



UNIVERSIDADE DE BRASÍLIA

Faculdade de Ciências de Saúde

Programa de Pós-Graduação em Odontologia

Dissertação de Mestrado

**Knowledge, Attitude, Access, and Confidence in Evidence-Based Practice: Validation
of a Preliminary Version of KACE Questionnaire Translated to Brazilian Portuguese**

**Conhecimento, Atitude, Acesso e Confiança na Prática Baseada em Evidências:
Validação de uma Versão Preliminar do Questionário KACE Traduzido para o
Português Brasileiro**

Liana Bonfim Misson Paulin

Brasília, 06 de maio de 2024.

Liana Bonfim Misson Paulin

Knowledge, Attitude, Access, and Confidence in Evidence-Based Practice: Validation of a Preliminary Version of KACE Questionnaire Translated to Brazilian Portuguese

**Conhecimento, Atitude, Acesso e Confiança na Prática Baseada em Evidências:
Validação de uma Versão Preliminar do Questionário KACE Traduzido para o
Português Brasileiro**

Dissertação apresentada ao Programa de Pós-Graduação em Odontologia da Faculdade de Ciências da Saúde da Universidade de Brasília, como requisito parcial à obtenção do título de Mestre em Odontologia.

Orientador: Cristine Miron Stefani

Brasília, 2024

Liana Bonfim Misson Paulin

Knowledge, Attitude, Access, and Confidence in Evidence-Based Practice: Validation of a Preliminary Version of KACE Questionnaire Translated to Brazilian Portuguese

**Conhecimento, Atitude, Acesso e Confiança na Prática Baseada em Evidências:
Validação de uma Versão Preliminar do Questionário KACE Traduzido para o
Português Brasileiro**

Dissertação aprovada, como requisito parcial para obtenção do grau de Mestre em Odontologia, Programa de Pós-Graduação em Odontologia da Faculdade de Ciências da Saúde da Universidade de Brasília.

Data da defesa:

Banca examinadora:

Prof(a). Dr(a). Cristine Miron Stefani (Orientador)

Prof(a). Dr(a). Luciana Faria Sanglard

Prof. Dr. Fábio Carneiro Martins

RESUMO

Introdução: A Prática Baseada em Evidências (PBE) é essencial para a tomada de decisões informadas na saúde do paciente. Até o momento, não há uma ferramenta validada em português brasileiro para avaliar as dimensões da PBE em um contexto odontológico. Este estudo teve como objetivo traduzir, adaptar e validar o questionário KACE (Knowledge, Attitude, Access, and Confidence Evaluation) para o português brasileiro. **Metodologia:** O questionário KACE foi traduzido, retrotraduzido e adaptado culturalmente para o português brasileiro. A versão pré-final foi testada com estudantes de pós-graduação e membros do corpo docente, enquanto a validação do instrumento envolveu análises de validade, confiabilidade e responsividade e incluiu estudantes de graduação e pós-graduação em odontologia, bem como membros do corpo docente de duas universidades federais brasileiras. Os estudantes de graduação responderam ao questionário antes e depois de cursos de treinamento para o uso da PBE, enquanto os estudantes de pós-graduação e membros do corpo docente responderam apenas uma vez. A análise estatística foi realizada utilizando o SPSS v26.0. **Resultados:** A versão em português brasileiro do instrumento KACE foi bem avaliada pelos participantes. No total, 62 estudantes de graduação, 23 estudantes de pós-graduação e 12 membros do corpo docente responderam ao instrumento. Foi observada uma confiabilidade adequada, com valores alfa de Cronbach variando de 0,172 a 0,96. Os resultados foram especialmente consistentes para a escala de Confiança (valores para todos os grupos acima de 0,86). O instrumento mostrou validade discriminante capaz de identificar diferentes níveis de experiência para as escalas de Conhecimento, Atitude e Confiança (valores de $p < 0,05$ entre os resultados de estudantes de graduação e pós-graduação/professores), mas não para Acesso. Não foram encontradas diferenças para nenhuma escala na comparação entre estudantes de pós-graduação e membros do corpo docente. As pontuações nas escalas de Conhecimento e Confiança mostraram melhorias significativas após o treinamento em PBE dos estudantes de graduação ($p < 0,05$), mas não as escalas de Atitude e Acesso. **Conclusão:** A versão traduzida e adaptada da ferramenta KACE (Knowledge, Attitude, Access, and Confidence Evaluation in EBP) para o português brasileiro manteve a maioria das propriedades psicométricas da ferramenta original. Uma ampliação do tamanho da amostra é necessária para confirmar os resultados de validade discriminante e responsividade. Além disso, ainda é necessário prosseguir com a validação da ferramenta para estudantes de pós-graduação.

Palavras-chave: Prática Clínica Baseada em Evidências; Inquéritos e Questionários; Odontologia Baseada em Evidências; Estudo de Validação.

ABSTRACT

Introduction: Evidence-Based Practice (EBP) is essential for informed decision-making in patient healthcare. To date, there is no validated tool in Brazilian Portuguese to assess the dimensions of EBP in a dental context. This study aimed to translate, adapt, and validate Brazilian Portuguese's KACE questionnaire (Knowledge, Attitude, Access, and Confidence Evaluation). **Methodology:** The KACE questionnaire was translated, back-translated, and culturally adapted to Brazilian Portuguese. The pre-final version was tested with graduate students and faculty members, while the instrument's validation involved analyses of validity, reliability, and responsiveness and included dental undergraduate and graduate students, and dental faculty members from two Brazilian federal universities. Undergraduate students answered the questionnaire before and after training courses for the use of EBP, while graduate students and faculty members answered it only once. Statistical analysis was performed using SPSS v26.0. **Results:** Participants evaluated the Brazilian Portuguese version of the KACE instrument well. In total, 62 undergraduate and 23 graduate students and 12 faculty members answered the tool. Adequate reliability was observed, with Cronbach's alpha values ranging from 0.172 to 0.96. Findings were especially consistent for the Confidence scale (values for all groups above 0.86). The instrument showed discriminant validity capable of identifying different experience levels for the Knowledge, Attitude, and Confidence scales (p-values <0.05 between undergraduate and postgraduate/professor results) but not for Access. No differences for any scale were found in the comparison between graduate students and faculty members. Scores on the Knowledge and Confidence scales showed significant improvements after undergraduate students' EBP training (p<0.05), but not the Attitude and Access scales. **Conclusion:** The translated and adapted version of the KACE tool (Knowledge, Attitude, Access, and Confidence Evaluation in EBP) for Brazilian Portuguese retained most of the psychometric properties of the original tool. Expanding the sample size is necessary to confirm discriminant validity and responsiveness findings. Also, it is still required to validate the tool for graduate students.

Keywords: Evidence-Based Practice; Surveys and Questionnaires; Evidence-Based Dentistry; Validation Study.

SUMÁRIO

1. INTRODUCTION	7
2. METHODOLOGY	8
2.1. Translation and Cross-Cultural Adaptation	8
2.2. Pre-final KACE tool testing	9
2.3. Preliminary Validation	9
2.4. Data Analysis	11
2.5. Ethics	11
3. RESULTS	11
3.1. Translation, back-translation, and cultural adaptation	11
3.1.1. Knowledge Section	12
3.1.2. Attitudes about Evidence-Based Practice Section	12
3.1.3. Access to Evidence Section	13
3.1.4. Confidence in Critical Appraisal Skills Section	13
3.2. Pre-final version testing	13
3.3. Validation	14
3.3.1. Reliability	14
3.3.2. Validity	15
3.3.3. Responsiveness	16
4. DISCUSSION	17
4.1. Reliability (internal consistency)	17
4.2. Validity (discriminant validity)	18
4.3. Responsiveness	20
4.4. Other considerations	21
4.5. Study limitations	21
5. CONCLUSION	21
REFERENCES	22
APPENDIX	25
PRESS RELEASE	27

1. INTRODUCTION

Evidence-based healthcare is the conscientious use of the best current evidence in decision-making regarding the care of individual patients or the provision of health services.¹ Evidence-based practice allows professionals to carefully integrate clinically relevant scientific evidence and relate it to the patient's oral needs.² Aligning science with clinical expertise and patient preferences enhances the quality of care, outcomes, and patient satisfaction.^{3,4}

Therefore, it is important to identify factors that may influence professionals' ability to adopt Evidence-Based Practice (EBP). Knowledge and experience of the healthcare provider, educational environment, and information overload, among other factors, may be perceived as barriers to implementing EBP.⁵

If dentists wish to maximize their skills, achieve excellence in practice, and provide high-quality, cost-effective services, they must develop strategies that empower them to use the results of relevant, well-designed, practice-oriented research studies.⁶ Apparently, however, the practice of EBP and the use of scientific evidence databases to inform clinical decisions still need to improve among dentists.⁷

To measure EBP dimensions specifically for dentistry, Hendricson et al. (2011)⁸ developed and validated an instrument named Knowledge, Attitude, Access, and Confidence Evaluation of Evidence-Based Practice (KACE) tool.

The KACE tool is a self-administered questionnaire consisting of 35 items divided into four scales, aiming to assess the four dimensions of Evidence-Based Practice (EBP): (i) knowledge of critical appraisal, (ii) attitudes towards EBP in Dentistry, (iii) behaviors in accessing evidence, and (iv) confidence in Critical Appraisal Skills. This questionnaire was designed to measure the outcomes of EBP training in the dental context. The knowledge and attitude scales comprise ten items, the access scale nine items, and the confidence scale six items.⁸

Each knowledge item presents five response options with a single correct answer. Among the response options is "I do not know" to minimize guessing. Knowledge score is calculated by assigning 1 point to the proper response and 0 to all others. The maximum total score for the knowledge scale is 10 points.⁸

Responses to KACE's attitude, access, and confidence scales constitute Likert scales with five answer options. The scoring is calculated according to the frames: (i) for the

attitude scale: 1 = "Strongly Disagree" to 5 = "Strongly Agree"; (ii) for the evidence access scale: 1 = "Never" to 5 = "Very frequently"; and (iii) for confidence scale: 1 = "Not at all confident" to 5 = "Very confident." The sum of the response scores gives a maximum total score of 50 for the attitude scale, 45 for the access scale, and 30 for the confidence scale. Respondents with the highest scores on each scale have the most positive attitudes toward EBP, better access to evidence, and are more confident in their critical appraisal skills.⁸

This study aimed to provide an instrument to assess the dimensions of evidence-based practice (EBP) among Brazilian Portuguese-speaking undergraduate and graduate dental students. We translated and cross-culturally adapted the KACE tool for the Brazilian Portuguese language and evaluated its psychometric properties in a sample of Brazilian dental students and faculty members.

2. METHODOLOGY

This study was conducted from September 2022 to March 2024 and comprised two phases: Phase 1 - translation and cross-cultural adaptation of the KACE tool into Brazilian Portuguese; Phase 2 – preliminary validation of the KACE tool in Brazilian Portuguese with undergraduate and graduate dental students as shown in the flowchart 1.

2.1. Translation and Cross-Cultural Adaptation

The Brazilian Portuguese version of KACE was obtained through translation and cross-cultural adaptation according to previously published methods.^{9, 10} First, three bilingual translators whose native language is Brazilian Portuguese independently translated and adapted the original English version of the KACE questionnaire. Of the translators involved in this initial stage, two were professional translators; one was experienced in health sciences text translations, and the other was not, and the third was not a professional translator but a health professional proficient in English with experience in research. Then, the first author synthesized the translations, and an expert panel of three experienced researchers discussed the product, reaching a consensus version. This version was "back-translated" by two certified English professional translators, one with no experience in health science text translations and an experienced one. The first author assessed consistency between the "back-translated" and original

English versions, and discrepancies were highlighted. After that, the expert panel discussed the product, considering semantics and conceptual equivalence, and the pre-final version of the Brazilian-Portuguese KACE tool was obtained.

2.2. Pre-final KACE tool testing

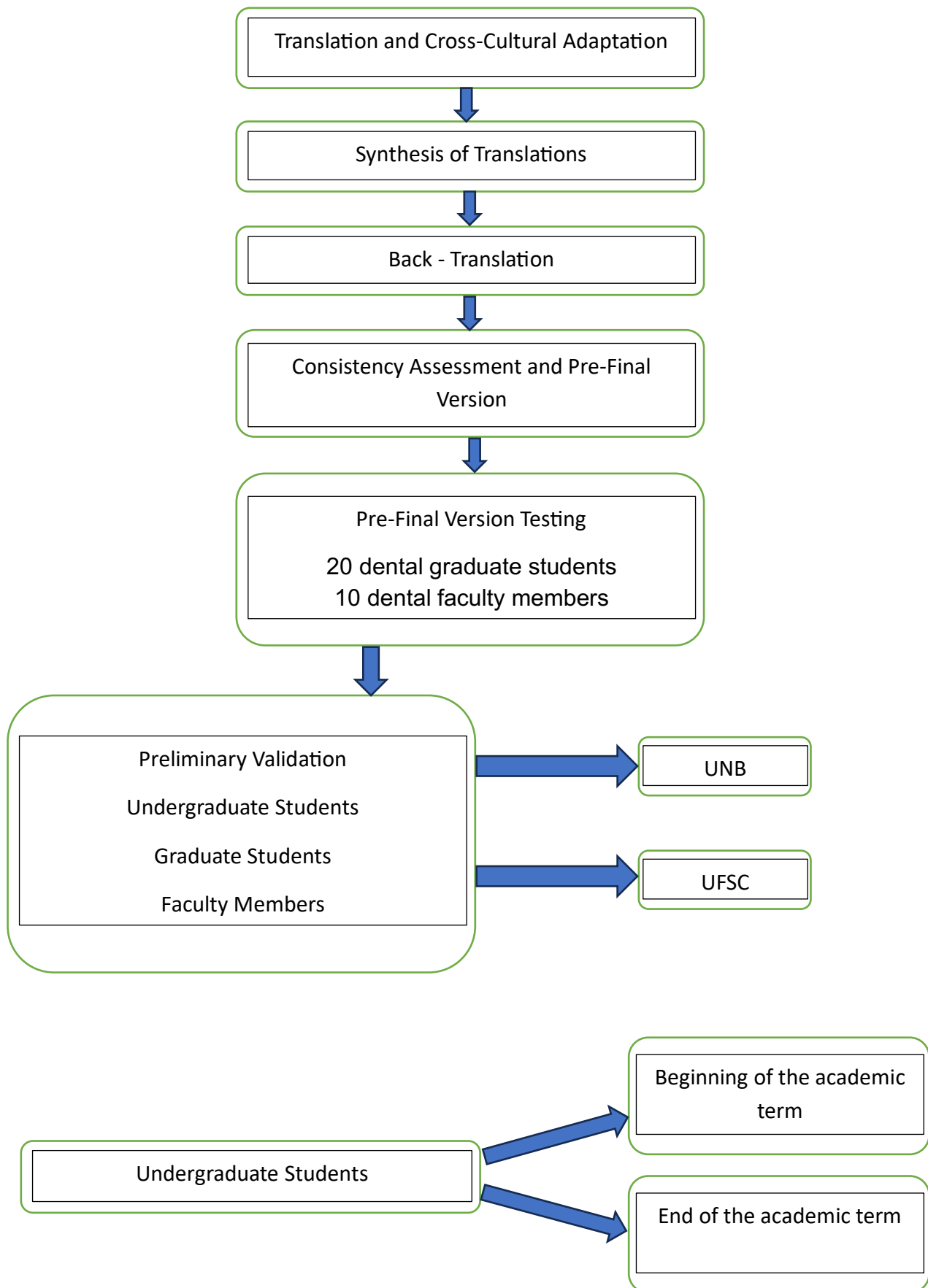
For testing the pre-final translated and culturally adapted version of the KACE questionnaire to Brazilian Portuguese, it was made available online via the Google Forms platform. The participants in this stage were 20 dental graduate students and ten dental faculty members experienced with EBP (experts), recruited by convenience among students and professors of the Dental Graduate Program at the University of Brasília. They were invited to participate through electronic media contact (e-mail and WhatsApp) or in person. Those who agreed to participate received a link to access the electronic form. Clicking on the provided link, the participants were redirected to the informed consent form and the online questionnaire. Besides answering the KACE questionnaire items, the participants were asked to comment on the clarity of the text and any comprehension difficulty within the questions and items of the translated instrument and to suggest text modifications when pertinent.¹¹ After this stage, the expert panel again revised the pre-final version, and a final version was presented by consensus.

2.3 Preliminary Validation

The participants in the second stage of the study (validation) were undergraduate and graduate dental students and faculty members not involved in the content validation phase. Undergraduate students were recruited in the School of Dentistry of the University of Brasília (UnB) among those attending the Epidemiology course and in the School of Dentistry of the Federal University of Santa Catarina (UFSC) among those attending the Scientific Methodology course. Both courses address the fundamentals of EBP. Graduate students enrolled in master's or doctoral courses were recruited among those attending the Scientific Methodology or Systematic Review courses either in UnB or UFSC. The faculty group included professors from different clinical areas of Dentistry from UnB or UFSC with doctoral degrees.

The undergraduate students were asked to answer the KACE questionnaire twice, at the beginning and end of the academic term, to identify possible improvements in the KACE's EBP scales (responsiveness).

Flowchart 1: Methodology of the study.



2.4. Data Analysis

To evaluate the properties of the Brazilian-Portugues KACE questionnaire, three types of analyses were performed: (I) Reliability - through internal consistency among the questions in the KACE scales; (II) Validity - the ability to detect differences between individuals with different levels of experience; and (III) Responsiveness: the ability to respond to detect the effects of education on students.^{8,12}

- For (I) Reliability, Cronbach's alpha coefficients were calculated for each KACE dimension and each group: Undergraduate Students (pre-course), Undergraduate Students (post-course), Graduate Students, and Faculty.
- For (II) Validity, a Kruskal-Wallis H test was run to determine if there were differences in KACE score in all scales between three groups: Undergraduate Students (pre-course), Graduate Students, and Faculty.
- For (III) Responsiveness, the impact of the training course was assessed by comparing pre- and post-course scores in undergraduate respondents through Mann-Whitney U tests.

All statistical analyses were conducted using the SPSS software (SPSS v26.0, IBM Corp, Armonk, NY, USA), and the level of statistical significance was set at .05.

2.5. Ethics

The study protocol was submitted to the Research Ethics Committees of the University of Brasília (UnB) under CAAE: 58153622.0.0000.0030 and the Federal University of Santa Catarina (USFC) under CAAE 58153622.0.3001.0121 and approved on September 1st, 2022. Before starting the study, the original developer of the KACE tool was contacted by email and asked for permission. He was also invited to join the research team, but he declined the invitation and authorized the translation of the KACE tool to Brazilian Portuguese.

3. RESULTS

3.1. Translation, back-translation, and cultural adaptation

The most significant adaptations to each KACE section are described in detail below.

3.1.1 Knowledge Section

In question 1, item A of the Critical Appraisal Knowledge section, the original English states, “Clinical case studies are ranked higher than randomized controlled trials.” The term “apresentam nível de evidência mais alto” was chosen for the Portuguese translation since studies are classified in a pyramid of evidence, and the final translation was, “Estudos de casos clínicos apresentam nível de evidência mais alto do que ensaios clínicos randomizados”.

In question 1, item D, the original in English, states, “Research supported by the National Institutes of Health is the highest level of evidence.” The term “endossados” was chosen because it was understood that “supported” referred to scientific and not financial support from the Ministry of Health and the final translation was “Pesquisas endossadas pelo Ministério da Saúde apresentam o nível mais alto de evidência,” since the equivalent to the “National Institutes of Health” in Brazil would be the Ministry of Health (Ministério da Saúde).

In question 4, item C of the Knowledge section, the original in English states, “Only large treatment effects can be observed when very large numbers of subjects are enrolled.” We discussed the possibility of using the terms “recrutado” or “incluído” for “enrolled”. Finally, “recrutado” was chosen as it refers to a number of selected participants, and the final translation was, “Apenas grandes efeitos do tratamento podem ser observados quando um número muito grande de participantes é recrutado”.

In question 9, items A and B, of the Knowledge section, the term “indivíduos saudáveis” and “indivíduos não doentes” were used respectively for the translation of “normal individuals” to better adapt to the most accurate and currently used terms¹³ since “normal” could be a sensitive word for some people. Thus, the final translation was, for item A: “A sensibilidade do teste define quantos indivíduos saudáveis o teste identifica corretamente como não doentes” and for item B: “Indivíduos não doentes que têm um resultado positivo em vez de negativo são classificados como verdadeiros-positivos”.

3.1.2 Attitudes about Evidence-Based Practice Section

In the section Attitudes about Evidence-Based Practice in Dentistry, “particularmente” was used for the translation of “personally” in the second item, resulting in the following translation: “Eu particularmente aprecio as vantagens de atender ao paciente usando a prática baseada em evidências.” In the fourth question of the same section, translating “I support EBP principles more than I did one year ago,” there was a

divergence in translating the term “support” to “apoio” or “adiro,” and the phrase “Eu apoio os princípios da PBE mais do que apoiava há um ano atrás” was chosen as there was no divergence in understanding and it facilitated reading in Portuguese.

In the same section, the Likert scale presented divergences in the translation for the neutral point, and the term “Incerto” was chosen as it is most commonly used in Portuguese to translate “uncertain.”

3.1.3 Access to Evidence Section

In the section Access to Evidence, the Likert scale presented in English with the terms “Never, Rarely, Occasionally, Often, and Very Frequently” was changed in the final version in Portuguese to “Nunca, Raramente, Ocasionalmente, Frequentemente e Sempre” after back-translation presented divergences of the terms “often” and “very frequently” and considering that “Sempre (always)” is the opposite of “Nunca (never)”.

3.1.4 Confidence in Critical Appraisal Skills Section

In the section Confidence in Critical Appraisal Skills, after back-translation, the Likert scale was changed from “nem um pouco confiante” to “nada confiante” in the translation of “not at all confident” and “não estou confiante” to “pouco confiante” in the translation of “not confident.”

3.2 Pre-final version testing

After testing the questionnaire's pre-final version, 90% of respondents considered the items in the Knowledge, Access, and Confidence scales clear and easily understandable, and 97% considered the items in the Attitudes scale adequate.

The participants questioned the writing of some items. In the Knowledge scale, item 3, which states “Se você estivesse conduzindo uma busca na base de dados PubMed para responder a uma questão clínica referente a um paciente odontológico, qual das seguintes seria a estratégia de busca menos produtiva?”, a respondent pointed out that the term “menos produtiva” could be understood as either yielding fewer articles or fewer articles with impact.

In the same section, another respondent signaled that the question in item 6 could be misleading to the respondent since asking about which factors may have favored a certain result when comparing two interventions could cause confusion. They cited, as an example, that the factors contributing to the observed difference between groups

could be due to rigorous study conduct (blinding, random allocation, randomization, blinded examiners, etc.) or poor conduction (lack of essential items for study quality). The respondent argued that it would be easier to answer the question accurately with further details about the study's methodology.

In the "Attitudes about Evidence-Based Practice in Dentistry" section, a respondent mentioned that questions 1 and 4 should not limit the temporal aspect to the "last year" but consider the beginning of professional practice as a reference.

The last item in the Confidence section mentions the "overall value" of research reporting. Three participants considered the term "valor global" to have an ambiguous meaning in Portuguese.

Even though the panel of experts considered all manifestations important, no modifications were made to the pre-final questionnaire version since these were also characteristics and limitations of the original version of the KACE tool.

3.3 Validation

3.3.1. Reliability

In the first phase of content validation, the one carried out before the training course, 49 undergraduate students answered the questionnaire. After the training courses, 62 undergraduate students responded to the questionnaire. Also, 23 graduate students and 12 faculty members responded to it.

Table 1 shows variations in the values of Cronbach's alpha coefficient for different groups and domains, indicating discrepancies in the internal consistency of the scales of the questionnaire between students of different levels and Faculty. Notably, the confidence scale exhibited high alpha values in all groups, suggesting a solid internal consistency. In contrast, "Knowledge of Critical Appraisal" revealed low internal consistency in the group of undergraduate students before the training course (0.374) and for graduate students (0.172). When evaluating the undergraduate students after the training course, we obtained an alpha of 0.519. Removing any questions (sensitivity analysis) did not significantly affect the alpha for any group.

Table 1: Internal consistency for the four scales of the KACE questionnaire, Cronbach's alpha.

	Undergraduate students (pre-course) (n=49)	Undergraduate students (post-course) (n= 62)	Graduate students (n=23)	Faculty members (n=12)
Knowledge of critical appraisal	0.374	0.519	0.172	0.670
Attitudes about EBP	0.746	0.892	0.798	0.607
Accessing evidence	0.851	0.892	0.733	0.602
Confidence in EPB skills	0.960	0.943	0.860	0.917

3.3.2 Validity

Table 2 provides the median (Mdn), interquartile range (IQR), and group comparison of total scores for each KACE scale.

Table 2: Median (Mdn), interquartile range (IQR), and comparison between Undergraduate students (pre-course), Graduate students, and Faculty of total scores for each KACE scale.

	Undergraduate students (pre-course) (n=49)			Graduate students (n=23)			Faculty (n=12)		
	Mdn	IQR	*	Mdn	IQR	*	Mdn	IQR	*
Knowledge of critical appraisal	3.0	2.0	a	6.0	2.0	b	6.0	1.5	b
Attitudes about EBP	40.0	7.5	a	45.0	8.0	b	43.0	7.0	ab
Accessing evidence	26.5	11.0	a	30.0	6.0	a	27.5	5.5	a
Confidence in EBP skills	12.0	10.0	a	16.0	6.0	b	23.0	9.0	b

*Statistical comparisons among groups and moments of the KACE application are expressed as letters. Different letters on the line indicate a statistically significant difference ($p < 0.05$) by the Kruskal-Wallis H test and pairwise comparisons performed by Dunn's procedure with a Bonferroni correction for multiple comparisons.

Median KACE scores were statistically significantly different between groups in Knowledge ($H(2) = 37.194$, $p < .001$); Attitudes ($H(2) = 8.448$, $p = .015$); and Confidence ($H(2) = 30.713$, $p < .001$) scales. Median KACE scores were not

statistically significantly different between groups in the Access scale ($H(2) = 5.888, p = .053$).

The post hoc analysis revealed that:

- Knowledge scale: undergraduate students' median KACE score (3.0) was statistically significantly different from those of graduate students (6.0) ($p < .0005$) and faculty members (6.0) ($p < .0005$), and there was no difference between graduate students and faculty members ($p = 1.000$).
- Attitude scale: Undergraduate students' median KACE score (40.0) was statistically significantly different from graduate students (45.0) ($p = 0.016$) but not from faculty members (43.0) ($p = .387$), and there was no difference between graduate students and faculty members ($p = 1,000$).
- Confidence scale: undergraduate students' median KACE score (12.0) was statistically significantly different from those of graduate students (16.0) ($p = .001$) and faculty (23.0) ($p < .0005$), and there was no difference between graduate students and faculty (.105).

Data in mean and standard deviation are displayed in the appendix, Table S1.

3.3.3 Responsiveness

The total scores for each KACE scale for undergraduate students pre and post-training courses are shown in Table 3.

Considering the Knowledge scale, undergraduate students' pre-course (3.0) and post-course (4.0) median KACE scores were statistically significantly different ($U = 2080, z = 3.371, p < .001$). Also, there was a statistically significant difference between undergraduate students' pre-course (12.0) and post-course (18.0) median KACE scores for the Confidence scale ($U = 2120, z = 4.277, p < .001$). There were no statistically significant differences in Attitudes ($U = 1595, z = .804, p = .421$) and Access scales ($U = 1718, z = 1.388, p = .165$) scores pre- and post-course.

Data in mean and standard deviation are displayed in the appendix, Table S2.

Table 3 - Median (Mdn), interquartile range (IQR), and comparison between Undergraduate students' pre-course and post-course total scores for each KACE scale.

	Pre-Course n (49)		Post-Course n (62)		p
	Mdn	IQR	Mdn	IQR	
Knowledge of critical appraisal	3,0	2,0	4,0	3,0	< .001
Attitudes about EBP	40,0	7,5	41,0	9,0	.421
Accessing evidence	26,5	11,0	28,5	12,0	.165
Confidence in EBP skills	12,0	10,0	18,0	9,0	< .001

4. DISCUSSION

This study translated, culturally adapted, and pre-validated the Brazilian Portuguese version of the KACE tool⁸, an assessment questionnaire designed to evaluate EBD dimensions (knowledge, access, attitudes, and confidence) and the effect of training on dental students.

As far as we know, this is the second translation of the KACE tool. A previous study translated and validated the KACE tool into French.¹² Unlike the French study¹² and more like the original validation study⁸, our study incorporated a group of graduate students as an intermediate group between undergraduate students and faculty members. Initially, we planned to apply the KACE tool at two different moments for the graduate students, as Hendricson et al. (2011)⁸ did. Yet, it was not feasible. Therefore, this group was composed of graduate students with and without previous training in EBP, and this was reflected in the validation results.

4.1 Reliability (internal consistency)

In our study, Cronbach's alpha was consistent with the results of Hendricson et al. (2011)⁸ and Agossa et al. (2021)¹² for all scales. In all three studies, the lowest values in Cronbach's alpha were found for the Knowledge scale: in our study for the graduate students group (0.172), in the original KACE study for the post-training course residents group (0.208) – quite similar to our results; and in the French study for the expert group (-0.46 originally, 0.07 after sensitivity analysis). Cronbach's alpha coefficient represents the correlation between items in a set, ranging from zero to one.

A zero value indicates no correlation, i.e., the questions are not related in that dimension. A value of one implies a perfect correlation.¹⁴ So, the alpha of Cronbach results for the Knowledge scale may be explained by the fact that this one is not a real scale but a knowledge test with binary results (right or wrong) for each item. In fact, the best way to evaluate the reliability of this scale is most probably through responsiveness analysis or the ability of the scale to register improvements after a training course.

For the Attitudes scale, our results were close to the original study⁸ for all groups except the faculty members group, which showed a lower alpha (0.602 versus 0.829). Yet our results for this group were the same as those of Agossa et al. (2021)¹² (0.60). For the Access scale, once again, our results were similar to the original and the French study for most groups, except for the faculty members group, which presented a result (0.607) between Hendricson et al. (2011)⁸ (0.767) and Agossa et al., (2021)¹² (0.42) results.

Finally, the Confidence scale, like the previous studies, had the highest Cronbach's alpha values in all groups.^{8,12} This is probably because it is the most straightforward among the KACE tool's scales.

4.2 Validity (discriminant validity)

In our study, undergraduate students (pre-course) scored lower on the Knowledge, Attitudes, and Confidence scales than graduate students and faculty members. There were no differences between graduate students and faculty members in Knowledge, Attitudes, and Confidence. There were no differences between groups in the Access scale. These results differed somewhat from those obtained by Hendricson et al. (2011).⁸ In the original study,⁸ faculty members scored higher than graduate students (residents), and these also performed better than undergraduate students in the Knowledge and Confidence scales. In the same study, faculty members and graduate students scored higher on the Attitudes and Access scales than undergraduate students but did not differ. A possible explanation for this finding is that, in our study, the graduate students group was composed of trained and untrained students, while Hendricson et al. (2011)⁸ included untrained students only in the comparison. In our study, the mean result for the graduate students on the Knowledge scale was 6.04, while in the original study, it was 4.1. This suggests that training graduate students is efficient in reaching the same performance as faculty members.

On the other hand, it may suggest that faculty members need more training in EBP. In the French study,¹² for example, the Knowledge mean score for the faculty members (considered experts in EBP) was 8.13. In our and the original study⁸, however, the faculty members were not necessarily experts in EBP, and the mean scores on the Knowledge scale were very close (6.25 and 6.3, respectively). Stanley et al. (2015)¹⁵ investigated the knowledge, attitude, access, and confidence of dental hygiene educators about EBP. They suggested that these aspects increased with additional education, highlighting the need for more EBP training for faculty members. Their results showed that as knowledge scores increased, so did confidence and access scores (positive correlation). Furthermore, another study focused on Preceptorship Training Educators (PTEs) in dentistry and underscored the importance of their proficiency in EBP to model these skills for their students. It highlighted that while many PTEs recognized the importance of EBP, there was a gap in how frequently they critically appraised literature despite feeling confident in their EBP abilities. This emphasizes the need for structured EBP training for educators, especially for new recruits, to ensure they can effectively impart EBP skills to students.¹⁶ Weyant (2019)¹⁷ highlighted the need for a multifaceted approach to teaching EBP, combining theoretical knowledge with practical application. According to the author, key barriers to implementation included individual and structural factors and the traditional reliance on authority figures in education. He also stated that effective EBP education requires well-prepared faculty, continuous professional development, and a supportive learning environment. And that the ultimate goal is to foster a lifelong commitment to evidence-informed practice, necessitating further research on long-term outcomes and effective teaching strategies.¹⁷

One interesting finding was the results for the Access scale. In our study, there were no differences between groups, while in the previous studies,^{8,12} undergraduate students scored lower than graduate and faculty members. According to the original KACE validation paper, as long as people gain experience in EBP, they should increase the number of information sources, increasing the Access scale score.⁸ However, The Access scale presents sources with different levels of trustworthiness (e.g., colleagues' opinions – the lowest level, and the Cochrane Database of Systematic Reviews – the highest level). So, it is expected that, with progressing experience in EBP, one should change information sources, refrain from using opinions, and increase the use of high-quality published evidence, for instance. Yet, all items have the same weight on the

scale and score equally; therefore, if one changes an untrustful source for a trustful one, the scale registers no change in score, which is a serious limitation of the original tool.

4.3 Responsiveness

In our study, the training course in EBP for undergraduate students improved their scores on the Knowledge and Confidence scales but not the Attitudes and Access scales. These results are similar to the findings of the French study,¹² but different from the original study,⁸ in which the training course improved the scores in all four scales. A possible explanation for this finding is that the KACE tool in our and French study was answered before and after a training course offered in a single academic term. This time gap may not be enough to capture changes in Attitudes and Access toward EBP. Two items in the Attitudes scale ask about the respondents' changes in the last year, so a longer period between the surveys could yield different results. Various studies observed a common trend of improvement in knowledge and attitudes, with inconsistent improvement in confidence levels after completing training courses.^{18- 21} Santiago et al. (2018)¹⁸ reported significant increases in knowledge and attitude among dental hygiene and third-year dental students after a 12-week course, but no significant change in confidence, indicating the need for more comprehensive training to impact confidence. In the access field, the results also suggested that both groups primarily relied on colleagues and the internet to find dental evidence, while using podcasts or databases of critically reviewed topics was rare. Wadgave et al. (2019)¹⁹ noted similar trends among final-year undergraduate students and interns from a dental institution after a 2-day workshop, with significant improvements in knowledge and attitude but limited changes in confidence and access. Only four out of nine items on the access scale showed statistically significant changes. Rodriguez-Fitzpatrick et al. (2022)²⁰, on the other hand, found significant improvements in knowledge, attitude, and confidence among dental students following an 11-week research design course.

Al-Yaseem et al. (2022)²¹ conducted a longitudinal study and observed that while new dental graduates initially showed some EBP engagement, attitude, confidence, and frequency of accessing evidence significantly decreased within six to nine months of entering professional practice, highlighting the need for sustained support to maintain EBP skills.

4.4. Other considerations

The original KACE tool Attitudes scale has ten items, and the possible answers follow a Likert scale varying from “strongly disagree” (1 point) to “strongly agree” (5 points). It was supposed to score from 10 (all answers “strongly disagree”) to 50 (all answers “strongly agree”) points. Yet, items 7 (“It has been difficult for me to practice evidence-based dentistry in the past year”) and 8 (“EBP is ‘cook-book dental care that disregards clinical experience in providing the best treatment for patients’”) have the opposite direction interpretation (the “strongly disagree” is the best answer). Therefore, the Attitudes scale maximum score reaches only 42 points, not 50. Even though previous studies did not mention it, we inverted the direction of these two items, i.e., the answers scored from “strongly disagree” (5 points) to “strongly agree” (1 point) to present results and run statistics analysis. This decision, however, did not impact the comparison with the other studies.

4.5 Study limitations

In our study, the sample size for the undergraduate students was small (49 pre-training courses, 62 post-training). In the original study,⁸ these numbers were 147 and 151, and in the French study,¹² 72 students. Ideally, the number of participants included in a validation study should vary between two and ten times the number of questionnaire items for validation purposes.²² For the KACE questionnaire, it represents 70 to 350 participants. A larger sample size generally provides more robust statistical power and enhances the representativeness of the findings.²³ Therefore, it would be important to increase the sample size, preferably involving participants from different regions in Brazil, to ensure the results' reliability and generalizability.

Our study did not measure test-retest reliability. It should have been important to identify the capacity of the Brazilian Portuguese KACE tool to provide consistent measurement across separate administrations within a 15-day interval. So, it is still to be done.

5. CONCLUSION

The translated and adapted version of the KACE tool (Knowledge, Attitude, Access, and Confidence Evaluation in EBP) for Brazilian Portuguese retained most of the original tool's psychometric properties. Expanding the sample size is necessary to

improve the discriminant validity and responsiveness findings. Also, it is still required to validate the tool for graduate students.

REFERENCES

- 1- Sackett, D. L., Rosenberg, W. M., Gray, J. A., Haynes, R. B., & Richardson, W. S. (1996). Evidence based medicine: what it is and what it isn't. *BMJ (Clinical research ed.)*, 312(7023), 71–72. <https://doi.org/10.1136/bmj.312.7023.71>
- 2- ISMAIL, AMID I.; BADER, JAMES D. (2004). Evidence-based dentistry in clinical practice. *The Journal of the American Dental Association*, 135(1), 78–83. doi:10.14219/jada.archive.2004.0024.
- 3- Empananza, Jose I.; Cabello, Juan B.; Burls, Amanda J. E. (2015). Does evidence-based practice improve patient outcomes? An analysis of a natural experiment in a Spanish hospital. *Journal of Evaluation in Clinical Practice*, 21(6), 1059–1065. doi:10.1111/jep.12460
- 4- Skaggs, Mary Kate Dilts; Daniels, Juli F.; Hodge, Angela J.; DeCamp, Valerie L. (2017). Using the Evidence-Based Practice Service Nursing Bundle to Increase Patient Satisfaction. *Journal of Emergency Nursing*, , S0099176717305470–. doi:10.1016/j.jen.2017.10.011
- 5- Kao RT. The challenges of transferring evidence-based dentistry into practice. *J Evid Based Dent Pract*. 2006 Mar;6(1):125-8.
- 6- Durr-E-Sadaf. How to apply evidence-based principles in clinical dentistry. *J Multidiscip Healthc*. 2019 Feb 11;12:131-136. doi: 10.2147/JMDH.S189484. PMID: 30804675; PMCID: PMC6375114.
- 7- Minja IK, Lwoga ET. Evidence Based Dentistry among Dentists in Low and Middle Income Countries: A Systematic Review. *East Afr Health Res J*. 2021;5(2):129-136. doi: 10.24248/eahrj.v5i2.662. Epub 2021 Nov 15. PMID: 35036837; PMCID: PMC8751479.
- 8- Hendricson WD, Rugh JD, Hatch JP, Stark DL, Deahl T, Wallmann ER. Validation of an instrument to assess evidence-based practice knowledge, attitudes, access, and confidence in the dental environment. *J Dent Educ*. 2011 Feb;75(2):131-44. PMID: 21293036; PMCID: PMC3078051.
- 9- Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000 Dec 15;25(24):3186-91. doi: 10.1097/00007632-200012150-00014. PMID: 11124735.

- 10- Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, Erikson P; ISPOR Task Force for Translation and Cultural Adaptation. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value Health*. 2005 Mar-Apr;8(2):94-104. doi: 10.1111/j.1524-4733.2005.04054.x. PMID: 15804318.
- 11 - Cardoso D, Coelho A, Louçano C, Parola V, Rodrigues M, Fineout-Overholt E, Apóstolo J. Translation and cross-cultural adaptation of evidence-based practice instruments for Portuguese nursing students. *Revista de Enfermagem Referencia*. 2019;4(23):141-152. Available at: <https://doi.org/10.12707/RIV19058>.
- 12- Agossa K, Sy K, Pinçon C, Nicolas T, Catteau C, Blaizot A, Dubar M. Knowledge, Attitude, Access and Confidence in Evidence-based practice amongst French dental undergraduates: A transcultural adaptation and psychometrics analysis of French version of the KACE questionnaire. *Eur J Dent Educ*. 2022 Feb;26(1):106-115. doi: 10.1111/eje.12677. Epub 2021 Feb 15. PMID: 33548112.
- 13- Crandon S. Sensitivity and specificity explained: A Cochrane UK Trainees blog. <https://uk.cochrane.org/news/sensitivity-and-specificity-explained-cochrane-uk-trainees-blog>. Accessed on April 24, 2024.
- 14- Nunnally, J.C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- 15- Stanley JL, Hanson CL, Van Ness CJ, Holt L. Assessing Evidence-Based Practice Knowledge, Attitudes, Access and Confidence Among Dental Hygiene Educators. *J Dent Hyg*. 2015 Jun;90 Suppl 1:42. PMID: 27458317.
- 16- Ciancio MJ, Lee MM, Krumdick ND, Lencioni C, Kanjirath PP. Self-Perceived Knowledge, Skills, Attitudes, and Use of Evidence-Based Dentistry Among Practitioners Transitioning to Dental Educators. *J Dent Educ*. 2017 Mar;81(3):271-277.
- 17- Weyant RJ. Teaching Evidence-Based Practice: Considerations for Dental Education. *Dent Clin North Am*. 2019 Jan;63(1):97-117. doi: 10.1016/j.cden.2018.08.010.
- 18- Santiago V, Cardenas M, Charles AL, Hernandez E, Oyoyo U, Kwon SR. Evidence-Based Practice Knowledge, Attitude, Access and Confidence: A comparison of dental hygiene and dental students. *J Dent Hyg*. 2018 Apr;92(2):31-37. PMID: 29739845.

- 19- Wadgave U, Khairnar MR, Kadu TS, Chadha GK, Wadgave Y. Effect of training on evidence-based practice to undergraduate dental students: pre and postexperimental study. *Int J Evid Based Healthc*. 2019 Mar;18(1):101-107. doi: 10.1097/XEB.000000000000199. PMID: 31335664.
- 20- Rodriguez-Fitzpatrick S, Gonzalez A, Dudar B, Oyoyo U, Kwon SR. Dental Students' Knowledge, Attitude, and Confidence toward Evidence-based Dentistry: A 5-year Retrospective Study. *J Contemp Dent Pract*. 2022 Nov 1;23(11):1146-1149. doi: 10.5005/jp-journals-10024-3418. PMID: 37073939.
- 21- Al-Yaseen W, Nanjappa S, Jindal-Snape D, Innes N. A longitudinal study of changes in new dental graduates' engagement with evidence-based practice during their transition to professional practice. *Br Dent J*. 2022 Feb 11. doi: 10.1038/s41415-022-3931-5. Epub ahead of print. PMID: 35140346.
- 22- Garcimartin P, Comin-Colet J, Delgado-Hito P, Badosa-Marcé N, Linas-Alonso A. Transcultural adaptation and validation of the patient empowerment in long-term conditions questionnaire. *BMC Health Serv Res*. 2017 May 4;17(1):324. doi: 10.1186/s12913-017-2271-7. PMID: 28472988; PMCID: PMC5418845.
- 23- Hulley, S. B., Cummings, S. R., Browner, W. S., Grady, D., & Newman, T. B. (2007).

APPENDIX

Table S1 – Results for the KACE scales in different groups.

		Knowledge	Attitude	Access	Confidence
Undergraduate students	Mean	3.02	39.71	26.29	12.23
	Standard deviation	1.76	4.99	7.42	5.81
	Median	3.00	40.00	26.50	12.00
	Percentile 25	2.00	35.50	21.00	6.00
	Percentile 75	4.00	43.00	32.00	16.00
	Count	49	49	49	49
Graduate students	Mean	6.04	43.04	30.61	17.35
	Standard deviation	1.58	5.89	5.21	4.03
	Median	6.00	45.00	30.00	16.00
	Percentile 25	5.00	39.00	28.00	14.00
	Percentile 75	7.00	47.00	34.00	20.00
	Count	23	23	23	23
Faculty members	Mean	6.25	42.17	28.00	23.82
	Standard deviation	2.34	5.17	4.35	4.87
	Median	6.00	43.00	27.50	23.00
	Percentile 25	6.00	39.00	25.50	19.00
	Percentile 75	7.50	46.00	31.00	28.00
	Count	12	12	12	12

Table S2 – Results for KACE scales pre and post-EBP training course for the undergraduate students.

		Knowledge	Attitude	Access	Confidence
Pre	Mean	3.02	39.71	26.29	12.23
	Standard deviation	1.76	4.99	7.42	5.81
	Median	3.00	40.00	26.50	12.00
	Percentile 25	2.00	35.50	21.00	6.00
	Percentile 75	4.00	43.00	32.00	16.00
	Count	49	49	49	49
Post	Mean	4.35	39.23	28.27	17.31

Standard deviation	2.10	8.41	7.86	6.16
Median	4.00	41.00	28.50	18.00
Percentile 25	3.00	36.00	23.00	13.00
Percentile 75	6.00	45.00	35.00	22.00
Count	62	62	62	62

PRESS RELEASE

Validação do Questionário KACE em Português Brasileiro: Impactos na Prática Odontológica Baseada em Evidências

Na Universidade de Brasília, foi conduzido um estudo pioneiro no Brasil, traduzindo e validando o questionário KACE (Knowledge, Attitude, Access, and Confidence) para o português brasileiro. Este instrumento avalia o conhecimento, atitudes, acesso e confiança dos profissionais de odontologia na prática baseada em evidências (PBE), crucial para a tomada de decisões na saúde bucal dos pacientes.

O estudo envolveu 97 participantes, incluindo estudantes de graduação e pós-graduação em odontologia e membros do corpo docente de duas universidades federais. O questionário KACE foi adaptado culturalmente e testado para garantir sua precisão e confiabilidade no contexto brasileiro. Os resultados mostraram que a versão em português do KACE manteve a maioria das propriedades psicométricas do instrumento original, destacando-se especialmente na avaliação da confiança dos profissionais em suas habilidades de avaliação crítica.

Os resultados do estudo indicaram que, após um treinamento em PBE, os estudantes de graduação apresentaram melhorias significativas nas escalas de conhecimento e confiança. No entanto, não foram observadas mudanças significativas nas escalas de atitudes e acesso.

Benefícios para a Sociedade

A validação do questionário KACE em português brasileiro representa um avanço significativo para a odontologia no Brasil. Esta ferramenta permitirá que instituições de ensino e profissionais avaliem e melhorem suas práticas baseadas em evidências, resultando em tratamentos mais eficazes e personalizados para os pacientes. Além disso, promoverá uma cultura de contínua atualização e melhoria profissional, garantindo que os dentistas brasileiros estejam alinhados com as melhores práticas globais. Este estudo não só preenche uma lacuna importante na pesquisa odontológica brasileira, mas também estabelece uma base sólida para futuras iniciativas de educação e treinamento em PBE, beneficiando diretamente a qualidade do atendimento odontológico e a saúde bucal da população brasileira.