**Original Article**

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# Validity and Reliability of the Turkish Version of the Breast Cancer Screening Beliefs Scale

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**ABSTRACT**

**Objective:** Breast cancer is an important public health problem because of its frequent occurence and fatal consequences. Early diagnosis of breast cancer increases the treatment success and survival. For the early diagnosis of breast cancer, women's screening beliefs and attitudes need to be determined. This study aimed to examine the reliability and validity of the Breast Cancer Screening Beliefs Scale to determine patients' beliefs and attitudes regarding breast cancer screening.

**Materials and Methods:** This methodological study was carried out with 261 women. A survey form and the Turkish version of the Breast Cancer Screening Beliefs Scale were used in the data collection. Coverage validity was determined by the coverage validity index, and the Davis technique, item-total score correlations, Cronbach alpha evaluation, factor analysis, and AMOS analysis were used.

**Results:** The factor structure of the 13-item Turkish version of the Breast Cancer Screening Beliefs Scale was examined. After the factor analysis, a three-factor structure emerged which accounted for 70% of the total variance and has an eigenvalue of over 1.00. In the internal consistency analyses of the scale, item-total score correlation values ranged from 0.37 to 0.90, and no items were extracted from the scale.

**Conclusion:** The Turkish version of the Breast Cancer Screening Beliefs Scale was found to be a valid and reliable measurement tool in determining the screening beliefs and attitudes of women.

**Keywords:** Women, breast cancer, screening, belief, attitude

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**Key Points**

- Breast cancer is the most common type of cancer in women and breast cancer screenings are very important for early detection of cancer.
- Inappropriate beliefs of women that might prevent breast cancer screening need to be determined.
- The Breast Cancer Screening Beliefs Scale is a valid and reliable measurement tool that can measure women's beliefs about breast cancer screening.

## Introduction

Worldwide, the second most common type of cancer after lung cancer is breast cancer. Each year, approximately 1.38 million women have breast cancer, and approximately 458,000 women die from it. Breast cancer affects approximately 15,000 women each year in Turkey, constituting 20%–25% of all cancer cases among women. According to the Global Cancer Incidence, Mortality and Prevalence study in 2008, the incidence of breast cancer varies from 19.3 per hundred thousand women in Eastern Africa to 89.7 per hundred thousand women in Western Europe (1). The incidence of breast cancer is 23 per hundred thousand worldwide, and it is 33.8 per hundred thousand in Turkey (2, 3). The incidence of breast cancer started to increase after 2008, while the mortality rate increased by 14%. At present, breast cancer is the most common type of cancer in women, and one of every four women continues to have breast cancer (4).

As with all chronic diseases, screening programs are important to raise awareness about cancer. Cancer screening programs are one of the most effective methods to fight cancer. If it is detected at an early stage through screening, breast cancer is fully treatable. Turkey follows the World Health Organization's (WHO) recommendations for cancer screening. Women participate voluntarily in these screening programs. They are consulted about monthly breast self-examination, a clinical breast examination is performed annually, and women aged 40-69 years undergo mammography every 2 years (5).

This study was presented in the 1st International Congress on Nursing and Innovation (May 4th-5th, 2018, İstanbul) as an oral presentation.

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Turkey offers community-based cancer screenings through a total of 208 cancer early diagnosis screening and education centers, with at least one in each of the country's 81 provinces. In addition, community health centers, mother and child health and family planning centers, and family health centers have provided great support for screening in recent years. In 2016, approximately two million people were included in breast cancer screening programs, an increase compared with that in 2015 (6). Although all women were requested to be involved in this program, only 35% were screened for women cancers. To increase these rates, nurses working at relevant centers can contribute positively by organizing informative programs for breast cancer screening. Women need health education and incentive programs to change their beliefs and attitudes toward screening.

Faith or attitude is a state of being ready to show a certain viewpoint toward a situation, event, object, or person. Social experiences are learned by experience and shaped by the influence of cultures. It may lead to positive or negative behaviors. Given its abstract nature, it cannot be observed directly. Behavior can be predicted by measuring individuals' behaviors and the behaviors that serve as the controlling forces behind them. However, it is difficult to measure attitudes by observing an individual's behavior or by examining their physiological responses. For this reason, there are scales for measuring beliefs or attitudes, in which responses are usually assessed by individuals using a series of sentences or adjectives. To our knowledge, no tool has been established to measure women's beliefs about breast cancer screening in Turkey.

The purpose of this study was to adapt the Breast Cancer Screening Beliefs Scale (BCSBS) to Turkish and to make it valid and reliable.

## Materials and Methods

### Design and participants

This methodological study was conducted to examine the validity and reliability of the BCSBS. Women aged >20 years who presented to three family health centers in eastern Turkey from October 2017 to December 2017 comprised the study population. In adapting a scale to another culture, it is necessary to reach a group 5–10 times as large as the number of scale items (7-9). This study included 13 scale items. Sample selection was not performed, and 206 female participants who presented to the relevant centers and agreed to participate in the research formed the sample group.

### Data collection and data collection tools

Research data were collected through face-to-face interviews with women using the personal information form and the Turkish version of the BCSBS.

**Definitive property form:** The researcher-prepared form, based on information from the literature, contains 44 questions that establish women's identities, pregnancy histories, family characteristics, and knowledge about breast cancer.

**BCSBS:** The scale was developed by Kwok et al. (10) in 2010 to identify women's breast cancer screening beliefs. It consists of 13 items. Each item on the original scale can be rated as one of five Likert options, ranging from "strongly disagree" (1 point) to "strongly disagree" (5 points). The scale consists of three subdimensions. The attitude subscale for health screenings consists of items 1–4, the breast cancer information and perceptions subscale consists of items 5–8, and the obstacles to mammography screening subscale consists of items 9–13. When the scale score mean was calculated, the scores were converted as 1–0, 2–25, 3–50, 4–75, and 5–100. After the conversion process, the mean score of each subscale was obtained by dividing the sum of the subscale item scores by the number of items. There were no reverse items in the scale. The lowest score taken from the scale was 0, and the highest score was 100. The mean scores of subscales >65 indicated that the screening beliefs increased positively, information status increased, and obstacles to mammography screenings decreased. The internal consistency coefficients (Cronbach's alpha) for the subscales of the original scale are between 0.76 and 0.79.

### Evaluation of data

The SPSS version 23 program was used to evaluate the data. For the adaptation of the scale to Turkish and validity-reliability analysis of the scale, the process steps in the WHO's guide to the translation and adaptation of scale tools were followed (11). Reliability of the scale was assessed by item analysis, Cronbach's alpha value, and test-retest correlation. Exploratory analyses were performed to test the factor structure validity of the scale. AMOS analysis were performed to confirmatory factor analyses. Appropriateness of the data for the factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) value and Bartlett's test of sphericity. Descriptive data were calculated by number, percentage, mean, and standard deviation. Statistical significance level was determined with $p<0.05$.

### Ethics of research

To develop the Turkish version of the BCSBS, written permission was obtained from Cannas Kwok through electronic mail. The approval of the Atatürk University Faculty of Nursing Ethics Committee was obtained before conducting the study (no: 2016-6/12, date: 2016/05/01). Verbal consent was taken after the participants were informed of the purpose of the investigation and the purposes for which the results were to be used.

## Results

Of the study participants, 39.1% were 18–24 years old, 64% were married, and 59% lived in the province center. In addition, 36% of the participants were primary school graduates, 83.5% were not employed, and 66.3% reported having moderate income.

### Language and content validity

The translation/back-translation method was used for the language validity of the BCSBS. Three people, which included a linguist and two field specialists, translated the original English version of the scale into Turkish. These translations were examined by the researchers and turned into a single common form. The resulting form was translated back into English by a different linguistic expert who is fluent in both Turkish and English. The original scale items and scale items that were translated/back-translated were compared, and results revealed the meanings of the scale items were not changed. Finally, the clarity of the scales was checked by a Turkish language expert. Results of these studies confirm that the Turkish form of the BCSBS is a suitable measuring tool in terms of language validity.

The Davis technique was used to assess content validity. The Turkish version of the BCSBS was presented to eight leading expert academicians. They were asked to evaluate each item in terms of

language suitability and intelligibility for the Turkish community, with scores ranging from 1 to 4 (4: very appropriate; 3: appropriate but small changes are needed; 2: appropriate to be included in the article; 1: not appropriate). For the evaluation of each item, the content validity index for each item was calculated by dividing the number of experts who marked option (3) or (4) by the total number of experts, and the content validity index was accepted as 0.80 (7, 9, 12). In this study, no items were removed because no item had value <0.80.

**Reliability analysis of BCSBS**

For material analysis and internal consistency, Cronbach's alpha reliability analyses were performed for the 13 items in the BCSBS. Table 1 shows the item-total score correlations of the scale. These correlations ranged from 0.46 to 0.57. No items were removed because there was no change in the Cronbach's alpha values when any item was removed; the item-total score correlations were not below 0.20 (Table 1).

The Cronbach's alpha value of the internal consistency reliability coefficient of the scale was 0.86. The Cronbach's alpha values that served as reliability coefficients of the subscales were as follows: attitude to health check-up, 0.86; breast cancer knowledge and perceptions, 0.81; and barriers to mammography screenings, 0.83. The average scores of the subscales were as follows: attitude to health check-up, 41.93±26.51; breast cancer knowledge and perceptions, 68.60±22.93; and barriers to mammographic screening, 66.46±22.19.

**Test-retest reliability**

To determine the reliability of the scale, a retest was administered to 66 people 2 weeks later. The correlation value between the first and second measurement results was r = 0.842, and p<0.001 was the significance level. This finding suggests that the first and second measurement results of the scale applied at 2-week intervals are comparable.

**Validity analysis of BCSBS**

Bartlett's test was applied to determine whether the relationships between the KMO test and variables to be analyzed were significant and non-zero and to determine whether data were applicable for the factor analysis. The KMO coefficient was 0.77, the chi-square value of Bartlett's test was also significant at the advanced level (p<0.001), and results revealed that the data were appropriate and sufficient for the factor analysis.

To reveal the factor structure of the 13-item BCSBS, principal component analysis and a varimax rotation method from the factor analysis methods were applied, and a three-factor structure that explains 65% of the total variance and has an eigenvalue above 1.00 emerged. Factor loadings of the items ranged from 0.59 to 0.86 (Table 2). The distribution of the 13 items constituting the three-factor structure of the BCSBS by factors was similar to that of the original:

**1. Subscale:** This factor consists of a total of four items (items 1–4), and it was named the "attitude to health check-up" subdimension as its original was.

**2. Subscale:** This factor consists of a total of four items (items 5–8), and it was named the "breast cancer knowledge and perceptions" subdimension as its original was.

**3. Subscale:** This factor consists of a total of five items (items 9–13), and it was named the "barriers to mammographic screening" subscale as its original was.

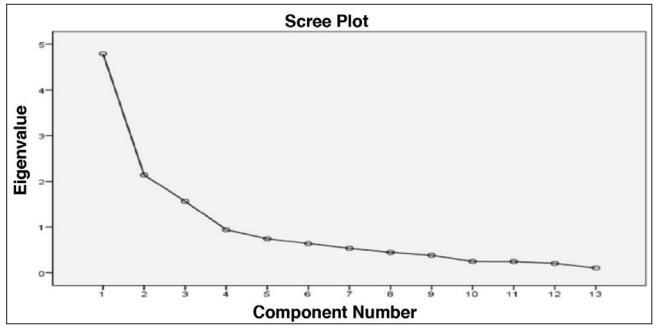


**Figure 1.** Scree plot test

Table 1. Internal consistency and homogeneity of the Breast Cancer Screening Beliefs Scale

| Items | Average of scale if item is removed | Variance of scale if the item is removed | Corrected Item-total correlation | Cronbach's alpha coefficient of the scale if the item is removed |
|---|---|---|---|---|
| **1.** | 41.3 | 73.6 | 0.52 | 0.85 |
| **2.** | 41.1 | 73.8 | 0.52 | 0.85 |
| **3.** | 41.5 | 75.1 | 0.47 | 0.85 |
| **4.** | 41.4 | 73.9 | 0.54 | 0.84 |
| **5.** | 40.2 | 74.7 | 0.57 | 0.84 |
| **6.** | 40.0 | 76.7 | 0.50 | 0.85 |
| **7.** | 40.5 | 75.3 | 0.51 | 0.85 |
| **8.** | 40.3 | 74.0 | 0.52 | 0.85 |
| **9.** | 40.7 | 76.8 | 0.48 | 0.85 |
| **10.** | 40.3 | 77.5 | 0.46 | 0.85 |
| **11.** | 39.8 | 76.2 | 0.51 | 0.85 |
| **12.** | 40.5 | 73.4 | 0.55 | 0.84 |
| **13.** | 40.4 | 73.1 | 0.55 | 0.84 |

Analysis of the factor structure of the BCSBS revealed that the first, second, and third factors explained 23.2%, 22%, and 20.2% of the total variance, respectively, and all these factors combined explained 65.3% of the total variance.

In the Scree plot test result graph, the first sudden change of the eigenvalue >1.00 occurred in the third factor, and based on this result, the scale would consist of three factors. The Scree plot test result is presented in Figure 1.

Confirmatory factor analysis (CFA) was performed to determine whether the three-factor structure of the scale was confirmed. A number of compliance indices were used to demonstrate the adequacy of the tested model in CFA. The chi-square test for the goodness of fit index (GFI), root mean square error of approximation (RMSEA), root mean square residual (RMR), comparative fit index (CFI), normed fit index (NFI), and adjusted goodness of fit index (AGFI) compliance indices for the CFA in this study were examined.

According to the results of the CFA, the values were detected as $\chi^2$ = 157.09, standard deviation (SD) = 57.12, and p = 0.000; $\chi^2$/SD = 2.75, which is within the acceptable reference value range ≤5. This finding also suggests that the data are compatible to the model, and results of other indices tests were as follows: RMSEA = 0.093, NFI = 0.890, CFI = 0.926, RMR = 0.10, GFI = 0.89 and AGFI = 0.84. These findings show that the model-data compatibility is acceptable. In other words, the three-factor model is appropriate and provided the construct validity of the scale. First-level CFA results are shown in Figure 2.

## Discussion and Conclusion

For material analysis and internal consistency, Cronbach's alpha reliability analyses were performed for 13 items in the BCSBS. The Cronbach's alpha coefficient was calculated to determine the internal consistency of Likert-type scales. The Cronbach's alpha coefficient is a weighted standard deviation mean found by the estimate of the total of the variances of the items in the scale to the general variance. A high Cronbach's alpha coefficient of a scale indicates that it consists of coherent items that measure the same items of the scale (8, 13).

In the literature, when the Cronbach's alpha coefficient range is $0.00<\alpha<0.40$, the scale is unreliable; when the coefficient range is $0.40<\alpha<0.60$, the scale is quite reliable; and when the coefficient range is $0.60<\alpha<0.80$, the scale is highly reliable (13, 14). In this study, the Cronbach's alpha coefficient of the Turkish version of the BCSBS was 0.86. The Cronbach's alpha values of each subdimension of the scale were as follows: attitudes toward health screenings, 0.86; information and perceptions about breast cancer, 0.81; and barriers to mammographic screening, 0.83. A study reported that the original scale has a Cronbach's alpha coefficient of 0.70 and the subscales have 0.76–0.79 (10). These coefficients are close to each other. The range of the Cronbach's alpha coefficients of the Turkish version of the scale and its subscales is $0.80<\alpha<0.100$, which may mean that the scale is highly reliable.

Another internal consistency criterion is the item-total correlation. In this method, the variance of a scale item and the variance of total scale score are compared, and the relationship between them is examined

Table 2. Factor structure, exploratory variance values, and Eigen, values of the scale

| Factors | Items | Factors loading | | |
|---|---|---|---|---|
| **Attitude toward health screening** | If I feel well, it is not necessary to have a health check-up | 0.85 | - | - |
| | If I follow a healthy lifestyle such as a balanced diet and regular exercise, I do not feel it is necessary to have a regular health check-up | 0.77 | - | - |
| | I see a doctor or have my health check-up only when I have a health problem | 0.86 | - | - |
| | If I feel healthy, I do not need to see the doctor | 0.84 | - | - |
| **Breast cancer knowledge and perceptions** | Breast cancer is like a death sentence; if you get it, you will surely die from it | - | 0.82 | - |
| | Breast cancer cannot be cured; you can only prolong the suffering | - | 0.80 | - |
| | Even if breast cancer is detected early, there is very little a woman can do to reduce the chances of dying from it | - | 0.81 | - |
| | If a woman is fated to get breast cancer, she will get breast cancer; there is nothing she can do to change fate | - | 0.64 | - |
| **Barriers to mammographic screening** | I am worried that having a mammogram will hurt my breasts | - | - | 0.59 |
| | It would be difficult to arrange transportation for getting a mammogram | - | - | 0.75 |
| | I do not want to have a mammogram because I cannot speak Turkish | - | - | 0.72 |
| | I do not want to go for a mammogram because I would need to take off my clothes and expose my breasts | - | - | 0.86 |
| | Having a mammogram is embarrassing | - | - | 0.82 |
| | **Explotary variance values of factors** | **Eigenvalues** | | |
| **Factor 1** | 23.6 | 3.0 | | |
| **Factor 2** | 22.0 | 2.9 | | |
| **Factor 3** | 20.2 | 2.6 | | |
| Total variance is 65.3% | | | | |

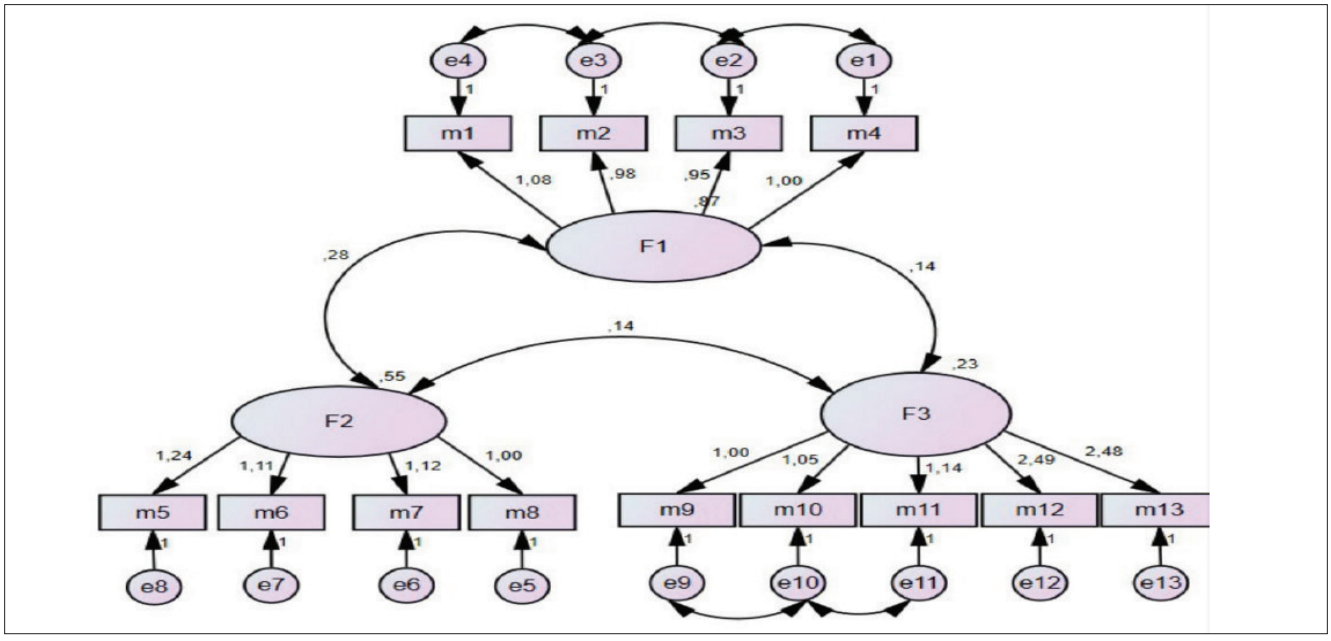


**Figure 2.** Confirmatory factor analysis of the Breast Cancer Screening Beliefs Scale

(13). As the item-total score correlation increases, the activity of that item increases, and when the correlation coefficient is low, the scale items are not reliable enough. In the literature, the correlation between the total score of a substance and the total score is 0.20 (15).

The item-total score correlation values of the original scale were not reported (10). In this study, the item-total score correlations ranged from 0.46 to 0.57, and the item-total score correlations of all items were sufficient. All item-total score correlations of the scale items were significant at $p<0.001$. No items were removed because there was no change in the Cronbach's alpha values when any item was removed; the item-total score correlation was not below 0.20. These findings show that there are no problematic items in the Turkish version of the 13-item BCSBS.

Test-retest reliability is a power that can give consistent results to an application without applying a measurement tool and show stability over time (8, 13). The stability of the scale is evaluated in terms of time invariance. When the same measurement tool is applied to individuals at different times, the similarity, i.e., consistency of the answers given by the individuals to the items of the measurement tool, indicates that the tool has determinedness against time (9). A correlation analysis of Pearson moment products of inertia was performed to evaluate the determinedness by time of the scale.

A study stated at least 30 individuals should be reached for the test-retest correlation analysis (16). In this study, the scale was applied to the sample group of 66 people twice at 2-week interval. The correlation value between the first and second measurement results of the scale was $r = 0.842$, and a statistically significant correlation was found between the two measurements at a significance level of $p<0.001$. This finding suggests that the first and second measurement results of the scale are comparable. The test-retest reliability analysis results were not specified on the original scale (10).

Findings from the analyses to determine the reliability of the scale indicate that the Turkish version of the BCSBS has high reliability.

**Findings related to the validity analyses**

Factor analysis is a process in which the subdimensions of the scale items are aggregated (17, 18). Before the factor analysis, KMO analysis was performed to determine the adequacy of the sample for the factor analysis, and Bartlett's test of sphericity analysis was performed to determine the suitability of the sample for the factor analysis.

The KMO value is excellent between 0.90 and 1.00, good between 0.80 and 0.89, moderate between 0.70 and 0.79, weak between 0.60 and 0.69, and poor between 0.50 and 0.59; if it is <0.50, it is interpreted as unacceptable (13, 14). For a good factor analysis, the KMO value must be above 0.60 (13). The KMO value of the original scale was 0.71 (10). In this study, the KMO coefficient was 0.77. When this finding was examined according to the above-mentioned KMO values, the sample size was considered sufficient for the factor analysis.

The result of Bartlett's test of sphericity in the original scale was $X^2$ = 1669.6% ($p<0.001$) (10). In this study, Bartlett's test result was $X^2$ = 1396.1% ($p<0.001$). The significance of this test suggests that the sample size is good and that the correlation matrix is appropriate for the factor (7, 13). This finding also indicates that the data are appropriate for the factor analysis.

Based on these findings, an exploratory factor analysis was conducted to reveal the factor structure of the Turkish version of the 13-item BCSBS, and the results were analyzed using the principal component method and varimax vertical rotation method (18).

After the explanatory factor analysis, a three-factor structure emerged that has an Eigenvalue >1.00 and explains 65% of the total variance. For factor analysis in the literature, the percentage of factor loadings to explain the total variance is required to be 0.40 and above (18).

Evaluation of the factor structure of the Turkish version of the BCSBS revealed that the first, second, and third factors explained 23.2%, 22%, and 20.2% of the total variance, respectively, and all these factors combined explained 65.3% of the total variance. On the original scale, three factors explain 46.8% of the total variance (10). A high ratio of

the explained variance of a scale indicates that the scale has a strong factor structure. Studies have presented that the variance rates are sufficient between 40% and 60% (13, 17, 18).

Studies have also presented that the factor loadings following factor analysis should be ≥0.30 (13, 17, 18). In this study, the factor load of the items is between 0.36 and 0.90. The reported factor loads of the 13 items on the original scale were between 0.42 and 0.85 (10). In the BCSBS, the factor load matrix was examined using the varimax rotation method to determine which items formed three factors. The matrix result of the factor load revealed the following:

Factor 1 on the original scale was composed of items 1–4.

Factor 2 on the original scale was composed of items 5–8.

Factor 3 on the original scale was composed of items 9–13.

In the factor analysis, the scale factor is determined by the Scree plot test. In that test, the factors with Eigenvalues >1 are examined by the graphical method. A study suggested selecting factors up to the first sudden change in the graph and the slope of the graphical curve obtained from this test (18). In the Scree plot test result graph, the first sudden change of the Eigenvalue above 1.00 occurred in the third factor. Considering this result, the Turkish version of the scale had three factors as in the original scale.

CFA was performed to determine whether the three-factor structure of the scale was confirmed. The results of the CFA revealed $\chi^2/SD = 2.75$, which is smaller than the acceptable reference value ≤5, and $p = 0.015$. $\chi^2$ results test the compliance of the model data and show that the data are compatible to the model. This finding also suggests that the data are compatible to the model.

In the literature, the acceptable compliance value of the GFI, CFI, and NFI is 0.90, and the perfect compliance value is ≥0.95. The acceptable compliance value of the AGFI index is 0.85, and the excellent compliance value is ≥0.90; and the acceptable compliance value for NFI is 0.90, and excellent compliance value is ≥0.95 (19-22). The acceptable compliance value of RMSEA and RMR indices is <0.08, and excellent compliance value is <0.05.

Results of some compliance indices of the Turkish version of the scale are as follows: RMSEA = 0.093, NFI = 0.890, CFI = 0.926, RMR = 0.10, GFI = 0.89, and AGFI = 0.84. These values are in a good level of fit index. These findings show acceptable model-data compatibility. In other words, the three-factor model is appropriate, and this provided the construct validity of the scale. CFA was not performed on the original scale (10).

The Turkish version of the BCSBS, consisting of 13 items and three subscales, was found to be a valid and reliable measurement tool in Turkish society. It can be used in studies on women's beliefs about breast cancer screening and influencing factors.

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**Ethics Committee Approval:** To develop the Turkish version of the BCSBS, written permission was obtained from Cannas Kwok through electronic mail. The approval of the Atatürk University Faculty of Nursing Ethical Committee was obtained before conducting the study (no: 2016-6/12, date: 2016/05/01).

**Informed Consent:** Verbal consent was taken after the participants were informed of the purpose of the investigation and the purposes for which the results were to be used.

**Peer-review:** Externally-peer reviewed.

### Authorship Contributions

Concept: A.S.Ç.; Design: A.S.Ç.; Materials: N.T.; Data Collection and/or Processing: N.T.; Analysis and/or Interpretation: N.T.; Literature Search: A.S.Ç.; Writing Manuscript: N.T., A.S.Ç.

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