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Health beliefs, health locus of control, and women's mammography behavior

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Research has shown that routine mammography screening can significantly reduce mortality from breast cancer. The use of mammography screening, however, remains well below national goals. In an effort to understand the factors that influence women's mammography behaviors, this study explored the relation between health beliefs, locus of control, and women's mammography practice. Survey instruments used were Champion's health belief scales and the Multidimensional Health Locus of Control (MHLC) scales. The study used a convenience sample of 25 African Americans and 72 white women ages 35 to 84. Findings showed that women who participated in mammography screening were significantly more likely to perceive greater benefits, greater health motivation, and fewer barriers to screening than those who did not participate. These same three variables were similarly associated with greater frequency of receiving mammograms. It also was found that perceived benefits and health motivation were significantly correlated with shorter duration of time since the last mammogram. No support was found for perceived susceptibility, perceived seriousness, and health locus of control as predictors of women's mammography behavior. Implications for nursing research in further examining the MHLC and the Health Belief Model construct of susceptibility as they relate to mammography behavior are identified. Practice implications for nurses are suggested.

Key Words: Health beliefs—Locus of control—Mammography screening.

The American Cancer Society projects 180,200 new cases of invasive breast cancer for American women in 1997, along with 43,900 deaths from this disease (1). For women in the United States, this corresponds to a lifetime risk of one in eight women developing breast cancer, which is second only to lung cancer as the leading cause of cancer deaths among American women (1). Unlike lung cancer, no methods of preventing breast cancer are currently known. However, morbidity and mortality from breast cancer can be reduced through early detection and treatment. Silverstein (2) described the development and acceptance of mammography screening as having "the

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most profound impact" in the field of breast cancer in the last 15 years. Mammography is further characterized as a test capable of dramatically reducing mortality associated with breast cancer.

Despite its life-saving potential, mammography remains underused. A goal of Healthy People 2000 is to increase the proportion of women age 50 and older who have received a mammogram in the preceding 1 to 2 years to at least 60%. However, this goal has not been met (3). Only half of the women in this age group have met this goal, with minorities still underrepresented (3). Furthermore, even when physicians recommend a mammogram to women, more than one-third do not follow through with the actual screening (4,5). To decrease cancer mortality through early detection, nurses must broaden their understanding of the factors that influence women's mammography behavior. Then nurses can be more effective in developing interventions that will facilitate a woman's choice to undergo mammography screening.

HEALTH BELIEF MODEL

The Health Belief Model (HBM) postulates that if individuals are to take disease prevention measures, they must feel susceptible to the disease, believe that occurrence of the disease would have a serious impact on life, and judge that preventive measures are beneficial, outweighing any barriers involved in taking such measures. Furthermore, individuals must believe that disease may exist in the absence of symptoms (6). The construct of motivation, or the intent to engage in health promotion activities, is also included in the HBM (7). The constructs of the HBM have shown some success in predicting mammography screening behavior (9–12).

Some studies have found positive correlations between participation in screening mammography and the HBM constructs of perceived susceptibility, perceived seriousness, perceived benefits of screening, and health motivation (8–11). Negative correlation between perceived benefits and compliance with mammography screening also have been found (12). Negative relation have been found between mammography screening and perceived barriers to participation (9,11–13). However, greater perceived barriers also have been related to compliance with mammography screening (14). Other studies have not found perceived susceptibility to be a significant predictor of compliance with screening (12).

Perceived severity appears to be the weakest predictor of the HBM constructs, perhaps because virtually all women consider cancer a serious condition (15,16). As a result, this construct often has been omitted in studies using the HBM (13). Thus, whereas the constructs of the HBM show potential as a framework to guide Advanced Practice Nurse (APN) interventions that promote mammography screening, further research is needed to use this model effectively as a framework to guide APN practice.

HEALTH LOCUS OF CONTROL

Another framework, health locus of control, has been used to examine health behaviors. Early in life, perceptions about the cause of health outcomes develop. People come to expect that health outcomes are the result of either their own actions (internal locus of control) or the actions of others (external locus of control) (17). Several researchers have studied the relation between health locus of control and women's cancer screening behaviors of breast self-examination (17–19). These studies have yielded mixed results regarding the relation of health locus of control to women's screening practices of breast self-examination.

Furthermore, whereas there is only minimal investigation of health locus of control in relation to screening mammography, findings have suggested that health locus of control may be a predictor of the intent to undergo mammography screening (20). Because the research in this area is scarce, this framework needs further investigation concerning its ability to predict mammography behavior.

PURPOSE

The purpose of this research was to discover how health beliefs and health locus of control are related to women's mammography screening practices.

VARIABLES

The dependent variables in this study were (a) ever having received a mammogram, (b) time since the last mammogram, and (c) frequency of mammograms. Because of the confusion and controversy about compliance guidelines, these variables were chosen as a measure of mammography practice.

The independent variables were the constructs of the HBM, perceived seriousness, susceptibility, barriers and benefits, and health motivation related to constructs of internal and external locus of control.

HYPOTHESES

Perceived benefits, seriousness, susceptibility, and health motivation will be higher among women who engage in regular mammography screening.

Perceived barriers will be lower among women who engage in regular mammography screening.

Internal locus of control will have a positive relation to regular mammography screening.

External locus of control (chance and powerful other) will have a negative relation to regular mammography screening.

METHODOLOGY

A total of 150 surveys were distributed to a convenience sample of women recruited at local community meetings, through word of mouth, and in response to the local community advertisements requesting women's participation. Volunteers were given the packet to fill out at their convenience. Each survey packet consisted of a cover letter, a demographic information questionnaire, the HBM and Multidimensional Health Locus of Control (MHLC) instruments, and a return envelope addressed to the researcher. The surveys were then returned in the sealed envelope. For the purpose of anonymity, no identifying information was asked.

Instrumentation

Health Belief Model constructs of perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and motivation were measured with a tool developed by Champion (10). Content and construct validity as well as internal consistency reliabilities of these scales have been established (10). The Health Belief Model instrument contains 31 Likert scale items, with a choice of five responses ranging from 1 (strongly disagree) to 5 (strong agree). Each item has a maximum score of five. Scores for each construct were calculated separately, with higher scores indicating stronger feelings related to that construct.

Health locus of control was measured by the MHLC scales (21). This instrument was designed to measure the subscales of Internal Health Locus of Control (IHLC), Chance Health Locus of Control (CHLC), and Powerful Other Locus of Control (POLC) as determinants of health outcomes. Responses were recorded using a six-point Lickert scale ranging from 1 (strongly disagree) to 6 (strongly agree).

Each of the three subscales consisted of six items. Each subscale was scored separately and had a maximum possible score of 36. A higher score in a subscale indicated a stronger orientation toward that dimension. Measurement of IHLC included items such as "I am in control of my health." An item used to measure PHLC was "Health professionals control my health." Finally, items used to assess CHLC included "Most things that affect my health happen to me by accident."

Alpha reliabilities indicating the internal consistency of the MHLC ranged from 0.673 to 0.767. A test of predictive validity found that health status correlated positively with internal health locus of control (r = 0.403, $p < 0.001$) and negatively with chance health locus of control ($r = 0.275$, $p < 0.01$). Health status was not correlated with powerful other health locus of control ($r = 0.055$) (21).

Protection of Human Subjects

This study was approved by the appropriate institutional review board. A cover letter informed subjects of the time commitment required as well as potential risks and benefits of participation. Participation in the study was totally voluntary, and no identifying information was elicited. Only group data were reported.

RESULTS

The sample consisted of 97 women whose average age was 53 years (range 35 to 84 years), the majority of whom were married (72.6%), white (74.,2%), and protestant (82.5%). Almost three-fourths of the women were employed in managerial or technical occupations, and 66% exceeded high school education level (Table 1).

The entire sample was divided into two groups based on their history of obtaining mammograms. Sixty-five women (68.2%) in the sample reported having had a mammogram, and 31 (32.3%) reported never having had a mammogram. In this sample, the women's mammography behavior appear consistent with the goals of Healthy People 2000 (3). The average age of women who had undergone mammography (54 years) was not significantly different from the average age of those who had not (51.8 years). Also, the age range of women who had undergone mammography (36 to 75 years) was similar to that of those who had not (35 to 84 years).

The demographic statistics of the two groups were compared. Table 2 depicts a comparison of the two groups on all the demographic variables. The two groups differed significantly on their income ($X^2[4] = 21.34$, $p < 0.001$), marital status ($X^2[4] = 13.80$, $p < 0.008$), education ($X^2 = 18.80$, $p < 0.009$), and choice of occupation ($X^2[4] = 17.39$, $p < 0.002$). In general, the participants who had obtained mammograms had more education, higher income, and a greater likelihood of being employed in a managerial or professional position and of being married. No differences between the two groups were observed for age, race, and religion.

The MHLC scales measure three factors related to health locus of control: degree of internal locus of control, belief in powerful others, and belief in chance. Table

TABLE 1. *Sociodemographic characteristics of the sample*

Variable	Frequency	Percentage
Age ($n = 97$)		
Mean	53.3	
Standard deviation	10.3	
Minimum	35.0	
Maximum	84.0	
Race		
African American	25	25.8
White	72	74.2
Education		
Less than high school	5	5.2
High school	28	28.9
Some college	34	35.1
Associate degree	12	12.4
Bachelor's degree	9	9.3
Master's degree	2	2.1
Doctoral degree	1	1.0
Other	6	6.2
Marital status*		
Single	6	6.3
Married	69	72.6
Divorced	9	9.5
Widowed	11	11.6
Income*		
$10,000–$19,000	21	21.9
$20,000–$29,000	17	17.7
$30,000–$39,000	16	16.7
$40,000–$49,000	16	16.7
$50,000 and up	26	27.1
Religion		
Catholic	9	9.3
Protestant	80	82.5
None	1	1.0
Other	7	7.2
Family history of breast cancer*		
Yes	14	14.9
No	80	85.1
Personal history of fibrocystic disease*		
Yes	24	25.0
No	72	75.0

**Note:* All frequencies may not add up to 97 because one or more participants did not respond to this item.

3 portrays the means, standard deviations, and correlations for these scales.

Five scales were measured related to the HBM: perceived susceptibility, seriousness, benefits, barriers, and health motivation. Table 4 shows the means, standard deviations and correlations for these scales.

To determine if there was a relation between obtaining a mammogram and the various scales, separate t tests were performed. Each t test compared mammogram status (obtained versus never obtained), on each of the dependent variables.

Significant differences between the mammogram and no mammogram groups were observed for the HBM benefits scale ($t[94] = 2.16$, $p < 0.033$), the HBM barriers scale ($t[94] = 3.83$, $p < 0.001$), and the HBM motivation scale ($t[94] = 1.99$, $p < 0.050$). Overall, women in the mammogram group had higher scores on the benefits and motivation scales and a lower score on the barriers scale. No other significant differences were found between the two groups on these variables. No significant difference was observed between the mammogram and no mammogram groups on the MHLC scales. Table 5 displays the means, standard deviations and t statistics for all of the primary dependent variables.

To determine if there were relations between frequency of mammography screening, time since last screening, and scales from the HBM and MHLC, Spearman's correlation coefficients were calculated and tested. (Table 6) Significant positive correlations were observed between frequency of mammograms and both the HBM benefits scale ($\rho = 0.225$, $p < 0.05$) and the HBM motivation scale ($\rho = 0.386$, $p < 0.01$). These significant positive correlations indicate that increases in frequency of obtaining mammograms are associated with increases in the benefits and motivation scales. A significant negative correlation was found between frequency of mammograms and the HBM barriers scale ($\rho = 0.204$, $p < 0.05$), indicating that higher scores on the barriers scale are associated with decreased frequency of mammography screening.

Significant negative correlations were observed between the time since the last mammogram and both the HBM benefits scale ($\rho = -0.257$, $p < 0.05$) and the HBM motivation scale ($\rho = 0.260$, $p < 0.05$). These significant negative correlations indicate that increases in the benefits and motivation scales are associated with shorter durations since the respondent's last mammogram.

When the results of this study are considered, the following limitations must be kept in mind. The study sample recruited via advertisement was one of convenience. Therefore, these women may have been more motivated and interested in their health than women in the general population. Only African Americans and whites were represented in the sample, which also limits generalizibility of the findings.

DISCUSSION

Findings from this study provide partial support for the HBM and no support for health locus of control as related to women's mammography behavior. Participants who had received mammograms perceived fewer barriers, recognized more benefits, and had more motivation than those who had not received mammograms. Furthermore, these same variables were significant when frequency of obtaining mammograms was examined. Increased frequency of obtaining mammograms corre-

TABLE 2. *Demographic variables by mammography status*

	Mammogram group		No mammogram group	
Variable	Frequency	Percentage	Frequency	Percentage
Age (years)				
Mean	54.0		51.8	
Standard deviation	8.5		13.5	
Minimum	36.0		35.0	
Maximum	75.0		84.0	
Race*				
African American	14	21.5	11	35.5
White	51	78.5	20	64.5
Education*				
Less than high school	0	0.0	5	16.1
High school	15	23.1	13	41.9
Some college	25	38.5	9	29.0
Associate degree	10	15.4	1	3.2
Bachelor's degree	7	10.8	2	6.5
Master's degree	2	3.1	0	0.0
Doctoral degree	1	1.5	0	0.0
Other	5	7.7	1	3.2
Marital Status*				
Single	2	3.1	4	13.8
Married	53	81.5	15	51.7
Divorced	5	7.7	4	13.8
Widowed	5	7.7	6	20.7
Income*				
$10,000–$19,000	6	9.2	15	48.4
$20,000–$29,000	11	16.9	6	19.4
$30,000–$39,000	13	20.0	3	9.7
$40,000–$49,000	11	16.9	4	12.9
$50,000 and up	23	35.4	3	9.7
Religion*				
Catholic	7	10.8	2	6.5
Protestant	51	78.5	28	90.3
None	1	1.5	0	0.0
Other	6	9.2	1	3.2

**Note:* All frequencies may not add up to 97 because one or more participants did not respond to this item.

lated with greater scores for benefits and motivation along with lower scores for barriers. Time since the last mammogram showed significant negative correlations with benefits and motivation scales, indicating that higher scores for benefits and motivation were associated with shorter durations since the last mammogram.

As expected, women in this study who reported having mammograms identified significantly fewer barriers than those who did not. This negative correlation between mammography and perceived barriers is consistent with the findings by most others (11–13,22). One exception is the work by Hyman et al. (14), who found that compliers with mammography identified greater perceived barriers than noncompliers. It may be that even when perceived barriers are high, these can be overcome if benefits outweigh the barriers.

Barriers to mammography screening identified in the literature include inconvenience, worry, embarrassment, fear of radiation or pain, belief that mammography is unnecessary in the absence of symptoms, and lacking knowledge of recommended guidelines (23). Also, the fear of finding cancer has been viewed as a nearly universal perceptual barrier among women (24). Although some barriers are are perceptual, others are related to lack of knowledge, and still others are more tangible problems such as cost. By identifying the barriers women may perceive, the APN can assist the women to overcome them.

Perceived benefits were significantly higher among those who participated in mammography screening. Again, this is consistent with findings by a number of other researchers (8,9,13,14,16,22). Benefits in this study correlated significantly not only with a woman's ever having had a mammogram, but also with increased frequency of mammograms and shorter duration since the last mammogram. One benefit in particular found by researchers was that women who underwent screening

TABLE 3. *Means, standard deviations, and correlations for multidimensional health locus of control scales*

Variable	Internal	Powerful others	Chance
MHLC internal	1.000		
MHLC powerful others	0.371**	1.000	
MHLC chance	–0.069	0.227*	1.000
Mean	24.0	19.0	17.2
Standard deviation	3.6	4.1	4.1

*$p < 0.05$.
**$p < 0.01$.

believed in the efficacy of mammography as a screening tool (16,22). Another cited benefit was the belief that breast cancer can be cured (9). These are important benefits for the APN to convey to women who need mammography screening.

Higher health motivation, as measured by the HBM, was associated with a woman's ever having had a mammogram. Like perceived benefits, higher health motivation also correlated with greater frequency of mammograms and shorter duration since the last mammogram. Although this construct is less frequently included in studies of the HBM, several researchers also have noted a significant positive relation between health motivation and mammography screening (9,11,12). It appears that a woman motivated to engage in other healthy behaviors is more likely to comply with recommended mammography screening guidelines.

Contrary to theory of the HBM, perceived seriousness was not found to be associated with ever having had a mammogram. One explanation offered for this finding is that breast cancer is regarded as a serious condition by most women, so little variation is observed in responses to this concept (16).

Perceived susceptibility to breast cancer was not significantly associated with receiving mammograms in this study. Although a few researchers have had similar results (12,14), most have found perceived susceptibility associated with mammography participation (9,13,15,16,25).

One explanation for these inconsistent findings may be that the HBM presupposes a decrease in susceptibility when preventive health actions are taken (10). Because mammography screening is not a preventive measure, and because, in fact, no preventive measures are currently available for breast cancer, the perception of susceptibility may not be altered by participation in mammography screening. By this reasoning, women, regardless of mammography participation, would be expected to perceive similar feelings of susceptibility, which is consistent with the findings of this study. Furthermore, the HBM construct of perceived susceptibility may be more applicable to measures of primary prevention than to those of secondary prevention, such as breast cancer screening.

In this study, health locus of control was not associated with mammography screening. Others have found a strong positive relation between health locus of control and intent to undergo mammography screening (20). It has been postulated that the intent to have mammography and actual mammography use may be related to different factors (9). This interpretation could explain the inability of the MHLC to predict actual mammography behavior.

NURSING IMPLICATIONS

The HBM provides some insight into health behaviors and the factors that influence the decision-making process regarding such behaviors. If a woman's health beliefs are known, interventions can be designed to influence these beliefs in the direction that favors participation in routine mammography screening. Research has, in fact, shown that interventions can significantly alter perceptions related to mammography (11), and that well-designed interventions can significantly increase the use of mammography screening (26).

Understanding women's mammography decisions is essential if nurses hope to obtain increased cooperation

TABLE 4. *Means, standard deviations, and correlations for the Health Belief Model Scales*

Variable	Susceptibility	Seriousness	Benefits	Barriers	Motivation
Susceptibility	1.000				
Seriousness	0.491	1.000			
Benefits	–0.002	–0.045	1.000		
Barriers	0.150	0.272**	–0.248*	1.000	
Motivation	0.049	–0.066	0.243	–0.153	1.000
Mean	12.6	20.1	26.1	10.7	28.9
Standard deviation	3.2	3.6	3.6	3.2	4.4

*$p < 0.05$.
**$p < 0.01$.

TABLE 5. *Mammogram status groups*

Variable	Mammogram group Mean (SD)	No mammogram group Mean (SD)	*t* statistic (degrees of freedom)	*p* value
MHLC internal	23.7 (3.4)	24.6 (3.9)	1.25 (94)	0.214
MHLC powerful others	19.8 (4.3)	20.2 (3.7)	0.47 (94)	0.638
MHLC chance	17.0 (4.0)	17.6 (4.4)	0.72 (94)	0.472
HBM susceptibility	12.7 (3.1)	12.2 (3.5)	0.84 (94)	0.406
HBM seriousness	19.7 (4.4)	21.0 (5.6)	1.28 (94)	0.206
HBM benefits	26.7 (3.7)	25.0 (3.4)	2.16 (94)	0.033
HBM barriers	9.8 (2.8)	12.4 (3.5)	3.83 (94)	0.001
HBM high motivation	29.5 (3.6)	27.6 (5.5)	1.99 (94)	0.050

and participation with screening. Nurses should seek information about how women perceive their health and the meanings they attach to health and its various components. The HBM provides one tool to facilitate the assessment of the beliefs that influence a woman's decision to receive a screening mammogram and to engage in ongoing screening. Women could be given the paper and pencil assessment HMB tool or an open-ended questionnaire based on the constructs of the HBM to complete while waiting for their appointment with their health care provider. The nurses could then review the results of the assessment and discuss them with the woman (Fig. 1). Even a brief discussion with the woman could open the door for a better understanding of the need for mammography practice.

According to the results of this study, beliefs about perceived barriers, benefits, and health motivation would be areas of particular significance to assess and attempt to influence. The woman who expresses cost as a barrier to screening mammography could be directed in a search for financial assistance as a way of helping her to overcome this obstacle. If a woman perceives few benefits of mammography screening, then perhaps teaching her about the safety and efficacy of current mammography technology would encourage her toward participation. A low health motivation could perhaps be enhanced by identifying important values and goals in life of the woman in question, then supporting that woman in her personal development as she realizes how mammography screening will correlate with her values and goals.

The demographic variables can also be a source of valuable information. Although not readily altered, these demographic statistics may help to identify women less likely to obtain screening mammograms, providing a basis for further assessment and meaningful intervention. Nurses strongly influence women's mammography use by consistently discussing mammography, expressing support for mammography, and prescribing mammograms when appropriate.

TABLE 6. *Spearman's rho correlations between frequency of mammograms, time since last mammogram, and scales of MHLC and HBM*

Variable	Frequency of mammograms ($n = 94$)	Time since last mammogram ($n = 64$)
MHLC internal	−0.058	0.074
MHLC powerful other	−0.201	0.017
MHLC chance	−0.129	0.164
HBM susceptibility	0.086	−0.072
HBM seriousness	0.038	−0.050
HBM benefits	0.225*	−0.257*
HBM barriers	−0.204*	0.072
HBM high motivation	0.386**	−0.260*

*$p < 0.05$.
**$p < 0.01$.

RECOMMENDATION FOR FURTHER RESEARCH

As evidenced by the findings of this study, the HBM continues to show mixed success in its ability to predict women's mammography behavior. Because the HBM was originally conceived to explain health behavior, perhaps more research is needed to modify the constructs for greater application to measures of secondary prevention. Such modification may be especially useful for the construct of susceptibility. In addition, work is needed to identify and test interventions that can influence women's health beliefs about screening mammography.

Health locus of control was not found in this study to be significantly associated with mammography practices. The literature, however, provided few comparisons for this finding because no other studies were found that related health locus of control to actual participation in mammography screening. Clearly, more research is needed to test this construct before any conclusions about its value can be drawn.

On the basis of these data, the nurse can discuss the following:

Barriers (e.g., make referrals to community resources if the woman needs financial assistance, insurance coverage, transportation, etc.)

Benefits (e.g., educate the woman about usefulness, safety, and effectiveness of mammography)

Health motivation (e.g., discuss mammography in the context of maintaining overall good health status)

Susceptibility (e.g., review the woman's family health history and risk factors with her)

FIG. 1. A paper and pencil assessment can be given to women to fill out while waiting.

By using the HBM constructs for assessment, nurses can gain an understanding of the beliefs that influence women's mammography practices. This knowledge can then provide the basis for individualized interventions designed to foster women's self-care motivation toward increased participation in routine mammography screening. The new evidence that routine mammography screening does save the lives of younger women intensifies the need to understand and influence women's mammography behavior. Only then can we hope to achieve our national goals of increased participation in mammography screening and decreased mortality from breast cancer.

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