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ORIGINAL ARTICLE

Translation and Cross-Cultural Adaptation of the "Child Drawing: Hospital" (CD:H) Scale for Paediatric Dentistry in Brazil

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ABSTRACT

Objective: To translate and perform the cross-cultural adaption of the CD:H scale for use in Paediatric Dentistry in Brazilian Portuguese language. **Material and Methods:** The translation and cross-cultural adaptation of the CD: H was carried out in four stages: 1) translation of the instrument; 2) reverse translation (back translation); 3) cross-cultural adaptation, and 4) face validation. Face validation consisted of the evaluation of 30 subjects from the target population. A pilot study was conducted with 15 children aged 5-10 years treated at a university dental clinic and their drawings were analysed by two dentists. Data were analysed using Stata 12.0. **Results:** In the face validation, most items were understood; however, some words were changed, and terms were included to identify the dental environment. Good reproducibility was obtained: inter-examiner reliability was 0.9647 and intra-examiner reliability was 0.9619 for examiner A and 0.8260 for examiner B. **Conclusion:** The Brazilian version of the CD:H scale is a useful tool for dentists, helping identify children's emotions and being enjoyable for them.

Keywords: Pediatric Dentistry; Anxiety; Translations.

Introduction

The dental environment can be considered by children as a stressful environment [1-3]. Children's emotions, such as dental fear and anxiety (DFA), are constantly demonstrated through behavioural reactions presented during dental care. However, children with challenging behaviour may be incorrectly diagnosed with DFA and children with DFA who do not behave in an outwardly way and become silent or frozen and go unrecognized [4]. So, it is important that professionals use tools to help understand children's emotions.

Drawing is considered a projective technique able to identify the emotional state of children, being easy to use, familiar, not expensive, and more enjoyable for children [5]. In Paediatric dentistry, drawings are a valuable tool to better understand children's emotions and expectations about the dental environment [6]. It has been effective in identifying the presence of stress and dental anxiety during dental treatment [7], the occurrence of negative dental experiences during dental care [6], as well as the perception in relation to the professional and the dental environment [2,6,8,9].

One of the well-known instruments used to evaluate drawing is the Child Drawing: Hospital (CD:H) scale, a useful method to identify the emotional status of hospitalized children [10]. This scale has been used for many years in nursing [11-13]. The use of the CD:H scale in dental research is relatively new, but it has been shown to be a useful and valid instrument to identify emotional status related to dental care in children, such as dental anxiety, pain, and distress [5,14–17].

Considering the importance of valid and reliable tools that identify children's reactions in the dental environment while being pleasant for the child, this study aimed to translate and perform the cross-cultural adaptation of the Child Drawing: Hospital (CD:H) scale for use in Paediatric Dentistry in Brazil.

Material and Methods

Data Collection and Ethical Clearance

The CD:H is a scale specifically developed to measure the emotional status of hospitalized school-age children (5-11 years of age). Administering the CD:H scale consists of a blank sheet and eight basic crayons (red, purple, blue, green, yellow, orange, black, and brown). A manual has been established in the study by Clathworthy to aid in the drawing scoring (CD: H Scoring Guide, Rating Scale and the CD: H score sheet), which consists of specific directions and examples. The drawing scoring consists of three sections: Part A involves 14 items scored on a scale from 1 to 10 (ranging from 10 to 140 points), while 1 demonstrates the lowest level of anxiety; 10 presents the highest level. Part B identifies the existence of any of eight items of pathological signs that may indicate high levels of anxiety (ranging from 0 to 65 points). Part C is a score that involves a total rating by the scorer to the child's anxiety shown in the picture on a 1 to 10 scale using specific identifiers (ranging from 1 to 10 points) [18,19]. The total score is the sum of the scores obtained in parts A, B, and C, ranging from 11 to 215 points. The detailed rating scale for CD: H is described in Table 1.

For analysis purposes, the total score is presented in five categories (≤ 43: very low stress; 44–83: low stress; 84–129: average stress; 130–167: above average; and 168 and over: very high stress) according to the level of anxiety and for each level an intervention for anxiety management (Table 2), as recommended by the authors of the original scale [10]. The translation and cross-cultural adaptation process followed the recommendations of Beton et al. [20] and Guillemin et al. [21] (Figure 1).

The study was approved by the Research Ethics Committee of the Faculty of Dentistry at Federal University of Pelotas under protocol number 1.706.382.

Table 1. Children Drawing: Hospital (CD:H) Rating Scale.

Section A	1	2	3	4	5	6	7	8	9	10
1. Position of person	Standing-grounded	Standing-not grounded	Standing with crutches	Standing on bed/dental chair	Sitting in regular chair	Sitting in bed/dental chair	Sitting in bed/dental chair, covered	Lying in bed/dental chair	Lying in bed/dental chair covered	Floating or no person
2. Action - Life	Visibly moving		Person or Picture lively		Shows some life		Potential for movement	No movement, but life		Rigid, no life
3. Length of person	Body tall, occupies whole paper	Tall body appropriate to picture	Short body appropriate to picture		Short people, bodies exposed		Very small, constricted people	Upper torso only	Head only, body covered	Floating head, no body
4. Width of person related to length	Width appropriate to length	Width slightly reduced compared to length	Width thin compared to length clothed	Width thin, not clothed, or appropriate, but not clothed	Appropriate body size, covered	Stick figures. with clothing	Stick figures. Not clothing	Very thin body or stick figure, covered	Ambiguous body shapes	No body, floating head, no evidence of body under covers
5. Facial Expression	Smile 		½ smile 		Neutral 			½ Frown 	Frown 	No face, no expression
6. Eyes/pupils						Piercing 	Pinpoint 	Closed 	Vacant, unseeing 	No eyes
7. Size of person in comparison to environment	Appropriate size		Medium to small		Small			Very small		Tiny, overwhelmed
8. Color predominance	Yellow		Green		Blue	Orange	Purple	Brown	Red	Black
9. Number colors used	8	7	6		5	4	3		2	1
10. Use of paper	All		3/4		1/2			1/4		Restricted to 1/6 of the sheet
11. Placement on paper										
12. Quality of strokes	Firm, dark		Dark, some light		Medium, equal light and dark			Light		Very light
13. Dental equipment	None included		Proportional in size		Slight increase in size			Larger equipment		Large and threatening
14. Developmental level	Above normal		Normal		Slight below normal			Below normal		Markedly below normal

Table 2. Anxiety level based on the total scores of CD:H scale (Child Drawing: Hospital).

Total Score CD: H	Anxiety Level	Necessary Intervention
≤ 43	Very low	Intervention with parents can provide means to stimulate the child's coping ability.
44-83	Low	Intervention with the child can prevent the development of difficulties.
84-129	Medium	Recommendation of daily intervention with therapeutic toy.
130-167	High	Continue the intervention daily with therapeutic toys; consultation with the psychologist.
≥ 168	Very High	Forward to the psychologist.

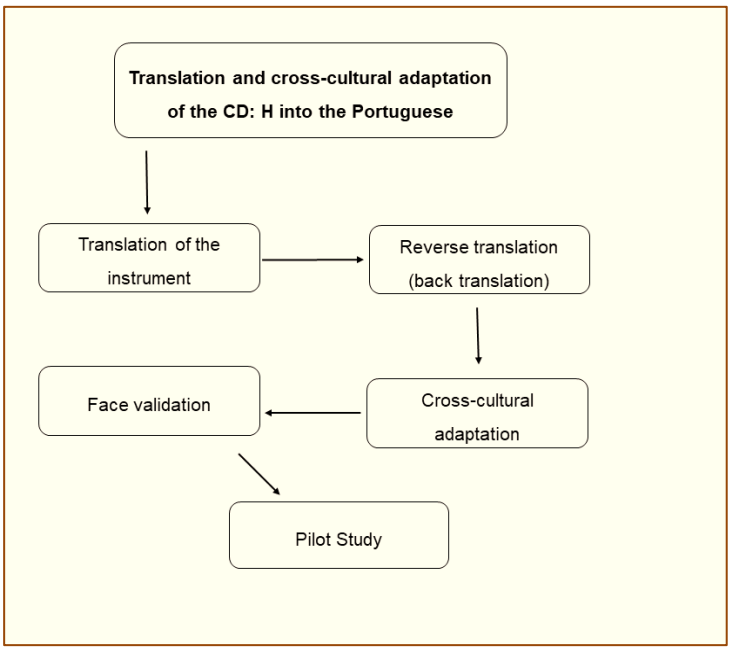

Figure 1. Flowchart of translation and cross-cultural adaptation of the CD:H in Brazilian Portuguese language.

Translation and Synthesis

The original instrument was translated into Brazilian Portuguese by two independent translators, an MSc in Paediatric Dentistry and a Ph.D. in Psychology, natives of the Portuguese language and fluent in the English language. The translated versions (T1 and T2) were synthesized in a final version made for comparison purposes and revised by a third translator, an English teacher (T3). The instrument was translated considering the concepts of the items and their application, based on the CD:H manual.

Back Translation and Committee Review

The Portuguese version was translated back into English independently by two MSc in Dentistry, Brazilian and bilingual, who created two back-translated versions (BT1 and BT2). A committee composed of a an MSc in Paediatric Dentistry, an English-speaking teacher, a Ph.D. in Psychology and an undergraduate dentistry student reviewed all reports and made idiomatic and semantic adaptations typical of the technical language. After reaching a consensus on discrepancies, the first Portuguese version was finalized.

Cross-Cultural Adaptation of the Pre-Final Version

This stage consisted of the evaluation of the instrument by subjects from the target population (dentists) for the adaptation of words or expressions that were considered difficult to understand, testing for operational equivalence, and checking for possible divergences regarding cultural or concept ambivalence of the instrument

scores. In addition, the scale was adapted to contain the elements present in the dental environment. To this end, an online questionnaire was sent to 10 participants. An information letter and the informed consent form were also sent with the questionnaire.

In the questionnaire, instructions and items to be evaluated were presented. For each item, the level of understanding was asked with the following question: "How much did you understand about the item read?", with the answer options: (a) I understood it very well; (b) I understood it more or less; and (c) I did not understand the item. For each item answered, a new question was asked to describe criticisms and / or suggestions regarding vocabulary, context, clarity, simplicity, objectivity, and cultural understanding.

The committee discussed again the problems detected in each item of the scale. After the semantic and operational considerations and adjustments, the intermediate version of the instrument was presented.

Face Validation

This stage consisted of comparing and evaluating the instrument in the original language with the intermediate version resulting from the cultural adaptation. To this end, the responsible committee discussed the changes made to obtain the idiomatic, semantic, cultural, and conceptual equivalences. Therefore, the final version of the instrument was prepared.

The final version of the instrument was tested online again with the participation of 10 undergraduate students, 10 graduate students, and 10 professors at dental school. Questions that presented a rate greater than or equal to 20% of incomprehension were reassessed, and changes were made, when necessary.

Pilot Study for the CD: H Scale Test

A pilot study was conducted at the paediatric dental clinic of the School of Dentistry from November to December 2016 to test the application of the final instrument. The pilot study was carried out using a convenience sample. Children aged 5-10 years participated, accompanied by their parents\guardians, who were previously informed and signed the informed consent form. Children were invited to participate and signed a consent form. Children with compromised physical and mental health history were excluded.

After the dental visit, the child was taken to another room, without the presence of parents, for the drawing. A sheet of craft paper and a box of coloured pencils were given to the child, who determined the direction and positioning of the drawing. The child was instructed with the following phrase: "Please draw a picture of a person at the dental office. I will pick up your drawing when you are finished. Can we start?". When the child indicated verbally or by gestures that finished the drawing, the paper sheet was collected and labelled on the backside with the patient's name, age, and birth date. The application of the drawings was carried out by 5 previously trained and instructed undergraduate students.

The drawings were independently assessed by a graduate student and an MSc in Paediatric Dentistry. After seven days, the drawings were evaluated again. Data were entered twice and independently in the Excel software (Office 2013) to detect and correct errors. Descriptive data analysis was performed to obtain the discrete and relative frequencies. Inter- and intra-examiner agreement was tested using the Weighted Kappa Coefficient to test reliability and reproducibility. Statistical analysis was performed using the Stata 12.0 software.

Results

After completing the translation and back-translation process, the cross-cultural adaptation was carried out through a pre-test applied to 10 dentists via an online questionnaire. Suggestions were made regarding the

inclusion of terms to describe the dental context and to improve clarity. Regarding these comments, during the translation meetings of the committee of reviewers, some specific changes were necessary to reach cross-cultural adaptation. The changes suggested are presented in Table 3. As for items referring to Part B, 100% of people understood them "very well". To facilitate interpretation, drawings were added for each item. In relation to Part C, no changes were needed. Face validation with the final instrument was carried out by applying the online questionnaire to 10 undergraduate students, 10 graduate students, and 10 teachers (100% participation). Items 4-9, 11, 12, 14, 15, 21, and 23 showed 100% understanding. Items 1-3, 10, 13, 16-20, and 22 showing over 92.5% of comprehension. Therefore, no modifications to the final instrument were necessary.

Table 3. Changes suggested during the translation meetings of the committee of reviewers to reach cross-cultural adaptation.

Item	Changes Needed
Part A	
1. Position of person	The word "solo" was replaced by the word "floor", the word dental chair was added to the scores to contextualize the dental environment.
2. Portrayal of action/life	The score drawings were modified for the dentistry context, as well as the explanations of each score. The words dental chair, dental instrument, dental owl, and bib were added.
6. Eyes/ pupils	A discrepancy between the description of the items and the drawings on the original scale was identified. Thus, it was necessary to adapt the drawings to match the item descriptions.
7. Size of the person in comparison to the environment	In the original scale, there was no reference image for comparison with the item descriptions; therefore, a table with images was added to the work to facilitate interpretation.
8. Predominant color	A question was observed as to whether the item referred to "the color most used in the painting of the drawing". For this reason, the expression "in the drawing" was added to the 10 scores of that item at the end of each score. For example: score 1: the yellow color is predominant in the drawing.
9. Number of colors used	The expression "all colors" was replaced by "8 colors".
13. Inclusion/size of dental equipment	A table of specific drawings was added for each score, as requested in the suggestions of the scale's evaluators.
Part B	To facilitate interpretation, drawings were added for each item.

During the pilot study, 15 drawings of children aged 5-10 years (mean age 7.3 years) were evaluated. The majority (80%; 12) of children had, according to the interpretation of drawings, global scores ranging from 44 to 83 points, indicating a low level of anxiety (Table 4). In Part A, children had scores ranging from 39 to 89 points. In Part B, most children (40%; 6) scored 10 points. In part C, the majority (73.3%; 11) of children had score 1, indicating their ability to cope with the situation through a realistic, pleasant, and well-proportioned design.

Table 4. Description of sample (n=15).

Item	Age (Years)	Scores CD:H scale				Anxiety Level
		Part A	Part B	Part C	Global Score	
Drawing 1	5	76	10	1	87	Medium
Drawing 2	9	62	10	5	77	Low
Drawing 3	10	89	5	7	101	Medium
Drawing 4	8	68	10	1	79	Low
Drawing 5	9	69	10	1	80	Low
Drawing 6	7	51	0	1	52	Low
Drawing 7	7	48	10	1	59	Low
Drawing 8	10	74	15	8	97	Medium
Drawing 9	7	58	5	5	68	Low
Drawing 10	6	52	0	1	53	Low

Drawing 11	7	44	10	1	55	Low
Drawing 12	6	65	0	1	66	Low
Drawing 13	5	39	15	1	55	Low
Drawing 14	6	50	10	1	61	Low
Drawing 15	8	43	0	1	44	Low

The inter-examiner agreement coefficient of the global score was 0.9647 (standard error of 0.1664). The weighted Kappa of Part A was 0.8982 (standard error of 0.1650), part B weighted Kappa was 0.9402 (standard error of 0.1886), and part C with weighted Kappa of 0.7273 (standard error of 0.1891) (Table 5).

After seven days, the drawings were evaluated once again. The intra-examiner concordance coefficient of evaluator A regarding the global score was 0.9619 (standard error of 0.1676). Regarding scores of parts A, B and C, the agreement coefficients were 0.9651 (standard error of 0.1636), 0.9402 (standard error of 0.1886) and 0.8888 (standard error of 0.1996), respectively. Evaluator B obtained an agreement coefficient for the global score of 0.8260 (standard error of 0.1716). The intra-examiner agreement coefficients for parts A, B, and C were 0.9085 (standard error of 0.1605), 0.8810 (standard error of 0.1869), and 0.6512 (standard error of 0.2096), respectively (Table 5).

Table 5. Reliability and reproducibility of the CD:H scale.

CD:H Scale	Reliability*	Reproducibility**	
	Evaluators A and B	Evaluator A	Evaluator B
	wK (se)	wK (se)	wK (se)
Part A	0.8982 (0.1650)	0.9651 (0.1636)	0.9085 (0.1605)
Part B	0.9402 (0.1886)	0.9402 (0.1886)	0.8810 (0.1869)
Part C	0.7273 (0.1881)	0.8888 (0.1996)	0.6512 (0.2096)
Global score	0.9647 (0.1664)	0.9619 (0.1676)	0.8260 (0.1716)

wK (se): weighted Kappa (standard error); *Inter-examiner agreement coefficient; **Intra-examiner agreement coefficient.

Discussion

The final version was considered adequate to use in dental settings by Brazilian professionals. Our results corroborate other studies, which found that CD:H is a scientifically safe and reliable mechanism for application in dentistry [5,14,16,17].

This is a study of translation for Portuguese and cross-cultural adaptation of the CD:H. Thus, our results point to the applicability of the scale in the dental environment and not to the validity and reproducibility of the scale, which is an important limitation of this study. Noteworthy, the validation study with a representative sample is already being carried out by the authors.

The translation process for obtaining the Brazilian versions of the instruments was carried out by two qualified and bilingual translators who could understand the cultural context of the two countries, which agrees with other studies that have translated other instruments into Portuguese [22-24]. As a result, different translations were obtained, which allowed the detection of errors and divergent interpretations, contributing to a better-quality translation. However, simple translation is insufficient when it is intended to use an instrument from another country; and as previously observed, countries have individual cultural characteristics with their own terms and expressions, requiring cultural adaptation [22,25].

The back-translation stage makes it possible to ascertain the occurrence of errors made during the translation process) [22], which was not found in this study. Scale comprehension pre-tests included undergraduate, graduate students and teachers. These three points of view, due to the existing differences in

terms of understanding and level of knowledge, allowed a wide and comprehensive assessment of the scale items and scores in the semantic and cultural scope.

Although used in some studies to assess the child's perception of the dentist and the dental environment [5,14,16,17], the CD: H scale was created to assess the children's feelings regarding the use for the hospital environment [10]. For this reason, some very specific terminologies related to the hospital environment (e.g., "hospital bed") were present along the scale's evaluation criteria. Furthermore, during the cross-cultural adaptation process, changes for the dental environment were made as suggested by the academic population to improve the context of the scale, making it clearer and with a more accessible language for this population.

Face validation was essential for improving the scale. This increase in the understanding of the scale items occurs through permanent review and discussion, following the suggestions and criticisms indicated by participants, which demonstrates the importance of the cross-cultural adaptation process during the translation of an instrument. The cross-cultural adaptation process allows the achievement of reliability and validity similar to the original instrument, allowing the instrument to remain with the reference elements [25,26].

The pilot study demonstrated the easy scale application and interpretation. Drawing is an instrument widely used to assess psychological phenomena, easy to be applied, fast, inexpensive, familiar, and pleasant for the child [5,27]. However, when evaluating the drawings, it was possible to observe that the score referring to part C has greater difficulty to be performed due to its subjectivity when compared to the others, resulting in lower Kappa.

For many years, drawing has been used as a form of non-verbal communication [28], in which the child unconsciously expresses information about the elements of quality of life and health [29]. In our study, inter- and intra-examiner agreements showed significantly consistent values. The high degree of agreement in the pilot study was highlighted as the evaluators had no experience in evaluating drawings and were not previously trained and calibrated. Drawings were evaluated by an MSc in Paediatric Dentistry and a graduate student in Dentistry. This fact reinforces our support for the easy application of this scale and the reliability it presents. This expressive consensus increases the confidence that the evaluators have captured the essence of the feelings projected in the drawings.

One of the greatest advantages of this scale is the fact that it can identify children's reactions in a natural way, considering the motor and psychological patterns of the age [5,10]. Further studies should perform validation, comparing the DFA evaluation by drawings with other instruments considered the gold standard.

Conclusion

The CD:H scale was translated and adapted for use in Dentistry in Brazil, presenting significant scale reliability and reproducibility coefficients. In order to measure the instrument's psychometric properties, subsequent validation steps must be performed.

Authors' Contributions

NBC	https://orcid.org/0000-0003-0724-0069	Conceptualization, Methodology, Validation, Investigation, Writing - Original Draft, Writing - Review and Editing, Supervision.
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MLG	https://orcid.org/0000-0002-6512-2602	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Writing - Original Draft, Writing - Review and Editing, Supervision, Project Administration.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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