

# Instrument development for health belief model constructs

Research was conducted to develop valid and reliable scales to test the Health Belief Model (HBM). The dependent variable chosen for scale development was frequency of breast self-examination. Independent variables were constructs related to the HBM: susceptibility, seriousness, benefits, barriers, and health motivation. Analyses for construct validity and theory testing included factor analysis and multiple regression. Chronbach Alpha and Pearson *r* were used to compute reliabilities. Scales that were judged valid and reliable were susceptibility, seriousness, benefits, barriers, and health motivation.

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**A**N IMPORTANT area of research for nurses has been investigation of attitudinal components of health-related behaviors. If attitudes related to health behaviors can be identified, nursing interventions for attitude change can be developed, and an increase in desirable health behaviors would result.

One theory addressing attitudinal components of health behaviors is the Health Belief Model (HBM). Although many researchers have investigated relationships between attitudes and behaviors using the HBM, methodological problems have plagued the research. Major problems associated with past research included use of invalid or unreliable data collection instruments and limited sample sizes.

## THEORETICAL FRAMEWORK

The theoretical base for this research was the HBM, formulated by Hochbaum, Lev-

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enthal, Kegeles, and Rosenstock during the 1950s.<sup>1</sup> Behavior was explained by the HBM as resulting from the combination of attitudes related to four concepts.<sup>2</sup>

- Perceived susceptibility refers to a person's view of the likelihood of experiencing a potentially harmful condition.
- Perceived seriousness is concerned with how threatening the condition is to the person.
- Perceived benefit focuses on the effectiveness of specific behavior in reducing the threat of the condition.
- Perceived barriers relate to the negative aspect of the anticipated behavior.

These four concepts have been tested individually and in combination as predictors of health-related behaviors.

In addition to the four original concepts, health motivation has also been used as part of the HBM in predicting health-related behavior. Health motivation refers to a generalized state of intent that results in behaviors to maintain or improve health. This concept was first introduced for inclusion in the HBM by Becker.<sup>1</sup> The concept of health motivation used in combination with the original four HBM concepts has evidence significant predictive ability.<sup>3,4</sup>

The HBM has generated prolific research regarding behaviors for maintenance of health or prevention of disease in asymptomatic subjects. The first major study using concepts from the HBM was completed by Hochbaum to identify factors related to decisions by 1200 subjects to have chest x-rays for the detection of tuberculosis.<sup>5</sup> Data analyses revealed that when persons believed in their susceptibil-

ity to tuberculosis and in the benefits of x-ray, 82% had the x-ray; 62% of those who believed in their personal susceptibility without believing in the benefits of x-ray voluntarily had x-ray; and 29% of those who believed in benefits but not in susceptibility had x-ray. Results did suggest that susceptibility and benefits were related to voluntary chest x-ray; however, reliability and validity for the instruments were missing. In addition, data were limited to a nominal level of measurement, precluding more stringent statistical analysis.

Kegeles<sup>6</sup> studied the relationship of belief and attitudinal variables to preventive dental visits. Belief variables of susceptibility, severity, benefits, and barriers were measured using a sample of 430 factory employees. The number and purpose of dental visits for the preceding three years were recorded. Data analyses revealed that the largest number of preventive visits were made by persons exhibiting all four beliefs (78%) and that as the number of beliefs decreased, so did the number of preventive visits. Although evidence favored the HBM theory, criticism of Kegeles centered around the retrospective data gathering of dental visits.

Addressing this criticism, Kegeles three years later mailed the subjects of the first study questionnaires requesting information on dental visits for the three years following the initial data collection.<sup>7</sup> Susceptibility and barriers were found to be significantly ( $p \leq .05$ ) related to preventive dental visits. Although Kegeles addressed the problem of retrospective data gathering, other problems remained. Data were collected via interviews, and no measure of inter-rater reliability was addressed. In addition, the questionnaire for beliefs was

open ended without mention of reliability or validity or of consistent coding.

In 1977, Becker and associates researched variables related to mothers' adherence to providing a diet prescribed for obese children.<sup>3</sup> Variables measured were health motivation, illness threat, potential weight loss benefits, barriers to compliance, and control over health. Significant ( $p \leq .05$ ) correlations were found between the dependent variables of weight loss and appointments kept and susceptibility, severity, benefits, and barriers. Although this research demonstrated one of the more thorough attempts at testing the HBM, the instruments for data collection were not tested for validity or reliability.

Recently, Leavitt<sup>8</sup> used the HBM as a framework for studying the relationship of attitudinal variables to use of ambulatory health services. Susceptibility, seriousness, and benefits were measured and correlated with general use. Susceptibility, seriousness, and benefits were all significantly related ( $p \leq .05$ ) to utilization; however, conclusions were problematic because of operationalization of scales. Reliability and validity were missing, and questions were nonspecific for a certain disease, leading to concerns about content validity.

The HBM has also been used to study illness behaviors when symptoms have already occurred. Becker et al<sup>9</sup> tested the relationship between HBM variables and mothers' adherence to giving prescribed medication. In a sample of children with otitis media, presence of an antibiotic in the urine was significantly correlated ( $p \leq .05$ ) with feelings of resusceptibility, severity, benefit, barriers, and general health motivation.<sup>9</sup> Becker and Rosen-

stock<sup>10</sup> also found that medication adherence for asthmatic children was significantly correlated ( $p \leq .05$ ) with feelings of susceptibility to asthma attacks, cognizance of the severity of attacks, and benefits of medication adherence. As before, validity and reliability of instruments were lacking. Variables were also measured at a nominal level, limiting statistical analysis.

The constructs in the original HBM have been empirically tested since 1952. Research has been completed using both preventive behaviors and illness behaviors. In general, most research has used the four original constructs: susceptibility, seriousness, benefits, and barriers. Studies have supported the HBM constructs and their ability to predict behavior. However, methodological problems have plagued research.

- Tools used in past research were not tested for validity or reliability.
- Operational definitions varied greatly from one study to another.
- Many studies used only one or two items for measuring a concept.
- Concepts were often operationalized at a nominal level, allowing the use of only elementary statistics.

Since major methodological problems with past research seem to center around instrument development, the research reported here was intended to develop scales for measuring concepts in the HBM and to test these scales for validity and reliability, so that the theory can eventually be used in nursing practice.

## MEASUREMENT ISSUES

The theory of measurement error was the basis for all work on reliability.

According to classical reliability theory, each person had a true score for any test, which was the score obtained if there were no measurement errors. Because of random error, any obtained score was composed of both the true score and the error score.<sup>11</sup> Reliability is a form of measurement for random errors. If an instrument is said to have high reliability, the corresponding random error is small.

There are several sources of error and several methods for measuring error. First, there is error based on sampling of the total content, which is measured using an internal consistency coefficient. Coefficient alpha provides an excellent measure of internal consistency.<sup>12</sup> Second, error over time can be measured by correlating parallel forms of a test given approximately 2 weeks apart. This type of reliability is called equivalence.<sup>13</sup> Finally, error over time can be measured by a test-retest correlation in which an identical test is given to the same subjects at different times.<sup>13</sup>

Nunnally<sup>11</sup> suggested that at least two different coefficients be used to estimate

reliability. Because parallel forms of the instrument were not available, internal consistency and test-retest reliability were used to develop scales. Hypotheses 1 and 2 (boxed material) reflect the testing of scales for internal consistency and test-retest reliability.

The validity of any measuring instrument must be established before the instrument is useful. The concept of validity pertains to the degree to which an instrument measures what it is supposed to measure.<sup>12</sup> In general, three types of validity are addressed: criterion, content, and construct.

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*Criteria-related validity involves correlating responses to an instrument against an external criterion; content validity addresses adequacy of sampling content; and construct validity is related to and depends on theory.*

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Criterion-related validity involves correlating responses to an instrument against an external criterion. Validity is shown by the degree of correlation between the measurement and criterion.<sup>11</sup> Because adequate measures had not yet been developed for HBM constructs, criterion validity could not be addressed in this research.

Content validity addresses adequacy of sampling content. Kerlinger<sup>12</sup> believed that content validity was the representativeness of instrument content as it relates to the domain. Content validation consists of expert judgment in which the property being measured is judged for relevance. Content validity for this research was

### Hypotheses

1. Internal consistency reliability coefficients for susceptibility, seriousness, benefits, barriers, and health motivation are  $>.7$ .
2. Correlation coefficients for test-retest reliability on susceptibility, seriousness, benefits, barriers, and health motivation are  $>.7$ .
3. Concepts of susceptibility, seriousness, benefits, barriers, and health motivation are mutually exclusive.
4. Combination of susceptibility, seriousness, benefits, barriers, and health motivation is related to the frequency of breast self-examination.

judged prior to data collection and thus was not represented by a hypothesis.

Construct validity is characterized by its relationship to and dependence on theory. If a measurement has construct validity, it represents the constructs as theoretically specified. Factor analysis is a powerful tool for construct validity because it helps determine the internal structure and cross structure of a set of variables.<sup>11</sup> If the factors correspond to the theoretical structure, then construct validity is evidenced. Hypothesis 3 (boxed material) addressed construct validity via factor analysis. Another method of determining construct validity involves statistical techniques that address the theoretical relationships. Construct validity is demonstrated by substantiating or rejecting hypotheses based on the theory.<sup>14</sup> Hypothesis 4 (boxed material) tests construct validity based on theoretical relationships in the HBM.

Both reliability and validity are important in tool construction. These four hypotheses represent an attempt to test developed scales for reliability and validity. Hypotheses 1 and 2 represent internal consistency and test-retest reliability, respectively. Hypotheses 3 and 4 test for construct validity. The behavior of breast self-examination was selected for scale development because it is a health behavior the majority of adult women need to complete each month. In the past few years, it has received much publicity, enabling large numbers of women to be aware of the procedure and its benefits. Thus, a large population of subjects were available for data collection, using the behavior of breast self-examination.

The assumption was made that subjects would report the frequency of self-exami-

nation and attitudes related to breast cancer and self-examination honestly and accurately. It was also assumed that attitudes preceded behavior. When testing for construct validity, it was further assumed that the HBM was accurate in prediction of behavior.

## METHOD

### Instruments

Scales were initially developed to measure the five concepts: susceptibility, seriousness, benefits, barriers, and health motivation using a Likert summative score technique. Items were developed based on concept measurements from past research. The following conceptual definitions, developed by the author, also served to guide item development.

- Perceived susceptibility refers to the subjective risks of contacting a specific condition within a specified time period.
- Perceived seriousness is concerned with perceived degree of personal threat related to a specific condition. Threat is defined as perceived harmful consequences of the condition in relation to altering personal physical health, role and social status, and ability to complete desired tasks.
- Perceived benefit focuses on belief regarding the effectiveness of a specific new behavior or alternate behavior in preventing or detecting disease, maintaining health, and curing or lessening undesirable consequences of a diseased state.
- Perceived barriers are the negative components of an anticipated behav-

ior, which would be undertaken to prevent or detect disease, maintain health, and cure or lessen undesirable consequences of a disease state. The negative aspects might involve problems such as monetary consequences, pain, changing habits, inconvenience, embarrassment, side effects, or need for new patterns of behavior.

- Health motivation relates to a state of concern (salience) about general health matters, which results in positive health activities and willingness to seek and comply with orders that are believed to decrease disease.

Items developed for susceptibility, seriousness, benefits, and barriers focused on breast self-examination and breast cancer. Items for general health motivation were drawn from behaviors related to general health. Initially, 20 to 24 items were written for each independent variable. For determination of content validity, the list of randomized items was distributed to eight judges: faculty and doctoral students who had studied the HBM. Along with the items, each judge was given the conceptual definition to aid in identification of concepts and was asked to identify the correct concept for each item. A sixth category of not applicable was also supplied to allow for response if items were judged not relevant to any of the five categories. Items were selected for inclusion if at least six of the eight judges concurred on a category. Ten to 12 items were judged to be representative of the content for each concept.

A questionnaire was then developed from the content valid items. All items were measured on a Likert scale. Responses were measured on a scale from 5 to 1; strongly agree was scored as 5 and

strongly disagree as 1. Questions concerning frequency of breast examination and selected demographic variables were added. All additional analyses of scales for validity and reliability were completed following data collection. The four stated hypotheses served as criteria for judgment as to internal consistency reliability, test-retest reliability, and construct validity.

### Sample

A convenience sample of 301 women was selected for this study. Women were obtained from the membership of organizations and businesses throughout a large metropolitan area. Four factors guided selection of subjects for this study.

- All subjects were women because the criterion variable was breast self-examination.
- All were required to respond to a written questionnaire, requiring a minimal ability to read and write.
- All subjects were at least 16 years of age to ensure a minimal level of physical maturity.
- The sample was stratified to obtain data from women of varied socioeconomic levels. This purposive sampling is referred to as deliberate sampling for heterogeneity.<sup>15</sup>

Demographic characteristics of the sample were similar with respect to race, marital status, religion, and education. The majority of persons were white, married, and Protestant, with a high school education (Table 1). Age was the most diverse characteristic, with an even distribution across groups. The mean of education was 13.5 years, indicating as average educational level of a sophomore in college.

**Table 1.** Demographic variables\*

Variable	Frequency
Age (yrs)	
17 to 29	76
30 to 38	75
39 to 51	75
52 to 82	75
Race	
Black	12
White	287
Missing	2
Marital status	
Married	230
Divorced	27
Widowed	8
Single	33
Other	2
Missing	1
Religion	
None	51
Jewish	16
Catholic	37
Protestant	187
Other	10
Education	
<12	9
12	121
13 to 15	114
16	34
17 to 20	21
Missing	2

\*N = 301.

Using a scoring method, a two-factor index was computed for socioeconomic status (SES), using years of school completed and occupation.<sup>16</sup> If the woman was unemployed or living with her parents, the occupation of the husband or father was used. The mean SES indicated a higher-than-average socioeconomic status, compared with that of a general population.

The research protocol was reviewed and approved by the Human Rights Commit-

tee of Indiana University School of Nursing. Participants were informed that responses would be kept confidential and that they would have the right to withdraw from the study at any time; they were also told the purpose of the study and given instructions about participation. All subjects were given the option of obtaining results after completion of the study.

### Procedure

Approximately 640 questionnaires were initially distributed: 440 by mail and 200 by personal presentation. In each case, a postage-paid envelope accompanied the questionnaire. Participants returned the questionnaire by mail to decrease the possibility of feelings of coercion; 301 questionnaires (47%) were returned. This return rate is considered adequate for analysis.<sup>17</sup>

Subjects were asked if they would be willing to participate in a second survey to determine change over time. Willingness to participate was indicated by checking the appropriate blank and including name and address. Of the 190 persons who indicated a willingness to participate a second time, 60 were arbitrarily selected to receive questionnaires. An additional questionnaire and a postage-paid envelope were mailed to these 60 participants approximately 2 weeks after the initial questionnaire was returned; 57 retest questionnaires (95%) were returned.

## DATA ANALYSES AND RESULTS

### Hypothesis 1

The first step in data analyses was to develop internally consistent scales for each concept. Initial reliability coefficients

for the five scales were computed using the Cronbach Alpha statistic with an appropriate statistical package.<sup>18</sup> Items demonstrating low correlations with their respective scales were deleted, and internal consistency coefficients were recomputed. When further deletion began to decrease the alpha coefficient, scales were considered to be at maximum reliability. Hypothesis 1 was accepted for the scales of susceptibility, seriousness, and barriers when internal consistency reliability coefficients were increased to .7 or above (Table 2). The scales of benefits and health motivation had coefficients of .61 and .60, and the hypothesis had to be rejected for these concepts. The scales, after inconsistent items were deleted, contained between 5 and 12 items per scale. These revised scales were then used for analyses of hypotheses 2 to 4. Items retained are shown in Table 3.

### Hypothesis 2

A sample of 57 persons was used to calculate test-retest reliabilities. Only items from Table 3 were used for analyses. Hypothesis 2 was accepted for the scales of susceptibility, seriousness, barriers, and health motivation when test-retest correla-

tion coefficients were found to be above .7 and significant ( $p \leq .001$ ). Table 4 summarizes the results. The benefit scale evidenced the lowest correlation coefficient for test-retest reliability. Although the benefit correlation coefficient was not adequate for hypothesis acceptance, it was still significant ( $p \leq .001$ ). The first testing may have sensitized persons to the benefits of breast self-examination. Thus, the perceived benefits mean in second testing increased, and the resulting test-retest correlation coefficient decreased.

### Hypothesis 3

Construct validity of the scales was tested first by factor analysis. All items of the revised scales (Table 3) were pooled and subjected to factor analysis via the Statistical Package for the Social Sciences program.<sup>19</sup> A principal component factor technique with iteration was used. The diagonal of the correlation matrix was replaced with communality estimates and orthogonal rotation using varimax criterion was specified. Interpretation was most meaningful when seven factors were extracted. The scales of susceptibility, seriousness, benefits, barriers, and health motivation were found to be mutually exclusive, and hypothesis 3 was accepted.

Results of the factor analysis are shown in Table 5; a factor loading of .35 for each item was used as an arbitrary criterion. The barriers scale is represented by factor 1 and accounted for about 35% of the variance. Factor 2, accounting for 24%, included six items from the susceptibility scale. Factors 3, 4, and 7 all yielded items from seriousness. Factor 3 included items related to physical symptoms of fear, factor 4

Table 2. Summary of statistics for revised scales

Scale*	N items	Mean/N	SD/N	Cronbach $\alpha$
SUS	6	2.56	.56	.77
SER	12	2.68	.53	.78
BEN	5	3.91	.51	.61
BAR	8	1.81	.48	.76
HM	8	3.57	.51	.60

\*SUS = susceptibility; SER = seriousness; BEN = benefits; BAR = barriers; HM = health motivation.



Table 3. Items evidencing internal consistency for each scale

Item	Correlation with scale
<b>Susceptibility</b>	
1. My chances of getting breast cancer are great.	.60
2. My physical health makes it more likely that I will get breast cancer.	.42
3. I feel that my chances of getting breast cancer in the future are good.	.63
4. There is a good possibility that I will get breast cancer.	.61
5. I worry a lot about getting breast cancer.	.44
6. Within the next year I will get breast cancer.	.39
Cronbach Alpha	.78
<b>Seriousness</b>	
1. The thought of breast cancer scares me.	.40
2. When I think about breast cancer I feel nauseous.	.35
3. If I had breast cancer my career would be endangered.	.35
4. When I think about breast cancer my heart beats faster.	.46
5. Breast cancer would endanger my marriage (or a significant relationship).	.39
6. Breast cancer is a hopeless disease.	.32
7. My feelings about myself would change if I got breast cancer.	.54
8. I am afraid to even think about breast cancer.	.54
9. My financial security would be endangered if I got breast cancer.	.29
10. Problems I would experience from breast cancer would last a long time.	.45
11. If I got breast cancer, it would be more serious than other diseases.	.38
12. If I had breast cancer, my whole life would change.	.55
Cronbach Alpha	.78
<b>Benefits</b>	
1. Doing self breast exams prevents future problems for me.	.27
2. I have a lot to gain by doing self breast exams.	.48
3. Self breast exams can help me find lumps in my breast.	.50
4. If I do monthly breast exams I may find a lump before it is discovered by regular health exams.	.47
5. I would not be so anxious about breast cancer if I did monthly exams.	.21
Cronbach Alpha	.61
<b>Barriers</b>	
1. It is embarrassing for me to do monthly breast exams.	.46
2. In order to do monthly breast exams I have to give up quite a bit.	.62
3. Self breast exams can be painful.	.32
4. Self breast exams are time consuming.	.48
5. My family would make fun of me if I did self breast exams.	.50
6. The practice of self breast exams interferes with my activities.	.62
7. Doing self breast exams would require starting a new habit, which is difficult.	.39
8. I am afraid I would not be able to do self breast exams.	.47
Cronbach Alpha	.76
<b>Motivation</b>	
1. I eat a well-balanced diet.	.33
2. I always follow medical orders because I believe they will benefit my state of health.	.29
3. I frequently do things to improve my health.	.45
4. I take vitamins when I don't eat good meals.	.26
5. I search for new information related to my health.	.39
6. I have the recommended yearly physical exams in addition to visits related to illness.	.31
7. I have the recommended periodic dental exams in addition to visits for a specific problem.	.19
8. I exercise regularly—at least three times a week.	.37
Cronbach Alpha	.62

**Table 4.** Results of test-retest correlations for revised scales\*

Scale†	Scale mean/N	SD	r‡
SUS 1	2.52	.49	.86
SUS 2	2.53	.49	
SER 1	2.65	.43	.76
SER 2	2.60	.46	
BEN 1	3.93	.40	.47
BEN 2	4.04	.43	
BAR 1	1.81	.42	.83
BAR 2	1.86	.43	
HM 1	3.76	.50	.81
HM 2	3.73	.47	

\*N = 57.

†1 = 1st testing; 2 = 2nd testing. For other definitions, see Table 2.

‡=  $p \leq .001$ .

included questions that applied to long-term effects of breast cancer, and factor 7 related to financial or career problems. All seriousness items accounted for about 28% of variance. Factor 5 included four items from the benefits scale and accounted for 8% of the variance, and factor 6 included five of eight items for the health motivation scale and accounted for 6% of the variance. With only one exception, all items on a factor were from the same construct. The seriousness construct resulted in three factors relating to physical symptoms of fear, long-term effects of

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*The seriousness construct resulted in three factors relating to physical symptoms of fear, long-term effects of breast cancer, and financial or career problems.*

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**Table 5.** Results of principal component factor analysis for all items

Factor*	Weight
Factor 1 (BAR)	.54
	.71
	.52
	.53
	.67
	.44
	.43
Factor 2 (SUS)	.71
	.47
	.75
	.73
	.41
Factor 3 (SER)	.40
	.46
	.65
	.65
	.56
Factor 4 (SER)	.53†
	.36
	.61
	.36
	.60
	.43
Factor 5 (BEN)	.66
	.40
	.57
	.66
Factor 6 (HM)	.61
	.43
	.65
	.36
	.48
Factor 7 (SER)	.53
	.57
	.41
	.41

\*Factor 1, 35% of the variance; factor 2, 24%; factor 3, 13%; factor 4, 10%; factor 5, 7.8%; factor 6, 6.1%; factor 7, 4.8%. For definitions, see Table 2.

†The construct of this item was SUS, rather than SER.

breast cancer, and financial or career problems.

These results indicate that the serious-

ness scale may not be unidimensional. The conclusions from factor analysis for this research yielded strong evidence for construct validity by substantiating the independence of constructs as used in the HBM.

#### Hypothesis 4

Construct validity may also be measured by testing the ability of the instruments to measure as theoretically specified.<sup>11</sup> A multiple regression analysis was computed to test the HBM constructs with breast self-examination. A multiple *R* of .51 ( $p \leq .001$ ) was obtained with 26% of the variance accounted for; therefore, hypothesis 4 was accepted (Table 6), and construct validity was again demonstrated. However, the variable barriers accounted for the largest portion of variance (23%) on the dependent variable breast self-examination. Health motivation was also a significant contributor, although only 4% of the variance was accounted for relative to the dependent variable. Persons who saw few barriers were more likely to report increased frequency of self-examination. Likewise, persons with high scores on health motivation reported greater frequency of self-examination. Benefits, susceptibility, and serious-

ness did not account for a significant amount of variance.

#### Demographic data

Information was collected on age, education, SES, knowledge of breast cancer, race, marital status, religion, and experience with breast disease. Analysis by Pearson *r* demonstrated a significant inverse relationship of age ( $r = -.11$ ,  $p \leq .03$ ) and education ( $r = -.12$ ,  $p \leq .01$ ) with susceptibility. Knowledge of breast disease was significantly related to age ( $r = -.20$ ,  $p \leq .01$ ), as were years of school ( $r = .33$ ,  $p \leq .001$ ) and SES ( $r = .28$ ,  $p \leq .001$ ). Persons who were younger and better educated had higher SES demonstrated greater knowledge but were not significantly different in number of self-examinations. In addition, analysis of variance demonstrated differences in feelings of susceptibility by personal experience ( $F_{(1,263)} = 13.26$ ,  $p \leq .00$ ). Those who had relatives or friends with breast cancer felt more susceptible to breast cancer themselves.

#### DISCUSSION AND CONCLUSIONS

The results of this research yielded substantial evidence for the ability of the revised scales to reliably and validly measure the constructs. Based on these results, additional refinement of scales can continue and testing of the HBM can commence.

Content validity was initially addressed and items were selected. Content validity of each of the items on revised scales could again be addressed, and judges could again rate the revised items for clarity and meaning within the constructs.

Table 6. Multiple regression of constructs by frequency of self breast examination

Scale*	Multiple <i>R</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	Overall <i>F</i> †
BAR	.48	.23	.23	91.09
HM	.50	.25	.01	49.71
BEN	.50	.25	.00	33.41
SUS	.51	.26	.00	25.31
SER	.51	.26	.00	20.24

\*For definitions, see Table 2.

† $p \leq .001$ .

Construct validity was validated by factor analysis, with overwhelming statistical evidence for the independence of constructs. Future work should address possible differences, which were apparent in the seriousness scale. If there are different aspects of seriousness, it is possible that they could differentially influence behavior.

Construct validity was also demonstrated when the scales of barriers and health motivation predicted behavior as theoretically specified, using multiple regression. However, the scales of seriousness, susceptibility, and benefits did not account for a large amount of variance. The insignificant contribution of seriousness might result from the nature of breast cancer, which tends to have a negative and hopeless connotation for most women. Seriousness, which is probably related to fear, may have a curvilinear relationship to the behavior of breast self-examination. High levels of seriousness may function to inhibit response. Becker et al<sup>3</sup> studied voluntary screening for the Tay-Sachs disease trait and found that seriousness reached such high limits as to become dysfunctional. Similarly, Hochbaum<sup>7</sup> found that persons who perceived the high severity of tuberculosis did not have voluntary chest x-ray. As shown from past research, the role of severity is difficult to predict. It may be that seriousness of breast cancer caused such intense feelings of fear that self-examination was inhibited.

Susceptibility may also be difficult to evaluate in relation to the disease of breast cancer. The occurrence of breast cancer is not related to SES, race, general health, or preventive measures. Although breast cancer can be detected early through breast self-examination, there is no specific mea-

sure to decrease feelings of susceptibility; therefore, the specified relationship between susceptibility and behavior may not hold.

The construct of benefits also proved insignificant in predicting breast self-examination. Since there is not a direct cause-effect relationship between self-examination and decrease in feelings of susceptibility and seriousness, the lack of statistical significance was not surprising. A person must believe that self-examination results in early detection and that early detection is desirable and increases survival when breast cancer is discovered. Although this research yielded impressive evidence of construct validity for the developed scales, replication of these findings would be beneficial.

The sample for this research, although adequate for size, was too homogeneous and thus limits generalization to a larger population. The majority of persons were white and Protestant. Future work should include a population with varied racial representation and an increased percentage of persons from the Catholic and Jewish religions. It would also be advantageous to attempt inclusion of a group of persons with less education. The average educational level for this sample was that of a sophomore in college. A more varied population would lend credence to the universality of these constructs.

## IMPLICATIONS FOR NURSING PRACTICE

The beginning development of valid and reliable tools for measurement of the HBM constructs has direct benefit for the profession of nursing. With valid and reliable tools, model testing can commence.

For years, the HBM has been tested with inadequate instruments. Although past research has seemed promising, the results must be questioned. The scales developed from this research can be used with substitution of a word or phrase to test the HBM using many different behaviors. The current scales can also be used as a basis for further tool refinement.

The HBM, if found to be theoretically sound, can be used for development of nursing interventions. For instance, according to the HBM, at least a moderate level of susceptibility and perceived seriousness is necessary for behavior to follow. If susceptibility and seriousness for a certain disease could be measured, evaluations and interventions for belief change might be instituted. Likewise, the concept

of benefit could be evaluated and interventions developed to help persons understand personal benefits for a health-related behavior. Barriers to action could be evaluated in terms of resources available and strategies for handling barriers developed.

General health motivation, which does seem to be a component of health behaviors, could be routinely assessed during any nurse-client interaction. Thus, all concepts could be measured and interventions for belief change developed when deemed necessary. However, before interventions are planned, careful testing of the model must begin. It is hoped that the instruments developed through this research will allow for rigid testing of the HBM, followed by development of nursing interventions based on HBM constructs.

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