Predictors of Adoption of Mammography in Women Under Age 50

Ilene C. Siegler, John R. Feaganes, and Barbara K. Rimer
Duke University Medical Center

Women in the University of North Carolina Alumni Heart Study reported their knowledge of and attitudes toward mammography as well as their adoption of mammography by 1991. Personality measured in 1988-1989 at the age of 42 was associated with the pattern of adoption of mammography reported 2 years later. Adoption of regular mammograms was predicted by conscientiousness, extraversion, and lower depression but not by anxiety. After adjusting for 8 traditional predictors of mammography shown to be significant in this population, the previous personality factors did not maintain their significance. When the women were divided into those who reported breast problems and those who did not, the same set of adjustment factors reduced, but did not eliminate, the association of conscientiousness with adoption of mammography for women without breast problems.

Key words: personality, mammography

In spite of years of evidence supporting the benefits of mammography for women over age 50 and a current debate about recommendations for women aged 40-50 (Fletcher, Black, Harris, Rimer, & Shapiro, 1993), most women do not get regular mammograms. Numerous surveys have now confirmed a number of barriers to mammography. Women said they did not get mammograms because their doctors did not recommend them, they did not need them, or there was no evidence of breast disease (Dawson & Thompson, 1990; Harris et al., 1991; NCI Breast Cancer Screening Consortium, 1990; Rimer, Trock, Engstrom, Lerman, & King, 1991; Zapka, Stoddard, Maul, & Costanza, 1991). Other barriers such as cost, fear of the result, concerns about pain and embarrassment, and procrastination are also mentioned, but much less often.

Mammography use is higher among college educated women and those with incomes above $30,000 (Rimer, 1992), insurance and a regular source of health care (Rakowski, Rimer, & Bryant, 1993), regular visits to an obstetrician/gynecologist (Burg & Lane, 1992), and regular checkups (Rimer, 1992). Women who know the guidelines and recognize that the risk of breast cancer increases with age are also more likely to get mammograms (Rimer et al., 1991). The role of perceived personal risk has been inconsistent (Rimer, 1991).

Eysenck (1988) argued that there is a cancer-prone personality complex (hopelessness, helplessness, depressive feelings, and repression in the face of stress) that is the inverse of coronary-prone personality (hostility/anger). However, the support for such a pattern is moderate at best (Faragher & Cooper, 1990; Gammon & John, 1993; Rowland & Holland, 1989). Although personality may or may not be related to cancer incidence, personality might be related to screening behaviors (Contra, Leventhal, & O'Leary, 1990).

The role of personality factors in breast screening behavior has been examined in three studies. Morris and Greer (1982) found that higher levels of state anxiety predicted screening for the women with benign breast disease. Maclean, Sinfield, Klein, and Harnden (1984) found that practical concerns about scheduling and fears about breast cancer were the major reasons why women declined breast screening. Kreitler, Chaitchik, and Kreitler (1990) explored the psychological profile of clinic attendees and reported that women with a cancer-prone personality were more likely to attend the screening.

The University of North Carolina Alumni Heart Study (UNCAHS) afforded the opportunity to examine mammography use by women in their 40s who had their personality assessed before their mammography attitudes and behavior were measured. We expected that adoption of mammography would be predicted by extraversion and by conscientiousness—which has facets labeled competence, order, dutifulness, achievement striving, self-discipline, and deliberation—because extraversion and conscientiousness have been associated with general factors of health behavior (Booth-Kewley & Vickers, 1991). Furthermore, adoption of mammography would be related to higher levels of anxiety and depression.
PERSONALITY AND MAMMOGRAPHY

This research was designed to answer the following questions: (a) Do the factors that explain mammography screening behaviors for women in their 50s and 60s also predict mammography screening behaviors in women in their 40s? (b) What personality characteristics predict mammography use within the next 2 years? (c) Is personality an independent factor in understanding mammography screening behavior or does it work through traditional predictors?

Method

Subjects

The women in this study are members of the UNCAHS, an ongoing mail survey of biobehavioral factors in coronary heart disease (see Siegler, Peterson, Barefoot, Harvin, et al., 1992; Siegler, Peterson, Barefoot, & Williams, 1992). A women's health questionnaire (WHQ) was mailed on April 10, 1991. Women who returned a WHQ by October 31, 1992, were eligible for the current study if they were under the age of 50 at the time they were sent the WHQ. Of the 936 women who returned the WHQ, 778 (83%) returned it. The analyses in this article are based on 756 women (excluding 8 who reported breast cancer and 14 who did not answer four or more of the questions on the WHQ) representing 81% of the eligible participants and 97% of those who returned a WHQ. There were no significant differences in personality measured in college as a function of participation in the WHQ or the exclusion criteria for the study. Personality was measured before the WHQ and thus defines a prospective cohort study.

Measures

Personality. In 1988–1989, personality was measured with the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985). The mean values of the scales were what would be expected and were all in the normal range.

Mammography behavior. Mammography behavior was assessed by the stages of adoption developed by Rakowski et al. (1992) as part of an adaptation of the Trantheoretical Model to mammography. The stages were precontemplation, no prior mammograms and no plans in the coming year \((n = 17, 2.3\%)\); contemplation, no prior mammograms but planning for one or more or one prior mammogram and no plans for the coming year \((n = 89, 11.8\%)\); action, one prior mammogram and planning for one in the coming year \((n = 160, 21.2\%)\); and maintenance, more than one prior mammogram and planning for one in the coming year \((n = 490, 64.8\%)\). The stage was derived from the answers to three questions: Have you ever had a mammogram? Number of previous mammograms? and Are you planning to have one in the next 1–2 years? In the UNCAHS women, 89% have had at least one mammogram.

Rakowski et al. (1992) defined their model as “a sequence of stages along a continuum of behavioral change” (p. 112). Because the outcome measure had ordinal response categories, we used Mantel-Haenszel methodology and ordinal logistic regression assuming proportional odds (Agresti, 1990; Koch & Imrey, 1985) in order to take full advantage of the data with modeling techniques. The use of regular logistic regression would have required collapsing the dependent variable into only two categories and would have lost important information.

Mammography associations. Mammography questions were modeled after those used in the National Health Interview Survey and designed by the National Cancer Institute’s breast screening consensus (Dawson & Thompson, 1990; Lerman, Rimer, Trock, Balshem, & Engstrom, 1990; Rimer et al., 1991; Zapka et al., 1991). A quantitative measure of risk was calculated with the algorithm developed by Gail et al. (1989), which combines age at first pregnancy and family history to estimate an individual’s lifetime risk of breast cancer. These questions formed the independent variables that are called traditional predictors.

Reasons for mammography. Even though women with breast cancer were removed from the study, women have mammograms for symptomatic reasons. Thus women reporting no breast problems \((n = 411)\) were compared with women reporting fibrocystic disease, benign tumor or lump, or calcifications \((n = 343)\).

Statistical Analyses

Each personality variable was tested first in a model with only that trait as a predictor of mammography behavior. The significant variables were then tested in the final model. This model combined factors from each of the domains of traditional mammography predictors to evaluate the extent to which personality added to the prediction of mammography behavior.

Within each domain, each question was first tested for association with the dependent variable of stage of adoption through the Mantel-Haenszel methodology. Ordinal logistic regression assuming proportional odds (referred to as logistic regression) was then used to test the a priori hypothesis of statistical independence between adoption of mammography and each domain. Using the logistic regression models, one for each domain, we calculated odds ratios for each ordinal category and 95% confidence intervals for each traditional predictor. These results are available from the senior author. The odds ratios are unconditional and represent univariate tests. The grouping of the independent variables into domains is important because the logistic model of each domain provided a statistical test of significance of the entire domain, and this provided a basis for dealing with the highly intercorrelated nature of the data. (For further information on ordinal logistic models, see Agresti, 1990; McCullagh & Nelder, 1989; and Koch & Imrey, 1985.) Variables representing the domains were selected as covariates in logistic models. These were combined with the significant personality factors to assess the impact of personality adjusted for variables with known associations to mammography behavior. Anxiety was included in the modeling because of previous findings (Siegler & Costa, 1994).

A Mantel-Haenszel chi-square test that utilizes modified ridit scores (Mantel, 1963) was used to test the assumption of statistical independence between the stages of adoption and the proportions of women with missing data for each variable. Women in earlier stages of adoption were more likely to have missing information on the predictors used in this article. When the 14 women with four or more missing items were excluded from the analysis, the association between missing items and adoption was no longer statistically significant. However, the potential for bias remains a problem for this study and for this area of research, as Fallowfield, Rodway, and Baum (1990) noted.

Results

Respondent Characteristics

The mean age of respondents at the time the mammography questionnaire was returned was 44.16 years. The sample was well educated, with 50% reporting an undergraduate degree and 41% a graduate degree. The sample was 98.5% White. The majority of women (76%) were married. Respondents worked full (58%) or part time (23%) or were homemakers (14%). The median family income reported was in the $60,000 range.
Modeling of Variables Within Domains

General knowledge. Knowledge about recommended guidelines and overestimating the recommended screening interval and the prevalence of breast cancer were associated with the adoption of a more regular pattern of mammography.

Personal knowledge of breast cancer. The risk of developing breast cancer was calculated according to the method developed by Gail et al. (1989). Individual risk ranged from .07 to .35, with a mean of .12 and a standard deviation of .03. Actual risk was correlated with the woman’s perceived subjective risk (r = .46, p = .001) and uncorrelated with her knowledge of the prevalence of breast cancer (r = .05, p = .148). The majority of women in the study had at least one friend (61%) and no family members with breast cancer (66.5%). These variables are uncorrelated and independent. When both are put into the same model and the interaction is tested, the associations remain at the same level and the interaction is not significant, suggesting that each factor has an independent and multiplicative effect on the adoption of mammography. When the odds ratios were calculated in separate models to estimate the odds for the actual number of friends or family members, each friend multiplicatively increased the odds by 1.18 and each relative by 1.74. Thus, although having family members with breast cancer is less likely than having friends with breast cancer, it is a more powerful motivator of screening behavior.

Financial barriers to mammography. Even though this sample is well educated and middle-class, financial considerations and insurance coverage still had an impact. This is consistent with other studies that have shown that willingness to pay out of pocket increases the odds of having had a mammogram (Rimer, 1991).

Attitudinal barriers. The fear of finding breast cancer was not significantly related to stage of adoption of mammography in this sample.

Use of medical care. Women who feel uncomfortable asking physicians about mammography are at an earlier stage of adoption, whereas women who report obstetrician/gynecologist visits or pap smears every 6 months are at a later stage of adoption.

Adult Personality Functioning

Extraversion and conscientiousness were significantly related to adoption of mammography. Of the 18 facets of personality measured, only assertiveness and depression were significant predictors of adoption. The unadjusted odds ratios were calculated for a 2-standard-deviation change in the personality factor and are shown in the first column of Table 1.

Personality Adjusted for Eight Traditional Predictors

In order to understand the role of personality in conjunction with traditional predictors of mammography, we tested the personality factors using the following covariates: (a) knowledge of recommendation for women aged 40-49, (b) knowledge of prevalence of breast cancer, (c) subjective estimate of own risk, (d) number of friends with breast cancer, (e) family history of breast cancer, (f) frequency of regular obstetric/gynecological care, (g) insurance coverage, and (h) the role of the cost of a mammogram as part of the decision process. When the personality factors were tested in a model adjusted for these covariates, none of the personality factors remained significant.

In order to explore the associations between the personality factors and the covariates, we ran multiple regression models with the personality factor as the dependent variable and the covariates as independent variables. Conscientiousness was associated with the number of relatives with breast cancer and agreeing that cost would not be a factor in seeking mammography. Extraversion was associated with the number of friends with breast cancer. Assertiveness was associated with the schedule of obstetric/gynecological examinations and agreeing that cost would not be a factor in seeking mammography. Depression was associated only with cost, and anxiety had no significant associations.

The Role of Breast Problems

Of the 754 women in this study, 55% reported that they never had a lump, tumor, or cyst on their breast, whereas 45% reported breast problems. Analyses were repeated taking this into account. Women with breast problems were more likely to be in the maintenance stage of screening (82% vs. 51%). The report of breast problems was unrelated to adult personality but was related to the covariates. Thus, the final models were calculated separately for women with and without breast problems (see Table 1). After this analysis the odds ratio for

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<td>Odds ratio</td>
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<td>Conscientiousness</td>
<td>1.64</td>
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<td>1.44</td>
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<td>Extraversion</td>
<td>1.44</td>
<td>1.05, 1.97*</td>
<td>1.13</td>
<td>0.79, 1.64</td>
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<td>Assertiveness</td>
<td>1.44</td>
<td>1.05, 1.96*</td>
<td>1.18</td>
<td>0.80, 1.74</td>
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<td>Anxiety</td>
<td>1.26</td>
<td>0.92, 1.73</td>
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<tr>
<td>Depression</td>
<td>0.73</td>
<td>0.53, 0.99*</td>
<td>0.69</td>
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*The odds ratio is statistically significant when the value 1.0 is not included in the confidence interval.
conscientiousness was significant for women without breast problems.

Discussion

The variables that have been found to predict mammography in older women also predicted mammography in this sample of women under 50. The data suggest that the same barriers (e.g., knowledge of guidelines) and facilitators (e.g., regular medical care) are important. The majority of these women currently accept the value of mammography. Whether this will continue as the recommendations for women under 50 become more variable remains to be seen.

These data help explain the relationship between personality functioning and cancer-screening behavior. When tested directly with the adoption outcome univariately, adult personality indicators do predict the behavior. Conscientiousness, extraversion, and assertiveness, as well as low depression, predicted use of mammography. Booth-Kewley and Vickers (1991) concluded that extraversion and conscientiousness predicted wellness behaviors in a sample of young men. This suggests a more general role for these two domains of personality in understanding health-promoting behaviors. The importance of depression as a predictor suggests a potential subgroup of women who may require special attention, not only for cancer screening but for other health-promotion activities as well.

The fact that the personality–mammography associations are no longer significant in models that include traditional predictors of mammography behavior does not mean that they are unimportant. Rather, the effects are interwoven with the traditional risk factors and mammography indicators, including breast problems and the cost of mammography. The salience of such variables as perceived risk and the experience of having friends and family members with breast cancer may overwhelm the impact of personality.

Although almost two-thirds of this sample report themselves in the maintenance stage of adoption of mammography, the final third does not. Some strategies are suggested by these findings. Individual differences in personality functioning related to mammography adoption may be more sensitive to the experiences of peers and family members and to the perception of receiving good value for what is invested in mammography than to other predictors. Thus, interventions that are designed for peers and family members of breast cancer patients may be especially effective. This analysis contributes to the literature on the associations between perceived risk and adoption of mammography. Although previous studies have been inconsistent, among the UNCAHS women, higher perceived risk (indexed by number of family members with breast cancer) was associated with a later stage of adoption that is more action oriented. This suggests that information about personal risk might be a useful intervention. As a group, women in their 40s should be monitored. With recommendations about mammography in flux, it is not known how their behavior patterns with regard to mammography will change and how they will approach mammography as they enter their 50s—a decade in which all the experts agree about the value of mammography in saving lives (Fletcher et al., 1993).

References

NCI Breast Cancer Screening Consortium. (1990). Screening mammog-

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