Scientia Medica

e-ISSN: 1980-6108 | ISSN-L: 1806-5562

10.15448/1980-6108.2019.1.32295

EDUCATION IN HEALTH SCIENCES

Open Access

Brazilian version of the Fresno test of competence in Evidence-Based Medicine: a validation study

Versão brasileira do teste Fresno de competência em Medicina Baseada em Evidências: um estudo de validação

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How to cite this article:

Salerno MR, Herrmann F, Debon LM, Soldatelli MD, Forte GC, Bastos MD, Sarria EE, Antonello ICF, Mattiello R. Brazilian version of the Fresno test of competence in Evidence-Based Medicine: a validation study. Sci Med. 2019;29(1):e32295. https://doi.org/10.15448/1980-6108.2019.1.32295

ABSTRACT

AIMS: To validate the Brazilian version of the Fresno test of competence in Evidence-Based Medicine.

METHODS: This is a cross-sectional, validation study. Phase 1: translation of the Fresno instrument. Phase 2: validation of the translated version, which was tested in 70 undergraduate medical students. The psychometric properties evaluated were validity, internal consistency, and sensitivity to change.

RESULTS: Overall, validity was adequate; most items showed a moderate to strong and significant correlation with the total score; there was an important and significant difference between both groups, with and without previous contact with Evidence-Based Medicine (median, 55 [IQ25-75, 45.2-61.7] vs. median, 18.5 [IQ25-75, 6.0-29.7]) ($p<0.001$). Internal consistency was also adequate (α-C 0.718), and sensitivity to change showed a considerable and significant difference between pre and post-test (median, 18.5 [IQ25-75, 6.0-29.7] vs. median, 44 [IQ25-75, 34.0-60.0]) ($p<0.001$).

CONCLUSIONS: The Brazilian version of the Fresno test showed satisfactory psychometric properties, and it can now be used as a tool to assess the knowledge and skills of Evidence-Based Medicine in Brazilian medical students.

KEYWORDS: validation studies; evidence-based medicine; questionnaire; students, medical.

RESUMO

OBJETIVOS: Validar a versão brasileira do teste Fresno de competência em Medicina Baseada em Evidências.

MÉTODOS: Este é um estudo transversal de validação. Fase 1: tradução do instrumento Fresno. Fase 2: validação da versão traduzida, testada em 70 estudantes de graduação em medicina. As propriedades psicométricas avaliadas foram validade, consistência interna e sensibilidade à mudança.

RESULTADOS: No geral, a validade foi adequada; a maioria dos itens apresentou correlação moderada a forte e significativa com o escore total; houve diferença importante e significativa entre os dois grupos, com e sem contato prévio com medicina baseada em evidências (mediana, 55 [IQ25-75, 45,2-61,7] vs. mediana, 18,5 [IQ25-75, 6,0-29,7]) ($p<0,001$). A consistência interna também foi adequada (α-C 0,718), e a sensibilidade à mudança mostrou uma diferença considerável e significativa entre o pré e o pós-teste (mediana, 18,5 [IQ25-75, 6,0-29,7] vs. mediana, 44 [IQ25-75], 34,0-60,0]) ($p<0,001$).

CONCLUSÕES: A versão brasileira do teste Fresno mostrou propriedades psicométricas satisfatórias, e agora pode ser usada como uma ferramenta para avaliar o conhecimento e as habilidades da Medicina Baseada em Evidências em estudantes de medicina brasileiros.

DESCRITORES: estudos de validação; medicina baseada em evidências; questionário; estudantes de medicina.

Received: *2018/10/22*
Accepted: *2019/22/05*
Published: *2019/02/13*

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Abbreviations: α-C, Cronbach's alpha; Br-Pt, Brazilian Portuguese; EBM, Evidence-Based Medicine; PBL, Problem-Based Learning; PUCRS, Pontifícia Universidade Católica do Rio Grande do Sul; UNISC, Universidade de Santa Cruz do Sul.

INTRODUCTION

According to Michael LeFevre [1],

> the goals in medicine should be modest; the work of medical professionals should relieve suffering, prevent future suffering, and prolong life. An essential part of that effort is making good clinical decisions, one patient and one decision at a time. These decisions are multifaceted, best made in the context of a relationship, integrating what we know and learn about the individual as a person and as a patient with an understanding of the biopsychosocial setting in which their story unfolds. Good clinical decisions involve more than bedside wisdom; they necessitate good science. The search for a science of clinical care led to the development and evolution of clinical epidemiology, and among many important conclusions, there was widespread agreement that for clinical decisions about medical interventions, experiment trumps observation.

The search for a science of clinical care led to the development and evolution of clinical epidemiology and, among many important conclusions, there was widespread agreement that for clinical decisions about medical interventions, experiment trumps observation. Since the term first appeared in print, in 1991 [2], the use of Evidence-Based Medicine (EBM) has increased significantly both in the medical literature and in clinical practice. The need to find, understand, and apply the best available scientific evidence has promoted the use of day-to-day research tools for patient care. The primary purpose of EBM is to integrate the clinical information obtained from a patient with the experience of health professionals and the best available evidence from research [3-6].

Schools of Medicine all over the world, including in Brazil, have already begun the process of training students and teachers to apply EBM concepts in all stages of medical training and in clinical practice as well [4]. Publications have highlighted the positive results of this process, through studies that have assessed EBM trainees' performance in clinical practice [2-5, 7-12]. However, despite the importance of its use, there are no validated instruments in Portuguese to assist in measuring EBM knowledge and training medical students in Brazil [13].

The Fresno test is among the few available and validated instruments to assess competence in EBM; it was created and validated in 2003 at the University of California in San Francisco, branch Fresno, United States of America, to be applied to professionals, students, and teachers within the healthcare sector. The Fresno test begins with the presentation of two scenarios that suggest clinical uncertainty [14, 15] from where a series of questions derive. To properly answer them, the person should follow an EBM strategy.

The aim of this study was to validate the Brazilian version of the Fresno test of competence in EBM.

METHODS

Design, population and ethics

This is a validation study. Medical students from Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) and Universidade de Santa Cruz do Sul (UNISC), both institutions from southern Brazil, were recruited to participate in the study. UNISC students were in their first semester of medicine and had no previous epidemiology classes; PUCRS students were attending the first two years of medical school, with no previous epidemiology classes, or attending the last two years of the medicine course, already taken epidemiology classes.

The institutional Ethics Committee reviewed and approved the study (protocol number 975.124). All participants signed the written and informed consent.

Fresno test of competence in EBM

The Fresno test consists of 12 questions, each one with a score between 0 and 24 points. The topics that comprise the instrument are: study design, database, type of study, search strategies, relevance, internal validity, magnitude and significance, sensitivity, specificity, predictive value and probability, number needed to treat, confidence interval, diagnosis, and prognosis [14].

Study phases

The study was divided into two phases [13, 16-18]. The first phase consisted of translating and culturally adjusting the instrument; the second phase consisted of applying the test to a sample with an adequate number of subjects to assess the questionnaire's psychometric properties.

Phase one: The translation followed international recommendations. First, the original English version of

the Fresno questionnaire was translated into Brazilian Portuguese (Br-Pt) by two independent bilingual translators, who were aware of the study aims and carried out a conceptual translation (rather than a literal translation). Once they finished, both versions were reviewed and discussed together between the translators and one of the lead authors of the study, to reach a consensus version. Subsequently, the Br-Pt version was back-translated to English by two different and independent translators, also bilinguals and aware of the aims of the study, as well as blind to the original English version. These translators also reviewed and discussed the respective versions together until a consensual version was obtained. After that, a comparison of both English versions was performed to evaluate possible disagreements until reaching a consensus. The resulting Portuguese version of the questionnaire was applied to 10 participants (pilot study) to make final adjustments based on possible observations on reading/interpretation difficulties [13, 16-18]. **Appendix 1** contains the Br-Pt questionnaire.

Phase two: We applied the resulting Br-Pt version of the questionnaire to a sample of students and evaluated the psychometric properties of the instrument. Validity was studied assessing the correlation between the items of the questionnaire with the total score, and comparing the performance of the students who had received EBM classes and those who had not (discriminant validity). Reliability was studied through internal consistency and sensitivity to change, by comparing student's pre and post-intervention scores. The intervention consisted of a lecture that addressed a series of topics related to EBM, including searching for evidence, and basic concepts of epidemiology and statistics. The contents discussed in the lecture had the aim of reviewing the contents addressed in the Fresno questionnaire. The questionnaire was applied pre and post intervention.

Sample size

To assess the psychometric properties, the required sample size was estimated in 60 subjects, considering the inclusion of five participants for each component (items) of the instrument.

Statistical analysis

Continuous variables were described as median and interquartile range, according to their symmetry; categorical variables were described as absolute and relative frequency. Overall validity was analyzed using Spearman's correlation coefficient, were values ≥ 0.3 were considered relevant. Discriminant validity and sensitivity to change were analyzed using the *t-test* for independent samples. To evaluate internal consistency, Cronbach's alpha (α-C) was used, considering values ≥ 0.6 adequate (13, 16-18). Data analysis was performed with SPSS Statistics for Windows, version 17.0 (SPSS Inc., Chicago, Ill., USA). A p-value of < 0.05 was considered statistically significant

RESULTS

Following the Pilot study, the discussion with the students that took part of it did not render modifications to the translated version of the instrument. Seventy medical students participated and answered the questionnaire, including 42 (60%) students from the first two years and 28 (40%) students from the last two years of medical school.

The psychometric properties of the Br-Pt version of the Fresno test were satisfactory. Most correlations of items with the total score of the instrument were moderate to strong (**Table 1**). The discriminant validity was able to identify a significant difference ($p < 0.001$) among students who had previous contact with EBM through their epidemiology curriculum (median, 55; IQ25-75: 45.2-61.7), and those who had no previous contact (median, 18.5; IQ25-75: 6.0-29.7) (**Figure 1**).

The results of the internal consistency were also adequate, with α-C values of 0.718. As for sensitivity to changes, there was a large and significant difference between pre- and post-intervention: median, 18.5 points (IQ25-75: 6.0-29.7) vs. median, 44 (IQ25-75: 34-60) (**Figure 2**).

Table 1. Total score and item's correlations

Question number	rho*	p-value
1	0.695	<0.001
2	0.728	<0.001
3	0.475	<0.001
4	0.721	<0.001
5	0.492	<0.001
6	0.535	<0.001
7	0.192	0.111
8	0.488	<0.001
9	0.339	0.004
10	0.149	0.218
11	0.345	0.003
12	0.397	0.001

* rho, Spearman's rank correlation coefficient.

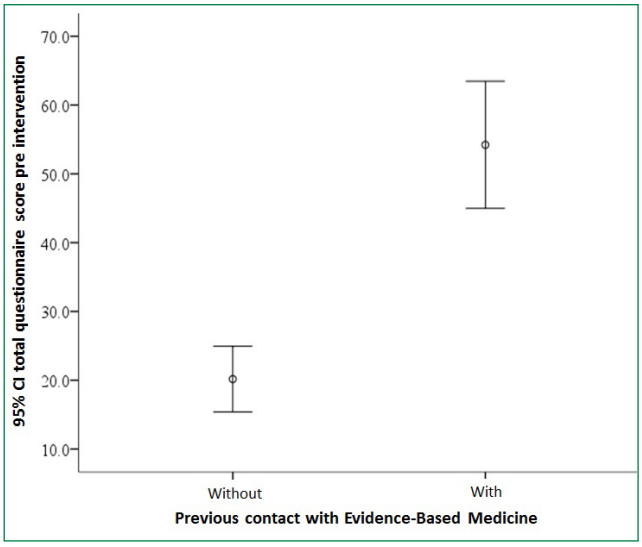

Figure 1. Comparison of the total questionnaire score among students who did not have and those who had previous contact with Evidence-Based Medicine.

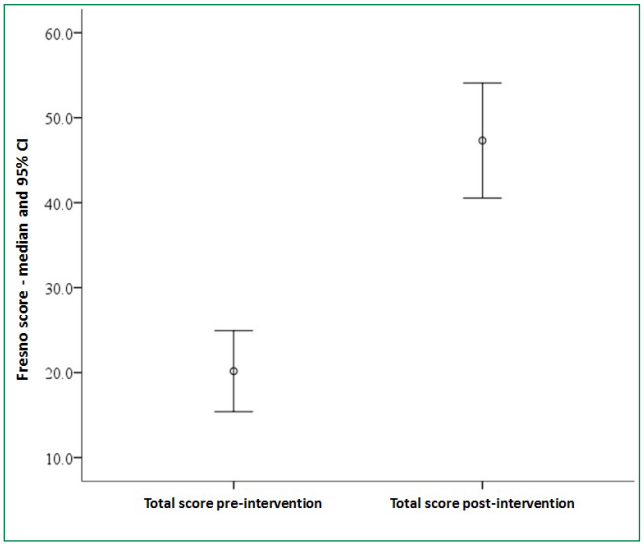

Figure 2. Comparison of the total questionnaire score before and after the intervention.

DISCUSSION

The Brazilian version of Fresno test was shown to be a reliable and valid tool for assessing key knowledge and skills of EBM. The performance-based test had content validity, good reliability, and internal consistency. The ability of the test to distinguish between well-informed and naïve students was high. The use of the Fresno test to measure the change in the students' knowledge after they received information on EBM also showed a good performance [19].

The results of this study demonstrate that the Brazilian version of the questionnaire can be used in Brazilian health-care educational institutions as another teaching tool of EBM. The teaching of EBM has been increasing in medical schools worldwide, once it has proven the benefits of a more objective, integrated and academic view of clinical decision making during patient's care [3, 5, 6, 12, 20]. Typically, the contents of EBM have been part of the Epidemiology or Public Health disciplines, which take place early on. To meet these ideal conditions, EBM practice must already be in place, or training should also be promoted in all settings where students and clinical instructors interact while dealing with patients [21]. Within this dynamic process, the Fresno test is a tool that would help to monitor progress and to identify aspects that might need improvement [11].

Far from restricting EBM to teaching, it should be at the core of clinical practice and in the never-ending process of learning, not only for physicians, but for other health care professions as well. Two recent studies, a systematic review and a synthesis of systematic reviews found that training in EBM had positive effects on knowledge and skills of healthcare professionals, independent on the length of training [12, 22]. Similarly, a study suggested that promoting EBM skills in medical residents enhances their lifelong learning skills and attitude. The study explored with success the inclusion of EBM curriculum in journal clubs, using the Fresno test to monitor performance and skills development, as an option to use in resident's education [23].

With the demanding time-constrains of modern life and the increasing curricular load healthcare students and professionals face, electronic learning (e-learning) could be an additional or complementary alternative option in EBM learning. E-learning is a teaching platform initially received both with enthusiasm and skepticism in the healthcare field, but improvements of the methods and delivery of contents have gained the confidence of learners and institutions, including those with EBM courses. According to a recent and extensive systematic review, pure e-learning (online only) or mixed e-learning (online plus some form of face-to-face activities) were superior to no formal teaching activities to improve EBM knowledge and skills, and no differences were found when comparing e-learning with a traditional face-to-face method [24]. In any of those circumstances, assessment tools, such

as the Fresno test, are important if we wish to improve EBM teaching [25].

The use of active learning methodologies in medical schools has been widely stimulated since the creation of the curricular guidelines for undergraduate courses in the healthcare field. Problem-Based Learning (PBL) is among those interventions, stimulating student in the autonomous search of study references, having a tutor to guide the process [7-9]. EBM skills can easily be adopted within the PBL methodology since there is some common ground between them. Evaluating performance through different educational interventions helps in choosing better strategies according to the profile of students and tutors and the context in which they are [9].

Including only students could be considered a limitation of our study. However, the study aimed to develop and validate the Br-Pt version of the Fresno questionnaire, and not just to compare differences in EBM knowledge between trained vs. naïve subjects. The inclusion of students with different levels of knowledge allowed us to develop this version and successfully test its psychometric properties. Another potential limitation could be the inclusion of individuals from a single state of Brazil, but we believe that the use of conventional academic language equalizes the subtle linguistic, regional differences.

In conclusion, the Brazilian version of the Fresno test showed satisfactory psychometric properties, recommending its use to evaluate the knowledge and skill of EBM in medical students.

NOTES

Funding

The present study was financed in part by Brazilian Coordination for Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES). Rita Mattiello is Research Career Awardees of the Brazilian National Council of Scientific and Technological Development (CNPq).

Conflicts of interest disclosure

The authors declare no competing interests relevant to the content of this study.

Authors' contributions

All the authors declare to have made substantial contributions to the conception, or design, or acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and assume full responsibility for the integrity of these results.

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APPENDIX 1

Brazilian version of the Fresno test of competence in Evidence-Based Medicine

O teste Fresno de Medicina Baseada em Evidências

A prática da Medicina Baseada em Evidências (MBE) compreende alguns conhecimentos e habilidades básicas relacionadas à busca e avaliação da literatura médica. Esta ferramenta de Educação Médica da Universidade da Califórnia São Francisco-Fresno é delineada para avaliar o nível no qual você já está usando as habilidades da MBE. Por favor, responda ao teste inteiro de uma só vez. Há 7 perguntas para respostas curtas, 2 perguntas que requerem uma série de cálculos matemáticos e três questões nas quais devem ser preenchidas as lacunas. Serão necessários pelo menos 30 minutos para completar o teste.

Responda às perguntas 1-4 com base nos seguintes cenários clínicos:

a) Você acaba de ver a Lydia que, recentemente, deu à luz um bebê saudável. Ela tem a intenção de dar de mamar, mas também quer começar a tomar anticoncepcionais orais. Você prefere, geralmente, receitar anticoncepcionais orais combinados (estrógeno + progesterona), mas lhe disseram que esses poderiam afetar mais negativamente a produção de leite dela do que comprimidos apenas de progesterona.

b) John é um menino de 11 anos de idade que apresenta enurese primária. Ele está ficando frustrado com a inconveniência e o constrangimento do seu problema. Você excluiu a possibilidade de anomalias do trato urinário e infecção como causas possíveis. Você está pensando em recomendar um alarme contra molhar a cama, mas um colega lhe diz que acha que "não adiantam de nada" e sugere tratamento com Imipramina ou Desmopressina.

1. Escreva uma pergunta focada para cada um desses casos, que o ajude a organizar uma busca de respostas na literatura clínica e que escolha a melhor resposta entre aquelas que forem identificadas.

População	Intervenção	Comparação	Desfecho
População	Intervenção	Comparação	Desfecho

2. Onde é que os clínicos poderiam procurar uma resposta a perguntas como estas? Diga tantos tipos ou categorias possíveis de fontes de informação quanto puder. Você poderá achar que algumas são melhores do que outras, mas discuta tantas quanto puder a fim de demonstrar a sua consciência dos pontos fortes e pontos fracos de fontes de informações comuns na prática clínica. Descreva as mais importantes vantagens e desvantagens de cada tipo de fonte de informações que enumerar.

Variedade de fontes	Conveniência	Relevância Clínica	Validade

3. Se você fosse fazer uma busca no MEDLINE para encontrar pesquisas originais sobre uma dessas perguntas, descreva qual seria a sua estratégia. Seja tão específico quanto puder sobre em que temas e que categorias (campos) de busca você procuraria. Explique a sua justificativa para ter usado esta abordagem. Descreva como poderia limitar a sua busca caso necessário e explique o seu raciocínio.

Termos de Busca	Etiquetas	Delimitadores

4. Escolha enfocar um dos cenários clínicos (amamentação e anticoncepcionais orais, ou alarme de enurese noturna). Que tipo de estudo (delineamento do estudo) poderia melhor abordar esta questão? Por que?

Delineamento do Estudo	Justificativa

5. Quando você encontra um relatório de pesquisas originais sobre essas perguntas, que características do estudo você irá considerar para determinar se é relevante? Inclua exemplos (As perguntas 6 e 7 serão como determinar se o estudo é válido, e quão importantes são os achados para esta pergunta enfoque em como determinar se é realmente relevante à sua prática.)

A pergunta	Descrição dos assuntos

6. Quando você encontra um relatório sobre pesquisa original a respeito dessas perguntas, que características do estudo você considerará para determinar a validade dos achados? Você já abordou a relevância e a pergunta 7 pedirá como determinar a importância dos achados para essa pergunta; enfoque a validade do estudo.

Validade interna

7. Quando você encontra um relatório de pesquisa original sobre essas perguntas, quais características dos achados você considerará para determinar sua magnitude e significância? Inclua exemplos (Você já abordou relevância e validade para esta pergunta enfoque em como determinar o tamanho e significado de um efeito relatado no estudo.)

Magnitude	Significância estatística

8. Um estudo recente sobre acurácia diagnóstica de gás arterial no diagnóstico de embolia pulmonar incluiu 212 pacientes com suspeita de embolia pulmonar, 49 dos quais se verificou, posteriormente, que tinham uma embolia pulmonar. Entre aqueles com o diagnóstico de embolia pulmonar, 41 tinham um gradiente de oxigênio alveolar-arterial anormal ($(A\text{-}a)DO_2$). Dos 163 pacientes nos quais se determinou que não tinham embolia pulmonar, 118 tinham ($(A\text{-}a)DO_2$) anormal.

- Com base nestes resultados, a sensibilidade de $(A\text{-}a)DO_2$ para embolia pulmonar é
- Com base nestes resultados, a especificidade de $(A\text{-}a)DO_2$ para embolia pulmonar é
- Com base nestes resultados, o valor preditivo positivo de $(A\text{-}a)DO_2$ para embolia pulmonar é
- Com base nestes resultados, o valor preditivo negativo de $(A\text{-}a)DO_2$ para embolia pulmonar é
- Com base nestes resultados, a razão de verossimilhança positiva para um $(A\text{-}a)DO_2$ anormal para embolia pulmonar é

9. Um estudo randomizado recente constatou que 29% dos diabéticos com cardiopatia coronariana tratados com Pravastatina sofreram um evento coronariano recorrente durante 5 anos de seguimento, enquanto que 37% do grupo com placebo sofreu eventos coronarianos recorrentes.

- A redução de risco absoluta para eventos recorrentes é
- A redução de risco relativa para eventos recorrentes é
- O número necessário para tratar (NNT) a fim de prevenir um evento recorrente é

10. O recente estudo HERS comparou mulheres que estavam tomando suplementos de estrogênio com mulheres que estavam tomando placebo. Os resultados revelaram que um risco relativo de eventos tromboembólicos venosos é de 2,89 para as mulheres que tomavam estrogênio. Isso sugere que o tratamento com estrogênio apresenta um risco coronariano, mas nós nos perguntamos se essa diferença é estatisticamente significativa, de modo que olhamos o intervalo de confiança. Dê um exemplo de intervalo de confiança que apoiaria a conclusão de que a taxa de eventos tromboembólicos venosos foi de fato (estatisticamente) diferente para os dois grupos de tratamento

11. Que delineamento de estudo é melhor para um estudo sobre diagnóstico?

12. Que delineamento de estudo é melhor para um estudo sobre prognóstico?