

# Examining Asian Women's Motivations to Undergo Breast Cancer Screening

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## Abstract

**Purpose:** This study utilizes Protection Motivation Theory as a theoretical framework to predict women's intentions to go for mammogram screening in Singapore, a country with the highest incidence of breast cancer in Asia.

**Materials and Methods:** A questionnaire centered on the theoretical predictive model of early detection behavior was developed to examine the hypothesized relationships. Data was collected from Singaporean women between 40 to 69 years of age. The data was analyzed using hierarchical regression.

**Results:** Amongst all predictors tested, we found that Perceived Severity influences protection motivation (Beta=.346,  $p=.033$ ), whereas Perceived Vulnerability has little effect on protection motivation (Beta= .075,  $p=.355$ ). There is also a significant relationship between Self-Efficacy and protection intention (Beta= .373,  $p<.001$ ). However, contrary to expectations, neither Response Cost (Beta=.136,  $p=.101$ ) nor Physical Cost (Beta=-.051,  $p=-.036$ ) was related to protection intention.

**Conclusions:** Our findings indicate that coping appraisal variables are more significantly associated with protection motivation than threat appraisal variables. In particular, self-efficacy was found to be the strongest predictor of breast cancer screening intentions, whereas response cost and physical cost were found to have little effect. This implies that breast cancer screening motivators should communicate the ease of undergoing the procedure and other confidence building messages. Implications for health education and policy are discussed.

**Keywords:** Breast; Cancer; Screening; Self-efficacy; Coping appraisal; Health education; Communication

## Introduction

Breast cancer is currently the most common malignancy among women in both developed and developing regions of the world. Although the incidence of breast cancer is higher in developed countries, the majority of mortalities occur in low-income areas where many cases are diagnosed at late stages [1]. Breast cancer has also become an increasing burden in Asian countries, although it has typically been perceived as a "Western" disease. More seriously, the rate of breast cancer in Asian women below the age of 40 is higher than in Western women of the same age [2].

Singapore has the highest Age-Standardized Rate (ASR) of breast cancer in Asia [3]. Although the ASR of breast cancer in Singapore is still lower than in the USA, Europe or Australasia, Singapore experienced a three-fold increase in the incidence of breast cancer between 1968 and 2002 [4,5]. Additionally, the incidence of female breast cancer has been steadily increasing in the last decade, from 54.9 per 100,000 in 1998-2002 to 60.0 per 100,000 in 2005-2009 and breast cancer remains the most common cancer among Singaporean females [6]. In women below 50 all three major ethnic groups (Chinese, Malay, and Indian) are equally affected [7]. However, it is noteworthy that there are differences in the ASRs of the three ethnic groups for women over 50. Indians living in Singapore have the highest breast cancer rate, and the ASR is the lowest among Malays [5].

It is important for women to undergo screening, so that breast cancer can be detected at an early stage. The seriousness of the disease is strongly influenced by the stage at which it is detected; breast cancer produces few symptoms when it is most treatable [8,9]. There are three generally recommended early detection methods: mammography screening, Clinical Breast Examination (CBE), and Breast Self-Examination (BSE). Of these methods, mammography screening has been proven to decrease cancer mortality from 30% to 20% in women over 50 in developed countries [1]. Statistics also indicate that breast

cancer screening can improve survival in an Asian population as well as in Western countries [10].

Unfortunately, due to existing cultural and social barriers, Asian women tend to present breast cancer at later stages than their Western counterparts [2]. For instance, it has been found that the awareness of mammography is lower among Singaporean women in the 60-69 age group than among younger women in the 50-59 age group. In addition, according to the National Health Survey of Singapore, many Singaporean women believe that mammograms are not necessary for healthy females [11,12]. To address the rising incidence of breast cancer and to reduce breast cancer mortality in Singapore, a national government-subsidized breast screening project (BreastScreen Singapore) was launched in 2002 to encourage women between 50 and 69 to go for screening once every two years. The program sends invitation letters every two years to women in this age group. One of its primary achievements has been correcting the misunderstanding that mammography is less effective for Asian patients than for Western patients. More importantly, this program successfully facilitates early detection with a high portion of DCIS, which could be absolutely cured [10]. However, Jara-Lazaro and his colleagues noted that despite the ready availability of subsidized mammographic screening, a significant number of women in Singapore do not undertake breast screening [10].

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Previous studies on mammography show that various factors are associated with the maintenance of breast cancer screening, including recommendations from a physician, knowledge perception, and other motivational incentives [13-15]. Hence, it is inadequate to promote early screening frequency by merely eliminating financial restraints and device shortage, as personal beliefs and experiences can also influence willingness to be tested [16,17]. Although there are local studies focusing on the medical aspects of breast cancer, there currently are no available studies researching awareness and behavioral responses toward breast screening. To fill in the research gaps, this study will investigate women's perceptions of breast cancer and screening behavior in Singapore, adopting a Protection Motivation Theory as the theoretical framework to predict women's mammogram screening intentions.

### Protection motivation theory (PMT)

Protection motivation theory (PMT) was first proposed by Rogers to analyze the effects of fear appeal on both attitude and behavior changes and later modified it to a more general theory of persuasive motivation that emphasized the cognitive processes mediating behavioral change [18,19]. Protection motivation theory postulates that two cognitive processes, threat appraisal and coping appraisal, will influence a person's motivation to adopt regular healthy behavior [20]. Threat appraisal is comprised of factors that influence the evaluation of danger, including perceived severity and perceived vulnerability. Coping appraisal is an individual's perceived ability to cope with threat, and includes self-efficacy, response efficacy, and response cost [19].

Protection motivation theory has been broadly used to analyze women's behavioral intentions toward breast cancer among different social groups, such as breast cancer survivors and mothers with younger daughters [21-24]. It is notable that Neuberger and his colleagues provide a novel insight by employing protection motivation theory to predict mothers' concerns about their daughters' breast cancer risks [23]. More recently, a study by McGinty, Goldenberg, and Jacobsen indicates that the combination of high threat appraisal and low coping appraisal is significantly related to the fear of recurrence among breast cancer survivors [25]. Specifically, perceived vulnerability to recurrence tends to be more influential in the interaction than perceived severity among breast cancer survivors. There are also a large number of studies that use threat appraisal and coping appraisal to explain why some women ignore early breast cancer screening.

Previous studies have explored a wide variety of factors connected to women's perceived efficacy in dealing with breast cancer. The self-efficacy variable is related to a woman's self-perception that she is important to others or that she cannot depend on others. However, women's responsibilities within the family can conflict with self-care and limit early screening [26,27]. Second, breast cancer screening is associated with inconveniences, such as physical discomfort, lack of regular places of care, and the gender of healthcare professionals [16,27,28]. Furthermore, there is a disagreement between knowledge level and perceived efficacy. It was pointed out that demographic variables, which can be linked to screening decisions, are often mediated through psychosocial variables. A higher income earner may be more educated and therefore could be more knowledgeable about risks [29]. Although a study suggests that older women with more education are more motivated to undergo breast cancer screening, Helmes finds that the greater a woman's knowledge, the less intention she has of undergoing screening [30,31]. A study also indicates that an individual's beliefs about the cause of the disease affect how the person understands relevant clinical information and may lead to

misunderstandings about the nature of testing [17]. One stream of breast cancer screening research has examined the effect of fear appeal on breast cancer screening. Fear without efficacy is predicted to arouse prevention behavior in Smith and his colleague's study, while another study shows that fear of detecting cancer is the most common deterrent to screening [27,32].

### Early screening decisions as social behavior

Some social factors have been addressed to be influential on women's early screening intentions. First, family history and family relationships play a determinant role in the perception of severity. Women with a family history of breast cancer are more likely to respond to an invitation for a mammogram that mentioned their personal risk than one that addressed the risk in general [29]. Even though a family history of breast cancer is not associated with individual woman's intentions to seek and share health information, having a daughter apparently enhances their awareness of breast cancer risks. Nevertheless, mothers with younger daughters appear to be more concerned about the severity of breast cancer than risk reduction strategies. Additionally, they often judge breast cancer risks as less important than other health issues for their daughters [23,24]. A longitudinal study of predictors of health-related behavior in middle-aged Swedish women shows that among women whose children are leaving home, the transitional period provides women with time and space for "self-care" or for care giving for aging parents [33]. Second, choice and personal responsibility for health have social dimensions that are critical to understanding the decision to opt for screening. A study captures the ideas and social meanings of breast cancer screening for a group of women who were not specifically invited to participate—they made the 'choice' to do so [34]. Third, direct experiences in breast cancer activities, including knowing someone diagnosed with breast cancer, and wearing a pink ribbon, will effectively reinforce the perceived severity of breast cancer, especially for youth [35]. Previous studies of health messages also suggest that the most effective factual statement for arousing women's perceived vulnerability is presenting the high rates of breast cancer, which directly engages each individual [26].

Several recent studies focus on providing opportunities to improve perceived efficacy within a cultural framework. Rippetoe and Rogers suggest that coping strategies adopted in high efficacy conditions will increase adaptive responses, whereas coping strategies in low efficacy conditions will strengthen feelings of fatalism, religious faith, and hopelessness [20]. Other recent studies prove that some cultural beliefs and fatalism will reduce women's response efficacy in early breast cancer screening. Compared to Western women, Chinese women tend to seek fewer healthcare services. Chinese women living in Washington, D.C. emphasize self-care (e.g., regular exercise and healthy diet) rather than the healthcare system as the way to enhance personal and family health [36]. Additionally, cultural groups that prefer traditional healing methods will not prioritize modern biomedicine [37]. Statistics suggest that women who are convinced that breast cancer is curable if the disease is diagnosed early prefer mammography. A sense of fatalism will lead to a lack of interest in early detection as these women believe early diagnosis is a waste of time [28,36]. Furthermore, South Asian women may perceive breast cancer as both affecting mainly Western women and as a terminal disease—serious and almost always fatal [38]. Hubbell et al. argue that cultural beliefs about risk factors may have prevented Latina immigrants from obtaining pap smears. In such cases, healthcare systems will not be reached by specific groups [39].

It is apparent that the variables in protection motivation theory play

distinctive roles in different areas of breast cancer research. However, few studies have investigated the motivators of early breast cancer screening practices within the protection motivation framework. It has been suggested that PMT is an appropriate model to describe factors influencing women with low to moderate risks to obtain breast screening, as protection motivation is aroused by fear [31]. However, to our knowledge, no study has investigated this correlation in an Asian context. This study examines women's intention to undergo early breast cancer screening using a conceptual framework based on PMT that considers individuals' cognitive and coping processes (Figure 1).

The relationships among perceived severity, perceived vulnerability, response efficacy, self-efficacy, response cost, and protection motivation are hypothesized as follows:

- H1: Perceived severity positively influences protection motivation.
- H2: Perceived vulnerability is positively associated with protection motivation.
- H3: Self-efficacy positively influences protection motivation.
- H4: Response efficacy positively influences protection motivation.
- H5: Response cost negatively influences protection motivation.

## Materials and Methods

### Measures

To examine the hypothesized interaction effects, a detailed questionnaire with six question constructs was designed based on 7-point Likert scales ranging from 1 (*strongly agree*) to 7 (*strongly disagree*).

The first construct *Perceived Severity (SEV)* was assessed with a total of four items (e.g., breast cancer is a serious condition). A higher score indicated that the respondent assumes breast cancer is more severe. Similarly, *Perceived Vulnerability (VUL)* was tested with five items and a higher score indicated a higher perceived vulnerability to breast cancer. Two sets of five items were used to measure *Response Efficacy*

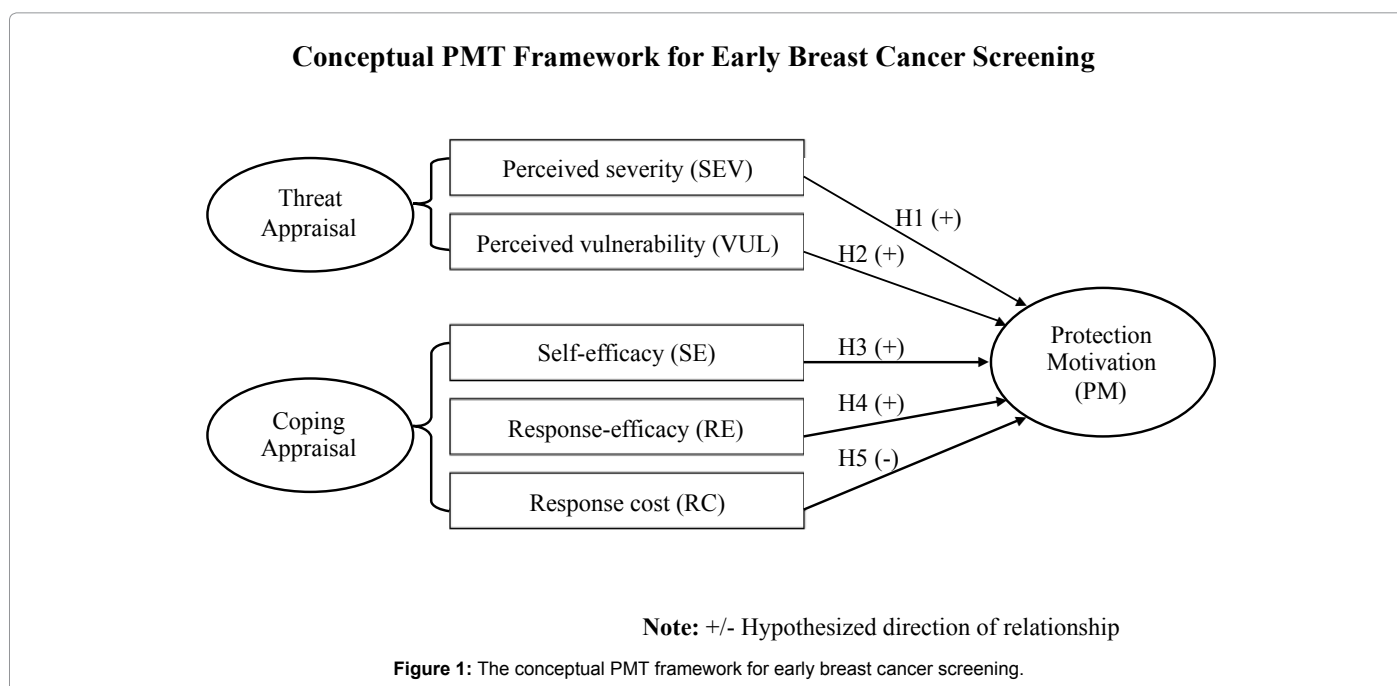
(*RE*) and *Self-Efficacy (SE)* separately, with a higher score indicating a higher level of response efficacy or self-efficacy. In addition, we adopted a six-item scale to test the perception of *Response Cost (RC)*. A higher score indicated that the respondent thought she needed to invest more to undergo breast cancer screening. Finally, *Protection Motivation (PM)* was investigated with a four-item measure. The higher the overall score, the higher the level of protection motivation.

### Sample

We sent out invitations to a number of women's groups and clubs, asking them to disseminate the questionnaires to Singaporean women between 40 and 69. The secular community groups/clubs were selected as they fit the target age profile and involve cross sectional representation of older females in Singapore. Overall, 132 responses were obtained. After questionnaires with incomplete answers or missing data, and respondents who did not fall in the age band were removed, 106 responses remained. The sample was generally reflective of the racial profile of the local Singapore population, with 67% Chinese, 16% Indian, 13.2% Malay and 3.8% other races. Exploratory factor analyses, item reliability, and variable correlations were used to refine each construct and to determine the most suitable items for the final questionnaire. Items that performed poorly due to (1) low factor loadings, (2) loadings on multiple components, or (3) low reliability were removed.

### Results

We conducted an exploratory factor analysis to test unidimensionality by inputting all items into a principal component analysis with a varimax rotation. The rotated factor matrix revealed seven groups. All constructs except for *Response Cost* were grouped into one factor. For *Response Cost*, the six items were classified into two factors. Therefore, we used these items to define two separate constructs; *Response Cost* and *Physical Cost* (Table 1). The reliability analysis of each construct was then used to examine the item-total reliability. As a result, SEV 4 in the construct of *Perceived Severity*, VUL 3 in the construct of *Perceived Vulnerability*, SE 5 in the construct



Constructs	Item Coding	Item Descriptions	Factor Loading	alpha
Severity	SEV 1	Breast cancer is a serious condition.	0.705	.639
	SEV 2	Late detection of breast cancer increases the possibility of it being found at an advanced stage, which can reduce the survival rate.	0.761	
	SEV 3	An advanced stage of breast cancer increases the risk of death and losing your breasts.	0.826	
Vulnerability	VUL 1	The chance of me being diagnosed with breast cancer is high.	0.796	.787
	VUL 2	It is possible that I will get breast cancer in the future.	0.846	
	VUL 4	The older I am, the higher the risk of developing breast cancer.	0.651	
	VUL 5	It is possible that I have breast cancer even if I do not feel any lumps in my breasts.	0.694	
Response Efficacy	RE 1	Regular mammography screening will provide me with reassurance about my breasts health.	0.765	.877
	RE 2	Going for regular mammography screening could save my breasts and life.	0.840	
	RE 3	Early detection of breast cancer increases the likelihood of successful treatment.	0.686	
	RE 4	Breast self-examination could help detect the existence of breast cancer early.	0.647	
	RE 5	Regular mammography screening is effective in detecting breast cancer at an early stage.	0.778	
Self-Efficacy	SE 1	I am confident of my ability to go for regular mammography screening.	0.572	.889
	SE 2	It is easy for me to go for regular mammography screening.	0.618	
	SE 3	I am confident of my ability to practice breast self-examination.	0.526	
	SE 4	It is easy for me to practice breast self-examination.	0.522	
Response Cost	RC 1	It is time consuming for me to go for regular mammography screening.	0.848	.830
	RC 2	It is expensive for me to go for regular mammography screening.	0.748	
	RC 3	It is not convenient for me to go for regular mammography screening.	0.744	
Physical Cost	PC 1	I feel uncomfortable going for mammography screening.	0.701	.822
	PC 2	I find that mammography screening is painful.	0.847	
	PC 3	I am worried about the radiation effect of mammography screening.	0.782	
Protection Motivation	PM 2	I intend to practice breast self-examination once a month.	0.734	.750
	PM 3	I intend to find out more about how I can avoid breast cancer.	0.700	
	PM 4	I intend to exercise regularly and consume a low fat and low meat diet to reduce the risk of developing breast cancer.	0.624	

Table 1: Construct loadings and internal reliability.

of *Self-Efficacy*, and PM 1 in the construct of *Protection Motivation* were eliminated because higher alpha scores could be achieved after removing them from their constructs. The alpha score of *Perceived Severity* was improved to .639 after deleting SEV 4. The item-total correlation of *Perceived Vulnerability* ascended to .787 when VUL 3 was removed. The elimination of SE 5 and PM 1 helped enhance the reliability of their respective constructs to .889 and .750 (Table 1). The Cronbach's alpha scores for all constructs indicated acceptable or goal levels of reliability, and hence, the items for each construct were averaged to obtain the composite measure score. We also performed a correlation analysis among all of the constructs.

## Regression Analysis

To investigate the effects of threat and coping variables on breast cancer early screening intentions, we adopted multiple linear regression analysis. *Protection Motivation* was the dependent variable, whereas *Perceived Severity*, *Perceived Vulnerability*, *Response Efficacy*, *Self-Efficacy*, *Response Cost*, and *Physical Cost* were input into the regression model as dependent variables. The model explained 45.5% of the variance ( $p < .001$ ) in breast cancer screening. Among these predictors, *Perceived Severity* influenced protection motivation (Beta= .346,  $p = .033$ ), whereas *Perceived Vulnerability* had little effect on protection motivation (Beta= .075,  $p = .355$ ). There was a significant relationship between *Response Efficacy*, and *Self-Efficacy* and *Protection Motivation* (Table 2), especially *Self-Efficacy* (Beta= .373,  $p < .001$ ). Therefore, protection motivation was enhanced by a higher coping appraisal. However, protection motivation was related to neither *Response Cost* nor *Physical Cost* (Table 2). We also included *Educational Background* as a dependent variable to predict protection motivation, but it was not a significant predictor of protection motivation (R square= .025,  $p = .102$ ).

Finally, we took into account the influence of age on protective intentions by entering this variable in Block 1 and imputing six other constructs (*Perceived Severity*, *Perceived Vulnerability*, *Response Efficacy*, *Self Efficacy*, *Response Cost* and *Physical Cost*) in the second block for regression analysis (Table 3). Although older women are confronted with higher risks, the result showed that age had little added positive influence (Beta= .085,  $p = .387$ ) on intentions. With the variation in age, the protection motivation experienced only slight enhancement (Table 3).

## Conclusions

In this study, we demonstrate that threat appraisal and coping appraisal together are significantly and positively associated with protection motivation toward the adoption of early breast cancer screening. The research finding suggests that the PMT is an appropriate framework in the breast cancer screening context. There are several noteworthy findings regarding individual variables. First, of the six theoretically grounded variables, *Self Efficacy* and *Response Efficacy* are the most significant predictors of preventive intentions, whereas threat appraisal and costs have little influence on women's intentions to go for early breast cancer screening. Second, *Self Efficacy* is the most significant predictor and is more strongly predictive of screening intentions than *Response Efficacy*. That is, Singaporean females' confidence in their personal ability to undertake regular mammography screening is an efficient predictor of screening intention as are the perceived medical benefits of early breast cancer detection. This finding is similar to those from other applied PMT studies that demonstrate the importance of self-efficacy in predicting protective motivation in other health contexts such as adolescents' myopia prevention [40]. Hence, it is important for health authorities to work towards achieving greater self-efficacy among the target population, when promoting breast cancer screening.



	Protection Motivation		
	B (Sig.)	Std. Error	Beta
Perceived Severity	.346*	.160	.168
Perceived Vulnerability	.075	.081	.075
Response Efficacy	.348*	.142	.250
Self-Efficacy	.373***	.098	.399
Response Cost	.101	.070	.136
Physical Cost	-.036	.066	-.051
R Square	.455***		

Note. Significance indicated by: \*p < .05; \*\*p < .01; \*\*\*p < .001

**Table 2:** Hierarchical regression results 1.

	Protection Motivation		
	B (Sig.)	Std. Error	Beta
Block 1			
Age	.146	.168	.085
Block R2	.007		
Block 2			
Age	.164	.130	.095
Perceived Severity	.339*	.159	.165
Perceived Vulnerability	.071	.080	.071
Response Efficacy	.332*	.142	.240
Self-Efficacy	.391***	.099	.418
Response Cost	.115	.071	.155
Physical Cost	-.034	.066	-.048
Block R2	.456***		
Total R2	.463***		

Note. Significance indicated by: \*p < .05; \*\*p < .01; \*\*\*p < .001

**Table 3:** Hierarchical regression results 2.

This can be emphasized through a variety of initiatives such as positive message framing highlighting the relative ease of undergoing breast cancer screening, empowering women to select screening times/place of convenience and providing ease of payment through a variety of options. Likewise, response efficacy is found to also influence screening intentions, implying that health education messages need to clearly demonstrate the tangible benefits of screening.

The hypothesis that higher costs will result in lower protection intention is not supported; neither *Response Cost* nor *Physical Cost* are associated with protection motivation in our study. Our findings imply that Singapore women do not regard costs, transportation problems or physical discomfort as impediments to breast cancer screening. The effect of these external factors might be weakened in Singapore due to the convenient transportation system and well-established clinical system. These findings might be unique to developed cities like Singapore. It is suggested that further PMT studies should be conducted in other Asian regions, including less affluent countries (e.g., Cambodia), where women are confronted with more costly healthcare that poses a substantial economic burden.

In spite of the increasing incidence of breast cancer in Singapore, perceived vulnerability is also found *not* to drive females' intentions to go for early breast cancer screening. Likewise, age is not a major predictor of protective intentions in our study, although older women in general are known to face higher health risks. One possible reason for this condition and the low perception of vulnerability may be the lack of knowledge about breast cancer. Additionally, Asians' misperception that breast cancer is a "Western" disease might also reinforce the lack of perceived vulnerability. However, perceived severity of breast cancer was found to drive screening intentions. Thus in the current state, messages focusing on breast cancer as a major health threat coupled

with both benefits and ease of screening are likely to be much more effective than those focusing on how vulnerable local women are to the disease. Some evidence based messaging to enhance perceived severity include those that utilize fear appeals to arouse the health threat. It would be appropriate for educators and policy makers trying to encourage breast cancer screening to couple messages enhancing perceived levels of threat while at the same time providing information to enhance coping confidence.

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