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Knowledge and Beliefs of Breast Cancer Among Elderly Puerto Rican Women: Validation Process of Scales

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ABSTRACT. This paper presents the results of the validation process to determine the concepts for knowledge and beliefs about breast cancer early detection practices among Puerto Rican elderly women. An initial questionnaire was designed based on the scientific literature review and focus group experiences. To determine its reliability and validity, 50 elderly women, stratified by type of profession and place of residence, were interviewed twice. Consistency of the questionnaire was analyzed using binomial test, matched t-test, Pearson correlation coefficient, and Cronbach's coefficient effect. Factor analysis (FA) was the statistical technique used to analyze the grouping of the knowledge and beliefs statements. FA indicated that three scales for knowledge and one for beliefs can be constructed. The purpose of the scales was to identify differences among groups, according to breast cancer early detection practices. Construct validity was performed to determine the number of statistical associations between the scales and these practices. The results showed that beliefs scales was associated with practice of mammogram ($p<0.05$), and visit to the gynecologist ($p<0.05$) while the knowledge scale for early-detection was associated with the clinical breast examination ($p<0.05$). The beliefs scale had better consistency than the knowledge scale. The Cronbach's alpha was 0.75 for the beliefs' scale and 0.30, 0.41 and 0.43 for each defined knowledge scale, respectively.
Key Words: Puerto Rican elderly women, Breast cancer, Knowledge scale, Beliefs' scale, Validity, Reliability, Factor analysis.

There is a need to have more information on barriers to breast cancer screening in older women, particularly the effect of physician referral and the women's knowledge and attitudes. Most studies on breast cancer in elderly women focus on the epidemiology of this condition. Few address the equally important issues related to how cultural value orientations, beliefs and the type of information exchanged in the client-physician relationship affect breast cancer knowledge and screening practices. This is relevant to the design of programs directed to prevention of breast cancer and the development of an awareness program in women of need for screening examinations, including breast self examination (BSE), clinical breast examination (CBE), and mammogram, specially among elderly women (1).

Cancer was the second cause of death for older women in Puerto Rico for 1990 (2). Heart ailments was first and diabetes, third. In terms of breast cancer morbidity, when age specific breast cancer incidences were calculated for 1990 an increment was observed as age increased. Among females 40-44 years old, the rate was 88.7 cases on average per 100,000 females in this age group, while among females 75 years or older the rate was 202.7 cases on average per 100,000 females (3).

Hispanic women's utilization of CBE and mammogram are lower than that of their White and Afro American counterparts (4). The Report "Healthy People 2000" (1991) points out that among Mexican American, Cuban and Puerto Rican elderly women, Puerto Ricans comprised the largest group who had never heard of a mammogram. Another study of older Hispanic women indicated that 57% stated that no one had suggested a CBE within the last years and 82% said no one had

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indicated that they have a mammogram (5). A recent study conducted among Puerto Rican elderly women showed that the relationship patient-physician and educational level seem to be the key variables to comply with early detection practices of breast cancer (6).

The objective of this paper is to determine whether a scale of knowledge and beliefs can be used to measure personal and external barriers to early detection practices of breast cancer.

Materials and Methods

In order to measure personal and external barriers affecting breast cancer early detection practices among Puerto Rican elderly women (65 and older) an initial questionnaire was designed. The process of designing this questionnaire was based on the literature review (7-10) and the experiences of seven focus groups (FG) using elderly women living in Puerto Rico.

As a consequence of the FG experience and the scientific literature review, 32 statements were identified related with breast cancer. These statements were classified as knowledge, if there was scientific evidence to support them, and beliefs, if there was not scientific evidence to support them.

Validation process. A structured questionnaire was initially designed, that included the 32 knowledge and beliefs' statements related with breast cancer, in addition to demographic information and breast cancer early detection practice. In order to assess the properties of the questionnaire, several reliability and validity techniques were used.

Reliability is the extent to which variation in an instrument for collecting data reflects real differences rather than random fluctuation. The reliability of the questionnaire was analyzed by test-retest approach to evaluate time consistency and the distribution of the Cronbach's coefficient for internal consistency. For the test-retest approach, fifty elderly women were interviewed twice (with a minimum of two weeks difference between each interview). The results were statistically analyzed using the t-test and binomial test for paired samples (11).

Validity determines whether the instrument assesses what it intends to measure. There are at least three ways to assess validity (12):

1. content validity: It is determined by the assessment that the content of the questions or items of the instrument measure what they are expected to measure.
2. criterion validity: It is determined by the correlation of the measures of the instrument with some other measure of the trait under study; ideally, a "gold standard" which has been used and accepted in the field.
3. construct validity: It is determined by the capacity of the hypothetical construct to explain the relationship among various behaviors or attitudes in a specific group. This construct is regularly formed by a combination of different variables or characteristics of the study population.

Criterion validity was not considered for this study because a "gold standard" instrument for measuring knowledge and beliefs about breast cancer among elderly women was not available. Content validity was achieved by the review of the format and content of the questions, based on the experiences of the FG results, and the expertise evaluation. Construct validity was developed by the identification of constructs using the statistical technique of factor analysis; a multivariate method intended to explain relationships among several difficult-to-interpret correlated variables in terms of a few conceptually meaningful relatively independent factors (13).

The construct validity intends to evaluate or confirm the existence of a hypothetical concept that permits the identification of different subgroups of a population under study. This concept is measured by a set of mutually related variables that form a scale. The scales were formed by the unweighted sum of scores assigned to the responses of the statements of knowledge and beliefs. It is supposed that an adequate scale can distinguish different subgroups of the study population. For example, assuming that the concept will be the level of belief about breast cancer, it is expected that a scale formed by statements of beliefs related with two levels of education (high and low) would produce the following results:

> "Persons with a high educational level should obtain a higher punctuation in the scale of beliefs, and persons with a low education level should obtain a lower punctuation"

If a significant number of associations can be found, the better the construct validity (7-9). Vaeth in 1993 correlated women's knowledge scale about breast cancer and demographic data to determine the construct validity (8). In this documents the construct validity was determined by demographic and health practices variables.

Study group. A total of 52 elderly women who reside in Puerto Rico were interviewed between the months of September and October 1995 (Table 1). All women were mentally capable to answer the questionnaire. Two interviews were administered to each interviewee to evaluate the instrument reliability. The estimated time between the first and second administration of the questionnaire ranged between 12 and 21 days; with a

median time of 14 days. The second administration of the questionnaire was not performed in two cases due to death and travel reasons. Therefore, for the reliability analysis only 50 interviews were analyzed.

Table 1. Interviewees by Area of Residence and Education Level: Validation Process

Education Level	Area of Residence		Total
	Metro	No-metro	
Professional	12	12	24
Non-professional	15	13	28
Total	27	25	52

Women's ages ranged from 65 to 92 years with an average of 72 years. Most women (69.2%) were 74 years or younger and less than one-third (30.8%) of then were 75 years old or more at the time of the interview. Half of the interviewees were married or living together, 28.9 were widowed and 13.5% were divorced or separated. Only four women (8%) had never been married.

Endorsement of statements. The thirty-two statements of knowledge and beliefs about breast cancer were answered as: true, false or don't know (Table 2). The endorsement frequency for every response in each statement was taken as a criterion to select those statements to be included in the reliability and construct validity. If more than 90% of the interviewees answered the same alternative, then the statement did not contribute information for the scales construction, and, therefore, it was eliminated.

The statements identified by the numbers 63, 67, 69 and 79 showed an excess of 90% in the endorsement frequency in the alternative 'true" (Table 2) and therefore were eliminated for further analysis.

Questionnaire reliability. The reliability of the questionnaire was analyzed by the test-retest method (10). This method consists of accomplishing two interviews at two different times and comparing the results in order to determine time consistency. A statistical significant result

Table 2. Endorsement Frequency for Breast Cancer Knowledge and Beliefs Statements: Validation Process*

Statements†	True	False	Don't Know
54. A possible tratment for breast cancer is to remove the nodule (ball, lump, mass, gland).	89.2	6.9	3.9
55. Women who have had breast cancer have more possibilities of developing it a second time.	83.3	7.8	8.8
56. Radiation therap (X-rays) is a breast cancer treatment.	74.5	7.8	17.6
57. Women with large breasts have more possibilities of developing cancer than women with small breasts.	31.4	43.1	25.5
58. A possible symptom of breast cancer is fluid coming out of the nipples.	80.4	9.8	9.8
59. Radiation therapy (X-rays) may produce similar symptoms as a sunburn's symptoms (red and injured skin).	80.4	2.0	17.6
60. A swelling of the arm can be a consequence (result) of breast cancer treatment.	76.5	2.9	20.6
61. The only breast cancer symptom is a nodule (ball, lump, mass, gland).	18.8	67.3	13.9
62. Women who give birth to their first child before 30 years of age have a lesser possibility of developing breast cancer.	44.1	23.5	32.4
63. A mammography is recommended once a year for women 50 years of age or older.	94.1‡	2.0	3.9
64. Thin women have a higher possibility of developing breast cancer.	5.9	66.7	27.5
65. To hit, bruise or hurt the breast can cause breast cancer.	63.7	24.5	11.8
66. Women who begin their first period before 12 years of age have more possibilities of developing breast cancer.	22.5	34.3	43.1
67. The breast self-exam (touching yourself) instructions are easy to follow.	94.1‡	3.9	20.
68. women whose mother or sister have suffered from breast cancer have more possibilities of developing this type of cancer.	85.3	6.9	7.8
69. It is recommended that women undergo an annual clinical breast examination (doctor touches the breast).	99.0‡	1.0	-------
70. The only breast cancer treatment is mastectomy or amputation of the breast (remove the breast).	19.6	72.5	7.8
71. Pain, stinging sensation or discomfort in the breast are possible symptoms of breast cancer.	68.6	20.6	10.8
72. The mammography (breast cancer plate or X-rays) detects (discovers) breast cancer in its early stages.	86.3	4.9	8.8
73. Women 50 years or older have more possibilities of developing breast cancer than younger women.	64.7	21.6	13.7
74. The breast self examination (touching yourself) must be performed once every month.	73.5	19.6	6.9
75. The mammogram (breast cancer plate or X-rays) is necessary only when a woman feels discomfort in her breast.	20.6	75.5	3.9

Table 2. Endorsement Frequency for Breast Cancer Knowledge and Beliefs Statements: Validation Process*

Statements†	True	False	Don't Know
76. Women who have suffered from breast cancer must wait five (5) years to know if they are cured.	63.7	16.7	19.6
77. Breast cancer always leads to death.	22.5	71.6	5.9
78. The breast self examination must be performed monthly.	77.5	19.6	2.9
79. Breast cancer can spread to other parts of the body (metastasize) if not treated early.	97.0‡	1.0	2.0
80. Breast cancer always causes pain.	34.3	46.1	19.6
81. Women who have never been married have less possibilities of developing breast cancer.	24.5	54.9	20.6
82. Women with a diet high in fats have more possibilities of developing breast cancer.	78.4	15.7	5.9
83. A swelling or increase in the size of the breast is possible symptom of breast cancer.	70.6	16.7	12.7
84. Women with a diet high in fiber (vegetables, fruits and cereals) have less possibilities of developing breast cancer.	78.4	16.7	4.9
85. A mammogram (breast cancer plate or X-rays) is the most accurate test to detect (discover) breast cancer.	85.3	9.8	4.9

* Included in first and second interviews
† The number in each statement was the number assigned in the questionnaire
‡ Excess on the 90% recommended criterion.

in this method means that the respective item was not consistent in time.

In order to apply the binomial test, the item responses were grouped as follows: 1,true; 0,false/do not know. The results of the binomial test demonstrated that statements 54 ($p=0.006$) and 56 ($p=0.001$) were statistical significant whereas statement 59 ($p=0.077$) was marginally significant. Therefore, these statements were eliminated from the validation analysis (Table 3). To confirm these results, the Student t-test for paired samples was carried out without grouping the responses and using the following codes: - 1, false; 0, do not know; 1, true. The statements 56, 59, 73, 81 and 84 were not consistent ($p<0.05$) over time, and they were eliminated from the validity analysis (Table 3).

Construct validity. The construct validity was evaluated through the construction of several scales that represent the belief and knowledge statements. The principal component and factors analysis techniques were used to construct the scales. These scales were correlated

Table 3. Questionnaire Reliability for Breast Cancer Knowledge and Beliefs Statements, Validation Process (Binomial test and t-test for paired samples)*

Statements†	Binomial Probability (p-value)	Student (p-value)
54. A possible treatment for breast cancer is to remove the nodule (ball, lump, mass, gland).	0.006	0.181
55. Women who have had breast cancer have more possibilities of developing it a second time.	0.210	0.367
56. Radiation therapy (X-rays) is a breast cancer treatment.	0.001	0.038
57. Women with large breasts have more possibilities of developing cancer than women with small breasts.	0.660	0.214
58. A possible symptom of breast cancer is fluid coming out of the nipples.	0.146	0.118
59. Radiation therapy (X-rays) may produce similar symptoms as a sunburn symptoms (red and injured skin).	0.077	0.052
60. A swelling of the arm can be a consequence (result) of breast cancer treatment.	0.238	0.241
61. The only breast cancer symptom is a nodule (ball, lump, mass, gland).	0.454	0.197
62. Women who give birth to their first child before 30 years of age have a lesser possibility of developing breast cancer.	0.332	0.549
63. Thin women have a higher possibility of developing breast cancer.	0.453	0.477
64. To hit, bruise or hurt the breast can cause breast cancer.	0.523	0.141
65. Women who begin their first period before 12 years of age have more possibilities of developing breast cancer.	0.629	0.935
66. Women whose mother or sister have suffered from breast cancer have more possibilities of developing this type of cancer.	0.508	0.167

Table 3. Questionnaire Reliability for Breast Cancer Knowledge and Beliefs Statements, Validation Process (Binomial test and t-test for paired samples)*

Statements†	Binomial Probability (p-value)	Student (p-value)
67. The only breast cancer treatment is mastectomy or amputation of the breast (remove the breast).	1.000	0.207
68. Pain, stinging sensation or discomfort in the breast are possible symptoms of breast cancer.	0.332	0.919
69. The mammography (breast cancer plate or X-rays) detects (discovers) breast cancer in its early stages.	0.774	0.676
70. Women 50 years or older have more possibilities of developing breast cancer than younger women.	0.481	0.055
71. The breast self-examination (touching yourself) must be performed once every month.	0.503	0.321
72. The mammogram (breast cancer plate or X-rays) is necessary only when a woman feels discomfort in her breast.	1.000	0.687
73. Women who have suffered from breast cancer must wait five (5) years to know if they are cured.	0.664	0.974
74. Breast cancer always leads to death.	0.774	0.682
75. The breast self-examination must be performed monthly.	0.238	0.127
76. Breast cancer always causes pain.	0.791	0.571
77. Women who have never been married have less possibilities off developing breast cancer.	0.607	0.275
78. A swelling or increase in the size of the breast is a possible symptom of breast cancer.	0.167	0.119
79. Women with a diet high in fiber (vegetables, fruits, cereals) have less possibilities of developing breast cancer.	0.549	0.022
80. A mammogram (breast cancer plate or X-rays) is the most accurate test to detect (discover) breast cancer.	0.289	0.749

*Statements with $p > 0.10$ in one of th two tests were recommended for inclusion in the questionnaire
†Statement 79 was eliminated in endorsement frequency.

with early detection practices and other demographic variables to determine if they identify different subgroups of the population. Association between scales and selected variables were assessed by the chi-square distribution (11). In addition, the odds ratio (OR) was used to determine the direction of the correlation between the scale and selected variables.

Factor analysis. The statistical technique of factor analysis (13) was used as an initial reference to define scales of breast cancer knowledge and beliefs. This technique permits to identify a quantitative variable, V_i, expressed as a linear combination of factors not seen, F_j, which are common for all the variables V_i, as follows:

$$V_i = \lambda_{i1}F_1 + \lambda_{i2}F_2 + \ldots\ldots + \lambda_{im}F_m + E_i$$

where:

λ_{ij}: Factor loading that expresses the correlation between the j^{th} variable and the j^{th} factor.

E_i: Indicates an unique factor to the variable 'i' that is independent and normally distributed with mean zero and variance ψ_i.

The principal components technique (13) was used to determine the number of factors, F_j; where the cumulative variance of the components would be greater than 65% and the eigenvalue would be greater than one. To estimate the factor loading, the VARIMAX method was used. This method assumes that factors Fj are uncorrelated. The data processing was accomplished with the statistical package SAS(14).

The variables V_j represented the statements related to knowledge and beliefs on breast cancer. The variables F_j defined some theoretical concept of knowledge or beliefs, and were formed based on grouping these variables V_j. The grouping criteria was considered when the absolute value of the factor loading was greater than or equal to 0.5. The statements that satisfied this criteria determined the way the corresponding factor was named. The resulting statement in each factor defined the scales of knowledge and belief of breast cancer. In case a statement could be allocated in two or more factors, the item content determined which factor best fit.

The factor analysis for the knowledge statements was accomplished with five factors and thirteen statements. For each factor, the number of statements with factor loading greater than or equal to 0.50 were distributed as follows: 5 statements for factor 1, 4 statements for factor 2, 3 statements for factor 3, 1 statement for factors 4 and 5. Therefore, it was decided to build three scales for determining different levels of knowledge about breast cancer (Table 4).

The factor analysis for the belief statements was accomplished with three factors and eight statements. The first factor contained seven of the statements submitted

Table 4. Factor Loadings for Knowledge of Breast Cancer Statements Obtained from Factor Analysis: Validation Process

Statement	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
55	0.3289	0.2999	-0.2320	0.4255	**0.5127**
58	0.3208	0.2519	**0.6906**	-0.0654	0.0991
60	0.0877	-0.2075	0.2568	**0.8358**	-0.0595
62	**0.5512**	0.1981	-0.4120	0.1849	-0.2338
66	**0.5537**	0.1730	-0.0851	-0.2082	-0.3754
68	0.4320	0.4522	**0.5863**	-0.2394	0.0196
71	0.3077	0.3971	**0.6006**	0.1804	-0.1414
72	**0.6473**	**-0.5507**	-0.0611	0.1301	0.2375
74	0.3725	**0.5479**	-0.0450	-0.1075	0.2991
76	0.5785	-0.1404	-0.1805	0.1054	**-0.5603**
82	0.6237	0.2143	-0.1061	-0.3739	0.2775
83	0.4105	**0.6650**	-0.892	0.0259	-0.1153
85	0.4553	**-0.6028**	-0.1496	-0.0298	0.3149

to analysis with an absolute value of the factor loading greater than or equal to 0.50. Therefore, it was decided to build a belief scale with eight belief statements (Table 5).

One of the limitations of factor analysis was the assumption of normality in the statements of knowledge

Table 5. Factor Loadings for Beliefs of Breast Cancer Statements Resulting from Factor Analysis: Validation Process

Statement	Factor 1	Factor 2	Factor 3
57	**0.6048**	-0.4358	-0.3856
61	**0.6791**	-0.2479	0.1713
64	**0.6113**	**-0.5039**	0.1664
65	**0.5375**	0.0918	**0.7391**
70	**0.6029**	-0.2257	-0.3489
75	**0.7178**	0.3061	0.0644
77	**0.6596**	**0.5202**	-0.1784
80	0.4793	**0.5504**	-0.2094

*Bold numbers indicate an absolute value of the factor loadings equal or greater to 0.50

and beliefs. These statements took only three possible values: -1, 0, and 1. Therefore, the results of factor analysis were used as an initial orientation of what sort of statements should be grouped to define a scale.

Construction of scales. Following the results of factor analysis, several scales were constructed; three for knowledge and one for beliefs. A factor was converted into a scale when three statements or more had an absolute value of the factor loading greater than or equal to 0.50. Each scale was constructed using the unweighted sum of scores of the different statements. For the knowledge statements the responses "do not know" and "false" were assigned a zero score, and the "true" response was assigned unity. For beliefs statements the responses "do not know" and "true" were assigned the zero score, and the "false" response was assigned unity.

The factors that met the criterion to define a scale in the knowledge statements were the first (1), second (2) and third (3) factors. The statements of the first factor were associated with knowledge of risk factors for breast cancer; those of the second factor with knowledge of practices for early detection; and those of the third factor with knowledge of symptoms related to breast cancer. As a consequence, three sub-scales were defined for knowledge. The sub-scale of risk factors consists of three statements; the sub-scale for early-detection practices consists of four statements; and the sub-scale of symptoms for breast cancer consists of three statements. In addition, an overall scale for knowledge was formed with the three sub-scales plus the statements 55, 60, 76.

The beliefs' scale was constructed adding the statements of the first factor derived from the factors analysis. This factor contained all the statements related to beliefs included in the questionnaire.

After the scales were defined, the median of the scores for each scale was calculated (Table 6). The median was used to determine low and high values in the scales. For the knowledge scales, the sample was divided in two groups: those which had limited knowledge (below the median) versus those which had adequate knowledge (median or above). A similar procedure was performed for the "beliefs" scale. In this case, a score above the median implies that women had a high level of opinions that are not based on scientific knowledge.

Table 6. Median Score of the Constructed Scales, Validation Process

Scale	Median	Maximun value	Minimun value
"Risk"	1.5	3	0
"Early-detection"	3	4	0
"Symptom"	3	3	0
"Beliefs"	3	8	0

Contingency tables were constructed between the grouped scales and demographic variables, breast cancer history variables and early-detection practices' variables. As the number of significant results increases, the better the validity for each construct. The OR was computed to confirm the direction and interpretation of the significant associations (11).

The "risk" sub-scale demonstrated a significant association with the variable area of residence (p=0.025). Persons residing in the metropolitan area demonstrated

to have a limited knowledge about breast cancer risk factors compared with those in the non-metropolitan area (Table 7). Women who reported at least one discomfort related to breast cancer (nodules, secretions, pain) or breast cancer family history demonstrated to have a trend toward a limited knowledge in this sub-scale (p=0.058) compared with those without them.

The "early-detection" sub-scale demonstrated a significant association with the CBE compliance during the previous two years (p=0.006). Women that had the (p=0.027) with the beliefs'scale (Table 8).

Internal consistency. The internal consistency evaluates the correlation that exists between the statements that belong to a given scale. Its evaluation can be summarized with the alpha Cronbach's coefficient and the Pearson correlation (11).

The Cronbach´s alpha for each scale confirmed that the statements were highly correlated if this value was near one. For practical purposes, if the Cronbach alpha

Table 7. Demographic, Breast Cancer History and Detection Practices Variables by Risk, Detection and Symptom Sub Scales: Validation Process

Selected Variable		Risk Scale Low vs High	Early-Detection Scale Low vs High	Symptom Scale Low vs High
Region Metro No metro		OR=4.25 p=0.025	OR=2.00 p=0.355	OR=3.09 p=0.058
Education	≥ 12 years < 12 years	OR=1.87 p=0.404	OR=2.76 p=0.130	OR=0.38 p=0.102
Age	< 75 years ≥ 75 years	OR=1.44 p=0.764	OR=0.73 p=0.738	OR=0.80 p=0.769
Medicare part B	Yes No	OR=0.96 p=1.000	OR=3.00 p=0.288	OR=0.49 p=0.349
Other plan	Yes No	OR=0.8 p=1.000	OR=2.44 p=0.472	OR=0.28 p=0.106
At least one discomfort	Yes No	OR=3.02 p=0.06	OR=0.50 p=0.35	OR=1.15 p=0.50
Frequency of BSE	Monthly Other	OR=1.00 p=1.000	OR=0.68 p=0.755	OR=1.36 p=0.781
Mammogram sometime in life	Yes No	OR=2.82 p=0.291	OR=1.60 p=0.710	OR=0.83 p=1.000
Freq. of mammogram	Every 2 years Other	OR=1.44 p=0.764	OR=0.73 p=0.738	OR=1.15 p=1.000
Last mammogram	≤ 1 year > 1 year	OR=2.86 p=0.144	OR=0.69 p=0.746	OR=0.44 p=0.245
CBE sometime in her life	Yes No	OR=30.8 p=0.132	OR=0.48 p=0.316	OR=0.80 P=0.769
Last CBE	≤ 2 years > 2 years	OR=0.84 p=0.555	OR=0.15 p=0.006	OR=0.67 p=0.562
Visit gynecologist last 12 months	Yes No	OR=1.62 p=0.572	OR=0.49 P=0.353	OR=0.80 p=0.781

CBE every two years or less have a higher score in the early detection scale (Table 7).

The "symptoms" sub-scale showed a marginally association with the area of residence (p=0.058). Women residing in the metropolitan areas have a lower on the risk scale (p=0.025) (Table 7).

Women with an educational level greater or equal to 12 years had a higher score of beliefs' scale (p <0.001). Similar pattern were obtained for women that had a mammography sometime in their life (p=0.036), and for women that had a mammography in the last twelve months

was greater than 0.20 a scale was consistent (11). Another way to analyze the item's correlation with the scale was eliminating the item and computing again the alpha. If alpha increases when an item is deleted, then the item must be excluded to increase the internal consistency.

In the knowledge sub-scale of symptoms, the higher Cronbach´s alpha was 0.4339, followed by detection sub-scale with 0.4098 and risk sub-scale with 0.3069 (Table 9). In the beliefs' scale, a Cronbach´s alpha of 0.7598 was obtained. This scale was the one with the best internal consistency. All the statements had a correlation greater

than 0.30, which implies that all their components are adequately correlated with the total scale (Table 10).

Conclusions

Table 8. Demographics Variables, Breast Cancer History and Detection Practices by the Belief's Scale: Validation Process

Selected Variables		Belief's Scale Low vs High	
Region	Metro No metro	OR=1.34	p=0.609
Education	≥ 12 years < 12 years	OR=0.13	p=<0.001
Age	< 75 years ≥ 75 years	OR=0.37	p=0.23
Medicare B	Yes No	OR=0.81	p=0.734
Other plan	Yes No	R=0.35	p=0.192
At least one discomfort	Yes No	OR=2.34	p=0.939
Frequency of BSE	Monthly Other	OR=0.62	p=0.397
Mammogram sometime in life	Yes No	OR=0.12	p=0.036
Frequency of mammogram	≤ 2 years > 2 years	OR=1.22	p=0.742
Last mammogram	≤ 1 year > 1 year	OR=0.27	p=0.027
CBE sometime in life	Yes No	OR=0.57	p=0.371
Last CBE	≤ 2 years Other	OR=1.50	p=0.494
Visit gynecologist in the last year	Yes No	OR=0.043	p=0.31

According to the results, the beliefs' scale had better consistency than the knowledge scales. This may be explained by the fact that statements were defined by the FG experience. The FG provided the orientation to culturally adapt the questionnaire. The construct validity process showed a limited number of significant associations between knowledge scales and demographic variables, contrary to the beliefs' scales where the number of significant associations was higher. Therefore, this study showed that less beliefs about breast cancer increased the early detection practices in the participants, on th high level of knowledge of breast cancer not necessarily implied an increment in these practices.

The findings of this study were applied to design a questionnaire that was used in a national survey in Puerto Rico to determine the personal and external barriers affecting breast cancer early detection practices among elderly women.

Table 9. Internal Consistency Assessment for Sub-Scales of Risk, Detection and Symptoms: Validation Process.

Risk sub-scale	Total correlation*	Cronbach's alpha‡
Item 62	0.2460	0.0322
Item 66	0.1503	0.2197
Item 82	0.0919	0.3881
	Sandarized alpha	**0.3069**
Detection sub-scale	Total correlation	Cronbach's alpha*
Item 72	0.2849	0.2738
Item 74	0.2892	0.2200
Item 83	0.1583	0.3853
Item 85	0.1426	0.3884
	Standarized alpha	**0.4098**
Symptoms sub-scale	Total correlation	Cronbach alpha*
Item 58	0.3088	0.2446
Item 68	0.2094	0.4213
Item 71	0.2832	0.3070
	Standarized alpha	**0.4339**

* Person correlation between the knowledge scale and respective item
† Computation of the Cronbach's alpha coefficient after omitting the item

Table 10. Internal Consistency for the Beliefs Scale Validation Process.

Beliefs scale	Total correlation*	Cronbach's alpha†
Item 57	0.4037	0.7384
Item 61	0.4984	0.7206
Item 64	0.4400	0.7355
Item 65	0.4861	0.7229
Item 70	0.4173	0.7356
Item 75	0.5689	0.7067
Item 77	0.4908	0.7220
Item 80	0.3428	0.7523
	Standarized alpha	598

* Person correlation between the knowledge scale and respective item
† Computation of the Cronbach's alpha coefficient after omitting the item

Resumen

Esta publicación presenta los resultados del proceso de validación para medir el conocimientos y las creencias sobre el cáncer de mama y las prácticas de detección temprana entre las mujeres puertorriqueñas de edad mayor. Un cuestionario inicial fue diseñado basado en la literatura científica y de la experiencia de grupos focales. Para determinar la consistencia y validación de las

mediciones del cuestionario, 50 mujeres de edad mayor fueron entrevistadas dos veces. La consistencia se analizó a través de diferentes pruebas estadísticas para muestra pareadas y con el coeficiente de Cronbach. Análisis de Factortes (FA) fue utilizada para evaluar agrupación de conceptos sobre conocimientos y creencias. A través de FA tres escalas para conocimiento y una para escala fueron diseñadas. El propósito de las escalas es identificar subgrupos, de acuerdo a las prácticas de detección temprana. Valiadación de Concepto fue realizada para determinar el número de asociaciones estadísticas entre escalas y prácticas. Los resultados demostraron que la escala de creencias estaba asociada a la práctica de la mamografía ($p<0.05$) y a la visita al ginecologo ($p<0.05$), mientras que la escala de conocimiento sobre detección temprana se asoció con el examen clínico ($p<0.05$). La escala de creencias demostró mejor consistencia que las escalas de conocimiento. El coeficiente de Cronbach fue 0.75 para la escala de creencia y 0.30, 0.41 y 0.43 para cada una de las escalas de conocimiento definidas, respectivamente.

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