Champion's Health Belief Model Scale Validity Evidence for Brazil

Evidências de Validade da *Champion's Health Belief Model Scale* para o Brasil

Evidencias de Validez de la *Champion's Health Belief Model Scale* para Brasil

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Abstract

Objective: Performing translation and cross-cultural adaptation of the Champion's Health Belief Model Scale (CHBMS) for use in Brazil for mammographic screening, and verify the validity evidence of the Brazilian version of this scale.

Methods: Methodological study, conducted with 206 women attending a Basic Health Unit, in the city of Fortaleza, state of Ceará, Brazil, from August 2015 to December 2017. The scale went through a process of translation and cross-cultural adaptation, including face and content validation. Afterwards, validity evidence was verified (1.Vality based on internal structure, assessed by exploratory analysis, with varimax orthogonal rotation and retention of factors by parallel analyzes; 2. Reliability from Cronbach's alpha homogeneity and test-retest stability).

Results: In face and content validation, the tool showed good acceptance among the judges and the target audience. The final exploratory factor analysis model resulted in a seven-item scale, divided into three domains, with an explained variance of 71.4%, with Cronbach's alpha ranging from 0.50 to 0.88. For scale reliability, Pearson r and Spearman ρ showed high reliability (0.997 and 0.986).

Conclusion: The Brazilian version of Champion's Health Belief Model Scale provides good evidence of validity based on internal structure and is reliable. It may be used in Brazil to assess mammography compliance monitoring.

Resumo

Objetivo: Realizar tradução e adaptação transcultural da *Champion's Health Belief Model Scale* (CHBMS) para uso no Brasil, no rastreamento mamográfico, e verificar as evidências de validade da versão brasileira desta escala.

Métodos: Estudo metodológico, realizado com 206 mulheres frequentadoras de unidade básica de saúde, na cidade de Fortaleza-CE, Brasil, de agosto de 2015 a dezembro de 2017. A escala passou por processo de tradução e adaptação transcultural, incluindo validação de face e conteúdo. Posteriormente, foram verificadas as evidências de validade (1.Validade baseada na estrutura interna, avaliada mediante análise exploratória, com rotação ortogonal varimax e retenção de fatores por análises paralelas; 2. Confiabilidade, a partir da homogeneidade por alfa de Cronbach e estabilidade por teste-reteste).

Resultados: Na validação de face e conteúdo, o instrumento apresentou boa aceitação entre os juízes e o público-alvo. O modelo final da análise fatorial exploratória resultou em escala com sete itens, divididos em

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três domínios, com variância explicada de 71,4%, com alfa de Cronbach variando de 0,50 a 0,88. Para confiabilidade da escala, o r de Pearson e o ρ de Spearman mostraram alta confiabilidade (0,997 e 0,986).

Conclusão: A versão brasileira da *Champion's Health Belief Model Scale* apresenta boas evidências de validade baseada na estrutura interna e é confiável, podendo ser empregada no Brasil para avaliação do monitoramento da adesão à mamografia.

Resumen

Objetivo: Realizar la traducción y adaptación transcultural de la *Champion's Health Belief Model Scale* (CHBMS) para su aplicación en Brasil en el rastreo mamográfico y para verificar las evidencias de validez de la versión brasileña de esta escala.

Métodos: Estudio metodológico, realizado con 206 mujeres que asistían con frecuencia a una unidad básica de salud, en la ciudad de Fortaleza, estado de Ceará, Brasil, de agosto de 2015 a diciembre de 2017. La escala pasó por un proceso de traducción y adaptación transcultural, que incluyó validación aparente y de contenido. Posteriormente, se verificaron las evidencias de validez (1. Validez basada en la estructura interna, evaluada mediante análisis exploratorio, con rotación ortogonal varimax y retención de factores por análisis paralelos; 2. Confiabilidad a partir de la homogeneidad por alfa de Cronbach y estabilidad por test-retest).

Resultados: En la validación aparente y de contenido, el instrumento presentó buena aceptación entre los jueces y el público destinatario. El modelo final del análisis factorial exploratorio tuvo como resultado una escala con siete ítems, divididos en tres dominios, con varianza explicada de 71,4%, con alfa de Cronbach que varía de 0,50 a 0,88. En la confiabilidad de la escala, el r de Pearson y el ρ de Spearman demostraron alta confiabilidad (0,997 y 0,986).

Conclusión: La versión brasileña de la *Champion's Health Belief Model Scale* presenta buenas evidencias de validez basada en la estructura interna y es confiable, por lo que puede emplearse en Brasil para evaluar el monitoreo de la adherencia a la mamografía.

Introduction

Increasing late diagnosis of breast cancer has led to prognoses of incurable disease with imminent risk of death.[1] Despite technological advances that enable early detection of this disease, breast cancer is still one of the leading causes of morbidity and mortality in Brazil and worldwide.[2,3] In addition, it is estimated that by 2030 cancer will become the leading cause of death worldwide and 70% of these deaths will occur in low- and middle-income countries.[4]

Mammography is one of the most effective methods for early detection of the disease due to its high efficacy and low cost compared to other similar diagnostic methods.[5] In keeping with international trends, the Brazilian National Cancer Institute (INCA - *Instituto Nacional do Câncer*) announced the recommendations of the Brazilian National Breast Cancer Screening Protocol that includes mammography.[6]

Despite the existence of this protocol,[6] scientific studies and national data indicate that mammography performed by women in the country is not equivalent to the recommended indications. This occurs mainly in women aged 50 to 60 years, ages for which access to and compliance with the test are essential, which raises concern regarding national public health.[7,8] In a recent integrative review, it was found that in addition to having physical infrastructure and skilled personnel, there is a need for culturally competent interventions that consider mammography-related barriers and beliefs to improve compliance with this screening method.[9]

The use of tools to assist in monitoring mammography compliance presents satisfactory results and lower costs, as well as subsidizing improvements for women's health care.[10,11] Among the tools developed for this purpose, the Champion's Health Belief Model Scale (CHBMS) stands out.[12] It is widely used in international studies to measure compliance with mammography, translated into several languages and tested in several ethnic and cultural groups.[13]

The CHBMS was developed by an American epidemiologist nurse in 1984 to assess women's breast self-examination compliance.[14] In 1999, the tool was revised and adapted to assess mammography compliance.[12] It is a Likert-style tool based on the Health Belief Model. Originally, the CHBMS underwent the following assessment processes: construct validation, predictive validation and reliability. Analyzes included internal consistency, test-retest, factor analysis, confirmatory analysis and techniques for known groups. Internal consistency ranged from 0.75 to 0.88 and test reliability from 0.59 to 0.72. In factor analysis, varimax rotation provided a conceptually clearer solution than oblique rotation. Three factors were selected and represented 54% of the variation. The three factors also represented values greater than one. Factorial extraction was guided by the eigenvalue theory. The

matrix ended with 19 items, distributed in three factors or domains, with five response options, ranging from one to five. Factor 1 refers to the perceived susceptibilities to breast cancer illness and includes three items. Factor 2 portrays the perceived benefits of mammography practice and encompasses five items. Factor 3 consists of 11 items, which reflect the perceived barriers to the exam.[12]

Therefore, it was considered relevant to understand the validation process, as well as the use of the scale in other languages and contexts, to study the proposals for this research, besides the applicability after validation.

Research on monitoring mammography compliance is widespread among the scientific community.[15] However, there are no data involving the Brazilian population regarding mammography compliance using the CHBMS. Therefore, this study aimed to perform CHBMS translation and cross-cultural adaptation for use in Brazil, and to verify validity evidence of the Brazilian version of this scale.

Methods

This is a methodological study developed to verify the validity evidence of the CHBMS involving translation, cross-cultural adaptation and validation for use in Brazil. The use of the CHBMS in Brazil was authorized by the lead author via electronic contact. The first stage of the research took place with the process of translation and cross-cultural adaptation, carried out according to the protocol recommended in the literature, including content and face validation.[16] Validity evidence verification was carried out from the validity based on the internal structure, through exploratory analysis, with varimax orthogonal rotation and retention of factors by parallel analyzes. In addition, reliability was verified from Cronbach's alpha homogeneity and test-retest stability.

To follow the translation protocol,[16] two Brazilians (one health professional and one linguist) participated, who acted independently. The participation of two bilingual Americans (one health professional and one professional translator) was also required. In addition, a committee of judges was set to analyze cultural, semantic, conceptual and idiomatic equivalence and content validity, ending with the formulation of the version that would be used in the next step. To make up the assessment committee, the criteria mentioned in similar studies were used[17,18]. The committee members were invited via e-mail. Two nurses, three radiologists and one psychologist with experience in the scale validation process agreed to participate in this phase. In addition to this, a linguist, holding a degree in Languages and Linguistics, specialised in English language translation, identified in a language course, was part of this committee.

The translated version was submitted for pre-testing with the audience for face validation, and content validation with experts. Although face validation has been outlawed by some experts,[19] the authors decided it was appropriate to do so. It was a parameter assessed in the various versions of the scale,[20-25] and for validating a tool with a completely different population in social and educational terms.[26]

As recommended by the protocol used,[16] there were 40 women from the target audience at this stage of the study. For experts sampling, it was used suggestion of thematic researchers who suggest 22 judges as ideal to identify statistically acceptable values in the analysis of validation studies.[27] These judges were identified by snowball sampling, 25 contacts were made, and 23 respondents and survey respondents returned. With the scale ready, the second stage of the study was started to verify the psychometric properties.

The second stage was developed in a Basic Health Unit (BHU) based in the city of Fortaleza, state of Ceará, Brazil. There are five Family Health Strategy teams performing gynecological examinations three times a week, serving about 10 women per shift. The participants' eligibility criteria for tool validation were women aged between 50 and 69 years, registered in the referred BHU who attended to perform the gynecological exam in the two months for data collection. Women in consultation who met the inclusion criteria and agreed to participate were included.

For purposes of internal structure analysis, the exploratory analysis and the main components were adopted. Because they are considered complex analyzes, a minimum of 200 subjects or ten respondents were required for each item of the tool.[28,29] To ensure greater sample power, it was decided to assess a larger number of patients, therefore 206 women were involved. To test CHBMS stability, the test-retest was performed. The 45-day interval, the average interval between the gynecological consultation for the Pap smear, and the return to receive the test results at the health unit where the research was performed was considered.

Data collection occurred from August 2015 to December 2017, through structured interviews with the application of specific tools for each phase of the study. These tools were the Informed Consent Form, the socio-demographic and clinical characterization tool (including data related to risk factors for breast cancer) and the CHBMS. For the judges, in order to apply tools to assess aspects of the scale to be analyzed, an e-mail containing explanatory text about the importance of the study was sent and, after accepting to participate in the research, they had access to the material for assessment.

Data were submitted to descriptive analysis of sample characteristics and tool items, with identification of central measures and variability. In face validation, the Concordance Index was calculated. For content validation, we used the Content Validity Index (CVI) and the Kappa coefficient. Items with up to 80% agreement were kept in the definitive tool and items with lower agreement percentages were reviewed by the researchers (including the original scale author), undergoing minor modifications or being eliminated. The internal structure validity was performed through exploratory analysis, based on principal component analysis, with varimax rotation to facilitate the interpretation of factor loadings and the allocation of items in factors. Reliability was verified by the Intraclass Correlation Coefficient (ICC) and by the internal consistency measure, verified by Cronbach's alpha, considering as acceptable values alpha above 0.60.[30] For reliability, the test-retest was analyzed by Pearson's r coefficients and Spearman's ρ. The significance level adopted was 0.05.

Following the recommendations for the development of research involving human beings, this study was approved by the Ethics Committee of *Universidade Federal do Ceará* via *Plataforma Brasil* (Brazil Platform) (Opinion 1.140.550). Human research norms and guidelines were complied with, as required by the Brazilian National Health Board (*Conselho Nacional de Saúde*) Resolution 466/12.

Results

Of the 25 invitations sent to the professionals selected to make up the Judges Committee, 23 accepted. The committee profile had between three and 17 years of experience in oncology, 14 (60.1%) of them with five years or more experience in this area. There were 20 (86.9%) nurses, two psychologists and one doctor; two professionals holding PhDs in nursing, three with masters in nursing and one in collective health. The others were specialised in oncology; four worked directly in radiology, eight in chemotherapy and 11 in the clinic; 17 in care and six had simultaneous experience in care, teaching and research.

Overall the tool presented high CVI values, ranging from 0.91 (Ba5 in the pertinence criterion) to 0.95 (items B5 of the clarity criterion and items S3, Ba4, Ba5 and Ba7 of the relevance criterion). According to the Kappa scores obtained for each criterion, it was noticed that the results in the relevance and relevance criteria were significant, but the scores were very low (Relevance: alpha=0.095; $p < 0.05$; Relevance: alpha=0.053; $p < 0.05$). Low scores can be explained by the predominance of judges' responses in only one alternative. The clarity criterion was not assessed as there was not enough variability to detect any significant difference. Therefore, based on these results and in the absence of recommendations, it was decided to maintain the scale in the current version, so that it could proceed to the next steps and analyzes.

Of the 40 women involved in the face validation phase, most were between 60 and 64 years old (n=22; 55%), married (n=22; 55%), white (n=35; 87.5%), concluded secondary education (n=26;

65.0%) and retired (n=30; 75.0%). In scale assessment, the three aspects (clarity, comprehension and appropriateness of the instruction items and the response scale) were generally considered comprehensible and adequate. Only item B2 ("*A realização da mamografia me ajudará a encontrar mais cedo os tumores na mama*") did not score 100% in the Concordance Index analysis, with a value of 0.35. However, this does not indicate that the scale presented negative assessment by these women, it just means to affirm relative disharmony between the scores in this item. Therefore, it was considered appropriate to maintain it so that more analysis could be performed after application with the judges and a larger sample of the target audience.

Following these steps, the final version was submitted to the original author for approval. Details of the CHBMS's final version for Brazilian Portuguese can be found in Chart 1.

In the internal structure assessment, sampling adequacy correlations and measures were verified to determine the CHBMS dimensions for Brazilian Portuguese. Bartlett's sphericity test (683.2; p <0.001) revealed significant correlations, the overall Measure of Sampling Adequacy was 0.552, close to the critical level. Regarding the examination of the values for each variable, it was identified that the variables B1, B5, Ba3, Ba7 and Ba11 presented values below 0.50. Therefore, they were excluded from the analysis in an attempt to obtain a set of variables with greater discriminatory power from internal structure analysis. Excluding these five variables, significant results were continued in Bartlett (509.1; p <0.001), and with a Measure of Sampling Adequacy (MSA) of 0.636, improving over the previous one, corroborating the need to exclude them.

In order to find out how many common latent factors/constructs/dimensions were present in the variables, we used principal component analysis. Initially, six factors representing 67% of the total variance of the data were extracted.

Four additional variables were excluded based on low commonality (Ba10; 0.490) or cross factor loadings (Ba4, Ba8 and Ba9). A new factor analysis was applied after excluding these items, obtaining a significant Bartlett Test (360.5; p <0.001), MSA

Chart 1. Translation of the Champion's Health Belief Model Scale's original version items for use in Brazil

Original version	Final version (in Brazilian Portuguese)
Title Champion's Health Belief Scale for Mammography Screening	***Título*** Champion's Health Belief Scale *para Rastreamento Mamográfico no Brasil*
Instructions For each of the following statements, please select a response that best describes how sure you are in your how sure you are in your breast cancer screening behaviors. Please mark your response by circling the number closest to how you feel. There are no correct or incorrect answers to those questions that follow.	***Instruções*** *Para cada uma das afirmativas a seguir, por favor, selecione a resposta que melhor descreve sua opinião em relação ao seu comportamento frente ao rastreamento para o câncer de mama. Por favor, marque sua resposta circulando o número mais próximo do que você sente. Não há respostas corretas ou incorretas para as afirmativas que seguem.*
Options of answers 1- Completely disagree 2- Partially disagree 3- Neither agree nor disagree 4- Partially agree 5- Completely agree	***Opções de respostas*** *1- Discordo completamente* *2- Discordo em parte* *3- Nem concordo e nem discordo* *4- Concordo em parte* *5- Concordo completamente*
Susceptibility	***Suscetibilidade***
1. It is likely that I will get breast cancer.	*S1. É provável que terei câncer de mama.*
2. My chances of getting breast cancer in the next few years are great.	*S2. Minhas chances de ter câncer de mama nos próximos anos são grandes.*
3. I feel I will get breast cancer sometime during my life.	*S3. Sinto que terei câncer de mama em algum momento da minha vida*
Benefits	***Benefícios***
1. If I get a mammogram and nothing is found, I do not worry as much about breast cancer.	*B1. Se eu fizer uma mamografia e nada for encontrado, não me preocupo tanto com o câncer de mama.*
2. Having a mammogram will help me find breast lumps early.	*B2. Realizar a mamografia me ajudará a encontrar mais cedo os tumores na mama*
3. If I find a lump through a mammogram, my treatment for breast cancer may not be as bad.	*B3. Se eu encontrar um tumor através da mamografia, meu tratamento para o câncer de mama pode não ser tão ruim.*
4. Having a mammogram is the best way for me to find a very small lump.	*B4. Para mim, a realização de uma mamografia é a melhor forma de encontrar um tumor muito pequeno.*
5. Having a mammogram will decrease my chances of dying from breast cancer.	*B5. Fazer uma mamografia diminuirá as minhas chances de morrer de câncer de mama.*
Barriers	***Barreiras***
1. I am afraid to have a mammogram because I might find out something is wrong.	*Ba1. Eu tenho medo de fazer uma mamografia porque pode ser que eu descubra que há algo de errado.*
2. I am afraid to have a mammogram because I don't understand what will be done.	*Ba2. Eu tenho medo de fazer uma mamografia porque não entendo o que vai ser feito.*
3. I don't know how to go about getting a mammogram.	*Ba3. Eu não sei o que fazer para conseguir realizar uma mamografia.*
4. Having a mammogram is too embarrassing.	*Ba4. Realizar uma mamografia é muito vergonhoso.*
5. Having a mammogram takes too much time.	*Ba5. Realizar uma mamografia leva muito tempo.*
6. Having a mammogram is too painful.	*Ba6. A mamografia é muito dolorosa.*
7. People doing mammograms are rude to women.	*Ba7. As pessoas que realizam a mamografia são grosseiras com as mulheres.*
8. Having a mammogram exposes me to unnecessary radiation.	*Ba8. Fazer uma mamografia me expõe à radiação desnecessária.*
9. I can not remember to schedule a mammogram.	*Ba9. Não consigo me lembrar de agendar uma mamografia.*
10. I have other problems more important than getting a mammogram.	*Ba10. Tenho outros problemas mais importantes do que fazer uma mamografia.*
11. I am too old to need a routine mammogram.	*Ba11. Eu sou muito velha para precisar fazer mamografia de rotina.*

of 0.621. It was signaled that the initial assumptions were met, but it was found that variable B3 had a commonality of 0.355, below the optimum level, and was also excluded. Through these nine variables, the Bartlett Test (332.5; p <0.001) was significant. MSA increased to 0.634, showing improvement in the factorial model, with the initial assumptions met. Thus, it can be concluded that the four-factor and nine-item model (Factor 1: S1, S2, S3, Factor 2: B1, B4, Factor 3: Ba1, Ba2, Factor 4: Ba5, Ba6) was adequately adjusted to dimensional structure.

To assess the internal consistency of the CHBMS, Cronbach's alphas were calculated for each of the factors, most of which were below acceptable values for the four-factor and nine-item model: 0.83 (Factor 1), 0.524 (Factor 2), 0.496 (Factor 3) and 0.284 (Factor 4). Given the results, both Factor 4 modeling items were excluded and a new exploratory analysis was conducted, resulting in the final seven-item and three-factor model, presenting three factors and seven items: 0.81 (Factor 1), 0, 52 (Factor 2) and 0.50 (Factor 3).

For the latter model, the Bartlett Test (286.3, p value <0.001) was significant. MSA was 0.636 and with three factors, the total variance explained by the model was 71.04% of the data, expressive numbers in an exploratory analysis modeling. The alpha values were better suited to the model, the latter being considered the ideal model.

In the retest stage, 206 women participated, and the reliability assessment was performed according to Table 1. The scores applied at two different times of the research remained consistent, so that both coefficients state that the scores are statistically correlated. positively, revealing high agreement between values and, consequently, high reliability of the scale.

Table 1. Champion's Health Belief Scale test-retest reliability analysis for mammographic screening in Brazil, considering factors and total score

Correlations	Pearson	Spearman	P value
Total score versus total score after 45 days	0.998	0.996	< 0.001
Susceptibility versus Susceptibility after 45 days	0.997	0.986	< 0.001
Benefits versus Benefits after 45 days	0.998	0.987	< 0.001
Barriers versus Barriers after 45 days	0.998	0.986	< 0.001

After validation was completed, the scale was submitted for the original author's opinion, and was approved, thus obtaining the CHBMS' validated Brazilian version.

Discussion

The 1999 version of the CHBMS was translated, adapted and validated for Brazil and its psychometric properties were measured. As pointed out in the literature, the use of the CHBMS in mammographic screening assists in subpoenaing women by health services for mammography, as well as in developing intervention strategies to increase compliance.[31-33]

The results of other methodological research on the CHBMS were similar to the data presented here regarding the methodology presented. They differ in some respects, such as experts composition on the judging committee, the period between steps and the sample size of the target audience. Despite these differences, the CHBMS proved to be a valid, reliable and easy-to-understand tool for use among women from different countries involved.[24,31-33]

The items of the original scale were explained with three factors, corroborating the findings of this research and others found in the literature.[12,26,27,35] However, in a study conducted in Turkey with 209 women from two educational institutions aimed at women, the results indicated adjustment of the factorial model for representation by four factors. They demonstrated that the Turkish version of the scale was composed of the three factors of the original version, plus one more factor called 'Harm'. This factor included five items indicating women's prejudiced attitudes toward mammography.[23] Therefore, it is observed that some research conducted in different cultures provide evidence that confirms different factor structures from the model proposed by the original tool.[21,22] This may be acceptable considering the cultural factors of each population.

In the literature, there are divergences in the reliability analysis of the tool, with Cronbach's alpha value of the subscales varying considerably from the value considered acceptable. 'Barriers' domain was lower due to corrected item-total correlation in

some searches.[24,33] In this study, the reliability of the tool was assessed with both the ICC and Cronbach's alpha analysis, with the latter values ranging from 0.496 to 0.809. Factors 2 and 3 were below the recommended levels, similar to the Spanish study (between 0.48 and 0.71) which maintained the same structure as the original scale, but low alpha value.[20] However, we discuss the aspect of Cronbach's alpha below the recommended score, suggesting that correlations of items> 0.30 should be considered. This value may be satisfactory if deleting the item did not improve the overall value.[23] Therefore, in the case of this study, exclusion made no difference to the total. In fact, these items require specific mammography information, which also influences the acceptance of values below the indicated.[34]

Explanation for these findings can be understood as the scale does not include beliefs about breast cancer and screening mammography, regarding benefits and perceived barriers that are particularly relevant for Brazilian women. A similar result was identified in Peruvian version.[29]

Test-retest reliability was high, especially compared to previous findings,[12,23,32] indicating that participants responded to items adequately. The good psychometric properties presented revealed the high potential use of the CHBMS in Brazil, either in research or care practice, in health promotion contexts.

It is noteworthy that the recommendation for mammography varies by the Brazilian Society of Mastology, between 40 and 74 years.[35] Therefore, sample specificity as a study limitation stands out, as well as context specificity (performed in a single health center), polarization set at the extremes of the responses, lack of concurrent validity and the low value of Cronbach's alpha. They need to be considered in future studies to consolidate tool validity in order to strengthen its potential.

Conclusion

The CHBMS adapted for use in Brazil was found to be a reliable, valid, stable tool capable of assessing compliance of Brazilian women with mammographic examination. Thus, the final configuration of the tool had seven items divided into three domains, with response options ranging from one to five.

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Collaborations

Moreira CB, Fernandes AFC, Champion V, Dahinten VS, VSC Village, Howard AF, Oriá MOB and Schirmer J contributed to the project design, analysis and interpretation of data, writing, relevant critical review of intellectual content and final approval of the version to be published.

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