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Original Research

Brazilian Portuguese version of questionnaires assessing evidence-based practice competencies in healthcare students: Translation, cross-cultural adaptation, and measurement properties

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ABSTRACT

Background: While several instruments assess evidence-based practice (EBP) competencies, few are available for the Brazilian population, particularly healthcare students.
Objective: To perform a cross-cultural translation of the Student Evidence-Based Practice Questionnaire (S-EBPQ) and Evidence-Based Practice Evaluation Competence Questionnaire (EBP-COQ) into Brazilian Portuguese; to adapt and validate the Brazilian Portuguese versions for use with healthcare students from diverse courses; and to assess the measurement properties of the translated and adapted versions.
Methods: Four hundred forty-two healthcare students were included, and three versions were tested: S-EBPQ-BR, EBP-COQ-BR for nursing students, and EBP-COQ-BR for healthcare students. We assessed internal consistency, reliability, construct validity, responsiveness, and ceiling/floor effects. For reliability, participants completed the questionnaires twice, one week apart. For responsiveness, they completed them after participating in an educational program.
Results: No issues were identified with understanding or applicability. For overall scores, the translated questionnaires demonstrated strong internal consistency (Cronbach's alpha=0.87-0.92), good to moderate reliability ($ICC_{3,1}$=0.63-0.88), construct validity with moderate to very strong correlations to the Evidence-Based Practice Questionnaire (r=0.43-0.89), no ceiling or floor effects, and adequate responsiveness with significant pre- and post-educational program score differences. For subscales, the majority of them demonstrated satisfactory measurement properties, except for S-EBPQ-BR attitude (low internal consistency, poor reliability, and ceiling effect), EBP-COQ attitude (inadequate construct validity), and EBP-COQ skills (inadequate construct validity).
Conclusion: The Brazilian Portuguese versions of S-EBPQ and EBP-COQ exhibit strong measurement properties, including high internal consistency, adequate reliability, valid construct validity, and responsiveness. However, some subscales present suboptimal internal consistency, reliability, and construct validity.

Introduction

Evidence-based practice (EBP) is an approach that integrates the best available scientific evidence with patient preferences and clinician experience to guide clinical decision-making.[1,2] This approach has been associated with reduced financial costs, improved care quality, increased patient satisfaction with treatments, and more consistent clinical outcomes.[3–5]

Despite the positive attitude towards EBP,[6,7] healthcare professionals still report various barriers to its adoption, such as lack of time, language of publication, limited access, and insufficient statistical and general skills.[7–9] One approach to overcoming these barriers is to promote the

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development of EBP skills from the outset of professional training, during undergraduate courses.[10,11] This can lead to the graduation of professionals who are more confident and proficient in applying EBP, potentially reducing or even eliminating these barriers. Various educational programs have been proposed to teach undergraduate students about EPB.[10,11] However, to assess the effectiveness of these educational strategies and the actual knowledge of healthcare students, it is essential to use reliable assessment instruments.

A review published in 2006 found that there are more than 100 instruments available in the literature for assessing aspects of EBP, with the majority of them targeted towards healthcare students.[12] Given this array of options, the choice of questionnaires should prioritize ease of application and the rigor of the validation methods employed during their development.[13–15] Two examples of instruments that meet the aforementioned criteria are the "*Student Evidence-Based Practice Questionnaire* (S-EBPQ)"[16] and the "*Evidence-Based Practice Evaluation Competence Questionnaire* (EBP-COQ)".[17] The S-EBPQ was originally formulated in English and demonstrated satisfactory measurement properties.[16] It has been translated into Mandarin,[18] Korean,[19] Italian,[20] and Arabic.[21] Similarly, the EBP-COQ, originally developed in Spanish, demonstrated satisfactory measurement properties.[17] It has been translated into Arabic,[22] Italian,[23] Polish,[24] Turkish,[25] Greek,[26] Persian,[27] and English.[28] Both questionnaires have been validated exclusively for nursing students.[16,17]

While numerous instruments exist for assessing EBP competencies,[12] there are limited options for the Brazilian population,[29–31] with none designed for healthcare students. This presents a challenge when evaluating educational programs or conducting surveys in this population. Although the Fresno test, an instrument that evaluates the use of EBP, involved some students in the validation process, the sample size is insufficient to validate it for healthcare students.[30,31] Therefore, there is a need for translated and validated questionnaires in Brazilian Portuguese that can assess EBP competencies in undergraduate students across various healthcare courses. The current study aimed to perform a cross-cultural translation of the S-EBPQ and EBP-COQ questionnaires into Brazilian Portuguese; to adapt and validate the Brazilian-Portuguese versions for use with healthcare students from diverse courses; and to assess the measurement properties of the translated and adapted versions, including internal consistency, reliability, construct validity, responsiveness, and ceiling and floor effects.

Methods

Design

This is a study of measurement properties that employed both cross-sectional and prospective data. The study received approval from the Human Research Ethics Committee of the Federal University of Santa Maria (Santa Maria, RS, Brazil; registration no CAAE 48078321.0.0000.5346), and informed consent was obtained from all participants. The authors of the original versions granted prior authorization for the translation process. The study was conducted and reported in accordance with established recommendations and guidelines.[13–15,32,33]

Translation and adaptation procedure

The questionnaires were translated following the guidelines recommended by Beaton et al.[32] and the COSMIN checklist.[15] The translation process comprised the following steps:

Translation: Two independent bilingual translators translated the S-EBPQ from English into Brazilian Portuguese, and another two independent bilingual translators translated the EBP-COQ from Spanish into Brazilian Portuguese. The translators were native speakers of Brazilian Portuguese, and for each pair, one translator was literate in EBP, while the other had no background in this health field.

Synthesis: The translated versions were compared, and the translators reached a consensus to produce a single Brazilian Portuguese version of each questionnaire.

Back Translation: Two additional pairs of independent bilingual translators, unaware of the original versions and having no background in EBP, back-translated the Brazilian Portuguese versions of the S-EBPQ and EBP-COQ into English and Spanish, respectively. One of the back-translators of the EBP-COQ was a native Spanish speaker.

Expert Committee Review: An expert committee of experienced researchers in questionnaire translation convened by the translators, the authors of the original versions, and healthcare students (physical therapy n=2, nursing n=2, occupational therapy n=1), reviewed all versions to address discrepancies and culturally adapt the questionnaires. This process resulted in the prefinal Brazilian Portuguese versions of the S-EBPQ and EBP-COQ, named "S-EBPQ-BR" and "EBP-COQ-BR for nursing students".

Subsequently, the committee modified the nursing-specific questions within the EBP-COQ-BR for nursing students to enhance applicability to a broader range of healthcare students, resulting in the version "EBP-COQ-BR for healthcare students". The S-EBPQ-BR remained unchanged in this regard.

Pretesting: The three prefinal versions (S-EBPQ-BR, EBP-COQ-BR for nursing students, and EBP-COQ-BR for healthcare students) underwent pretesting to assess comprehensibility.

Instruments

***Student Evidence-Based Practice Questionnaire in Brazilian Portuguese* (S-EBPQ-BR):** the tool consists of 21 items across four subscales: practice, attitudes, evidence retrieval and review, and EBP application.[16] Each item is rated on a scale of one to seven. Total or subscale scores are calculated by averaging,[16] which results in scores range from one to seven, with higher scores reflecting greater EBP competence.

***Evidence-Based Practice Evaluation Competence Questionnaire in Brazilian Portuguese* (EBP-COQ-BR)**: the tool consists of 25 items across three subscales: attitudes, skills, and knowledge.[17] Each item is rated on a scale of one to five. Total or subscale scores are calculated by averaging,[17] which results in scores range from one to five, with higher scores reflecting greater EBP competence. We decided to include both versions for nursing and healthcare students to evaluate the validity of the original version (nursing) and to investigate whether the adaptations for healthcare students affected the measurement properties.

***Evidence-Based Practice Questionnaire* (EBPQ):** this questionnaire was validated to evaluate EBP competencies among nurses,[34] and was included to evaluate construct validity. The tool consists of 24 items across three subscales: practice, attitudes, and knowledge.[29,34] Each item is rated on a scale of one to seven. Total or subscale scores are calculated by averaging,[29,34] which results in scores range from one to seven, with higher scores reflecting greater EBP competence. This instrument has already been translated and validated in Brazilian Portuguese, presenting adequate measurement properties.[29]

Validation procedure

Participants completed the questionnaires and provided demographic data, including age, course, and course stage. Nursing students completed the EBPQ, S-EBPQ-BR, and EBP-COQ-BR for nursing students, while other healthcare students completed the EBPQ, S-EBPQ-BR, and EBP-COQ-BR for healthcare students. To assess questionnaire reliability, participants completed the S-EBPQ-BR and EBP-COQ-BR again one week later.

A subgroup of physical therapy students completed the S-EBPQ-BR and EBP-COQ-BR for healthcare students one month after the first assessment to evaluate questionnaire responsiveness (Fig. 1). These participants underwent a month-long training program, which consisted of 30 h of both online and in-person activities designed to enhance their

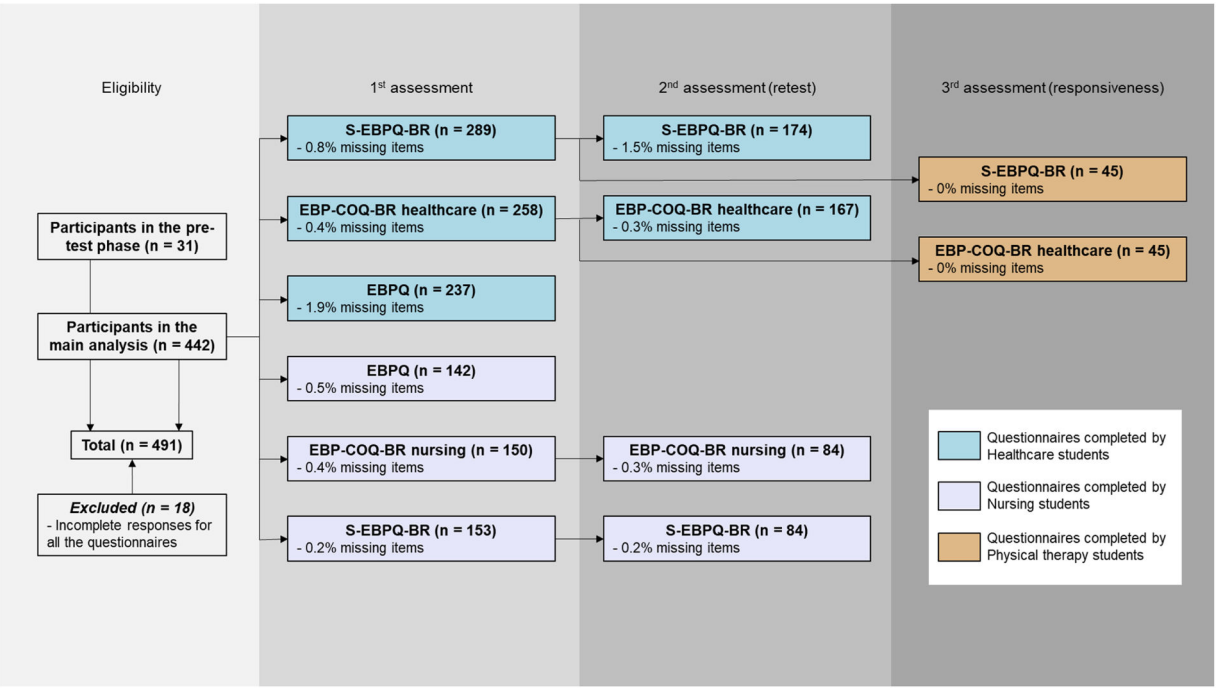

Fig. 1. Flow diagram. (Abbreviations: EBP-COQ-BR, evidence-based practice evaluation competence questionnaire in Brazilian portuguese; EBPQ, evidence-based practice questionnaire in Brazilian portuguese; S-EBPQ-BR, student evidence-based practice questionnaire in Brazilian portuguese.)

EBP competencies.[10,11] The content of the program was derived from the book authored by Herbert et al.[1] and encompassed instructions on the definition and fundamental concepts of EBP, techniques for searching scientific literature, criteria for evaluating robust evidence, foundational principles of statistical analysis and data presentation, and interpretation of the clinical significance of scientific findings.

All participants completed the questionnaires using either paper format or an online survey tool (QuestionPro, QuestionPro Inc.). Previous studies have demonstrated the comparability of both methods,[35,36] and we verified this comparability in this study through testing (Supplementary material 1A). Data collection was conducted between June 2021 and June 2023.

Participants

We included undergraduate students enrolled in healthcare courses from public or private universities, including nursing, physical therapy, occupational therapy, speech therapy, biomedical science, dentistry, gerontology, medicine, and nutrition. Eligible participants needed to be fluent in Brazilian Portuguese and over 18 years old. No restriction was imposed regarding their curricular stage. We recruited a convenience sample by directly inviting students on university campuses and through social media posts that provided a link to the online survey.

To determine the sample size, we adhered to guidelines recommending the inclusion of at least 100 participants to ensure sufficient statistical power for the analyses.[32] However, for specific analyses, we considered smaller sample sizes. In the responsiveness analysis, we predetermined the sample size based on a pre-post effect size of 0.5, which we deemed to be the smallest worthwhile difference,[37,38] with power of 80% and an alpha of 0.05. The calculation indicated that a minimum of 34 participants was required. For the reliability analysis, we predetermined the sample size based on a power of 80%, an alpha of 0.05, an intraclass correlation coefficient ($ICC_{3,1}$) of 0.5 as the minimum acceptable value ($\rho 0$) and an $ICC_{3,1}$ estimated of 0.7 ($\rho 1$); the calculation indicated that a minimum of 79 participants was required.[39]

Data analysis

Pre-Testing Phase: in the pretest versions, an open field was provided after each item to allow participants to comment on the applicability of the question or any difficulties in comprehension. Additionally, participants were asked to indicate whether the question was "clear" or "unclear" and rate their understanding of each item on a scale from zero (totally unclear) to 10 (completely understood). The expert committee analyzed the responses to identify any concerns raised by participants that could indicate content-related issues.[14,15]

Internal Consistency: we employed Cronbach's alpha to evaluate the degree of interrelatedness among the questionnaire items.[14,15] Values between 0.70-0.95 are indicative of strong internal consistency.[13,40]

Reliability: we used the intraclass correlation coefficient ($ICC_{3,1}$) to assess the instruments' reproducibility and their relationship with measurement error.[14,15] Reliability was categorized based on the ICC value as follow: <0.50= poor reliability, 0.50-0.75=moderate reliability, >0.75-0.90=good reliability, and >0.90=excellent reliability.[41]

Measurement Error: the standard error of measurement (SEM) was employed to quantify the extent of error based on the observed variability.[13–15] To calculate the SEM, we used the formula $SD\sqrt{1\text{-}ICC_{2,1}}$, where SD represents the standard deviation, encompassing both test and retest.[42] The percentage of SEM in relation to the total score was used to classify the agreement: ≤5%=very good, 5-10%=good, 11-20%= doubtful; and >20%=negative.[43] Additionally, we conducted an analysis of the minimum detectable change (MDC) using the formula MDC_{95}=1.96 x SEM x $\sqrt{2}$.[13] Formulas are presented in Supplementary material 2.

Construct Validity: Pearson correlation (95% CI) was utilized to assess the relationship between the construct of the tested instruments and the EBPQ. We also examined overlapping subscales between the tested instruments and the reference (EBPQ). Correlation strength was categorized as very weak (r=0.0-0.19), weak (r=0.20-0.39), moderate (r=0.40-0.59), strong (r=0.60-0.79), and very strong (r≥0.80).[44,45] The construct validity analysis was based on hypothesis testing; we hypothesized that total scores and the subscales of the tested instruments would exhibit convergent (positive) correlations of at least moderate

strength ($r \geq 0.40$) with the reference instrument.[46,47]

Responsiveness: to assess whether the tested instruments could detect longitudinal changes,[13–15,40,48] we employed the paired t-test, along with mean difference (95% CI) and effect size (Cohen's d).[49] Given the established effectiveness of the education program,[10,11] we hypothesized that the questionnaires would demonstrate an effect size of at least moderate magnitude ($d=0.5$)[48] associated with significant differences.

Ceiling and floor effect: to evaluate the sensitivity of the instruments to detect various levels of EBP competencies, we examined the percentage of participants reporting the minimum or maximum scores.[13–15] Percentages lower than 15% indicated the absence of ceiling and floor effects.[13,40]

We used R statistical software version 4.1.1 (packages psych, stats and mice) for analyses. Questionnaires with less than half of their items answered were excluded. Missing data were addressed using multiple imputation, generating 10 datasets with up to 50 iterations based on the responses (Fig. 1). Results were stratified according to the cohort (nursing and other healthcare students). For the S-EBPQ-BR, all participants were analyzed as one cohort because the questionnaire was identical for all cohorts. Given that the tested tools exhibited multidimensionality in their construct, the analyses utilized both the total scores of the questionnaires and their respective subscales.

Results

Participants

A total of 491 students were recruited. Of these, 31 participated in the pretest phase, and 442 were included in the main analysis. Eighteen students were excluded due to incomplete responses (Fig. 1). The individual participant data are presented in Supplementary material 2 and the sample characteristics for each analysis are presented in Table 1.

Translation and adaptation

For the S-EBPQ-BR, no adaptations were necessary. For the EBP-COQ-BR for nursing students, we incorporated sex-specific words in item A6. In the case of the EBP-COQ-BR for healthcare students, we made the following modifications: we replaced terms associated with "nursing" with "healthcare professional" in items A3, A4, and A6; we replaced the term "nursing" with "my field of specialty in health" in item A13; and we replaced the databases Joanna Briggs and Evidence Based-Nursing, with PubMed and Medline in item C2 (Supplementary material 1B).

During the pretest analysis, 31 healthcare students, including nursing students, completed the questionnaires. The percentage of participants classifying items as "clear" varied between 90 and 97% for the S-EBPQ-BR, 87% and 97% for the EBP-COQ-BR for nursing, and 87% and 97% for the EBP-COQ-BR for healthcare students. For the rating scale ranging from 0 (totally unclear) to 10 (completely understood), the mean scores varied between 8 and 10 for all pretest items. The comments included in the open fields did not indicate any meaningful issues related to understanding or applicability (Supplementary material 1B). The final versions of the questionnaires are presented in Appendix.

Internal consistency

The instruments tested demonstrated strong internal consistency, as evidenced by Cronbach's alpha values, which ranged from 0.87 to 0.92 (Table 1). The exception was the "attitude" subscale for the S-EBPQ-BR (Table 2).

Reliability

Most of the instruments exhibited good or moderate reliability ($ICC_{3,1} \geq 0.54$), with the exception being the "attitude" subscale of the S-EBPQ-BR for healthcare students, which displayed poor reliability ($ICC_{3,1}=0.44$; Table 1). The SEM ranged from 0.2 to 0.7 points, and all instruments demonstrated good to very good agreement (4-10%) (Table 2). The MDC_{95} for the EBP-COQ-BR versions ranged from 0.5 to 1.2 points (10-24%), while those for the S-EBPQ-BR versions ranged from 0.9 to 2.1 points (13-30%; Table 2).

Table 1
Sample characteristics for analysis on measurement properties.

Questionnaires	*Characteristics*	Internal consistency[3]	Reliability[4]	Construct validity	Responsiveness	Pre-testing[5]
EBP-COQ-BR (nursing)	***N***	150	84	140	-	31
	Age*[1] *[mean (SD)]	22 (5)	22 (5)	22 (5)	-	23 (4)
	***Periods of the course*[2]**	2nd-10th	2nd-10th	2nd-10th	-	3rd-10th
	Score [mean (SD)]	3.76 (0.41)	3.71 (0.40)/3.74 (0.45)	3.74 (0.41)	-	not applicable
EBP-COQ-BR (healthcare)	***N***	258	157	220	45	-
	Age*[1] *[mean (SD)]	22 (4)	22 (4)	22 (4)	23 (4)	-
	***Periods of the course*[2]**	2nd-10th	2nd-10th	2nd-10th	3rd-8th	-
	Score [mean (SD)]	3.70 (0.45)	3.68 (0.40)/3.70 (0.47)	3.67 (0.43)	see Table 4	-
S-EBPQ-BR (all)	***N***	442	258	379	-	-
	Age*[1] *[mean (SD)]	22 (4)	22 (4)	22 (4)	-	-
	***Periods of the course*[2]**	2nd-10th	2nd-10th	2nd-10th	-	-
	Score [mean (SD)]	4.75 (0.98)	4.85 (0.92)/4.66 (0.95)	4.77 (0.97)	-	-
S-EBPQ-BR (nursing)	***N***	153	84	142	-	-
	Age*[1] *[mean (SD)]	22 (5)	22 (5)	22 (5)	-	-
	***Periods of the course*[2]**	2nd-10th	2nd-10th	2nd-10th	-	-
	Score [mean (SD)]	5.01 (0.90)	5.13 (0.79)/4.91 (0.86)	5.01 (0.92)	-	-
S-EBPQ-BR (healthcare)	***N***	289	174	237	45	-
	Age- [mean (SD)]	22 (4)	22 (4)	22 (4)	23 (4)	-
	***Periods of the course*[2]**	2nd-10th	2nd-10th	2nd-10th	3rd-8th	-
	Score [mean (SD)]	4.61 (1.00)	4.71 (0.95)/4.54 (1.00)	4.63 (0.98)	see Table 4	-

Abbreviations: EBP-COQ-BR, Evidence-Based Practice Evaluation Competence Questionnaire in Brazilian Portuguese; S-EBPQ-BR, Student Evidence-Based Practice Questionnaire in Brazilian Portuguese.

[1] Age is presented as years;
[2] Period of the course is presented as semester;
[3] Including standard error of measurement, minimum detectable change, and ceiling/floor effect analysis;
[4] Scores are presented for test and retest;
[5] The presented characteristics are applied for all questionnaires.

Table 2
Internal consistency, reliability and ceiling and floor effect analyses for the Brazilian Portuguese versions of the tested questionnaires.

Questionnaires	*Subscales*	Internal Consistency (α[1] [95% CI])	Reliability ($ICC_{3,1}$ [95% CI])	SEM (points [%[b]])	MDC (points [%[2]])	Ceiling and Floor Effect	
						Maximum	*Minimum*
EBP-COQ-BR (nursing)	***Overall***	0.87 (0.83, 0.90)	0.81 (0.72, 0.87)	0.2 (4%)	0.5 (10%)	0%	0%
	Attitudes	0.81 (0.76, 0.85)	0.76 (0.65, 0.84)	0.2 (4%)	0.6 (12%)	1%	0%
	Skills	0.85 (0.81, 0.89)	0.74 (0.62, 0.82)	0.4 (8%)	1.0 (20%)	0%	0%
	Knowledge	0.80 (0.75, 0.85)	0.74 (0.63, 0.83)	0.4 (8%)	1.0 (20%)	1%	0%
EBP-COQ-BR (healthcare)	***Overall***	0.87 (0.85, 0.89)	0.63 (0.53, 0.72)	0.3 (6%)	0.7 (14%)	0%	0%
	Attitudes	0.84 (0.82, 0.87)	0.61 (0.50, 0.70)	0.3 (6%)	0.8 (16%)	2%	0%
	Skills	0.86 (0.83, 0.89)	0.66 (0.57, 0.74)	0.4 (8%)	1.2 (24%)	1%	1%
	Knowledge	0.78 (0.73, 0.82)	0.59 (0.47, 0.68)	0.4 (8%)	1.2 (24%)	0%	0%
S-EBPQ-BR (all)	***Overall***	0.92 (0.91, 0.93)	0.87 (0.84, 0.90)	0.3 (4%)	1.0 (14%)	0%	0%
	Practice	0.90 (0.88, 0.91)	0.80 (0.75, 0.84)	0.6 (9%)	1.7 (24%)	1%	4%
	Attitude	0.61 (0.54, 0.67)	0.55 (0.45, 0.63)	0.7 (10%)	2.0 (29%)	22%	1%
	Reviewing	0.91 (0.90, 0.92)	0.82 (0.77, 0.85)	0.5 (7%)	1.4 (20%)	1%	1%
	Applying	0.88 (0.87, 0.90)	0.73 (0.66, 0.78)	0.6 (9%)	1.7 (24%)	1%	1%
S-EBPQ-BR (nursing)	***Overall***	0.91 (0.89, 0.93)	0.78 (0.68, 0.85)	0.4 (6%)	1.1 (16%)	0%	0%
	Practice	0.89 (0.86, 0.91)	0.73 (0.61, 0.81)	0.6 (9%)	1.7 (24%)	1%	3%
	Attitude	0.55 (0.41, 0.66)	0.70 (0.57, 0.79)	0.7 (10%)	1.8 (26%)	26%	1%
	Reviewing	0.91 (0.88, 0.93)	0.76 (0.65, 0.84)	0.5 (7%)	1.5 (22%)	1%	0%
	Applying	0.84 (0.79, 0.87)	0.63 (0.48, 0.74)	0.6 (9%)	1.7 (24%)	1%	0%
S-EBPQ-BR (healthcare)	***Overall***	0.92 (0.90, 0.93)	0.89 (0.86, 0.92)	0.3 (4%)	0.9 (13%)	0%	0%
	Practice	0.90 (0.88, 0.91)	0.82 (0.76, 0.86)	0.6 (9%)	1.7 (24%)	1%	5%
	Attitude	0.63 (0.55, 0.70)	0.44 (0.31, 0.55)	0.7 (10%)	2.1 (30%)	20%	1%
	Reviewing	0.91 (0.90, 0.93)	0.85 (0.80, 0.88)	0.5 (7%)	1.3 (19%)	1%	1%
	Applying	0.90 (0.87, 0.91)	0.74 (0.66, 0.80)	0.6 (9%)	1.7 (24%)	1%	1%

Abbreviations: CI, confidence interval; EBP-COQ-BR, Evidence-Based Practice Evaluation Competence Questionnaire in Brazilian Portuguese; ICC, Intraclass Correlation Coefficient; MDC, Minimum Detectable Change; S-EBPQ-BR, Student Evidence-Based Practice Questionnaire in Brazilian Portuguese; SEM, Standard Error of Measurement.
[1] Cronbach's alpha,
[2] % of total score

Construct validity

Most of the analyses supported our hypotheses, revealing moderate to very strong correlations with the EBPQ scores (Table 3). The "attitude" subscale of both versions of the EBP-COQ-BR and "skills" subscale of the EBP-COQ-BR for nursing exhibited weak correlations with the corresponding subscales of the EBPQ (Table 3).

Ceiling and floor effects

A ceiling effect was observed for the "attitude" subscale of the S-EBPQ-BR in all analysis, with no instrument displaying a floor effect (Table 2).

Table 3
Construct validity analyses for the Brazilian Portuguese versions of the tested questionnaires.

Pearson's r (95% CI)		EBPQ			Total scores
		Practice	***Attitudes***	***Knowledge***	
EBP-COQ-BR for nursing	***Attitudes***		0.19 (0.03, 0.35)		0.58 (0.45, 0.68)
	Skills	0.49 (0.35, 0.61)			
	Knowledge			0.45 (0.29, 0.56)	
EBP-COQ-BR for healthcare	***Attitudes***		0.26 (0.14, 0.38)		0.43 (0.31, 0.53)
	Skills	0.34 (0.21, 0.45)			
	Knowledge			0.40 (0.28, 0.50)	
S-EBPQ-BR for nursing	***Practice***	0.80 (0.73, 0.85)			0.88 (0.84, 0.91)
	Attitudes		0.68 (0.58, 0.76)		
	Retrieving			0.80 (0.73, 0.85)	
	Applying			0.72 (0.64, 0.80)	
S-EBPQ-BR for healthcare	***Practice***	0.84 (0.80, 0.88)			0.89 (0.86, 0.92)
	Attitudes		0.56 (0.47, 0.64)		
	Retrieving			0.81 (0.76, 0.85)	
	Applying			0.76 (0.70, 0.81)	
S-EBPQ-BR total	***Practice***	(0.83 (0.80, 0.86)			0.89 (0.86, 0.91)
	Attitudes		0.61 (0.54, 0.67)		
	Retrieving			0.81 (0.77, 0.84)	
	Applying			0.74 (0.69, 0.78)	

Abbreviations: CI, confidence interval; EBP-COQ-BR, Evidence-Based Practice Evaluation Competence Questionnaire in Brazilian Portuguese; EBPQ, Evidence-Based Practice Questionnaire in Brazilian Portuguese; S-EBPQ-BR, Student Evidence-Based Practice Questionnaire in Brazilian Portuguese.
*No analysis was performed for the grey cells.

Responsiveness

Both the EBP-COQ-BR for healthcare students and S-EBPQ-BR questionnaires exhibited significant differences in their scores before and after an educational program, with effect sizes larger than 0.5. These differences were associated with moderate to very large effect sizes (Table 4).

Discussion

The EBP-COQ and S-EBPQ were translated into Brazilian Portuguese, and their measurement properties indicated that the translated versions displayed satisfactory semantic equivalence and reliability for use among Brazilian healthcare students. We observed that the questionnaires did not necessitate direct cultural adaptation because their content is specific to professional knowledge, and cultural interpretation is not required. The alterations made in the EBP-COQ-BR were solely related to language (sex-specific words) and field adaptation (nursing vs healthcare), and the S-EBPQ-BR did not necessitate any changes. These alterations maintained the comprehensibility or applicability of the questionnaires.

The questionnaires and their subscales demonstrated strong internal consistency with Cronbach's alpha values between 0.70 and 0.95,[13] except for the "attitude" subscale of the S-EBPQ-BR, which had values below 0.70. The EBP-COQ-BR displayed similar internal consistency to the original version[17] and translated versions.[25–27] The same trend was observed for the S-EBPQ-BR version compared to the original version[16] and translated versions.[18–21] It is worth noting that some previously translated versions also reported lower Cronbach's alpha values for the S-EBPQ-BR "attitude" subscale, such as the Italian (0.46)[20] and Mandarin (0.699)[18] versions. These values may suggest potential issues with internal consistency because the items within the subscale are weakly correlated.[13] However, it is important to consider that the subscale consists of only three items, and the number of items tested can influence the calculation of Cronbach's alpha.[50] Therefore, the internal consistency of the S-EBPQ-BR subscale "attitude" should not necessarily invalidate the use of the questionnaire. Still, it warrants attention, and future studies could explore the relationship among all the items in more detail.

Table 4
Responsiveness analyses for the Brazilian Portuguese versions of the tested questionnaires for healthcare students comparing results before and after an educational program.

Questionnaires (n=45)	*Subscales*	Before	After	Mean difference (95% CI)	Effect size (95% CI)
EBP-COQ-BR	***Overall***	3.64 (0.40)	4.31 (0.35)	-0.67 (-0.77, -0.56)	-1.76 (-2.21, -1.32)
	Attitudes	4.37 (0.36)	4.60 (0.34)	-0.23 (-0.32, -0.15)	-0.65 (-0.90, -0.40)
	Skills	2.88 (0.74)	3.97 (0.47)	-1.09 (-1.29, -0.88)	-1.67 (-2.17, -1.18)
	Knowledge	2.85 (0.65)	4.04 (0.47)	-1.19 (-1.38, -1.00)	-2.05 (-2.61, -1.48)
S-EBPQ-BR	***Overall***	4.39 (0.97)	5.43 (0.68)	-1.04 (-1.28, -0.79)	-1.19 (-1.55, -0.83)
	Practice	4.22 (1.30)	5.31 (0.82)	-1.09 (-1.36, -0.81)	-0.88 (-1.15, -0.62)
	Attitude	6.04 (0.70)	6.48 (0.60)	-0.44 (-0.65, -0.24)	-0.67 (-1.01, -0.34)
	Reviewing	3.84 (1.18)	5.23 (0.87)	-1.39 (-1.75, -1.03)	-1.31 (-1.77, -0.85)
	Applying	4.37 (1.15)	5.21 (0.96)	-0.84 (-1.15, -0.52)	-0.77 (-1.10, -0.45)

Abbreviations: CI, confidence interval; EBP-COQ-BR, Evidence-Based Practice Evaluation Competence Questionnaire in Brazilian Portuguese; S-EBPQ-BR, Student Evidence-Based Practice Questionnaire in Brazilian Portuguese.

The tested instruments demonstrated reliability with a low degree of error measurement and at least good agreement between the SEM and total score. Consequently, we concluded that these instruments provide information capable of discerning differences between participants and are also capable of detecting changes with low level of error.[13–15] The very low percentage of participants who achieved maximum and minimum scores (ceiling and floor effects) further supports the notion that these instruments effectively detect varying competencies in EBP.[13–15] However, assessors should be careful when analyzing the attitudes toward EBP using the S-EBPQ-BR for healthcare students, as this particular subscale displayed poor reliability. Additionally, this subscale reported a high percentage of participants achieving maximum scores, indicating that a significant portion of the sample holds positive attitudes regarding EBP. Given that the S-EBPQ-BR subscale "attitudes" consists of a limited number of items, it may lead to higher discrepancy, which can impact reliability.

In our study, we observed that both the S-EBPQ-BR and EBP-COQ-BR for healthcare students were responsive in detecting changes in EBP competencies among physical therapy students.[13–15] The validation study of the S-EBPQ in Italian compared the scores at different stages of an unspecific course and also found significant differences.[20] Consequently, both questionnaires are likely to provide valuable information in scenarios involving changes related to acquisition of EBP competencies over time. The analysis of MDC indicated that a difference between 0.5-1.2 points for the EBP-COQ-BR and 0.9-2.1 points for the S-EBPQ-BR should be considered important. However, based on the results from responsiveness analysis, it appears that a difference of 0.7 point for the EBP-COQ-BR for healthcare students and 1.0 point for the S-EBPQ-BR is sufficient to determine a meaningful difference over time. Nonetheless, future studies could establish specific cutoff points for the questionnaires.

The construct validity analysis for S-EBPQ-BR confirms our hypothesis, showing convergent and predominantly strong correlations with EBPQ. Although the EBPQ is designed for professionals while the S-EBPQ targets students, these strong correlations are expected given that the S-EBPQ was derived from the EBPQ.[16,34] Nonetheless, the construct of S-EBPQ-BR is considered valid because the EBPQ is a well-established questionnaire in the literature for assessing EBP competencies.[51,52] Similarly, the construct validity analysis of the EBP-COQ-BR partially supports our hypothesis, as 25% of the analyses did not yield a moderate correlation. Nevertheless, we can still consider the construct of the EBP-COQ-BR as valid.[13] The low correlation between the EBPQ subscale "practice" and the EBP-COQ-BR subscale "skills" is not entirely unexpected due to differences in their constructs. Additionally, the low correlations between the "attitude" subscales may arise from structural differences between the questionnaires. The EBP-COQ includes 13 items for attitude evaluation, whereas the EBPQ assesses the same construct with only 4 items, potentially leading to divergent values that could impact the results. Future studies could explore the construct validity of EBP-COQ-BR against other instruments, particularly for the "attitude" subscale.

Assessors can choose either the EBP-COQ-BR or S-EBPQ-BR to evaluate EBP competencies, as both have strong measurement properties. Also, assessors can accurately evaluate practice, evidence retrieval and review, and EBP application using the S-EBPQ-BR, and EBP knowledge using the EBP-COQ-BR. To evaluate EBP skills in healthcare students, the S-EBPQ-BR "practice" subscale is recommended due to inadequate construct validity of the EBP-COQ-BR "skills" subscale. If assessing attitude competency is essential, assessors should be aware that the EBP-

COQ-BR has inadequate construct validity despite adequate internal consistency and reliability, and the S-EBPQ-BR has adequate construct validity but issues with internal consistency and reliability.

Limitations

The validation process for the versions targeting healthcare students involved participants from various courses. While this approach allows for the generalization of the findings, it may obscure specific characteristics of different healthcare fields. Assessors should be mindful of this potential limitation if they intend to assess a particular student population within healthcare. Additionally, the assessment of responsiveness was conducted solely among physical therapy students participating in a specific EBP course. Although the responsiveness is clear, it is important to acknowledge that students from other healthcare courses may respond differently, potentially affecting the questionnaires' ability to detect changes. Another limitation concerns the absence of structural validity analysis. Despite our sample size ensuring statistical power for the analyses conducted, it does not provide sufficient confidence to perform confirmatory factor analysis for all analyzed questionnaires.[53] To avoid potentially distorted results due to small sample sizes, we chose not to include it in the study. Although the structure of the questionnaires has been investigated in previous studies,[18,19,21,25–27] further investigation can determine whether the Brazilian Portuguese versions maintain their original structural integrity. Lastly, the back-translation step was performed mostly by non-native speakers of the instruments' original languages, which should be acknowledge as a limitation.[32]

Conclusion

The questionnaires were successfully translated into Brazilian Portuguese while maintaining clarity and comprehensibility. Results indicate that the EBP-COQ-BR and S-EBPQ-BR are valid and reliable questionnaires for assessing EBP competencies in Brazilian Portuguese-speaking nursing and healthcare students. Issues were noted with "attitude" subscales, and the EBP-COQ "skills" subscale presented inadequate construct validity, necessitating attention when assessing these competencies specifically.

Conflicts of interest

The authors declares no conflicts of interest.

Supplementary materials

Appendix and Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjpt.2024.101140.

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