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BCSBQ Greek Version

RESEARCH ARTICLE

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Translation and Validation of the Greek Version of the Breast Cancer Screening Beliefs Questionnaire

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Abstract

Background: Breast cancer is the most prevalent cancer among women in Greece. It is crucial to have a simple, trustworthy and effective instrument for assessing the factors that impact cancer screening behaviors. **Objective:** This study aimed to translate and validate the Greek version of the Breast Cancer Screening Beliefs Questionnaire (BCSBQ). **Methods:** In this cross-sectional methodological study conducted from April to June 2024, 202 Greek women aged 21 to 69 years participated using a snowball sampling method. A backward-forward translation process was performed on the BCSBQ. The study evaluated the face, content, and constructs validity of the questionnaire. A confirmatory factor analysis was carried out to determine whether the data supported the 3-factor structure of the instrument. Additionally, the reliability of the BCSBQ was measured using Cronbach's alpha and intra-class correlation coefficients. **Result:** The results of the confirmatory factor analysis demonstrated the presence of three distinct factors: attitude, knowledge, and barriers to screening. The three-factor model was supported by standard indices, with the following values: chi-square = 112.5, RMSEA = 0.079, SRMR = 0.057, CFI = 0.94, and NNFI = 0.942. The instrument also showed a satisfactory Cronbach's alpha of 0.814, while the Cronbach's alpha values for the three subscales ranged from 0.72 to 0.84. The mean scores observed on the three subscales in this study were remarkably high (Attitudes=76.7±23.9, Knowledge=80.9±20.1, Barriers=89.9±12.7). **Conclusion:** The three-factor structure of the BCSBQ-12 demonstrated valid and reliable results among Greek women. Given its strong psychometric properties, this tool can be utilized in future studies to assess women's beliefs regarding breast cancer screening in Greece.

Keywords: BCSBQ- Translation- Validation- Breast Cancer- Screening

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Introduction

Cancer ranks as the second-leading cause of death in Greece and the EU, following cardiovascular diseases for both men and women [1]. In 2022, it has been estimated that over 63,000 new cancer cases were diagnosed in Greece, resulting in more than 32,000 cancer-related deaths [2]. Breast cancer is the most common cancer affecting women in Greece and Europe [2]. About 1 in 9 women will develop breast cancer at some point in their lifetime. In the European Union, more than 250,000 new breast cancer diagnoses occur each year, and approximately 90,000 women die from the disease. In Greece, there are around 7,770 new cases annually, with approximately 2,330 deaths resulting from breast cancer annually [3].

In 2019, 66% of women in Greece aged 50-69 participated in breast cancer screening, which aligns with the EU average [4-5]. However, significant inequalities between social groups have been identified. The percentage of women with higher incomes who reported having a breast examination was nearly twice as high (86%) compared to those with lower incomes (46%). A similar trend is observed concerning education, with women who have the highest educational attainment showing greater participation in screenings and residence with higher rates noted on rural areas. This is due that many breast screening tests are conducted on an opportunistic basis, with significant costs often paid out of pocket [2].

The primary purpose of breast cancer screening is to detect tumors at the earliest possible stage, as early detection significantly enhances the chances of reducing mortality rates associated with breast cancer [6]. Not only do patients diagnosed early experience higher survival rates, but their treatment costs are also 3 to 5 times lower compared to those diagnosed at advanced stages [7]. Thus, to address existing disparities in screening, Greece has launched a population-based program targeting women aged 50 to 69, marking the country's first cancer screening initiative [8]. As of mid-2022, the program has conducted 308,036 mammograms, leading to the identification of 20,330 breast cancer cases, the majority of which were

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detected at early stages. By late 2023, this program has expanded to include women aged 45 to 74, aligning with the latest European guidelines [9].

Recognizing that various factors can influence women's beliefs, it's essential to understand their views on breast cancer screening to enhance participation in national screening programs. The Breast Cancer Screening Beliefs Questionnaire (BCSBQ) is a brief and easy-to-complete tool designed to assess women's knowledge and attitudes about breast cancer screening. Given its significance for evaluating screening beliefs in programs focused on the early detection of breast cancer in Greece, this study aims to translate and validate the Greek version of the BCSBQ.

Materials and Methods

This study was a cross-sectional methodological study purposing the translation and validation of the Greek version of the Breast Cancer Screening Beliefs Questionnaire (BCSBQ).

Translation

After obtaining written permission from Dr. Kwok, the developer of the instrument, the original English version of the questionnaire was translated into Greek [10]. The technique of back-translation was used to translate the BCSBQ from English to Greek. The international standard procedure for translating research instruments was followed, involving three professional translators proficient in both Greek and English [11]. Two translators independently translated the English version of the BCSBQ into Greek. The two separate translations were then combined after resolving any differences and inconsistencies, resulting in the initial Greek version of the questionnaire. Afterward, a third translator was back-translated the Greek version into English. The two versions were compared to ensure equivalence. Following discussions, only minor adjustments were made as a result of this back-translation process, which aided in establishing the semantic equivalence of the instrument.

Face and content validity

In order to establish face validity, the translated version of the questionnaire was applied in a pilot study to fifty-one women with different demographic backgrounds [12]. Then they were asked to provide feedback on the clarity, comprehensibility, and readability of the Greek version. The participants reported that all items were clear and easy to understand.

Additionally, a group of ten professionals, including five health experts, two university professors from the nursing department, two nurses with master's degrees, and one Greek language expert, evaluated the content validity of a questionnaire. The evaluation of content validity involved calculating the content validity index (CVI) for the questionnaire. The specialists were tasked with rating the relevance of the items using the following scale: 1: "Irrelevant"; 2: "Somewhat relevant"; 3: "Acceptably relevant"; 4: "Completely relevant". Subsequently, the CVI for each item was determined by dividing the number of specialists who rated the item as 3 or 4 by 10. Items with a CVI of 0.78 or higher were deemed acceptable [13]. The assessment of content validity revealed that all items had CVIs exceeding 0.78. Consequently, none of the items were excluded.

Participants and recruitment

The target population of the study focused on women residing in Greece. To be included in the study, women had to meet the following criteria: i) aged between 21 and 69 years old, ii) have no previous history of breast cancer, and iii) have a good understanding of the Greek language, both written and spoken. The recruitment process was conducted using the snowball sampling method, a technique where initial participants are asked to refer individuals they know who meet the study criteria. This approach is particularly effective in reaching populations that may be hard to access or identify through conventional sampling methods. Sampling was conducted in this study after obtaining the ethical code (391ex-12/07/2024) from the ethics committee of the nursing department at the University of Thessaly.

Data collection

The questionnaire was shared digitally through Google Forms. The initial participants in the study were recruited through healthcare workers, including doctors, nurses, and administrative staff. After completing the questionnaire, they were kindly invited to share it with friends and relatives to encourage their participation in the study. Data was collected over a three-month period, from April to June 2024.

Sample size

The confirmatory factor analysis required a minimum sample size of five to ten subjects for each item in the instrument [14]. Since there are 12 items in the translated version of BCSBQ, it was necessary to recruit a maximum of 10 participants for each item, totaling 120 participants. To ensure an adequate final sample size, 346 women were invited to participate in the study, and 202 of them returned the questionnaire, resulting in a response rate of 58.4%.

Instruments

The instrument used in the study consisted of three parts:

i) Demographic information including age, educational level, marital status, etc.

ii) The BCSBQ which consists of 13 items divided into three subscales: Attitudes towards health check-ups (4 items), Knowledge and perceptions about breast cancer (4 items), and Barriers to mammographic screening practices (5 items). However, one of the 5 items related to barriers to mammographic screening does not apply in the Greek version of the questionnaire ("I don't want to have a mammogram because I can't speak English"), so it was removed. As a result, the final Greek version of BCSBQ included a total of 12 items.

iii) Following the instructions of the original questionnaire creators, breast health practices were also recorded to gather information about participants'

knowledge and practices related to self-examination, clinical examination, mammogram, etc.

Data analysis

For the three subscales of BSCBQ means computed as previously applied on other populations [10]. Subscales scores were changed into a 0–100 scale [15]. Missing values were imputed by the half-rule, i.e., the mean response to other items in the same subscale if half or more of the items were answered and valid [11]. Participants' demographic characteristics and the distribution of the subscale scores of the BSCBQ, as well as items related to breast health practices were summarized using descriptive statistics. Floor and ceiling effects were evaluated using the proportions of subjects scoring 0 and 100, respectively. Substantial floor and ceiling effects suggest that a 5-point Likert scale might not be sufficient to clearly distinguish the responses at the two extremes [16].

A confirmatory factor analysis (CFA) was carried out to determine whether the data supported the 3-factor structure of the instrument. Various measures, including those for parsimony correction, absolute fit, and comparative or incremental fit, were evaluated as recommended. These measures and their corresponding benchmarks included the root mean square error of approximation (RMSEA ≤ 0.06), standardized root mean square residual (SRMR ≤ 0.08), comparative fit index (CFI ≥ 0.95), and nonnormed fit index (NNFI ≥ 0.95). Covariance between items was adjusted based on the largest modification index to enhance the goodness of fit if there were concerns about its adequacy [17]. If the CFA did not confirm the originally proposed 3-factor structure, an exploratory factor analysis (EFA) would be conducted. Factors with an eigenvalue greater than 1 would be retained, and the respective loadings after a varimax rotation would be presented [18].

To assess construct validity, three hypotheses were tested. The first hypothesis suggested that individuals with more frequent screening practices such as breast awareness, clinical breast examinations (CBE), and mammograms would have a more proactive attitude towards general checkups, reflected in higher scores in the "attitude" subscale. The second hypothesis proposed that individuals with higher education levels would be more knowledgeable about breast cancer, resulting in higher scores in the "knowledge" subscale. The third hypothesis indicated that individuals with more frequent screening practices would be associated with fewer barriers to undergoing mammography, leading to higher scores on the "barriers" subscale. Cuzick's nonparametric test was utilized to test the trend due to the ordinal nature of the data on the frequency of health practices and education level [19].

The performance of the Greek version of the BCSBQ items was then evaluated. Cronbach's α was used to assess the internal consistency reliability. A low Cronbach's α value would suggest low homogeneity, while a value that is too high would indicate item redundancy. Therefore, a Cronbach's α between 0.7 and 0.9 could be considered to show good internal consistency reliability [20]. The corrected item-total correlation (rcorr), which is the correlation of each item with its corresponding subscale after removing that item, was also examined for all 12 items [21].

IBM SPSS Amos version 23 and R version 4.1 were utilized to perform the required statistical analysis.

Results

Table 1 is presenting the demographics of the participants. The majority of the sample lies between 41 and 60 years old, is married or partnered, well-educated, living in urban areas with a monthly household income over 1.000 €.

The distributions of the 3 subscales are summarized in Table 2. Missing values were imputed in the computation of the subscale scores. All the subscales had a range from 0 to 100. Subscales exhibited ceiling effects of 34.7% for attitudes, 33.2% for knowledge, and 44.6% for barriers.

The CFA of the proposed three-factor model of the BCSBQ yielded a chi-square statistic of 135.0 (with 51 degrees of freedom, $P < 0.001$), an RMSEA of 0.071 (95% confidence interval [CI] = 0.052 to 0.089), an SRMR of 0.074, a CFI of 0.915, and a NNFI of 0.916. Following the assessment of the Lagrange multipliers test, a covariance between Q11 and Q12 was incorporated into the factor model. The revised model showed a chi-square statistic of 112.5 (with 50 degrees of freedom, $P < 0.001$), an RMSEA of 0.079 (95% CI = 0.059 to 0.098), an SRMR of 0.057, a CFI of 0.940, and a NNFI of 0.942. The final CFA model

Table 1. Participants Demographic (N=202)

Variable	N	%
Age		
21-30	45	22.3
31-40	37	18.3
41-50	54	26.7
51-60	58	28.7
61-70	8	4.0
Marital Status		
Single	50	24.9
Married / Partnered	123	61.1
Divorced / Separated	20	10.0
Widowed	8	4.0
Education		
Primary	6	3.0
Secondary	28	13.9
Tertiary	112	55.7
Master	55	27.4
Residence		
Urban area	158	78.2
Rural area	44	21.8
Monthly Household Income		
Up to 700 €	25	12.8
701 – 1.000 €	39	19.9
1.001 – 1.500 €	61	31.1
Over 1.501 €	71	36.2

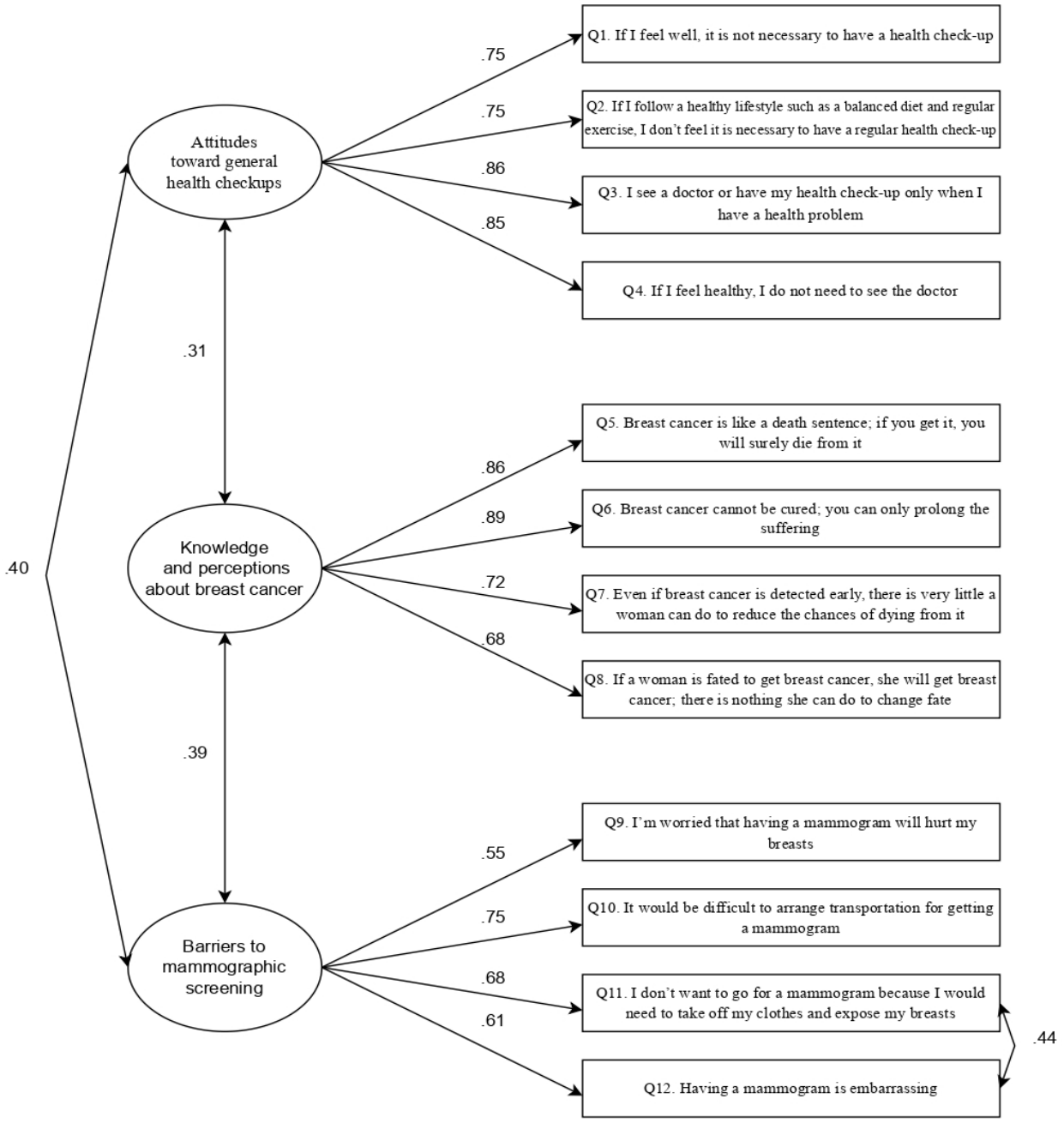

Figure 1. Path Diagram of a Confirmatory Factor Analysis of the Breast Cancer Screening Beliefs Questionnaire. The Values Correspond of the Standardized Estimates

is illustrated in Figure 1.

An EFA was intended to examine the factor structure if the previously established goodness-of-fit criteria were not met. Nevertheless, since all the criteria of CFA were satisfied, conducting an EFA was not necessary.

The mean scores for the three subscales, categorized by the frequency of breast screening practices and education level, are presented in Table 3. In the Attitude subscale, the mean score significantly increases with the frequency of practices (all $P < 0.05$), with the exception of women who reported never participating in screening. Additionally, women with higher education levels had significantly higher scores in the Knowledge subscale ($P < 0.05$). However, the Barriers subscale did not show a significant relationship with the frequency of practices (all $P > 0.05$)

A total Cronbach's α for the BCSBQ was calculated

Table 2. Distribution of the Subscale Scores of the Greek Version of the BCSBQ

Subscale	Mean	SD	Median	% at floor	% at ceiling
Attitudes toward general health checkups	76.7	23.9	75	1.5	34.7
Knowledge and perceptions about breast cancer	80.9	20.1	87.5	1.5	33.2
Barriers to mammographic screening	89.9	12.7	93.7	0	44.6

Table 3. Associations of the Breast Cancer Screening Beliefs Questionnaire Subscale Scores with Frequency of Breast Screening Practices and Education Level

Breast screening practices	n (%)	Attitudes towards general health check-ups	Knowledge and perceptions about breast cancer	Barriers to mammographic screening
		Mean ± SD	Mean ± SD	Mean ± SD
Breast self examination				
At least once a month	39 (20.2)	82.5 ± 19.4	85.3 ± 15.6	91.8 ± 10.1
Once every few months	59 (30.6)	78.5 ± 24.5	83.4 ± 19.1	90.5 ± 13.4
Once a year	45 (23.3)	69.0 ± 25.8	76.0 ± 22.8	88.9 ± 11.8
Never	50 (25.9)	79.8 ± 23.5	80.1 ± 21.4	92.2 ± 11.4
P for trend		0.038	0.181	0.408
Clinical breast examination				
A year or less	87 (45.1)	81.7 ± 22.6	80.1 ± 21.4	92.2 ± 11.4
More than a year & less than two years	43 (22.3)	79.5 ± 22.5	81.8 ± 20.6	91.4 ± 9.2
Two to three years	22 (11.4)	66.5 ± 24.5	74.7 ± 19.7	88.9 ± 9.2
More than three years	17 (8.8)	68.8 ± 24.0	89.0 ± 13.4	90.1 ± 15.6
Never had one	24 (12.4)	72.9 ± 26.8	85.9 ± 16.4	87.8 ± 14.1
P for trend		0.013	0.118	0.222
Mammogram				
Once a year	95 (48.7)	82.6 ± 20.8	82.4 ± 18.8	91.4 ± 11.3
Once every two years	21 (10.8)	63.1 ± 29.2	74.1 ± 24.6	88.7 ± 10.2
Once every three years and more	20 (10.3)	60.0 ± 27.2	77.8 ± 25.4	90.9 ± 10.6
Never had one	59 (30.3)	80.2 ± 21.0	84.2 ± 17.8	91.3 ± 12.6
P for trend		0	0.295	0.463
Education level				
Primary	6 (3.0)	64.6 ± 42.1	49.0 ± 28.1	88.5 ± 19.5
Secondary	28 (13.9)	71.0 ± 29.3	79.0 ± 23.6	88.2 ± 12.3
Tertiary	112 (55.7)	77.4 ± 23.9	83.4 ± 19.3	91.3 ± 12.0
Master	55 (27.4)	79.2 ± 17.6	79.9 ± 16.0	89.2 ± 12.2
P for trend		0.765	0.005	0.283

Table 4. Cronbach's α and Corrected Item-Total Correlation for the Subscales of the Greek Version of the Breast Cancer Screening Beliefs Questionnaire

Item	Attitudes toward general health check-ups	Knowledge and perceptions about breast cancer	Barriers to mammographic screening
Cronbach's α	0.84	0.82	0.72
Attitudes toward general health check-ups			
Q1	0.63	0.51	0.59
Q2	0.62	0.54	0.56
	0.72	0.6	0.65
Q4	0.73	0.58	0.69
Knowledge and perceptions about breast cancer			
Q5	0.54	0.7	0.66
Q6	0.53	0.75	0.63
Q7	0.48	0.58	0.54
Q8	0.41	0.56	0.51
Knowledge and perceptions about breast cancer			
Q9	0.28	0.38	0.41
Q10	0.37	0.4	0.56
Q11	0.4	0.37	0.63
Q12	0.29	0.24	0.48

as 0.814. The Cronbach's α values for the three subscales ranged from 0.72 to 0.84 (Table 4). For the Attitude and Knowledge subscales, the items demonstrated moderate to strong correlations with their respective subscales (rcorr values between 0.58 and 0.75) and weak to moderate correlations with the other subscales. Moreover, the correlation coefficients between the Barriers subscale and its items were lower, ranging from 0.41 to 0.63, while the items in this subscale showed weak correlations with the other subscales.

Discussion

Data from Greece reveals that the rates of primary prevention initiatives are markedly lower than the European average. Furthermore, preventive screening is largely conducted on an opportunistic basis, leading to considerable disparities within the Greek population in terms of access and utilization of these services [2]. The present study, aims to translate and validate a reliable instrument for examine the attitudes, knowledge, perceptions, and barriers faced by women in Greece regarding breast cancer screening behaviors. Consequently, a sample of 202 women was used; spanning ages 21 to 70 years and featuring diverse demographic backgrounds.

This study showed that the Greek version of the Breast Cancer Screening Beliefs Questionnaire (BCSBQ) has appropriate psychometric properties. Confirmatory Factor Analysis (CFA) validated the original three-factor structure of the BCSBQ in this Greek cohort. The three subscales-"Attitudes toward general health check-ups," "Breast cancer knowledge and perceptions," and "Barriers to mammographic screening"-are theoretically aligned with the original version. It is noteworthy that in the Greek version, the item "I don't want to have a mammogram because I can't speak English" from the Mammographic screening practices has been removed as unrelated to the target population.

Additionally, while there were minor floor effects in the subscales, increased ceiling effects were noted, suggesting that women in Greece generally have a higher degree of knowledge and face fewer barriers compared to women from the original population used to develop the questionnaire. This indicates that the 5-point Likert scale effectively captures responses at both high and low extremes.

Our findings demonstrated good construct validity for the Attitude subscale, as the anticipated associations were significant and aligned with our hypotheses. Women who followed recommended breast cancer screening practices, including more frequent breast self-examinations, clinical examinations, and mammograms, exhibited stronger positive attitudes toward general health check-ups. This aligns with comparable results found in recent literature [22-23]. Research has consistently indicated that individuals who maintain a positive attitude toward their health are more likely to engage in regular breast cancer screening practices. This correlation suggests that not only psychological factors, but also a proactive mindset, play a significant role in encouraging women to prioritize their health and participate in screenings. Greater awareness of the importance of early detection and a supportive environment may further enhance these positive behaviors, ultimately leading to improved health outcomes [24]. Additionally, Knowledge and Perceptions subscale showed a statistically significant relationship with education levels. Women with a higher level of education score higher on this subscale. This finding reinforces earlier research that underscores the significance of educational attainment as a critical factor influencing women's awareness and understanding of breast cancer [25-26]. Conversely, a study on American Korean immigrant women revealed that those with a lower educational level were more likely to undergo mammograms and utilize clinical breast exams [27]. On the other hand, the Barriers subscale did not reveal a relationship with the frequency of screening practices. This finding contrast with patterns observed in previous validation studies of the BCSBQ involving Chinese, Arabic and Korean groups [10, 28-29]. Other studies have highlighted that the most significant barriers for women include issues related to access, such as financial, geographical, and cultural obstacles. Additionally, factors like fear (of results and pain), embarrassment, long wait times for appointments, language barriers, and past negative experiences also play a crucial role [30]. It should be mentioned though, that mean scores on this specific subscale were notably high for the present study. Nevertheless, this discrepancy suggests a need for further investigation into the physical and psychological barriers to mammographic screening experienced by Greek women.

The reliability of the questionnaire was indicated by a Cronbach's α value ranging from 0.72 to 0.84, which is well above the acceptable threshold of 0.70 established in health measurement theory [20]. This demonstrates excellent internal consistency for each of the three subscales, with no evidence of item overlap. These findings align with previous validation studies that utilized the BCSBQ in Chinese, Arabic, Korean, African Australian, Persian, Indian, and Vietnamese versions [10, 15, 28-29, 31-33].

Limitations of the study and future research

Although established guidelines for translating and adapting questionnaires were carefully followed, there are some limitations in this study. Firstly, while multiple recruitment methods were employed, the generalize ability of our conclusions is limited due to the convenience sample, which was primarily drawn from healthcare settings. It is likely that women who are either unaware of or choose to ignore their health status were underrepresented in the study. Secondly, the study relied on self-reported measures of breast cancer screening practices, which may have been inaccurately reported. Lastly, the expert sample involved in the content validity process does not represent all health professionals, which introduces a potential risk of bias.

Future studies should incorporate methods to verify self-reported information in their designs. Additionally, further research in various healthcare settings is necessary to validate the Greek version of the questionnaire and to

reinforce the findings of the present study.

In conclusions, the attitudes of Greek women towards breast cancer screening are predominantly favorable; however, there is notable heterogeneity in these beliefs across various demographic segments, such as educational attainment. The validity, reliability, and conceptual equivalence of the questionnaire were ensured through the involvement of scientists, expert specialists, and adequate sample of the target population. In conclusion, the Breast Cancer Screening Beliefs Questionnaire is going to be a valuable tool for the Greek population. The Greek version of this questionnaire is valid, reliable, straightforward, and features easily understood concepts, allowing any woman to complete in a short time.

Author Contribution Statement

All authors contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript

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General

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Approval

This research is approved by the ethics committee of the nursing department at the University of Thessaly (Protocol number: 391ex-12/07/2024).

Ethical Declaration

uthors certify that the submission is original work and is not under review at any other publication. This research is approved by the ethics committee of the nursing department at the University of Thessaly (Protocol number: 391ex-12/07/2024).

Availability of data

The data that support the findings of this study are available upon request in Zenodo.org at https://doi.org/10.5281/zenodo.14327603 under the terms of the Creative Commons Attribution 4.0 International license.

Conflict of interest

The authors have no conflicts of interest to declare.

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