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Association between cancer screening perception and breast cancer fear among nurses and its implications for screening counselling: a cross-sectional structural equation modelling study

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Abstract

Background

Nurses play a central role in cancer prevention by providing screening education and counseling to patients. However, nurses' cognitive perceptions and emotional responses to cancer may influence how screening information is conveyed in clinical practice. Although cancer screening behaviors have been widely studied, it is not well understood whether nurses' perceptions of screening are related to cancer-related fears and how this may be reflected in the counseling process. This study aimed to examine the relationship between nurses' perceptions of cancer screening and breast cancer fear.

Methods

This cross-sectional study was conducted with 307 nurses working at a tertiary hospital in central Turkey between February and April 2025. Data were collected using a demographic information form, the Cancer Screening Perception Scale, and the Breast Cancer Fear Scale. Descriptive statistics, Pearson correlation analysis, confirmatory factor analysis, and structural equation modeling (SEM) were applied. SEM was used to evaluate the relationship between latent variables, taking measurement error into account. The study was reported according to the STROBE guidelines and obtained ethical committee approval.

Findings

Nurses' perception of cancer screening was high (94.08 ± 11.44) and breast cancer fear was moderate to high (29.85 ± 5.48). A positive and statistically significant relationship was found between screening perception and fear of breast cancer ($r = 0.19$, $p = 0.001$). Structural equation modeling showed that cancer screening perception significantly predicted breast cancer fear ($\beta = 0.433$, $p < 0.01$) and the model explained 18.7% of the variance in fear. The magnitude of the standardized effect indicates that the relationship is not only statistically but also clinically significant.

Conclusion

Increased awareness of cancer screening among nurses was found to be associated with increased fear of breast cancer. Unaddressed cancer-related fear may affect the clarity, trustworthiness, and effectiveness of screening counseling offered to patients. These findings suggest that cancer screening education in nursing should focus not only on knowledge and guidelines but also on emotional preparedness. Integrating communication skills and emotional coping training into nursing education and in-service programs may enhance counseling quality and support participation in preventive screenings.

Highlights

• Nurses' cancer-related fear may shape the clarity and confidence of screening counseling.

• Emotional preparedness is as important as knowledge in effective patient education.

• Communication and coping training should be integrated into routine nursing education.

• Providing psychological support to nurses may improve patient participation in screening programs.

Introduction

Cancer continues to be one of the leading causes of morbidity and mortality, affecting millions of people worldwide each year. Globally, the most commonly diagnosed cancers include breast, prostate, lung, colorectal, and cervical cancers [1]. Early diagnosis of breast cancer through screening programs is crucial to speeding up treatment and improving survival rates. However, overcoming barriers to effective implementation and leveraging new technologies are critical to enhancing the effectiveness of these programs [2–5].

Nurses play a fundamental role in the implementation and sustainability of cancer screening programs. Nurses manage follow-up processes, ensure continuity of care, and provide patients with the necessary information to make informed decisions [6]. By educating women about self-breast examination, clinical breast examination, and mammography, they contribute to increased awareness and participation in early detection practices [7].

Screening education is actually a communication process. Screening programs depend not only on the transfer of information but also on the quality of nurse-patient communication. Effective communication, establishing trust and empathy increases patient participation in screening and compliance with educational recommendations; patients feeling supported and understood increases the likelihood of compliance with recommendations [8]. Studies on breast cancer show that nurses generally have moderate knowledge and high levels of fear [9, 10]. Indeed, nurses' attitudes and behaviors can significantly affect patients' levels of fear and anxiety, with a positive approach and family support being associated with reduced fear [11]. Patients, especially during emotionally intense decision-making processes, consider nurses' attitudes and behaviors to be decisive based on the trust they place in them [12, 13]. This communication encompasses not only verbal interactions but also the appropriate use of nonverbal cues and the joint consideration of medical and psychosocial needs [14, 15]. However, heavy workloads, language differences, and logistical difficulties can limit effective communication [14, 16]. Overcoming these barriers is critical to improving patient experience and care outcomes. Furthermore, patients value compassionate relationships, spiritual support, and the preservation of hope; these elements have been reported to positively influence communication quality and care outcomes [17, 18].

According to the Health Belief Model, perceived sensitivity and severity of the disease can shape not only protective behaviors but also emotional responses such as fear by determining the perceived threat

level. Since nurses have more knowledge about the risks and consequences of breast cancer, they may perceive the disease as a more concrete threat, which can lead to fear [9, 10]. Therefore, perceptions regarding cancer screening can be considered part of a cognitive evaluation process related not only to behavioral orientations but also to emotional responses such as fear of cancer, and this internal process can influence patient communication and counseling [19–21].

However, the emotional reactions experienced by nurses can affect the quality of patient counseling. Nurses caring for cancer patients may experience significant psychological stress due to frequent encounters with terminally ill patients and the emotionally draining nature of the care process [22]. This emotional burden not only reduces job satisfaction but can also affect the quality of interaction with patients. In particular, increased anxiety levels can limit the ability to clearly convey information and attention, thereby complicating patient education and the informed consent process [23]. Managing emotional conflicts that arise during patient interactions requires metacognitive emotion regulation processes [24], and nurses' emotion management skills have been found to be associated with patients' psychological well-being and adherence to cancer screening programs [25].

In the current literature, breast cancer screening behaviors [26–28] and breast cancer fear [9, 29] have mostly been examined independently of each other. However, how the relationship between nurses' cognitive perceptions of breast cancer screening and their own emotional responses is reflected in patient counseling has not been sufficiently clarified. Nurses are not only healthcare professionals who implement screening programs, but also key educators and guides who influence individuals' health decisions in clinical settings. Therefore, revealing the relationship between nurses' perceptions of cancer screening and their fear of cancer may shed light on understanding the difficulties that may be encountered in patient communication and counseling and planning appropriate supportive interventions. In this context, this study aims to examine the relationship between nurses' perceptions of cancer screening and their fear of breast cancer and to evaluate the possible effects of this relationship on patient counseling.

Methods

Study design

This study employed a quantitative, cross-sectional, and correlational design. Structural equation modeling (SEM) was used to examine the relationship between cancer screening perception and fear of breast cancer. Because nurses play a central role in delivering screening education and counseling, the study conceptualized cancer screening perception as a professional cognitive component of patient education and breast cancer fear as an emotional component that may influence communication behavior. The structural model was therefore designed to evaluate the coexistence of cognitive awareness and emotional response within a clinical nursing context rather than as a purely psychological association. The study was reported in accordance with the STROBE guidelines.

Setting, participants, and sampling

The study was conducted between February 15 and April 15, 2025, at a tertiary city hospital in central Turkey. At the time of data collection, 1.840 nurses were employed at the hospital.

The sample size was calculated for a known population with a 95% confidence level and a 5% margin of error. Based on previous findings reporting a 69.1% prevalence of high breast cancer fear among nurses and midwives, the minimum required sample size was calculated as 279. To compensate for potential data loss, 10% was added, resulting in a final sample of 307 nurses. Convenience sampling was used, and nurses who volunteered and provided informed consent were included. A probability sampling method was not feasible because nurses worked rotating shifts and patient care responsibilities varied across units. Data collection had to be conducted during available break periods without interrupting clinical care. Units such as emergency and intensive care had high clinical workloads, and access to nurses depended on patient acuity and staffing availability. Therefore, participants were recruited based on their accessibility and willingness to participate with, in order to avoid disrupting clinical workflow and compromising patient safety.

Data collection

Data were collected through face-to-face interviews conducted in the nurses' workplaces. Completion of the questionnaire took approximately 15–30 minutes. The questionnaire consisted of a Demographic Information Form and two validated scales.

Demographic information form

This form included 12 items assessing sociodemographic and health-related characteristics such as age, marital status, education level, work unit, income status, perceived health, chronic disease, smoking, alcohol use, and exercise habits.

Cancer screening perception scale

The Cancer Screening Perception Scale was developed by Mahmood et al. and adapted into Turkish by Kıran et al. [30]. It consists of 26 items across five subscales and is rated on a 6-point Likert scale. Higher scores indicate higher cancer screening perception. In this study, internal consistency was acceptable (Cronbach’s alpha = 0.718). Confirmatory factor analysis (CFA) was conducted to assess construct validity. Items with factor loadings below 0.30 were removed, and model modifications were applied based on modification indices.

Because the original scale was developed in a general population, minor measurement variation was anticipated in a professional clinical sample. Item removal was performed only when both statistical

criteria (low factor loading) and conceptual inconsistency with the nurse population were present. The purpose of this procedure was not to redevelop the instrument but to perform sample-specific calibration to improve model fit while preserving the theoretical dimensions of the Health Belief Model. Items were removed only when theoretically and statistically justified, and the original factor structure was largely preserved. The final five-factor measurement model, which was, demonstrated acceptable goodness-of-fit (CMIN/df = 2.274; RMSEA = 0.064; CFI = 0.905; TLI = 0.888; GFI = 0.878; AGFI = 0.844; SRMR = 0.080) (Supplementary 1).

Item removal during confirmatory factor analysis was conducted cautiously and only for items demonstrating both low statistical loading and conceptual inconsistency within the nurse sample. Because the original scale was developed primarily in a general population, minor measurement variation in healthcare professionals was anticipated. The purpose of the modification was not to redevelop the scale but to optimize model fit for a professional clinical sample while preserving the theoretical dimensions of the Health Belief Model. Internal consistency remained acceptable, and the factorial structure of the five theoretical domains was maintained. Therefore, the procedure was considered a sample-specific measurement refinement rather than a modification of the construct itself.

Breast cancer fear scale

The Breast Cancer Fear Scale was developed by Champion et al. and adapted into Turkish by Secginli [31]. The scale consists of eight items rated on a 5-point Likert scale, with higher scores indicating greater fear of breast cancer. Internal consistency was acceptable in the present study (Cronbach's alpha = 0.754). CFA supported a single-factor structure following the removal of items with low factor loadings, and the final model demonstrated acceptable goodness-of-fit (CMIN/df = 4.670; RMSEA = 0.010; CFI = 0.938; TLI = 0.883; GFI = 0.964; AGFI = 0.906; SRMR = 0.088) (Supplementary 2).

Data analysis

Data were analyzed using IBM SPSS Statistics version 26.0 and AMOS version 24.0. Normality was assessed using skewness and kurtosis values (-2 to + 2) with [32]. Descriptive statistics and Cronbach's alpha coefficients were calculated, and Pearson correlation analysis was used to examine associations between variables. CFA was performed separately for each scale prior to SEM. Model fit was evaluated using χ^2/df, RMSEA, CFI, TLI, GFI, AGFI, and SRMR indices. After acceptable measurement model fit was achieved, SEM was conducted to examine the predictive effect of cancer screening perception on fear of breast cancer. Structural equation modeling was preferred over traditional regression analysis because both cancer screening perception and breast cancer fear represent latent psychological constructs measured through multi-item scales. SEM enables simultaneous evaluation of the measurement model and the structural relationship while accounting for measurement error across observed indicators. Therefore, the analysis allows estimation of the association between theoretical constructs rather than observed total scores, providing a more accurate representation of the relationship between nurses' perceptions and emotional responses.

The measurement model and the structural model were evaluated sequentially. Confirmatory factor analyses were conducted to establish construct validity prior to testing the hypothesized structural relationships, and no model modifications were made based on the structural path results. This approach was adopted to minimize the risk of overfitting and to ensure that the structural relationships were tested on a theoretically supported measurement model.

Results

Sociodemographic characteristics of participants

A total of 307 nurses participated in the study. The mean age of the participants was 34.75 ± 8.70 years (range: 21–58). Of the nurses, 45.5% were married, 60.0% held a university degree, and 59.0% resided in a district. More than half of the participants lived in a nuclear family (56.8%), and 34.2% worked in intensive care units.

Regarding health-related characteristics, 60.6% reported a moderate income level, 54.2% perceived their health status as moderate, and 34.2% reported having a chronic disease. Additionally, 39.7% of participants reported smoking, 25.2% reported alcohol use, and 72.9% reported not engaging in regular exercise. Detailed sociodemographic characteristics are presented in Table 1.

Table 1
Sociodemographic characteristics of nurses (n = 307)

Variables	n	%
Age (Mean, SD)	34.75 ± 8.70 (Min:21, max:58)	
Marital Status		
Married	141	45.5
Single	140	45.2
Divorced	29	9.4
Education		
High School	80	25.8
University	186	60
Graduate	44	14.2
Place of Residence		
Province	99	31.9
District	183	59.0
Town-Village	28	9.0
Family Type		
Nuclear Family	176	56.8
Extended Family	95	30.6
Broken Family	39	12.6
Work Unit		
Emergency	78	25.2
Intensive Care	106	34.2
Service	55	17.7
Outpatient Clinic	57	18.4
Other	14	4.5
Income Status		
Good	83	26.8
Average	188	60.6
Poor	31	12.6

Variables	n	%
Health Perception		
Good	111	35.8
Moderate	168	54.2
Poor	31	10.0
Chronic Disease		
Yes	106	34.2
No	204	65.8
Tobacco Use		
Yes	123	39.7
No	187	60.3
Alcohol Use		
Yes	78	25.2
No	232	74.8
Exercise		
Yes	84	27.1
No	226	72.9

Descriptive statistics and reliability of the scales

The mean total score of the Cancer Screening Perception Scale was 94.08 ± 11.44 (range: 52–134). The internal consistency coefficient (Cronbach's alpha) of the scale was 0.718.

The mean total score of the Breast Cancer Fear Scale was 29.85 ± 5.48 (range: 8–40), with a Cronbach's alpha coefficient of 0.754. Descriptive statistics and reliability coefficients of the scales are shown in Table 2.

Table 2
Mean scores and reliability coefficients of the scales

Variables	Mean	SD	Minimum	Maximum	Cronbach's Alpha
Cancer Screening Perception Scale (CSPS)	94.08	11.44	52	134	0.718
Breast Cancer Fear Scale (BCFS)	29.85	5.48	8	40	0.754

Correlation between cancer screening perception and breast cancer fear

Pearson correlation analysis revealed a positive and statistically significant relationship between cancer screening perception and fear of breast cancer ($r = 0.190$, $p = 0.001$).

Measurement models

Confirmatory factor analysis (CFA) was conducted separately for each scale prior to testing the structural model. For the Cancer Screening Perception Scale, items with factor loadings below 0.30 were removed, and model modifications were applied based on modification indices. The final five-factor measurement model demonstrated acceptable goodness-of-fit.

For the Breast Cancer Fear Scale, CFA supported a single-factor structure following the removal of items with low factor loadings. The final measurement model demonstrated acceptable goodness-of-fit. Fit indices for both measurement models are presented in Supplementary 1 and 2.

Structural equation modeling

Structural equation modeling was performed to examine the predictive effect of cancer screening perception on fear of breast cancer. The structural model demonstrated acceptable goodness-of-fit ($\chi^2/df = 2.039$; RMSEA = 0.058; CFI = 0.890; TLI = 0.878; GFI = 0.856; AGFI = 0.829; SRMR = 0.078).

Cancer screening perception was found to be a statistically significant and positive predictor of fear of breast cancer ($\beta = 0.433$, SE = 0.196, $t = 4.120$, $p < 0.01$). The model explained 18.7% of the variance in fear of breast cancer. Structural path coefficients are presented in Table 3, and the final structural model is illustrated in Fig. 1.

Table 3 Structural path model results for the effect of cancer screening perception on breast cancer fear

Effect	Estimator (β)	SE	t	p	Result
CSPS ⟶ BCFS	0.433	0.196	4.120	***	Accept

Discussion

The present study examined the relationship between nurses' perceptions of cancer screening and their fear of breast cancer, demonstrating that higher screening perceptions were associated with higher breast cancer fear. Although the correlation was weak, structural equation modeling indicated that screening perceptions significantly predicted fear. These findings suggest that awareness and knowledge alone may not reduce emotional responses related to cancer.

Although the bivariate correlation coefficient between the variables was weak, the structural equation model produced a higher standardized path coefficient. This difference arises because SEM estimates relationships at the latent construct level and accounts for measurement error across multiple

indicators. Consequently, the structural coefficient reflects the underlying association between theoretical constructs rather than the observed score correlation. Therefore, the SEM findings should be interpreted as representing the relationship between the conceptual variables rather than the raw scale scores, and the stronger path coefficient does not indicate a statistical inconsistency but a correction for measurement error.

One possible explanation is nurses' professional exposure to illness and mortality. Nurses regularly observe cancer diagnoses, treatment complications, and patient suffering, which may increase perceived susceptibility and perceived severity of disease. According to the Health Belief Model, heightened perceptions of risk can intensify emotional reactions, including fear [33]. Thus, greater awareness of screening may simultaneously increase recognition of cancer risk and amplify anxiety rather than alleviate it.

Previous studies support the presence of substantial cancer-related fear among nurses. Yılmaz et al. [34] reported high levels of breast cancer fear among nurses and midwives, while Wu and Chen [35] showed that despite adequate knowledge, many nurses did not participate in recommended screening practices. Similarly, Ezema et al. [36] found that moderate levels of breast cancer fear were associated with lower screening utilization. These findings indicate that emotional factors may influence preventive behaviors even among healthcare professionals.

Fear may function as a double-edged factor. Moderate fear can motivate protective behavior, but excessive fear may produce avoidance or delayed action [37]. From a nursing practice perspective, this finding may have implications beyond the individual emotional experience of nurses. Patients often interpret the confidence and emotional tone of healthcare professionals as indicators of treatment necessity and safety. A nurse who communicates screening recommendations with hesitation, excessive worry, or negative expectations may unintentionally reinforce patient anxiety and reduce adherence. Conversely, emotionally regulated communication can enhance perceived benefits and self-efficacy in patients. Therefore, nurses who experience heightened fear may unintentionally communicate anxiety, uncertainty, or negative expectations during patient counseling. Because patients are sensitive to healthcare professionals' verbal and non-verbal cues, nurses' emotional responses may affect the persuasiveness and clarity of screening recommendations.

Importantly, nurses' own beliefs influence the education they provide. Secginli and Nahcivan [38] demonstrated that perceived benefits and susceptibility are strongly associated with screening behaviors, while Wu and Chen [35] reported that nurses who personally valued screening were more likely to recommend it to patients. Therefore, nurses' emotional state may indirectly influence preventive healthcare delivery.

The findings highlight that cancer prevention training should address not only knowledge but also emotional coping. Educational programs typically emphasize screening guidelines and risk factors; however, insufficient attention is given to fear management and emotional resilience. Supporting nurses'

psychological well-being may improve their confidence in counseling and enhance patient education effectiveness.

The model explained 18.7% of the variance in breast cancer fear, indicating that additional psychosocial variables such as self-efficacy, coping skills, or fatalistic beliefs may also contribute. Future studies should examine these factors and evaluate whether emotional support interventions for nurses improve counseling behavior and screening promotion.

Overall, the results suggest that nurses' cognitive understanding of screening and their emotional responses to cancer should be considered together. Integrating emotional awareness and coping strategies into in-service education may strengthen counseling quality and support preventive care practices.

Limitations

This study has several limitations. First, the cross-sectional design prevents causal interpretation of the relationship between cancer screening perception and breast cancer fear. Second, the study was conducted in a single tertiary hospital, which may limit generalizability to nurses working in different healthcare settings. Third, the use of self-reported measures may have introduced response and social desirability bias. Additionally, some items were removed during confirmatory factor analysis; however, removal was theoretically and statistically justified, and the original factor structure was largely preserved. Therefore, the findings should be interpreted as an association rather than a causal relationship. Future longitudinal studies with more diverse samples are recommended to confirm these findings.

Implications

The findings indicate that nursing education and in-service training programs should address emotional preparedness alongside screening knowledge. Training that focuses only on guidelines and risk factors may not be sufficient to ensure effective counseling. Incorporating communication skills training, reflective practice sessions, and strategies for managing cancer-related anxiety may help nurses deliver clearer and more reassuring screening recommendations. Nursing managers may consider integrating brief communication workshops in, and emotional coping modules into continuing professional development programs. Evaluating nurses' comfort and confidence in discussing cancer screening may also be useful during orientation and clinical supervision processes. Addressing both the emotional and cognitive components of screening education may strengthen counseling quality and support patient participation in preventive services.

Conclusion

This study demonstrated that greater cancer screening awareness among nurses was associated with higher fear of breast cancer, indicating that professional awareness may coexist with emotional distress.

The findings suggest that cancer screening education in nursing should be viewed not only as a knowledge-based activity but also as a communication process influenced by the emotional state of the nurse. Because nurses are key providers of screening counseling, unmanaged fear may influence the clarity, confidence, and reassuring nature of patient education. Integrating emotional awareness and communication training into nursing education and continuing professional development may improve counseling quality and strengthen preventive care delivery. Considering both cognitive and emotional dimensions of screening may help optimize the effectiveness of nurse-led patient education.

Abbreviations

SEM	Structural equation modeling
CSPS	Cancer Screening Perception Scale
BCFS	Breast Cancer Fear Scale
CFA	Confirmatory factor analysis
CMIN/df	Chi-square Minimum Discrepancy divided by Degrees of Freedom (χ^2/df)
RMSEA	Root Mean Square Error of Approximation
CFI	Comparative Fit Index
TLI	Tucker-Lewis Index
GFI	Goodness of Fit Index
AGFI	Adjusted Goodness of Fit Index
SRMR	Standardized Root Mean Square Residual
SPSS	Statistical Package for the Social Science
AMOS	Analysis of Moment Structures (IBM SPSS AMOS)

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Prior to data collection, institutional approval was obtained from the Health Science Scientific Research Ethics Committee of Ahi Evran University (Decision No: 2025-03/28) and from the Provincial Health Directorate and City Hospital Management Services Directorate of Ankara Province (20.03.2025/32) where the study was conducted. In addition, verbal and written consent was obtained from the participants in the study.

Consent for publication

Not applicable.

Availability of data and materials

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Competing interests

The authors declare no competing interests.

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Authors' contributions

AE contributed to the conception, design, and methodology; analysis and interpretation of data; original draft writing; review and editing. KŞ contributed to the conception, design, and methodology; original draft writing; review and editing; supervision; and obtaining funding, contributed to the acquisition of data.

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Figures

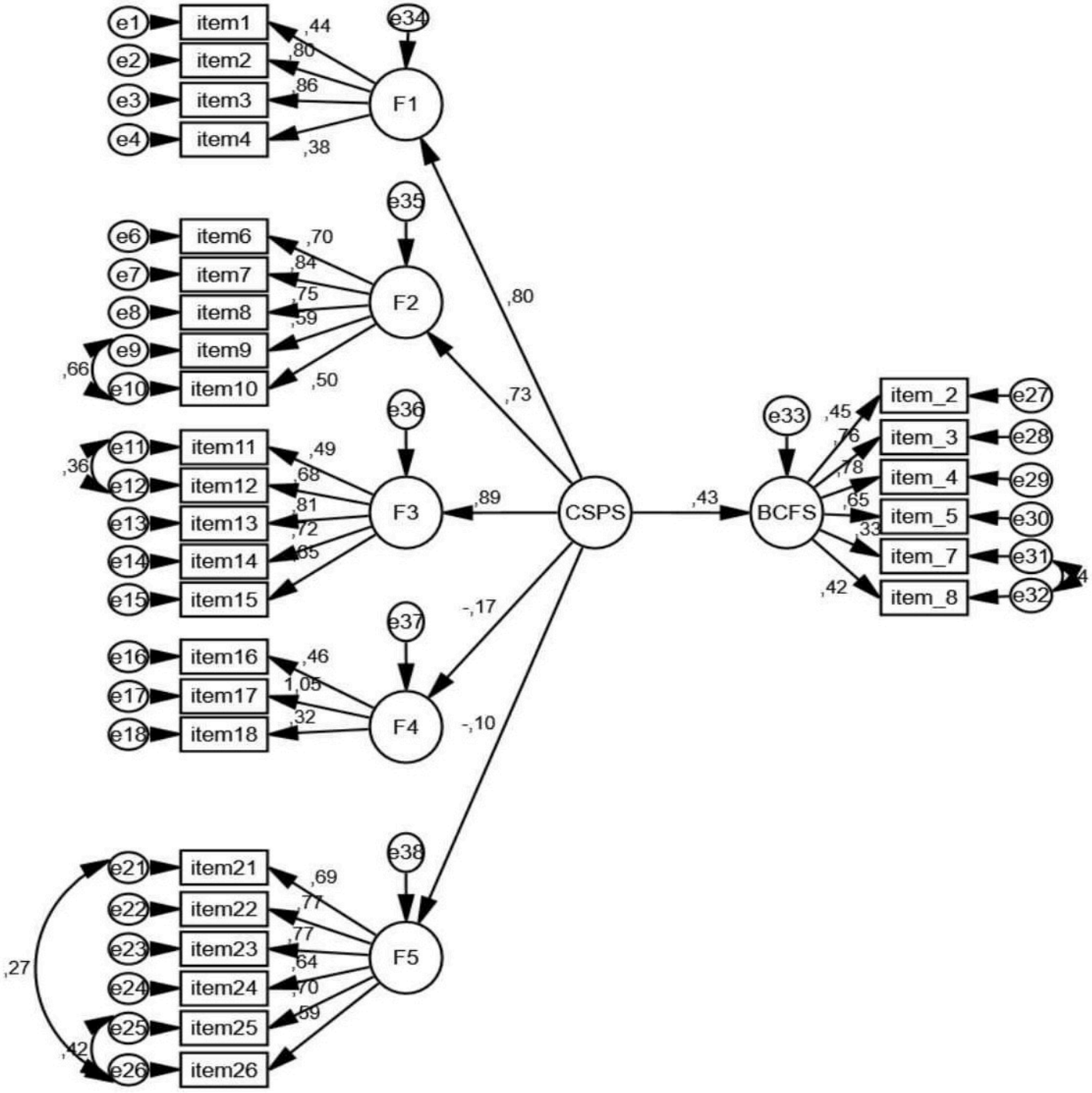


Figure 1

Structural Path Model Showing the Relationship Between Cancer Screening Perception and Breast Cancer Fear

Note: CSPS: Cancer Screening Perception Scale, BCFS: Breast Cancer Fear Scale, F1: Perceived Severity. F2: Perceived Susceptibility, F3: Perceived Benefits, F4: Perceived Barriers, F5: Cues for Action.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryMaterial.docx
- Supplementary1.jpg
- Supplementary2.jpg