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ORIGINAL ARTICLE

Turkish translation and adaptation of Champion's Health Belief Model Scales for breast cancer mammography screening

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Aims and objectives. To examine the translation and adaptation process from English to Turkish and the validity and reliability of the Champion's Health Belief Model Scales for Mammography Screening. Its aim (1) is to provide data about and (2) to assess Turkish women's attitudes and behaviours towards mammography.

Background. The proportion of women who have mammography is lower in Turkey. The Champion's Health Belief Model Scales for Mammography Screening-Turkish version can be helpful to determine Turkish women's health beliefs, particularly about mammography.

Design. Cross-sectional design was used to collect survey data from Turkish women: classical measurement method.

Methods. The Champion's Health Belief Model Scales for Mammography Screening was translated from English to Turkish. Again, it was back translated into English. Later, the meaning and clarity of the scale items were evaluated by a bilingual group representing the culture of the target population. Finally, the tool was evaluated by two bilingual professional researchers in terms of content validity, translation validity and psychometric estimates of the validity and reliability. The analysis included a total of 209 Turkish women. The validity of the scale was confirmed by confirmatory factor analysis and criterion-related validity testing.

Results. The Champion's Health Belief Model Scales for Mammography Screening aligned to four factors that were coherent and relatively independent of each other. There was a statistically significant relationship among all of the subscale items: the positive and high correlation of the total item test score and high Cronbach's α. The scale has a strong stability over time: the Champion's Health Belief Model Scales for Mammography Screening demonstrated acceptable preliminary values of reliability and validity.

Conclusion. The Champion's Health Belief Model Scales for Mammography Screening is both a reliable and valid instrument that can be useful in measuring the health beliefs of Turkish women.

Relevance to clinical practice. It can be used to provide data about healthcare practices required for mammography screening and breast cancer prevention. This scale will show nurses that nursing intervention planning is essential for increasing Turkish women's participation in mammography screening.

Key words: adaptation, mammography, the Champion's Health Belief Model, translation, Turkish

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Background

Breast cancer is one of the most common forms of cancer in women (DeSantis *et al.* 2011). While the vast majority of all breast cancers occurred in developed countries, during the 1980s, this rate has increased since 2010; this is likely due to considerations such as race, socio-economic structure and culture in the developing countries (Brower 2011, Jeffrey *et al.* 2012). Compared with developed countries, the mortality rates are higher in developing countries.

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One of the most important reasons for this difference is attributed to the opportunity for early diagnosis and treatment of cancer based on mammography screening in developed countries (Ozmen 2008, Tian *et al.* 2011). One-fourth of all cancers in women, in Turkey, occur in the breasts, and breast cancer is the second most common reason for cancer-related death. The Turkish Ministry of Health Department of Cancer Control established centres in many locations for cancer prevention. However, the number of women visiting these centres remains small (Avci & Gozum 2009, Ozmen *et al.* 2009, Dincel *et al.* 2010).

Problem

Research indicates that the breast cancer stage at diagnosis varies in Turkey from region to region. Especially in the Central Anatolia and Eastern regions, cancer is more frequently reported at advanced stages when initially detected. Among the causes of these regional differences are education, individuals' perception of health illness, sociocultural background, economic reasons and lack of knowledge about methods such as breast examination and mammography that may help with early diagnosis (Dundar *et al.* 2006, Discigil *et al.* 2007, Canbulat & Uzun 2008). Evidence suggests that individuals can be encouraged to pursue earlier diagnosis of breast cancer (Karayurt & Dramali 2007, Gursoy *et al.* 2009, Rizalar & Altay 2010). For breast health protection in Turkey, examining the factors that affect women's attitudes and behaviours, particularly about mammography, is absolutely necessary to improve its use for screening (Nahcivan & Secginli 2003, Dundar *et al.* 2006, Avci & Kurt 2008, Gursoy *et al.* 2009). To identify the health-related beliefs and attitudes of a society, it is necessary to develop the tools that reflect the structure of that society or to incorporate the tools developed in another culture after their validity and reliability are analysed for the target society. In fact, the validity and reliability of the tools/instruments used to define health-related perceptions/behaviours should be retested over time and/or new tools/instruments should be developed (Champion 1999, Cenesiz & Atak 2007, Karayurt & Dramali 2007). This is because the social, economic, technological and scientific developments that can be predicted to occur worldwide significantly influence the individual's health status and their perception of health. Turkey is a country that has been significantly affected by such developments.

The Central Anatolia region has a structure that is representative of the general structure of the entire country, as one of the seven regions of Turkey, it is a neighbour to all of the other regions except one. This study was conducted in Sivas, a city in the Central Anatolia region where breast cancer is diagnosed at advanced stages. A study conducted in 2007–2008 by the Kanser Erken Teshis-Tarama ve Eğitim Merkezi (KETEM) (2008) group included 1382 women with a mean of 57·11 years of age and asymptomatic breast health women's BI-RADS examined; the results showed that 1050 women (76%) were classified as BI-RADS 1, 288 (20·8%) as BI-RADS 2, 34 (2·5%) as BI-RADS 3 and 10 (0·7%) as BI-RADS 4; these findings are noteworthy with regard to the women's health beliefs about mammography in this region of Turkey.

Aim

The aim of this article is to describe the translation and adaptation of Champion's Health Belief Model Scales for Mammography Screening (CHBMS-MS) from English to Turkish and the psychometric estimates of validity and reliability of the Turkish version.

Research instrument

History and development of the Champion's Health Belief Model Scales (CHBMS)

The Health Belief Model (HBM) was developed in the early 1950s by a group of social psychologists to explain the insufficient participation in screening programmes for the early diagnosis and prevention of the disease (Maiman *et al.* 1977, Janz & Becker 1984). In 1984, Champion (1984) developed the CHBMS based on the constructs of the HBM to describe the health beliefs and screening activities related to breast cancer. The original version of the instrument had six components/variables to measure the health behaviour and perception related to breast cancer, and they were: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and cues to action (Champion 1984, Gozum & Aksayan 2003, Nahcivan & Secginli 2003). The CHBMS has 36 items.

Champion (1984) suggested that a person needs to be aware of the threat to perform a protective health behaviour. Therefore, the severity of breast cancer should first be understood and the risk of getting breast cancer realised, so that mammography screening will seem like a useful activity. In 1999, Champion revised the CHBMS and developed the current Champion's Health Belief Model Scale for Mammography Screening (CHBMS-MS): perceived *susceptibility* (three items) to breast cancer is

included, perceived *benefits* (five items) of mammography screening and perceived *barriers* (11 items) to mammography screening.

Selection of instrument

Mammography has been shown to be effective in the early diagnosis of breast cancer and in decreasing breast cancer mortality (by 20–25%) (Armstrong *et al.* 2007). The CHBMS-MS has been shown to be useful in determining women's susceptibility to mammography screening for early diagnosis (Champion 1999). The first reliability and validity estimations of the CHBMS were performed in north-east Turkey by Gozum and Aydin (2004) (the Black Sea region: Ordu province, $n = 266$), in north-west Turkey by Secginli and Nahcivan (2004) (the Marmara region: Istanbul province, $n = 656$) and west Turkey by Karayurt and Dramali (2007) (the Aegean region: Izmir province, $n = 430$). However, these studies focused on the reliability and validity of all the elements of the CHBMS. The instrument used in this study was the 1999 version of the CHBMS-MS, which focuses only on mammography screening and it does not include the breast self-examination in Champion's original studies.

Instrument scoring

The CHBMS-MS's format used the Likert scale. Each item has five options ranging from 1 indicating *strongly disagree* to 5 indicating *strongly agree*. The perceived threat of breast cancer variable was measured by three items classified as *susceptibility* variables; possible scores ranged from 3–15. The perceived *benefit* variables were measured by five items; the possible scores ranged from 5–25. The perceived *barrier* variables were measured by 11 items; the possible scores ranged from 11–55. The lowest score of the CHBMS-MS was 19 and the highest score was 95.

An individual's health belief about mammography screening was defined by the scores on the scale of all of the variables studied (i.e. susceptibility, benefits and barriers). Lower scores indicated a stronger disagreement with the items, and higher scores indicated a stronger agreement with the items (Champion 1999).

Recommendations for translation and adaptation

There are some methodological challenges presented by translating a research instrument in terms of colloquial jargon, idiomatic expressions, word clarity and word meaning. A simple word-for-word translation cannot properly address the target language's cultural and linguistic characteristics. Therefore, the presence of the original tool's cultural and linguistic properties in the target language and culture should be investigated (Hilton & Skrutkowski 2002, Kulis *et al.* 2011). When planning to translate an instrument, researchers should take translation and adaptation recommendations into consideration (Wong & Poon 2010).

Translation and adaptation

There are some guidelines that can be used when translating and adapting an instrument for use in another language. It is essential that the translated and original versions of the instrument be absolutely equivalent. In general, translations prepared by translators are correct. However, the targeted group may not understand some words or phrases in the translations. Therefore, it is recommended that the translation be examined by 'focus groups' that are bilingual, or typical of, the target population (Hilton & Skrutkowski 2002, Gozum & Aksayan 2003, Chen & Boore 2010).

A general approach to translate an instrument into another language usually involves three stages. During the first stage, a bilingual team (composed of two or more people) translates the instrument from the original language into the target language. The team members first prepare their own versions of the translation. Then, they give their versions of translation to each other and check each other's work. Finally, they come up with collaborative decisions about the translation. During the second stage, another team of translators (composed of two or more people) back translate the target language version of the instrument to the original language. In the third stage, both language versions are examined for conceptual equivalence by a team that speaks both languages (composed of people who know the target population and/or indigenous). During this stage, researchers who know the target population focus on the meaning conveyed by the words. This defined as the 'adaptation' process. Adaptation helps protect the cultural and social characteristics of the translation (Hilton & Skrutkowski 2002, Squires 2009, Wong & Poon 2010, Kulis *et al.* 2011). In this study, the researchers analysed the problems associated with the instrument that might develop from external or internal factors during this process. During this stage, the reliability of the instrument was tested and its reliability coefficient was calculated. Finally, based on the results, the translated instrument/tool is presented for use in the target population.

Translation, adaptation, face and content validity of the CHBMS-MS Turkish version

Translation

The CHBMS-MS instrument was translated from English to Turkish based on a method compatible with the recommendations (Champion 1984, 1993, 1999). The original instrument was translated by a bilingual biologist (PhD) who had been living in the USA for 15 years and was an instructor of English who spoke and wrote fluently in both languages. The text was then back translated into English by two independent bilingual professionals who also interpreted and translated. Next, the translators worked separately during the back-translation process, and then, they came together (only three translators) and prepared a final version of the Turkish translation that all of them agreed with. The final Turkish translation version was reviewed by a focus group with four bilingual professionals who were representative of the target population. During this stage, the cultural meaning and clarity of the scale items were evaluated.

Adaptation

The two versions of the instrument in English and Turkish were compared for conceptual equivalence. In particular, questions of subcultural word comprehension were discussed with a consensus reached regarding the terminology used for breast mass, mammography and radiation.

The term 'lump' in the original instrument was translated as 'kitle' from English to Turkish. However, all of the members of the focus group agreed that Turkish women would not understand the word 'kitle', because it was a medical term in Turkish. Instead of that word, the members agreed that the phrase 'sert yumru-beze' would be better understood by the target population of women as a Turkish expression for 'lump' in the original version. The second controversial term was 'radyasyon' in the translated instrument. Two members argued that some women in the target population would not know this word, because the general understanding of the word was 'X-ray'. After the issue was debated, the group decided to use both the words together [i.e. radiation, X-ray/in other words (radyasyon- röntgen)]. Another word discussed by all group members was 'mammography'. Research indicates that many women in Turkey do not know about early diagnostic methods for breast cancer, especially mammography. For example, 31·9% women with breast cancer did report that having mammography screening was not necessary (Dundar *et al.* 2006, Avci & Kurt 2008). These finding suggest that Turkish women need to learn about 'mammography'. Therefore, the group decided to use the terms 'mammography' and 'breast X-ray' together [i.e. mammography, breast X-ray in other words (mamografi-meme röntgen filmi)].

Face and content validity

A group of 12 women was formed to test the face validity and determine the cultural appropriateness of the instrument. One of the women was a 48-year-old college graduate who was a handicrafts teacher. Another was a 40-year-old college graduate who was a nurse. Among the other 10 women, nine were elementary school graduates and two were high school graduates and their ages ranged from 35–58 years. Among the women, 11 were unemployed, and they had only attended courses such as 'sewing' and 'household management' at the local Community Education Center in Sivas. One of the researchers read the translated text aloud to the participants (12 people). They were asked to score the comprehensibility of each item of the instrument with a point system ranging from 1–10. The participants gave eight points to *benefits* items 2 and 4 and *barriers* items 9 and 11 and 10 points to the other items of the instrument. They explained why they gave eight points to *benefits* items 2 and 4, and they said that 'these items measure knowledge, so women wouldn't know them'. They also thought that *barriers* items 9 and 11 were not necessary and therefore should receive eight points. Nevertheless, the participants found all of the instrument items to be clear and understandable and did not recommend any conceptual revisions. Finally, the researchers evaluated the content and semantic equivalence, the translation accuracy and cultural appropriateness of the instrument. The instrument was found to be acceptable and ready for data collection from the target population for use in psychometric testing.

Procedures

Setting

Data were collected in Sivas city, which is one of the largest cities in the Central Anatolia region of Turkey. The study was conducted in two institutions: Sivas Municipality Women's Cultural Centre and Sivas Municipality Center of Public Education. At the time of the study, there were a total of 500 Turkish women attending various courses in these institutions (e.g. sewing, knitting, ceramics and painting, wood and carving, painting, jewellery design, hairdressing, household management, family communication, foreign

language education and fitness). These courses required one to three days per week attendance (depending on the nature of the course) and lasted one to two months; the class size included 10–15 people.

Sample

A review of the relevant literature suggests that a sample size between 100–200 is adequate when the factors of instruments are strong and significant and when there are not many variables. When the relationships between the instrument's variables are strong and reliable and when there are not many variables, the sample size could be 100 or even less provided that it exceeds the number of variables. Generally, the most common way for determining the sample size for the validity and reliability of an instrument is considering the number of instrument items. A common recommendation for instruments is using subject to a variable ratio of at least 10:1 and up to 30:1 (Osborne & Costello 2004, Tavsancil 2010).

The number of items of the instrument was taken into consideration for the number of subjects in this study. Accordingly, there were 19 items in the CHBMS-MS for three variables, the study therefore needed to include 190 subjects. The selection criteria included women who could read and write in Turkish, 35–70 years of age, experienced no difficulty in communicating, did not have a previous diagnosis of breast cancer and voluntarily participated in the study.

Turkey's National Breast Cancer Screening report data indicate that the percentage of women 40 years old and younger who have breast cancer is 20·2%, which is almost twice that of Western countries (Ozmen 2008). In a study conducted in Turkey, Soyder *et al.* (2013) reported that 88 (16·9%) of 522 women with breast cancer were 35 years old and younger. Lee *et al.* (2009) stated that breast cancer threatens young women, and therefore, the age for first mammogram could be 35. Increase in the incidence of breast cancer in young women in Turkey requires that sensitivity about mammography screening be established at a young age. Thus, the study sample consisted of women 35 years old and older, so that the CHBMS-MS could also represent younger women in Turkey. Among the women enrolled in this study, the oldest one was 69 years old. According to 2011 data, the older population in Turkey is 7·3%, and the number of older women is less (Turkiye Istatistik Kurumu/Turkey Statistical Agency (TUIK) 2011). There were 500 women attending the courses offered by the Sivas Municipality Women's Cultural Centre and Sivas Municipality Center of Public Education. The sample had initially been planned to include 262 women meeting the eligibility criteria. However, 17 women did not agree to participate in the study and another 36 were excluded due to incomplete items in the research packet. After that, the data collection process was discontinued because the Kaiser–Meyer–Olkin (KMO = 0·776 > 0·5), Bartlett's test (χ^2 = 2741·93, p = 0·000) and Cronbach's α (0·776) indicated that 209 women would be enough for the study. Therefore, 209 women were involved in the validity and reliability testing of the instrument.

Mammography is usually recommended among women 40–70 years of age (Armstrong *et al.* 2007, Bowie *et al.* 2008). However, due to the increasing incidence of breast cancer at very early ages recently, the recommended age range for the first mammography screening has decreased to 35–40 years of age (e.g. if there is particular risk: breast health status, poor socio-economic conditions) (Lee *et al.* 2009, DeSantis *et al.* 2011).

Procedure

Written permission was obtained from Sivas Municipality Women's Cultural Center and the Sivas Municipality Center of Public Education, and verbal consent was received from all of the participants. Data were collected between February 2011 and March 2011.

To collect data, the researchers visited the institutions where women attended courses and informed the potential participants about the purpose of the study. Then, they gave the participants a research packet. The participants were then informed about the content of the packet: a survey that included demographic descriptions and the CHBMS-MS. The researchers then explained what to pay attention to when filling out the forms (e.g. expressing their own opinions, avoiding interaction with each other, asking any possible question to the researchers). The researchers helped those women who needed assistance with filling out the forms in the research packet. The vast majority of the women filled out the forms themselves. Completion of these forms took between 10–25 minutes.

The validity of the scale was confirmed by confirmatory factor analysis and criterion-related validity testing. Internal consistency reliability was by Cronbach's alphas. An estimation of reliability over time was obtained by a test–retest procedure. A group of 25 women were randomly selected among the women attending the embroidery course of Sivas Municipality Women's Cultural Center, and these participants were asked to complete the research packet twice. They were asked to complete the first packet during the first implementation once and to fill out the other packet after 12 days when the researchers came back. The test–retest

period is recommended to be not less than two weeks and not more than four weeks. If the test–retest period is less than two weeks, the reliability can be artificially high. Providing 'the same conditions (space, time and group characteristics)' gets more difficult for the two measurements if the time interval is too long. However, in some cases, if 'the same conditions' of the sample cannot be obtained, this duration can be shortened for the test–retest procedure (Sencan 2005, Balci 2011). In this study, most of the women in the test–retest group were to complete their courses two weeks after the start of the research. In this case, it would not be possible to reach them. Therefore, the test–retest was performed 12 days after the initial contact. SPSS, version 15.0 for Windows (SPSS Inc, Chicago, IL, USA) was used for data management and statistical analysis.

Results

Descriptive characteristics of the sample

This study included a total of 209 Turkish-speaking women living in the province of Sivas in the Central Anatolia region of Turkey. The women ranged from 35–69 years of age with a mean age of 45·76 (SD, 7·99). Among the 209 participants, 51 women (24·4%) were 35–40 years of age, 104 (49·8%) were 41–50 years of age and 54 women (25·8%) were 51–69 years of age. One hundred and fifty women (69·9%) were primary school graduates, 38 (18·2%) were high school graduates, and 21 women (10·0%) were university graduates. Two hundred and three women (97·1%) were married, 190 women (90·9%) were housewives, and 19 women (9·1%) were civil servant workers or retirees. Two hundred and six women (98·6%) lived in urban areas, and 156 women (74·6%) reported moderate economic levels.

Psychometric estimates of construct validity

The Kaiser–Meyer–Olkin and Bartlett's test

In this study, the appropriateness of scale items/variables for factor analysis and correlation levels was assessed with the KMO coefficient and Bartlett's test. The KMO should be over 0·60 for factorability. In addition, the *p*-value should be <0·05, so that Bartlett's test could indicate a sufficient relationship among the variables (Buyukozturk 2012, Eymen 2012). The KMO coefficient (KMO value: 0·776 > 0·5) indicates that the sample size in the present study was adequate. According to Bartlett's test ($\chi^2 = 2741{\cdot}93$, $p = 0{\cdot}000$), there was a strong correlation among the instrument items, and the data were appropriate for factor analysis. In this study, reliability and validity of the scale were used for confirmatory factor analysis method.

Factor analysis

In this study, the factors were rotated orthogonally using the varimax procedure with Kaiser normalisation to determine the contribution of each item in the instrument with regard to validity. The factor loading value is a coefficient describing the relationship of the items with the factors. The items with factors loading at 0·45 and below generally can be extracted because these items do not measure the same structure in the corresponding factor group (Tavsancil 2010, Buyukozturk 2012).

The factor matrix of the CHBMS-MS is presented in Table 1. The factors were guided by theory and eigenvalues, as well as the criterion that items >0·45 would be retained (Sencan 2005, Tavsancil 2010). Four factors were extracted and accounted for 66·6% of the total variance, with all four factors loading at 0·46 or above. Examination of the scree slope verified that a four-component solution was appropriate. Because factor 1 contained *susceptibility*,

Table 1 Summary of items and factor loading for varimax orthogonal four-factor solution for the Champion Health Belief Model Scales Turkish version ($n = 209$)

	Factor loading				
19 items*	1	2	3	4	Communality
Susceptibility 1	**0·76**	0·15	0·32	−0·02	0·71
Susceptibility 2	**0·89**	0·16	0·11	0·07	0·84
Susceptibility 3	**0·83**	0·30	0·11	0·02	0·80
Benefit 1	0·51	**0·69**	−0·17	0·03	0·78
Benefit 2	0·15	**0·87**	−0·08	−0·18	0·82
Benefit 3	0·47	**0·76**	−0·12	0·01	0·82
Benefit 4	−0·10	**0·61**	0·13	0·35	0·53
Benefit 5	0·13	**0·89**	−0·10	−0·11	0·84
Barrier 1	0·51	0·18	**−0·55**	0·32	0·70
Barrier 3	−0·26	0·18	**0·46**	0·33	0·48
Barrier 6	0·12	−0·05	**0·64**	0·33	0·42
Barrier 7	0·04	−0·03	**0·78**	−0·03	0·42
Barrier 8	0·23	−0·10	**0·73**	0·26	0·34
Barrier 9	0·25	−0·14	**0·78**	0·29	0·54
Barrier 2	0·00	0·09	0·23	**0·65**	0·62
Barrier 4	−0·03	0·06	0·09	**0·64**	0·68
Barrier 5	−0·13	0·01	0·22	**0·52**	0·79
Barrier 10	0·31	−0·25	−0·01	**0·75**	0·72
Barrier 11	0·43	−0·21	0·01	**0·69**	0·71
Eigenvalues	4·75	4·18	1·98	1·74	
% of variance	25·00	22·03	10·44	9·11	

Bold face indicates highest factor loading.
*Cronbach's α value 0·775, total variance 66·62.

factor 2 contained *benefits* and factor 3 contained *barriers* (only six items) variable of the original scale, these factors did not need to be renamed. Factor 4 consisted of five items of the *barriers* variable of the original scale. The meanings of the variables in the factor 4 were analysed to rename. Finally, factor 4 was named as *prejudices* because the variables (five items) grouped under factor 4 indicated the women's prejudiced attitudes towards mammography.

The factor loadings varied between 0·76–0·89 for *susceptibility*, between 0·61–0·89 for *benefits*, between −0·55–0·78 for *barriers* and between 0·52–0·75 for *prejudices*. The findings suggest that the variables adequately measured the structure of their factor (Table 1). In addition, there was a difference of >0·10 of the high factor loadings of items among each factor. This situation indicated that each variable was correlated with a single factor. However, in this study, the factor loading of the *barrier 1* variable was negative (−0·55), and it reduced the Cronbach's α value (from 0·580–0·754) of the *barriers* variable. A decrease of more than 10% of the Cronbach's α value by a variable is considered to reduce the reliability of the scale (Tekindal 2009, Buyukozturk 2012). Although negative, this item had a sufficient factor loading. However, if the factor loading of a variable is negative, then the variable is in inverse relationship with other variables. For this reason, when the score values of *barrier 1* were inverted (*1 strongly agree... 5 strongly disagree*), its factor loading became positive (0·55).

The eigenvalues and total variance

Determining the factors according to the factor loading is not adequate alone. The eigenvalues should also be determined. According to studies conducted in the social sciences, if the total variance score is 60%, the factor structure of the scale is power. A total variance score <50% is threat for the reliability of the scale (Tavsancil 2010, Balci 2011, Buyukozturk 2012). In this study, the factors 1, 2, 3 and 4 were, respectively, 25·0%, 22·0%, 10·4% and 9·1% of the total variance of the CHBMS-MS (eigenvalues: 66·6% of the total variance). These values showed that there was a valid structure of the CHBMS-MS. The CHBMS-MS could adequately account for women's attitudes towards mammography according to the four factors included in the study. Medina-Shepherd and Kleier (2010) reported that the scale items were divided into three factors. The three factors accounted for 50·4% of the total variance in their study. However, in their study, the acceptable factor loading value was taken as 0·30 and above. This score in the Medina-Shepherd and Kleier's study showed that the scale was less representative of Spanish women than that of Turkish women.

Correlation analysis: psychometric estimates of reliability

Cronbach's α value and the test–retest procedure were used in this study to determine reliability. Lower values indicate that the test was not homogeneous and reliable ($0{\cdot}00 \leq \alpha < 0{\cdot}40$ not reliable, $0{\cdot}40 \leq \alpha < 0{\cdot}60$ low reliability, $0{\cdot}60 \leq \alpha < 0{\cdot}80$ high reliability, $0{\cdot}80 \leq \alpha < 1$ very high reliability) (Tekindal 2009, Buyukozturk 2012, Eymen 2012). In the present study, Cronbach's α value was 0·775 for the CHBMS-MS (Table 1). Table 2 shows the Cronbach's α of the subscales. Cronbach's α estimations of each subscale were as follows: *susceptibility* $\alpha = 0{\cdot}908$, *benefits* $\alpha = 0{\cdot}884$, *barriers* $\alpha = 0{\cdot}754$ and *prejudices* $\alpha = 0{\cdot}737$. This value showed that the scale items measured similar features with high reliability. However, the Cronbach's α value is not sufficient for construct validity. Therefore, the power of the correlation of each subscale must also be analysed.

Item analysis and internal consistency

Table 2 shows the results of the item analysis and internal consistency of the CHBMS-MS. An acceptable '*the corrected item-total correlation*' value of a scale must be positive and >0·20 and even 0·30 (Buyukozturk 2012, Eymen 2012). In the present study, '*the corrected item-total correlation*' value of the *barrier 1* item was negative and <0·30 (−0·27). However, when the scores of this item were inverted, this value became positive (0·27). When this item was extracted, the Cronbach's α value of *barrier* variables demonstrated a very slight increase as 0·03. For this reason, the item *barrier* 1 was retained. Criteria for extraction for a item/variable in a scale: (1) an increase in the total reliability, which was more than 0·10 when the item was extracted or (2) a correlation between an item and the subscale score that was <0·30 (Tavsancil 2010, Balci 2011).

The Tukey's estimate of power to achieve additivity was considered and the results showed the following: susceptibility = 1·35, benefits = 3·27, barriers = 0·87 and prejudices = 1·71. Spearman's *rho*, the inter-item correlation coefficient of the subscales, was 0·690–0·830 ($p = 0{\cdot}01$) for *susceptibility*, 0·124–0·860 ($p = 0{\cdot}01$) for *benefits*, −0·105–0·819 ($p < 0{\cdot}05$) for *barriers* and 0·162–0·887 ($p < 0{\cdot}05$) for *prejudices* (Table 2). The Tukey's power analysis and correlation coefficients showed that the items had a high correlation power with each other for each of the subscales of the instrument and they accounted for their structure adequately on the subscales.

In summary, there was a statistically significant relationship among all of the subscale items. The positive and high

Table 2 Item analysis and internal consistency of the subscales for the Champion Health Belief Model Scales Turkish version: susceptibility, benefits, barriers, interest and prejudice (n = 209)

19-Items	Mean	SD	Corrected item-total correlation	Cronbach's α if item deleted	Spearman *rho*
Susceptibility*					
It is likely that I will get breast cancer	2·96	0·89	0·76	0·90	0·690–0·83; p = 0·01
My chances of getting breast cancer in the next few years are great	2·37	0·97	0·88	0·80	
I feel I will get breast cancer some time during my life	2·32	0·91	0·80	0·87	
α = 0·908					
Benefits*					
If I get a mammogram and nothing is found, I will not worry as much about breast cancer	3·59	1·11	0·77	0·84	0·124–0·860; p = 0·01†
Having a mammogram will help me find breast lumps early	4·09	0·88	0·81	0·83	
If I find a lump through a mammogram, my treatment for breast cancer may not be as bad	3·74	1·07	0·84	0·82	
Having a mammogram is the best way for me to find a very small lump	3·83	0·60	0·38	0·91	
Having a mammogram will decrease my chances of dying of breast cancer	3·89	0·93	0·82	0·83	
α = 0·884					
Barriers*					
I am afraid to have a mammogram because I might find out something is wrong	2·909	1·04	0·27	0·78	0–0·105–0·819; p < 0·05†
I don't know how to go about getting a mammogram	3·32	1·05	0·33	0·77	
Having a mammogram is too painful	2·79	0·75	0·55	0·70	
People doing mammograms are rude to women	1·66	0·77	0·60	0·69	
Having a mammogram exposes me to unnecessary radiation	2·83	0·87	0·64	0·68	
I cannot remember to schedule a mammogram	2·76	0·85	0·70	0·66	
α = 0·754					
Prejudices*					
Having a mammogram takes too much time	2·59	0·66	0·31	0·74	0·162–0·887; p < 0·05
I have other problems more important than getting a mammogram	2·18	0·86	0·78	0·65	
I am too old to need a routine mammogram	2·15	0·83	0·76	0·66	
I am afraid to have a mammogram because I don't understand what will be done	2·49	0·95	0·65	0·68	
Having a mammogram is too embarrassing	2·61	1·00	0·65	0·71	
α = 0·737					

*Tukey's estimate of power to which observations must be raised to achieve additivity: susceptibility: 1·35, benefit: 3·27, barrier: 0·87 and prejudices: 1·71.

†Spearman *rho:* between benefit 1 and benefit 4, p = 0·07, between barrier 1 and 2, p = 0·130.

correlation of the total item test score and high Cronbach's α values indicated that the Turkish version of the CHBMS-MS had internal consistency.

Reliability over time

The test–retest reliability refers to the correlation coefficient (<0·30: weak, 0·30 – 0·70: moderate and acceptable, >0·70: large or strong) obtained from any variable under the same conditions and over a certain time interval (Balci 2011, Buyukozturk 2012).

The test–retest results of this study are shown in Table 3. The total pretest and post-test reliability for all of the items had a Spearman's *rho* 0·691, p 0·000. Spearman's *rho* of the subscales of the Turkish CHBMS-MS was as follows: *susceptibility* 0·834 (strong level), *benefits* 0·709 (strong level), *barriers* 0·869 (very strong level) and *prejudices* 0·796 (strong level). In Medina-Shepherd and Kleier's (2010) study, test–retest correlations for control group women (n = 20) were significant: perceived susceptibility (r = 0·57), perceived benefits (r = 0·63) and perceived

Table 3 Test–retest correlations of the major theoretical variables ($n = 25$)

Variables	Test		Retest		Spearman's rho
	Mean	SD	Mean	SD	
Susceptibility	7·64	2·78	6·72	2·28	0·834*
Benefits	19·88	3·53	17·92	3·06	0·709*
Barriers	16·04	3·14	14·96	3·00	0·869*
Prejudices	12·44	2·66	11·24	2·47	0·796*
Total item	56·00	6·21	50·84	6·05	0·691*

*$p = 0·01$.
Cronbach's α for test group 0·646, Cronbach's α for retest group 0·678.

barriers ($r = 0·83$). In Champion's previous findings, test–retest was 0·62, 0·61 and 0·71, respectively. A test–retest score <0·80 indicates that the women did not answer the items the same way at the second data point. It could be that the women did not read the items of the scale the same way both times. However, according to the test–retest results, the women read, understood and answered the scale's items similarly in both the sessions, which indicates that the scale has a strong stability over time. The test–retest results in this study were higher than those reported in the Medina-Shepherd and Kleier's (2010) study and Champion's study (1999). This difference may be attributed to the younger age of the women in the present study.

Discussion

In this study, 1999 version of CHBMS-MS was translated and adapted into Turkish and its psychometric estimations were carried out. The scale items were explained with three factors in Champion's 1999 version and Medina-Shepherd and Kleier's (2010) study. In this study, however, the variables were more capable of representing with four factor analysis. Only the relationship of barrier 1 was inverted. The statement of this item was 'I am afraid to have mammogram because I might find out something is wrong'. Perhaps, the women in this study did not aware of their own risk of breast cancer as much as the women in other studies (Champion 1999, Avci & Gozum 2009, Medina-Shepherd & Kleier 2010) and did not believe that they needed to have mammograms. Therefore, being afraid of mammogram result might not be the case for them. According to Turkish literature, Turkish women are not aware of their own risk of breast cancer, they do not regard it as a threat and so they do not have mammograms. However, they believe that mammography is a useful test (Avci & Kurt 2008, Alpteker & Avci 2010). The scores of this item were inverted considering these conditions. Because extracting *barrier* 1 did not create a significant difference on overall α, it was decided that this item would be inverted and retained.

In this study, although the scale items created significant factors, the barrier variables were divided into two factors. This result suggests that the women did not perceive some of the items (barrier 2, 4, 5, 10 and 11 in the original scale) as barriers. This situation may be attributed to the women's sociodemographic characteristics, knowledge and experience with regard to mammography. Most of the items of the *barriers* variable in factor 3 were related to the implementation phase of the mammography process and the process results/effects (e.g. pain and fear of getting radiation). The items in factor 4, on the other hand, were conditions affecting the attitudes (prejudices) of the women towards requesting a mammogram appointment. For this reason, factor 3 was named as *barriers* and factor 4 was named as *prejudices*.

The subscales for perceived susceptibility to breast cancer, benefits, barriers and prejudices to mammography screening and the entire instrument demonstrated acceptable Cronbach's α level. The correlation coefficients obtained in this study were similar to those in previous studies (Champion 1999, Gozum & Aydin 2004). In Medina-Shepherd and Kleier's (2010) study, Cronbach's α value (0·63) and '*the corrected item-total correlation*' values (between 0·21–0·47) were lower for the *benefits* variable. In this study, '*the corrected item-total correlation*' value for *barrier 1* (0·27) was lower than 0·30. However, the Cronbach's α value of the barrier variables was high (0·754).

If the Cronbach's α score is low, then the corrected item-total correlations for values of <0·30 are considered (0·30 is considered by authorities to be the minimum acceptable item-total correlation). This value might be satisfactory if deletion of the item did not improve the overall α value (Tavsancil 2010, Buyukozturk 2012). In this study, deletion made no difference to the overall α. The correlation values of the variables *benefits* 4, *barrier* 1 and 2 *and prejudice* 1 were acceptable but low. In fact, these items require specific information about mammogram. For example, the statement associated with *benefit* 4 was 'Having a mammogram is the best way for me to find a very small lump'. This statement requires that women have knowledge about mammography. Many women may think mammography is a method used to diagnose any disease of their breasts, but they may not know the sensitivity of mammography for smaller or larger lumps. Therefore, the knowledge of women about mammography should be determined in cases where the scale is used.

In the current data, test–retest reliability was 0·83 for susceptibility, 0·70 for benefits and 0·86 for barriers (only six items) as compared with Champion's (1999) previous find-

ings of 0·62, 0·61 and 0·71, respectively. Medina-Shepherd and Kleier's (2010) study reported findings of 0·57, 0·63 and 0·83, respectively. Indeed, a test–retest score <0·80 indicates that the participants did not answer the items the same way at the second data point. It could be that the women did not read the items of the scale the same way both times. Overall, these values reflected moderate to very strong agreement and thus are acceptable scores for test–retest reliability.

In summary, this instrumentation study has provided beginning evidence that the CHBMS-MS Turkish version is both a reliable and valid instrument that can be useful in measuring the HBM construct among Turkish women.

Limitations of the study

The CHBMS-MS is because a translated tool is limited in reflecting all of the contextual meanings of a language. Although they were asked to express their true feelings and ideas, the women may have responded in a way that is considered socially acceptable or expected.

Strengths

The validity and reliability tests of the CHBMS (included 36 items) performed in Turkey included the whole model previously conducted in the north and west of the Turkey. This study, on the other hand, was carried out 'in a city in the Central Anatolia region', which represents a more common and shared sociocultural structure. The initial findings of the scale indicate that this revised Turkish version of the CHBMS-MS can be used in Turkey.

Conclusion and recommendations

Implications for nursing practice

The Turkish version of the CHBMS-MS scale may help researchers determine Turkish women's attitudes and behaviours towards mammography. Therefore, it can be used to provide data about healthcare practices required for mammography screening and breast cancer prevention. This scale will show nurses that nursing intervention planning is essential for increasing Turkish women's participation in mammography screening.

Implications for future research

The findings reported here are limited to the study sample. As these are preliminary findings for CHBMS-MS Turkish, further testing of the scales is recommended in future studies. Replicating this study with similar and larger populations to improve the instrument could help confirm the results of this study and eliminate random errors.

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The authors have confirmed that all authors meet the ICMJE criteria for authorship credit (www.icmje.org/ethical_1author.html), as follows: (1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content; and (3) final approval of the version to be published.

Conflict of interest

The authors have no funding or conflict of interests to disclose.

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