 0,90 para espaçamento, alcançando nível de significância em todas estas categorias. O CCI da categoria forma foi 0,53, não atingindo nível de significância, resultado esse que pode estar relacionado à variabilidade do padrão da

escrita manual apresentado pelas crianças brasileiras. Conclusão: A adaptação transcultural proposta e os resultados satisfatórios da validação do instrumento de avaliação da escrita em letra de bastão permite seu uso, com restrição da forma, no Sistema Educacional Brasileiro.

Palavras-chave: *Escrita Manual, Adaptação Transcultural, Validação.*

1 Introduction

The handwriting stands out as an important form of communication in human development among the different human productions, generally learned in childhood, throughout the education process. It is a typical ability of the human being, of great social, cultural and scholarly-academic value. Through handwriting, human beings register their thoughts, their emotions and a whole set of activities related to the acquisition of knowledge and with social interaction throughout lifespan (CALVO, 2007; TAM et al., 2009). The development of handwriting begins with the first scribbles that over time became more intentional and more precise. The forms of the letters can be seen in children's drawings, indicating an initial learning of handwriting (indicating the beginning of the learning process of handwriting) (FEDER; MAJNEMER, 2007).

With the acquisition of handwriting, children use it in different ways depending on the context, such as during a play, in communication, in the expression of thoughts. In this sense, handwriting should not be considered as a mere instrument of school learning, but as an element of intellectual and cultural production, allowing the exploration of the environment and communication with other participants in the context of the classroom, showing the varied uses and functions inherent to a literate and self-built society (BRITO, 2007). A certain level of sensorimotor and cognitive development is required for the acquisition of handwriting (FÁVERO, 2005; LE ROUX, 2005). This ability demands fine motor coordination, body schema, laterality, as well as a space-temporal organization (FEDER; MAJNEMER, 2007).

Handwriting is a special kind of motor activity in which the writer prepares and executes specific sequences of spatial patterns of pencil shift (MEULENBROEK; VAN GALEN, 1988), recorded on papers, and for the children, in particular, it enables to express, record and convey thoughts and ideas. Over the years, a poor performance pattern of the child's handwriting trajectory can hinder the academic learning process, hindering the reading, the development of the reasoning, with negative impact on the accompaniment of the content being transmitted (MARTINS et al., 2013). In this

context, the production of handwriting in the first years of education should be an issue addressed for the acquisition of quality handwriting.

The use of standardized tests to assess the quality of handwriting or the direct observation of teachers may facilitate the identification of students' handwriting performance standards. Such evaluation is relevant since the handwriting is the instrument that allows the evaluation of the acquisition of knowledge. According to Racine et al. (2008), a standardized, valid and reliable assessment tool provides quantitative scores that allow the evaluator to measure the progression of the individual throughout the learning process. However, there is a lack of evaluation methods and instruments in the context of the school and different areas in Brazil, motivating researchers to seek such instruments in other languages and cultures that could be used after adaptation and validation in the Brazilian context. According to Fuentes, Mostofsky and Bastian (2009), the Minnesota Handwriting Assessment - MHA (REISMAN, 1999) is an instrument for evaluating handwriting whose results are close to the reports about the difficulty of handwriting pointed out by the teachers of the children. Consequently, such an instrument can be viewed as an easy-to-manage tool and can be incorporated into the procedures used by teachers during the process for the students acquiring handwriting. Thus, translating and adapting cross-culturally to the Brazilian context, the MHA (REISMAN, 1999) means offering secure support to educators and therapists to evaluate the quality of handwriting, providing parameters for professional practice.

1.1 General characteristics of the Minnesota Handwriting Assessment (MHA)

The MHA, developed by Reisman (1999), is an English Language handwriting quality assessment, requiring copying, a printed sentence involving all the letters of the alphabet in the Palmer, Zaner-Bloser, or D'Nealian style. Developed in the state of Minnesota, in the United States of North America, it uses calligraphic forms typical of that country.

The participants must copy, in stick or italic, the words of a pangram consisting of a sentence that transmits a message, with words that have all the letters (vowels and consonants) of the English alphabet to evaluate the quality of the handwriting, according to the MHA protocol. The pangram used in MHA was “The quick brown fox jumps over the lazy dog” (Figure 1), prepared and used by Microsoft Word, and can be found in text editing software or the Open Office text editor.

2 General Objective

To validate the Minnesota Handwriting Assessment - MHA (REISMAN, 1999) for the Brazilian Portuguese language.

2.1 Specific objectives

- To adapt the MHA instrument from English into the Portuguese language.
- To verify the test-retest reliability of the MHA adapted to the Brazilian Portuguese language.
- To verify the reliability among MHA evaluators adapted to Brazilian Portuguese.

3 Method

The study was divided into two phases; the first phase was the “Cross-Cultural Adaptation”, that is, the MHA translation and back-translation process.

Formal authorization for translation of the English language into the Brazilian Portuguese of the MHA and use in the Brazilian context was requested from

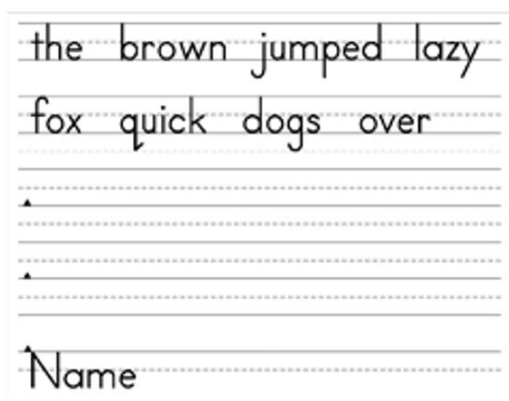


Figure 1. Model of the MHA assessment sheet (REISMAN, 1999). Source: Image taken from pearsonclinical².

the author Judith Reisman (PASCULLI, 2014). The second phase consisted of the validation of the MHA (REISMAN, 1999) in the Portuguese language with the participation of 448 children, aged between 6 and 8 years old, enrolled in the second and third grades of Elementary School of nine Municipal Schools of the city of Rio Claro, State of São Paulo. Also, two elementary school teachers acted as evaluators using MHA translated and adapted to the Brazilian context.

This project was approved by the Committee on Ethics in Research - human beings of the Institute of Biosciences, Unesp, Rio Claro, process 7166 and authorized by the Department of Education of the Municipality of Rio Claro. The participation of each child was authorized by parents or guardians, by signing the Informed Consent Form (ICF). The two participant teachers also agreed to participate in the study by signing the ICF.

The cultural adaptation (translation and retranslation) of MHA to the Brazilian context was carried out using the method proposed by Beaton et al. (2000), described below:

Initial translation: two translations of the instrument, from the original language into the target language, that is, from English into Portuguese, by two independent translators whose mother tongue, was Portuguese. The translators were not aware that another professional was simultaneously doing the same work.

Synthesis of translations: preparation of synthesis of translations by the project managers.

Back-translation: with the consolidated version in Portuguese, originated from the two translations, two back-translations of the instrument for the original language, English, were performed. Two other sworn translators were hired, to retranslate into English the versions previously translated into Portuguese.

Expert Committee: professionals from the school participated in this Committee. The objective of this committee was to prepare the final version of the instrument for evaluating the quality of handwriting from the two translations and re-translations mentioned above. This committee of experts was composed of a pedagogue, a physical education teacher and an occupational therapist.

Final version test: the level of understanding of the evaluators to the procedures for evaluation of the instrument was verified. The validation of the adapted MHA instrument was performed by estimating the test-retest reliability and reliability among the evaluators.

After completing the MHA, students performed the task of transcribing a pangram (that is, the sentence with all letters of the alphabet) on an A4 sheet, as shown in Figure 2. For this study, the pangram “*um pequeno jabuti xereta viu dez cegonhas felizes*” was used (WIKIPÉDIA, 2016).

Calvo (2007) in his study, whose objective was to verify the effects of an intervention program for children with handwriting difficulties, based on the variation of finger force production, used the same pangram. The task was done with all the students in the same room, sitting at their desks. For each of the students was provided black pencil and an evaluation sheet. Next, the evaluations of the 448 children were analyzed by two evaluators (i.e., elementary school teachers) from the Portuguese version of the MHA. The evaluators reviewed the evaluations again after fifteen days of the first analysis, 50 evaluations being chosen at random from the total applied. From these analyses, the verification of the test-retest reliability and reliability of inter and intra-evaluators were carried out by the Intraclass Correlation Coefficient (ICC). The ICC is

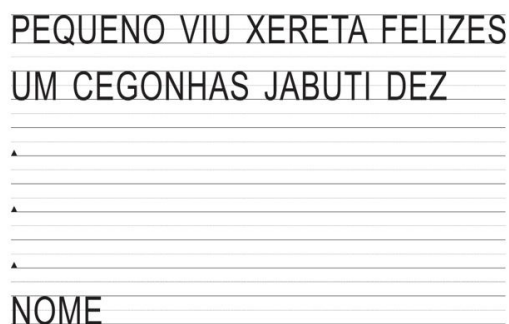


Figure 2. Handwriting quality assessment sheet in stick letter. Source: Pasculli (2014).

a statistical tool used to the reliability of measures, and it can measure the homogeneity of two or more measures. The ICC is an estimate of the fraction of the total variability of measures due to variations between individuals (MATTA, 2010). According to the literature, when the value of the ICC is less than 0.4, there is a low reproducibility, and when it is in the range of 0.4 to 0.75, the reproducibility is satisfactory, and when the values are above 0.75, the reproducibility is excellent (MATTA, 2010; THOMAS; NELSON, 2002; THOMAS; NELSON; SILVERMAN, 2012).

For this study, only the stick letter was used, considering the Brazilian educational context. Since 2005, through the Law nº 11.114/05 of the Ministry of Education (BRASIL, 2005), children must enter primary education at the age of 6, and Brazilian education has been extended to education for nine years. With this, some children in the third year are beginning to acquire cursive handwriting, presenting a great variation of performance for this type of letter. In the original protocol, the author performed the research with the 1st and 2nd grades. However, due to the change in Brazilian education, the research was carried out with the 2nd and 3rd years. The evaluation sheet was adapted for the English version of the MHA from 0.9cm to 0.6cm, seeking approximation with the size of the Brazilian notebooks.

The MHA quality categories were previously adapted by Calvo (2007) by the qualitative aspects of handwriting and the performance regarding legibility, form, letter alignment, and spacing between letters and words. A brief description of the handwriting quality evaluation criteria used by Calvo (2007) is presented in Table 1.

Table 1. Description of the quality criteria for writing.

QUALITY CATEGORIES	DESCRIPTION
LEGIBILITY	It is about the ability to identify and interpret the symbol (letter) produced by a combination of traits.
FORM	It is the characteristics of the traces of the symbol (letter), such as proportionality and sharpness of the traces.
SIZE	It is about the production of letters with or without all reference lines, except for the baseline. Respecting the lines of the ruling ensures that the size of the letters is preserved. Thus, each letter was evaluated considering the vertical dimensions. The height of the letters was considered about the lines.
ALIGNMENT	It is about the traces of the letters accompanying the main line of the ruling, and the letters that float on the line characterize errors of alignment with the main ruling.
SPACING	It is about the space between letters and words. The rightmost point of the first letter (or word) and the leftmost point of the next letter (or word) were adopted to measure the spaces between the letters and words of the sentence.

Fonte: Calvo (2007).

An unreadable, unidentified letter received an error point for each of the five quality categories. From the evaluation criteria of each of the categories mentioned above, a point is assigned for each detected error, being able to reach, the maximum of 35 errors in the set of words by category. Each letter may receive only one error point in each variable, even if, based on the criteria, there were several infractions/errors. Thus, the number of errors is deducted from the total number of letters (REISMAN, 1999).

The maximum score was also adapted from 35 to 42 letters since the set of words in the English sentence has 35 letters, and in Portuguese, there are 42 letters. In MHA, the handwriting time of the phrase in seconds is obtained by dividing the number of letters copied by 150 seconds, that is, by the period of 2'30" (two minutes and thirty seconds) of execution of the task. The handwriting time of the sentence in Portuguese was also adapted, being appropriate proportionally for the execution of 42 letters. The period stipulated for the execution of the task was 3'05" (three minutes and five seconds).

4 Data Analysis

For the analysis of the translation and back-translation process, the data were analyzed through meetings with the committee of experts to consolidate all versions of the translations, and to develop the final version of the instrument that was considered, verifying the equivalence and the quality of the translation. When necessary, the translators were contacted to obtain a consensus of the terms used. Thus, the evaluators considered the equivalence of concepts, semantic and idiomatic (BEATON et al., 2000). Discussions and consensus on the terms resulted in word adjustments, which sought to accurately portray the justification for each term adopted. The discussions and consensus of the terms were presented in descriptive systematized reports, seeking to portray the justification for each term adopted accurately.

For the analysis of the data collected in the schools, verification of the test-retest reliability of Inter and Intra-evaluators were performed. First, two evaluators were trained through ten evaluations. After this step, the evaluators analyzed the 448 paper sheets with the pangram reproduced by the students participating in this study. For each item, the agreement level of 90% between evaluators was accepted. Items that did not reach this percentage were revalued. After a period of approximately 15 days from the delivery of the first evaluation, 50 evaluations were randomly selected for the two evaluators to reassess

them. Seven days were established as a deadline for return of the second evaluation. The reliability of the instrument was verified by the Intraclass Correlation Coefficient (ICC). For the statistical test, the reliability interval of 90% was adopted. The statistical program used was IBM SPSS Statistic for Windows, version 21 (2012).

5 Results

The researchers responsible for the study carried out the synthesis of the translations prepared by the translators. The first translator gave a more literal translation of the words. On the other hand, the second translator had knowledge of the concepts examined in the evaluation instrument being translated, and its translation presented a greater equivalence with the real context.

The translation of the MHA into the Portuguese language was done through the inverted translation technique, which involves four translators. Two bilingual translators performed the translation of the instrument from the English language into the Portuguese language. It resulted in two independent translations, quite close but not the same. The two translations were transformed into a single document, based on the analysis and consensus of the committee of experts. The Portuguese version was translated into English by two other translators, without the help of the original version. Four versions were obtained, two in the Portuguese and two in the English. After the reverse translation, the preliminary versions were evaluated and modified.

The committee of experts met to evaluate the modifications of the preliminary versions. The two translations for the English were compared with the original version of the instrument, the semantics of the questions was retained, and the few necessary changes were restricted to replacing little-used words with more frequent synonyms. The two Portuguese versions were revised. Corrections regarding the technical terms used in the translation and adequacy of criteria for understanding by the target audience were the focus of the committee's discussions. The Portuguese language versions were adapted and unified, resulting in the final version of the instrument.

The sentence should have the least number of repetitions for the pangram to be suitable for the study. In this work, 13 letters of the 42 letters that compose the pangram appear only once, and 9 letters repeat two or more times. The vowel letters, which are binding letters, appear more than the consonant

letters. Regarding the repetitions, the letter “E” is the one that presents/displays the greater number of repetitions, with 19.1%. Each of the letters “N”, “O”, “S”, “T”, “Z” represent 4.7% of total repetitions, appearing twice in the sentence. The number and frequency of repetition of the letters in the sentence are shown in Table 2.

According to the manual handwriting assessment (REISMAN, 1999), each letter should be evaluated from each quality category. Thus, each letter presents a varied amount of error possibilities by category. In the case of the category legibility, there are 10 possibilities of error. However, most letters have the possibility of having six to seven items considered as a possibility of error, except for the letter “J”, which has nine, letter “P” with eight and the letter “X” with five possibilities of error. For the form category, most letters of the 11 possibilities of error present four to six error possibilities, except for the letter “I”, with three items of error possibilities. In the alignment category of the three possibilities, all letters may have only one possibility of error. For size, all the letters

Table 2. Frequency of each of the letters of the alphabet present in the sentence used in this study.

Letters	Total frequency of each of the letters in the sentence	Relative frequency of letters (n=42)
A	3	7.1
B	1	2.4
C	1	2.4
D	1	2.4
E	8	19.1
F	1	2.4
G	1	2.4
H	1	2.4
I	3	7.1
J	1	2.4
L	1	2.4
M	1	2.4
N	2	4.7
O	2	4.7
P	1	2.4
Q	1	2.4
R	1	2.4
S	2	4.7
T	2	4.7
U	4	9.6
V	1	2.4
X	1	2.4
Z	2	4.7
23	42	100

Source: Elaborated by the author.

present only one possibility of error, and for spacing of the two items, the letters have one or two error possibilities, except for the letters “P” and “U” not fitting the item because they do not have a previous letter to calculate the spacing. The number of error possibility of sub-items per letter in each category is shown in Table 3.

5.1 Test-retest reliability

By checking the reliability through the test-retest, the data from the first evaluation were compared with the data from the second evaluation performed by the same evaluator, after a period of 15 days between the evaluations. The results of the reliability are presented according to each of the five quality categories of handwriting.

Regarding the total test-retest scores (Table 4), the obtained CCI was 0.92 for legibility, 0.99 for form and alignment, 0.89 for size and 0.80 for spacing. According to the results presented in the test-retest, the values obtained were significant.

5.2 Reliability between evaluators

The reliability among evaluators aims to verify the degree of different evaluators obtained the same result from the same data (THOMAS; NELSON; SILVERMAN, 2012). The data were evaluated by two independent evaluators to verify the reliability. The results of the reliability are presented according to each of the five quality categories of handwriting. The reliability of the instrument was verified based on the Intraclass Correlation Coefficient (ICC). For the statistical test, the reliability interval of 90% was adopted.

According to Table 4, the CCI was 0.89, considering the total legibility scores presented by the two evaluators. Regarding the form quality category, the CCI value was 0.53, not reaching a level of significance. In the category of quality alignment, the value of CCI was 0.99, in the category of quality size, the value of CCI was 0.98, and in the category of quality spacing, the value of CCI was 0.90, with all significant results.

6 Discussion

Handwriting is an important tool in recording information of interest to the subject, allowing interaction and generalization of the central elements that support this typical human ability. In the Brazilian context, we do not have any handwriting

Table 3. Number of error possibility items per letter in each category.

Letters	Errors in legibility by letter	Errors in letter form	Errors in Letter Alignment	Errors in letter size	Errors in letter spacing
A	6	4	1	1	1
B	6	6	1	1	1
C	7	5	1	1	2
D	7	6	1	1	2
E	7	4	1	1	1
F	7	4	1	1	2
G	7	6	1	1	1
H	6	4	1	1	1
I	7	3	1	1	1
J	9	4	1	1	2
L	7	4	1	1	1
M	6	4	1	1	1
N	7	4	1	1	1
O	6	4	1	1	1
P	8	6	1	1	0
Q	7	4	1	1	1
R	7	6	1	1	1
S	7	4	1	1	1
T	7	6	1	1	1
U	6	4	1	1	0
V	6	4	1	1	2
X	5	5	1	1	2
Z	7	4	1	1	1

Source: Elaborated by the author.

Table 4. Intraclass Correlation Coefficient by category in the test-retest and between evaluators.

Category	Evaluation of reliability Test-Retest by category (90% Confidence Interval)	Evaluation of the reliability among evaluators by category (90% Confidence Interval)
Legibility	0.92*	0.89*
Form	0.99*	0.53
Alignment	0.99*	0.99*
Size	0.89*	0.98*
Spacing	0.80*	0.90*

Source: Elaborated by the author. Note: The symbol * represents the values with significant level.

evaluation tool that subsidizes this activity in the educational context.

The back-translation process enables not only to validate the translation, but also to provide support for the correction of errors that may be related to the literal translation or any interpretation embedded in the translated terms (MININEL, 2010). It is important to emphasize that the literature brings authors who points out different procedures for cross-cultural adaptation of an evaluation instrument to another culture (GUILLEMIN, 1995; BEATON et al., 2000; MANEESRIWONGUL; DIXON, 2004). According to Teixeira et al. (2011), it is very importance that

the stages of the cross-cultural adaptation process be rigorously described, ensuring the reliability of the results of the study.

Regarding the interpretation of the values obtained, values above 0.75 were considered as good, and values below 0.75 from poor to moderate, according to the proposal of Portney and Watkins (2000). According to these authors, the interpretation is only a suggestion, and it is up to the authors of the study to judge the reliability and level of acceptance of the instrument.

In this study, the proposed criteria were adopted by Portney and Watkins (2000), with the changes

suggested by Iwamizu (2013), who considered values above 0.75 as good, of 0, 50 to 0.75 as moderate and below 0.50 as “poor” for validation of the results in his study. Thus, the CCI for test-retest reliability was 0.92 for legibility, 0.90 for form, 0.99 for alignment and 0.89 for spacing, meaningful in all categories, that is legibility, form, size, alignment and spacing. Regarding reliability among the evaluators, the CCI was 0.89 for legibility, 0.53 for form, 0.99 for alignment, 0.98 for size and 0.90 for spacing, reaching significance level in the categories legibility, size, alignment, and spacing, except for the form category, which reached the CCI of 0.53, considered as moderate. This result may be due to the cognitive and motor process for acquisition and consolidation of handwriting tracing. Another relevant factor and addressed in the literature concerns the inconsistency between reading and handwriting in the initial stages of literacy (SOUSA; MALUF, 2004). According to the authors, when children begin to use orthographic strategies of reading and handwriting in the process of literacy, the ability to read is better than handwriting. In this context, it is possible that the production of the tracing has greater variability in the production of the letters of the alphabet, particularly for form.

From the results obtained in this study, it can be concluded that the process of cross-cultural adaptation of the proposed Brazilian version of the handwriting evaluation instrument is in a condition to be recommended for its application. The results of the evaluation of the quality of handwriting presented values that reached a level of significance, considering adequate for use in the educational context. However, analyses of manual cursive handwriting are also necessary.

7 Conclusion

Few studies are conducted on education about teaching and basic forms of handwriting. The lack of model and standard, as well as the lack of reference that could guide the work in education, hinders the steps that must be taken to have a quality education. Although these works are limited, regarding theoretical reference, they indicate the need to value enterprises in this sector, since they directly affect the school practice.

Considering the diversity of the Brazilian people, due to the size of the national territory and the variability of the cultures that are inserted, with European, American, Portuguese, Spanish and other cultures influence, making Brazil a unique

country, with a distance between the Brazilian reality and other countries. Thus, it is considered extremely important to evaluate the quality of children’s handwriting in the literacy process in the school context through a standardized instrument that allows comparing the written communication skills of students at this level of education in the educational system.

This study had to translate, adapt and validate the Minnesota Handwriting Assessment for the Brazilian context as its main objective (REISMAN, 1999). Specifically, it aims at verifying the reliability test-retest and between evaluators in the Brazilian context. The relative results of both the validation of the translation and the cross-cultural adaptation of the handwriting quality assessment instrument were considered satisfactory. Discussion and analysis of the data from back-translation elucidated some dubious terms that had been discussed during the translation synthesis, due to the difficulty of clarity of meaning in the context. Around 50 terms had to be adapted to the Brazilian context, terms that corresponded when back-translation to English, implying changes in the elaborated version. It should be noted that there were few suggested changes, given the number of terms that constitute the instrument in the original text.

In this sense, it can be considered that the adaptation to the Brazilian context of MHA may be useful for future analyses of handwriting. The evaluation of the quality of handwriting is one of the steps that should lead the Brazilian education to improve the teaching-learning process throughout the education process. Because we have a handwriting evaluation tool being used by teachers, we can then review the teaching process of handwriting. The lack of standards and models in Brazilian education impairs the acquisition of quality writing. On the other hand, this study shows the possibility of searching for a quality standard for the children through the evaluations.

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Author's Contributions

Adriane and Cynthia participated in the project design, data collection and analysis and writing of the text. Ana Maria Pellegrini participated in all the steps mentioned above, besides the review of the text. All authors approved the final version of the text.

Notes

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² Electronic Image Address: Pearson Clinical Brasil (2015).