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## VALIDATION OF THE BRAZILIAN VERSION OF THE PROFESSIONALISM MINI-EVALUATION EXERCISE (P-MEX) TO ASSESS THE PROFESSIONALISM OF PEDIATRICIANS

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### ABSTRACT

**Purpose:** Assessment allows students to identify their strengths and weaknesses and, when necessary, facilitates the intervention of the teacher. The Professionalism Mini-Evaluation Exercise (P-MEX) is an instrument with good psychometric properties used to assess the professionalism of students. Despite having good properties, there is no version validated for use in Brazil. Therefore, the aim of this study was to validate the cross-culturally adapted version of the P-MEX for Brazilian Portuguese and for the evaluation of pediatric residents. **Methods:** The adapted version of the P-MEX was applied by 17 preceptors to 30 pediatric medical residents. Validity was assessed by factor analysis with Varimax rotation. Cronbach's alpha coefficient and Kendall's tau-b correlation were calculated to verify the instrument's internal consistency and precision, respectively. **Results:** A total of 143 assessments were performed. Satisfactory internal consistency was observed (Cronbach's alpha 0.96). Confirmatory factor analysis indicated the permanence of the four original domains of the instrument, as well as the same number of items in each of these domains (factor extraction matrix > 0.3). A strong magnitude correlation (T=0.59, p=0.02) was observed between preceptors. **Conclusions:** The Brazilian version of the P-MEX is valid and reliable for assessing the professionalism of pediatric residents.

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## INTRODUCTION

In recent decades, the concept of professionalism has grown more significant in the context of medical education (ABIM, 2002; JHA et al. 2007; KWAN et al. 2018). Professionalism is a set of professional responsibilities that includes constant updating, professional confidentiality, and relationship with patients, family members, and the health team (ABIM 2002). In addition, it is an essential component of the medical education competency required for specialist certification in countries such as Canada (CanMEDS), India (Medical Council of India Regulations on Graduate Medical Education), the United Kingdom (Good Medical Practice), and the United States (ACGME) (CRUESS et al. 2016). As the process of teaching from a traditional approach change to a competency-based education model, the necessity of teaching and assessment of medical professionalism increases (Cruess et al. 2016). This is an important stage in professional training that allows for lapses or unwanted behaviors, which can compromise their performance and the

relationship with the patient, to be identified early (Jha et al. 2016). The assessment of medical professionalism is performed using instruments/questionnaires such as the Professional Mini-evaluation Exercise (P-MEX) (Cruess et al. 2006). The P-MEX was developed in Canada (Cruess et al. 2006) and validated for use in Japan (Tsugawa et al. 2009; Tsugawa et al. 2011), Finland (Karukivi et al. 2015), Iran (Amirhajlou et al. 2019) and Pakistan (Razzaq 2019). This instrument has good psychometric properties (Cruess et al. 2006; Kwan et al. 2018) and assesses professionalism through doctor-patient relationship skills, reflective skills, time management, and interprofessional relationship skills (Cruess et al. 2006; Fong et al. 2020). The P-MEX enables a diagnosis of strengths and weaknesses in the behavior of residents and intervention to prevent errors from happening (Van Mook et al. 2010). There are few studies on the assessment of the professionalism of Brazilian physicians and many of them use international instruments, some not validated for use in the country. In these studies, different methods and instruments are used, such as structured interviews with patients (Hamamoto Filho et al. 2012; Luiz et al. 2017), reflective portfolios (Franco et al. 2020),

Jefferson's empathy scale (Paro *et al.* 2017), student self-perception (Rodrigues *et al.* 2020), miniCEX (Coelho *et al.* 2019), standardized patients (Schweller 2018), and attitudinal scale (Santos *et al.* 2017). The lack of standardization and little evidence on the professionalism of Brazilian residents make it difficult to obtain a complete scenario on the training of these professionals and the diagnosis of inappropriate or unwanted attitudes and behaviors that can affect their performance and relationships with patients (Jha *et al.* 2016). The different forms of assessment used make it difficult to compare studies that investigated medical professionalism and highlight the need to standardize the assessment and the instrument used. Considering the good properties of P-MEX, its validation for use in Brazil is desirable. However, so far, there seems to be no validated version of this instrument for the country. Therefore, the aim of this study was to validate the cross-culturally adapted version of the P-MEX for the evaluation of the professionalism of Brazilian pediatric residents.

## MATERIALS AND METHODS

**Study design:** This is a validation study of the cross-culturally adapted version of the P-MEX – Mini-Exercise for Assessment of Professionalism (P-MEX) (Holdefer *et al.* 2021). The study was carried out from October/2020 to February/2021.

**Setting:** This study was carried out in a neonatal intermediate care unit of a Brazilian hospital, which is a referral center for treating cases of high and medium complexity in the areas of women's and children's health.

**Participants:** Study participants were the 30 pediatric medical residents of the hospital's residency program. Residents duly registered and working during the period of the study were included. Residents who were away from their activities due to sick leave, maternity leave, external rotation, or other reasons were excluded.

**Data collection and analysis procedures:** The medical professionalism of residents was assessed through direct observation and application of the adapted version of the P-MEX (Holdefer *et al.* 2021). The assessment was carried out by 17 trained preceptors. The training of evaluators took place synchronously and remotely and involved the presentation of the instrument and guidance on its use, as well as a practical portion. A short video was presented to tutors to assess the professionalism of residents using the adapted version of the P-MEX. The adapted version of the P-MEX is composed of 21 items that assess four domains, like the original instrument (Crues *et al.* 2006): 1) doctor-patient relationship; 2) reflective skills; 3) time management and 4) interprofessional relationships. For each of the 21 items, one answer option is selected. Response options are: (1) unacceptable; (2) below expectations; (3) within expectations; (4) exceeded expectations; (5) not observed or not applicable. The instrument's score is obtained by calculating the average of the answers attributed to the items. The answer option "not observed or not applicable" is not considered when calculating the average. The average score varies between 1 and 4. Higher scores indicate greater medical professionalism. To standardize the score of domains that have a different number of items, a formula for calculating scores in a range from 0 to 100% was proposed. The total P-MEX score is calculated from the arithmetic mean of the 4 domains.

$$\text{Equação 1: } x = ((i_1 + i_2 + i_3 \dots) / (a \times n)) \times 100$$

**Where:** x – domain; i – questionnaire items referring to each domain; a – maximum possible score of the items (it will always be 4); n – number of items in each domain.

**Data analysis:** The collected data were initially plotted in a spreadsheet using the Excel software (2016) and later analyzed with the aid of the statistical package SPSS (Statistical Package for Social Science) version 26.0. Descriptive analysis was performed to characterize the profile of the participants. Exploratory and

confirmatory factor analyzes with Varimax rotation were performed. Prior to the factor analysis, the adequacy of the data was verified using the Kaiser-Meyer-Olkin test (KMO >0.60) (Kaiser 1974) and Bartlett's Sphericity test ( $p < 0.05$ ) (Bartlett 1954). Parallel eigenvalue analysis (Horn 1965) was performed to verify the number of factors selected for the confirmatory factor analysis. Eigenvalue >1 was adopted as a selection criterion. The factor extraction matrix was adjusted so that only items with coefficients >0.3 remained on the scales (Tabachnick *et al.* 2007). The instrument's accuracy was assessed using Kendall's tau-b correlation test performed between the two evaluators with the highest number of completed forms. The internal consistency of the adapted version of the P-MEX was assessed by calculating the Cronbach's alpha coefficient, establishing values > 0.70 as evidence of satisfactory internal consistency (Pasquali 2010). Construct validity was analyzed by comparing known groups and confirmatory factor analysis. The following cutoff points were used to classify the magnitude of the inter-rater equivalence correlation: moderate (>0.3) and strong (>0.5) (Cohen 1992).

**Ethical Aspects:** This study followed the ethical precepts of research on human beings established by Resolution n. 466/2012 (Brasil 2013), from the National Health Council. The study was approved by the institutional Research Ethics Committee (Federal University of Goiás, CAAE: 30969020.4.0000.5083). Participants were informed about the objectives of the study and, agreeing to participate, signed an informed consent form.

## RESULTS

A total of 143 forms were completed. Five forms were excluded in the factor analysis; three forms from residents were evaluated only once, and another two which were completed by preceptors who had evaluated only one resident. The study included 30 residents, all of them female and with a mean age of 28.6 years (standard deviation 3.86). Each preceptor assessed an average of 9.64 residents (standard deviation 4.68). The minimum and maximum values of residents assessed by each preceptor were 3 and 18, respectively. Table 1 shows the percentages of each response option for the instrument items and the mean score. The overall mean was 3.0 (standard deviation 0.42) points (Table 1). The instrument had satisfactory internal consistency (Cronbach's alpha 0.96). High values were observed for the four domains: doctor/patient ratio 0.91; reflective skills 0.90; time management 0.84; interprofessional relationship 0.89. The following assumptions for the factor analysis were reached: KMO (0.93), Bartlett's sphericity test  $p < 0.001$ . For the 21 items of the instrument, 16 eigenvalues were obtained. As shown in Table 2, it is observed that up to factor or domain 4, the eigenvalue generated by the Varimax Rotation method is greater than the partial eigenvalue obtained for that domain, inverting this relationship after that point. This explains 73.4% of the data variance (Table 2). After defining the permanence of the 04 domains, the confirmatory factor analysis was performed. From the factor extraction matrix, it was confirmed that the 21 items must remain in the validated version of the instrument. Items 2, 4, 8, 17, 18, and 20 had a lower factor loading, but above the cutoff point. These items can be part of more than one domain of the instrument (Table 3). There was a significant correlation between the assessments of the two preceptors responsible for the largest number of residents' assessments, as shown in table 4 (Table 4).

## DISCUSSION

This is the first study to investigate the psychometric properties of the Brazilian version of the P-MEX applied to the assessment of the professionalism of pediatric residents. The instrument had satisfactory properties and maintained the items and domains of the original version (Crues *et al.* 2006). Additionally, satisfactory agreement was found between raters when using the instrument. From the factor analysis, it was confirmed that the 21 items of the validated instrument were organized similarly to the original P-MEX (Crues *et al.* 2006), grouping themselves into four domains.

**Table 1. Frequency of each answer option and average values for each item in the adapted version of the P-MEX**

	Response Options				Mean (standard deviation)
	1 n (%)	2 n (%)	3 n (%)	4 n (%)	
<b>Doctor/patient relationship</b>					
1. Actively listened to the patient	1 (0.9)	15 (13.5)	70 (63.1)	25 (22.5)	3.07 ± 0.63
2. Showed interest in the patient as a person	1 (0.7)	17 (12.6)	82 (60.7)	35 (25.9)	3.12 ± 0.64
3. Recognized and met patient's needs	0 (0.0)	17 (12.6)	88 (65.2)	30 (22.2)	3.10 ± 0.58
4. Extended his/herself to meet patient's needs	0 (0.0)	19 (14.1)	75 (55.6)	39 (28.9)	3.15 ± 0.65
5. Constantly made sure of the patient's care	0 (0.0)	14 (10.4)	96 (71.6)	24 (17.9)	3.07 ± 0.53
6. Advocated in defense for the patient	1 (0.8)	15 (11.5)	94 (72.3)	20 (15.4)	3.02 ± 0.55
7. Maintained appropriate boundaries	0 (0.0)	10 (7.5)	100 (75.2)	23 (17.3)	3.10 ± 0.49
<b>Reflective skills</b>					
8. Demonstrated awareness of own limitations	1 (0.7)	17 (12.6)	99 (73.3)	18 (13.3)	2.99 ± 0.54
9. Admitted errors and omissions	1 (0.8)	14 (10.7)	98 (74.8)	18 (13.7)	3.02 ± 0.53
10. Requested feedback	3 (2.2)	14 (10.4)	92 (68.1)	20 (14.8)	3.00 ± 0.60
11. Accepted feedback	2 (1.6)	9 (7.1)	97 (76.4)	19 (15.0)	3.05 ± 0.53
12. Remained composure in difficult situations	0 (0.0)	5 (3.8)	104 (78.8)	23 (17.4)	3.14 ± 0.44
<b>Time management</b>					
13. Was punctual	2 (1.5)	15 (11.1)	93 (68.9)	25 (18.5)	3.04 ± 0.60
14. Completed tasks reliably	2 (1.5)	9 (6.7)	90 (66.7)	34 (25.2)	3.16 ± 0.60
15. Was available for colleagues	4 (3.0)	12 (9.0)	96 (71.6)	22 (16.4)	3.01 ± 0.61
<b>Interprofessional relationships</b>					
16. Maintained appropriate appearance	0 (0.0)	3 (2.2)	108 (80.6)	23 (17.2)	3.15 ± 0.42
17. Addressed own gaps in knowledge and skills	0 (0.0)	9 (6.8)	101 (76.5)	22 (16.7)	3.10 ± 0.48
18. Showed respect for colleagues	2 (1.5)	3 (2.2)	102 (75.6)	28 (20.7)	3.16 ± 0.52
19. Avoided derogatory language	0 (0.0)	0 (0.0)	102 (78.5)	28 (21.5)	3.22 ± 0.41
20. Maintained patient's confidentiality	0 (0.0)	3 (2.4)	103 (83.7)	17 (13.8)	3.11 ± 0.39
21. Used healthcare resources appropriately	0 (0.0)	3 (2.2)	115 (85.2)	17 (12.6)	3.10 ± 0.37
Mean (standard deviation)	3.09 ± 0.49	3.03 ± 0.45	3.07 ± 0.53	3.15 ± 0.35	3.09 ± 0.42

n = absolute frequency; % = relative frequency; SD = standard deviation

1 = unacceptable; 2 = below expectations; 3 = within expectations; 4 = exceeded expectations

Items marked as "not applicable" are not included in the table - they were not scored.

**Table 2. Explained variance (eigenvalues), partial eigenvalue of each factor generated in the factor analysis**

Factors	Eigenvalue	Partial Eigenvalue	% of cumulative explanation
1	12.158	1.912	57,894
2	3.463	1.721	64,859
3	2.933	1.601	69,303
4	1.866	1.490	73,427
5	0.676	1.411	76,647
6	0.570	1.255	82,510
7	0.519	1.193	84,980
8	0.410	1.054	89,185
9	0.386	1.002	91,024
10	0.268	0.894	93,865
11	0.229	0.834	94,955
12	0.188	0.735	96,818
13	0.169	0.689	97,624
14	0.148	0.642	98,330
15	0.110	0.540	99,528
16	0.099	0.485	100,000

This finding will allow the comparison between results of studies carried out with the Brazilian version of the P-MEX and international investigations in which other validated versions or the original instrument are used. Six items had a low factor loading and could belong to more than one domain of the instrument. This result is due to the characteristics of the instrument, whereas the assessment of professionalism is complex and involves assessing similar aspects. This can cause items to overlap (Klemenc-Ketis2014). The validated version of the P-MEX had satisfactory internal consistency, as observed during the evaluation of other versions of the instrument (Razzaq 2019). The items in the Brazilian version of the P-MEX were able to measure the same construct – medical professionalism. This result reinforces the instrument's ability to measure the professionalism of medical residents. When evaluating the scores obtained for each item, it was observed that the average was approximately three for all items. It can therefore be said that the residents lived up to expectations in practically all the items evaluated. A similar result was observed in the assessment of the professionalism of Japanese (Tsugawa *et al.* 2011) and Canadian (Crues *et al.* 2006) medical residents. It is possible that this finding is due to early clinical exposure to organized and consistent standards

of professionalism during residency and to the competency-based curriculum structure made available to the medical education system in Brazil (Junior *et al.* 2021). Although professionalism is not part of the formal postgraduate curriculum in the country, the "hidden curriculum", where learning takes place through experience and observation, has an important influence, as it favors the development of reflective practice in the program (Santos *et al.*2020). As a matter of attitude, professionalism is linked to the "affective domain" that can be shaped during the formative years of medical education (Adkoliand Parija 2020). The development of medical identity takes place within a social context, in which the student is subject to a series of influences that are not always explicitly presented. Providing rich contextual experience in classrooms, community, and service environments certainly contributes to the development of this competence in residents (Rajput *et al.* 2017). Agreement between the two raters was good – moderate to strong. This indicates that the instrument is well understood by the evaluators, after adequate training. Training is a strong point of this study, as it minimizes subjectivity in the assessment by different preceptors. This study has strengths that include theoretical and practical training of preceptors before data collection and assessment of residents while working in

Table 3. Factor extraction matrix showing the coefficients of each instrument item and which factors were grouped

	Factors			
	F1	F2	F3	F4
Doctor/patient relationship				
1. Actively listened to the patient	0.33			
2. Showed interest in the patient as a person	0.61			0.34*
3. Recognized and met the patient's needs	0.40			
4. Extended his/herself to meet patient's needs	0.70		0.41*	
5. Constantly made sure of the patient's care	0.38			
6. Advocated in defense for the patient	0.40			
7. Maintained appropriate boundaries	0.42			
Reflective skills				
8. Demonstrated awareness of own limitations		0.35	0.31*	
9. Admitted errors and omissions		0.32		
10. Requested feedback		0.31		
11. Accepted feedback		0.32		
12. Remained composure in difficult situations		0.31		
Time management				
13. Was punctual			0.30	
14. Completed tasks reliably			0.32	
15. Was available for colleagues			0.31	
Interprofessional relationships				
16. Maintained appropriate appearance				0.55
17. Addressed own gaps in knowledge and skills	0.44*			0.41
18. Showed respect for colleagues	0.32*			0.34
19. Avoided derogatory language				0.31
20. Maintained patient's confidentiality	0.43*			0.43
21. Used healthcare resources appropriately				0.41

\*Items that presented coefficients > 0.3, but that were not considered within the factor.

F1 = Doctor/patient relationship; F2 = Reflective skills; F3 = Time management;

F4 = Interprofessional relationships

Table 4. Correlation matrix showing the coefficient of agreement of the instrument's domains and total score between the evaluators

	T	p
Total score	0.59	0.02
Doctor/patient relationship	0.54	0.03
Reflective skills	0.43	0.04
Time management	0.58	0.02
Interprofessional relationship	0.44	0.04

Kendall's tau-b correlation

the clinical environment. This allows for minimizing the bias in the assessment of professionalism and verifying the instrument's behavior in a context similar to that in which it will be used after validation. Despite these advantages, the study has limitations. Residents were directly observed while providing care. It is possible that, upon realizing that they were under observation, physicians changed some of their behavior (McCarney *et al.* 2007). To minimize this limitation, preceptors were instructed not to interfere with the service. At the end of the evaluation, the resident received feedback from the evaluators that allowed for the correction or change of any inappropriate behavior. Feedback may have been carried forward to later assessments. Each resident was evaluated by more than one preceptor at different times. From each observation, there can be an improvement in the resident's conduct and behavior and this can result in higher scores in the following evaluations. The validation of the P-MEX for the assessment of Brazilian residents was an urgent need. The National Curriculum Guidelines for medical courses do not yet refer to medical professionalism (Brasil CNE/CES 2014). However, aspects inherent to professionalism, such as the professional's ability to communicate through verbal and non-verbal language, development and expression of empathy, sensitivity, interest in the patient, and practice centered on caring for the person are explicitly mentioned in the guidelines (Meireles *et al.* 2019). Thus, even if indirectly, there seems to be a tendency to incorporate professionalism in the curriculum of Brazilian medical courses and, consequently, the need to validate specific instruments for its assessment. In this study, pediatric residents were evaluated in the process of validating the Brazilian version of the P-MEX. Residency in pediatrics has particular characteristics that make it different from other medical specialties. Pediatricians deal with patients who are growing and developing and with different needs characteristic of each stage of their development. This is a challenge for clinical practice and ethical processes.

These aspects are considered in the Global Pediatric Curriculum, which is being implemented in Brazil (Global Pediatric Education Consortium *et al.* 2018). The Global Pediatric Curriculum considers professionalism among the twelve areas of competence for excellence in pediatric practice (Global Pediatric Education Consortium *et al.* 2018). When compared to other specialties, the inclusion of professionalism in the residency curriculum for pediatricians in Brazil is an imminent need. After the implementation of the global curriculum, the assessment of professionalism should become routine in pediatric residency. For these assessments, the use of the Brazilian version of the P-MEX is encouraged. Assessing professionalism is a difficult and, in many ways, subjective task. From this study and the resulting use of a validated instrument with good psychometric properties, the assessment of professionalism should be facilitated and standardized. Therefore, additional studies are recommended to verify the behavior of the Brazilian version of the P-MEX in evaluations of medical teaching processes in larger samples of residents. Based on these findings, it was concluded that the Brazilian version of the P-MEX is valid and reliable for evaluating the professionalism of medical residents in pediatrics.

**Declaration of interest statement:** The authors report no conflict of interest.

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