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Message Framing and Mammography Screening: A Theory-Driven Intervention

Lila J. Finney, MPH, PhD; Ronald J. Iannotti, PhD

Although the rising incidence of breast cancer has prompted a surge of intervention strategies aimed at increasing women's use of mammography screening, the majority of patient-directed interventions have not been driven by relevant theoretical work on persuasive health communication. The authors evaluated an intervention derived from prospect theory that was designed to increase women's adherence to recommendations for annual mammography screening. They sent 1 of 3 reminder letters (positive frame, negative frame, or standard hospital prompt) to 929 randomly selected women who were due for mammography screening and had been identified as having either a positive or negative family history of breast cancer. The primary hypothesis that women with a positive history would be more responsive to negatively framed messages, whereas women with a negative history would be more responsive to positively framed letters, was not confirmed. The lack of support for predictions derived from prospect theory raises important questions about the generalizability of laboratory research to natural settings.

Index Terms: breast cancer, mammography, message framing, prospect theory

High incidence of breast cancer, coupled with the availability of improved methods for early detection, has spurred the development of several interventions aimed at increasing women's use of mammography screening.¹⁻³ We used the framing postulate of prospect theory,⁴ to guide the development of persuasive messages, to remind women to return for annual mammography screening. The framing postulate of prospect theory states that the preference for a risky option may depend on whether the option is positively or negatively framed. Individuals avoid risks when considering gains but prefer risks when considering losses.⁴ Reversal of preference in response to problems that emphasize potential loss versus potential gain highlights the impor-

tance of the decision maker's conception of the problem, which is partially determined by how the problem is framed. Formal tests of prospect theory have revealed consistent shifts in preference for precisely stated probabilities of gains or losses in response to decision frames that provide strong support for the theory.⁴

Rothman and Salovey⁵ argue that although the operationalization of the concepts of certainty, risk, loss, and gain are rather straightforward in formal tests of prospect theory, it is much more difficult to operationalize such terms when the theory is integrated into practical health recommendations. In applications of prospect theory to health recommendations, preferences and behaviors generally involve deciding whether to adopt a particular course of action in response to positively or negatively framed recommended health actions rather than to selecting between 2 distinct courses of action. Furthermore, the positive or negative outcomes associated with certain behavioral options usually cannot be defined in terms of precise likelihood of occur-

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rence.⁵ For example, a recommendation to use dental floss on a regular basis may be stated in terms of potential loss: "If you do not floss regularly, you will increase your chances of gum disease and tooth decay." This same recommendation may also be stated in terms of potential gain: "If you floss regularly, you will increase your chances of having healthy gums and teeth."

Many interventions aimed at promoting health behaviors have relied on the underlying assumption in prospect theory that people respond differentially to gain and loss-framed messages.⁵⁻¹² However, these investigations have yielded rather mixed results. Although a number of investigations have found at least partial support for prospect theory, the relative effectiveness of negatively framed and positively framed information has been inconsistent,^{5,6,8-10,13} and some investigations have failed to find the effect altogether.^{7,11}

Variables that influence the effect of message framing on personal health decisions have been identified.^{5,10,13} One factor proposed to explain past inconsistencies in the effect of message framing is the type of behavior being promoted.^{5,10,13} The distinction between prevention behaviors and detection behaviors is important, and differences between the 2 may mediate the effectiveness of positively and negatively framed messages. Prevention behaviors are aimed at maintaining health or preventing the occurrence of a health problem, whereas detection behaviors are aimed at finding or detecting potential health problems in the early stages of disease. Results of past investigations offer some support for the idea that positive framing may be more effective for prevention behaviors and negative framing may be more effective for detection behaviors.^{5,10,13}

Another factor that may be useful in explaining inconsistencies in earlier investigations is issue involvement. Previous investigations have demonstrated that the degree of issue involvement influences whether information is processed in a detailed (systematic) or in a peripheral (heuristic) manner.^{5,10,13} Individuals who are highly involved in a behavioral area tend to process information in a systematic manner, and those who are not highly involved tend to process information in a heuristic manner. Such research suggests that positive information tends to be more persuasive than negative information when the information is processed heuristically, but negative information has been found to be more persuasive when the information is processed systematically. This pattern of results has been consistently found in research on health communication and marketing.^{14,15} The moderating effects of issue involvement and target behavior must be taken into consideration when one examines the effect of message framing on health behavior.

The effectiveness of message-framing interventions has

also been examined in breast health promotion.^{6,9} Meyerowitz and Chaiken⁹ investigated an intervention designed to increase breast self-examination (BSE) among college women. Operating on the assumption that performing BSE is a risk-seeking behavior, according to prospect theory, they expected that a pamphlet promoting BSE would be more effective if it stressed the negative consequences of nonadherence rather than the positive consequences of adherence. Participants who read the negatively framed pamphlet demonstrated the most positive BSE attitudes, intentions, and behaviors, which was consistent with predictions.

Banks and colleagues⁶ examined the effectiveness of negatively and positively framed messages in persuading women to obtain mammograms. Women over the age of 40 who were not adhering to the national guidelines for obtaining mammograms watched 1 of 2 (negatively framed vs positively framed) educational videos on breast cancer and mammography. The positively framed video emphasized the benefits of obtaining a mammogram, and the negatively framed video emphasized the risks of not obtaining a mammogram. In accordance with hypotheses based on prospect theory, the women who were exposed to the negatively framed video were more likely to report having obtained a mammogram at the 6- and 12-month follow-up contacts.

Present Investigation

To assess the effectiveness of message framing in an applied setting, we drew on considerations raised in the literature and applied predictions derived from prospect theory to a patient-reminder system intervention targeting women due for annual mammography screening. We explored 2 different hypotheses. The first hypothesis, based on the findings of Rothman et al¹⁰ regarding issue involvement, predicted that women with positive family histories of breast cancer would demonstrate a high degree of issue involvement regarding breast cancer and would therefore be more responsive to negatively framed reminder letters. Women with negative family histories of breast cancer would demonstrate lower issue involvement and therefore would be more responsive to positively framed messages.¹⁰ An alternative and complimentary hypothesis, derived from Rothman and colleagues' work demonstrating the superiority of negatively framed letters for detection behaviors,^{5,10,13} predicts compliance would be higher in response to negatively framed letters among women with a positive family history compared with women with a negative family history. By contrast, no difference in compliance would be found between the two groups in response to a positively framed letter. The participating clinic used its standard prompt letter for comparisons with the framed letters.

METHOD

Site Characteristics

We implemented our intervention in a small, not-for-profit hospital that provides medical care for primarily rural areas in Butler and Preble counties in Ohio and in Franklin, Union, and Fayette counties in Indiana.

Needs Assessment

In 1998, 73% of the women aged 40 years and older in Ohio and 66% of the women aged 40 years and older in Indiana reported having had a mammogram in the previous 2 years.^{16,17} Although mammography-screening rates among women in Indiana and Ohio are fairly high, according to the Ohio Cancer Incidence Surveillance System¹⁸ and the Indiana Health Department's Health Behavior Risk Factor Report,¹⁷ breast cancer is the most commonly diagnosed cancer and the second leading cause of cancer death among women in both states. The demonstrated association between annual mammography screening and the reduction in breast cancer mortality demands continued efforts to maintain or increase current screening levels.

Recruitment and Selection of Participants

Each month, lists of women due for annual screening were generated from the patient database at the participating hospital to determine who should receive a reminder letter. The women we selected for inclusion in the study met the following criteria: (a) they were at least 40 years of age, (b) their recommended frequency of mammography was no more than annual, (c) they had no prior breast cancer diagnosis, (d) they had received a mammogram at the facility the previous year, (e) their records indicated knowledge of family history of breast cancer, and (f) they were not on Medicaid or Medicare. The final pool of participants included 929 women who were due for their annual mammography screening over a 10-month period extending from December 1999 through September 2000. We obtained family histories of breast cancer from patient records, and classified women whose records indicated that 1 blood relative had been diagnosed with breast cancer as having a positive family history.

None of the participants were aware of the message-framing manipulation at any time during the study. The participating hospital routinely sent out screening-reminder letters; we modeled the positively and negatively framed reminder letters created for this intervention after the hospital's standard reminder letter. The institutional Committee on the Use of Human Subjects in Research and the hospital review board reviewed and approved of our research protocol.

Materials

We used the hospital's standard mammography screening reminder letter as the basis for constructing 2 additional reminder letters. One of the reminder letters contained a negatively framed message in addition to the information in the standard letter. That message emphasized the risks of failing to obtain a mammogram and included some of the loss-framed statements used in an investigation Banks et al⁶ reported in 1995. The other reminder letter contained a positively framed message in addition to the information in the standard hospital prompt. It emphasized the benefits of obtaining a mammogram and included some of the gain-framed statements presented in the Banks et al investigation. All 3 letters were assessed as being at or below the ninth-grade reading level.

A subsample of women ($n = 300$) who were exposed to the intervention also completed a questionnaire that assessed an expansion and application of the health belief model to mammography screening and breast cancer. We do not discuss the results of that questionnaire in the present analysis; however, the findings replicate earlier work that demonstrated higher levels of issue involvement among women with a positive family history of breast cancer.¹⁹ Those results confirm the appropriateness of the assumption that women with a positive family history of breast cancer show greater issue involvement than women with a negative family history of breast cancer.

Procedure

We stratified the list of women due for their annual mammogram by family history of breast cancer and randomly selected them to receive 1 of the 3 reminder letters: (a) a negatively framed reminder, (b) a positively framed reminder, or (c) a standard hospital reminder. We timed the letters to arrive 1 week before the month during which the repeat mammogram was due.

Power Analysis

Reminder Letters

Previous studies²⁰⁻²² have reported a compliance rate from reminder letters of approximately 45%. The average difference in compliance between positively and negatively framed health recommendations reported in previous studies of message framing and health behavior was approximately 19%.^{6,10,13} Although our sample included fewer women with a positive family history ($n = 313$) than with a negative family history ($n = 616$), the sample sizes obtained for both groups allowed sufficient power to detect differences of 19% between the positive and negative letters as

well as differences between the standard letter and the framed letters. Power for conducting nondirectional tests ranged from .79 to .98, and power for conducting directional tests, which is justified in view of the directional nature of the hypotheses tested, ranged from .87 to .99.

Hypotheses and Analyses Conducted

We assessed compliance 1 month and 2 months after we mailed the reminder letters, and recorded the number of women who attended an appointment in 1 or 2 months after the mailing. According to our first hypothesis, women with a positive family history of breast cancer who received the negatively framed messages were expected to attend screening significantly more often than those who received the positively framed letters. By contrast, women with a negative family history of breast cancer who received the positively framed messages were expected to attend screening significantly more often than those who received the negatively framed messages. The alternative hypothesis predicted higher compliance in response to the negatively framed letter among women with a positive family history compared with women with a negative family history and no difference in compliance between the groups in response to the positively framed letter.

We conducted a binary logistic regression analysis predicting compliance with the reminder letters according to type of letter sent, family history, and the interaction between type of letter and family history. Following the first hypothesis, we expected a significant interaction between family history and type of message. The negatively framed message, we anticipated, would elicit higher attendance for women with a family history of breast cancer and the positively framed message would result in higher attendance for women with a negative family history of breast cancer. We expected no differences in compliance across family history in response to the standard letter. According to the alternative hypothesis, we expected a significant interaction between family history and type of message. The negatively framed message, therefore, would elicit higher attendance among women with a positive breast cancer family history, and the positively framed message would elicit similar compliance among the 2 groups. We made no specific predictions about compliance in response to the standard letter.

RESULTS

Intervention Duration

Although the projected intervention duration was 12 months, the intervention was withdrawn early because of ethical concerns about the positively framed reminder letter

eliciting lower compliance than the standard letter. Throughout the duration of the intervention, we monitored compliance with the various reminder letters monthly to ensure that none of the letters were having a negative impact on compliance. The data available for assessment of compliance lagged behind actual intervention exposure (mailing of reminder letters) by 2 months. After sending out framed reminder letters for 10 months, 8 months of compliance data were available. Our examination of 8 months of compliance data revealed significantly lower compliance among women with a family history of breast cancer who received the positively framed letter (39%) compared with those who received the standard hospital prompt (54%, $\chi^2[1, N = 167] = 3.75, p = .05$). Although this difference was not highly significant statistically ($p = .05$), we assessed the 15% difference in compliance favoring the standard letter as clinically significant and withdrew the intervention. The total duration of the intervention was 10 months.

Sociodemographic Characteristics

Sociodemographic information for the entire sample ($n = 929$) was not accessible, but we did obtain demographic information from a subsample of women who were exposed to the intervention and who completed a questionnaire. The information from this subsample suggests that the women exposed to the intervention were fairly homogeneous in terms of race, education, marital status, and employment (see Table 1). General demographic information about the population served by the participating hospital supports our assessment of homogeneity.

Reminder Letters

Outcome Variable

We examined compliance by assessing chart documentation of appointment attendance at 1-month and 2-month endpoints. At the 1-month endpoint, we addressed the immediate effect of the message-framing manipulation. At the 2-month endpoint, we assessed compliance to provide a more ecologically valid measure of the long-term effects of the message-framing manipulation. We categorized women who attended an appointment for mammography in the first month as compliant at the 1-month endpoint ($n = 231$), and categorized women who did not attend an appointment in the first month as noncompliant at the 1-month endpoint ($n = 698$). An additional 160 women attended an appointment for mammography during the second month, resulting in our categorizing 391 women as compliant at the 2-month endpoint. Finally, we categorized the women who did not attend an appointment in 2 months as noncompliant at the 2-month endpoint ($n = 538$).

Predictor Variables

The predictor variables we assessed included family history of breast cancer and type of reminder letter sent to the patient. We identified family histories of breast cancer from patient files and found that 66.3% ($n = 616$) of the participants reported a negative family history, whereas 33.7% ($n = 313$) reported a positive family history of breast cancer. We randomly assigned the type of letter, and mailed approximately equal numbers of negative ($n = 316$), positive ($n = 312$), and standard ($n = 301$) letters. The number of compliant women in each exposure group is shown in Table 2.

Logistic Regression

We conducted logistic regression analyses to assess the influence of breast cancer family history, type of reminder letter, and the interaction of family history and type of letter on the participants' compliance at both the 1-month and 2-month endpoints. We then conducted 2 separate analyses of the impact of the intervention. The first hypothesis was that

TABLE 1
Sociodemographic Characteristics of the Subsample in a Study of Message Framing for Mammography Screening

Variable	<i>n</i>	%
Age		
40–49	114	38
50–59	132	44
60–69	54	18
Race		
White	278	92.7
Minority	20	6.7
Education		
< high school	23	7.6
High school graduate	98	32.7
Some college/technical school	68	22.7
College graduate	58	19.3
Graduate school/ advanced degree	53	17.7
Marital status		
Not married	53	17.7
Married	247	82.3
Employment		
Full-time	174	58
Part-time	51	17
Not employed	74	24.7

Note. Because of missing data, all *ns* do not sum to total sample size ($N = 300$).

TABLE 2
Participants' Exposure to Intervention and Subsequent Adherence in a Study of Message Framing for Mammography Screening

Framing group	<i>n</i>	Adherence	
		1 mo	2 mo
Positive family history	313	90	147
Standard letter	102	30	55
Frame			
Positive	102	24	41
Negative	109	36	51
Negative family history	616	141	244
Standard letter	199	46	79
Frame			
Positive	210	47	83
Negative	207	48	82
Total	929	231	391

TABLE 3
Logistic Regression Predicting Compliance at Month 2 in a Study of Message Framing for Mammography Screening

Factor	β	Odds ratio	95% CI
History	.57*	1.78	1.10, 2.88
Negative letter	-.00	1.00	.67, 1.48
Positive letter	-.01	.99	.67, 1.48
History			
Negative letter [†]	-.28	.75	.39, 1.48
Positive letter [†]	-.55	.58	.29, 1.14

Note. Model $\chi^2(5, N = 929) = 8.46, p = .13$.

[†]indicates interaction with negative and positive letters.

* $p < .05$.

women with a positive family history of breast cancer who received the negatively framed message would attend screening significantly more often than those who received the positively framed letter. On the other hand, women with a negative family history of breast cancer who received the positively framed message were expected to attend screening significantly more often than those who received the negatively framed message.

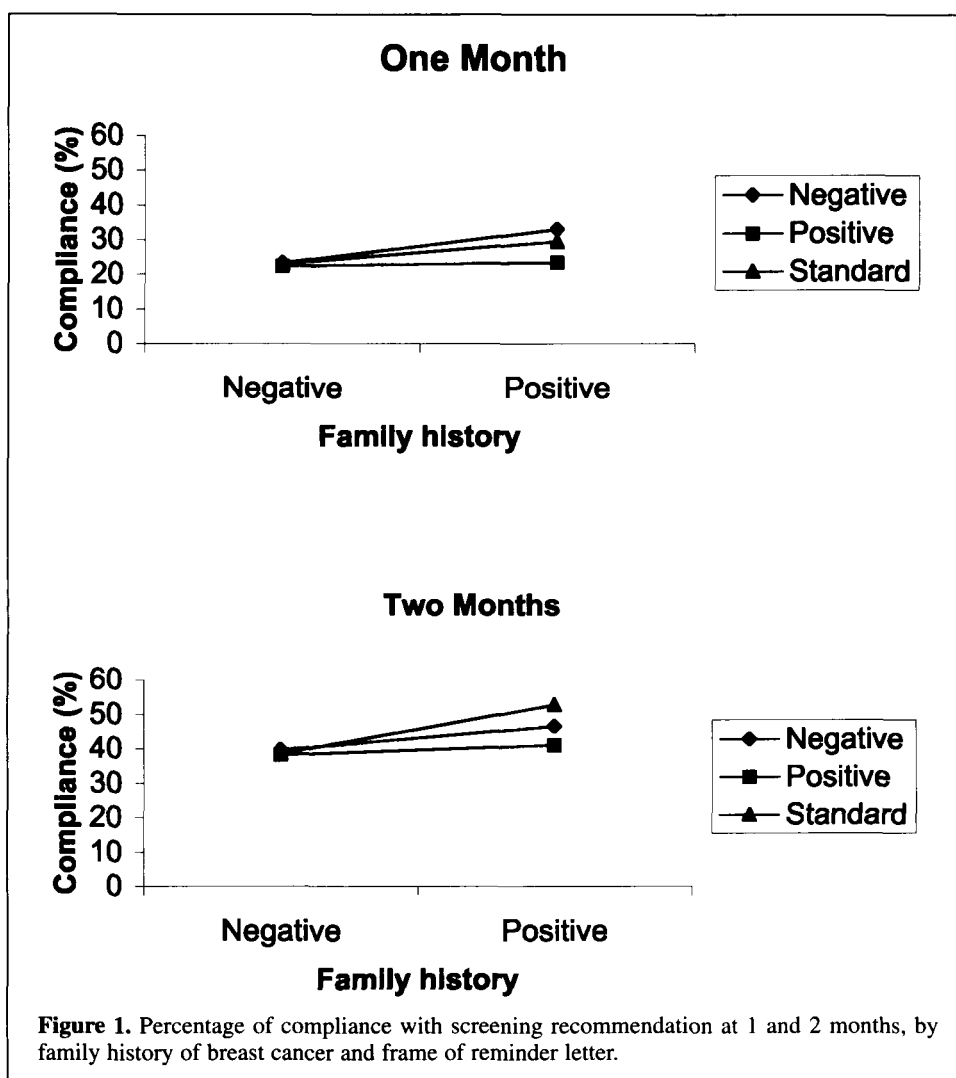
To assess predictions derived from prospect theory, we first analyzed only the interaction between the framed letters and family history. We used indicator contrasts to code the

type of letter and family history; the positive letter was the reference category for type of letter, and a negative family history was the reference category for family history. Logistic regression at the 1-month and 2-month endpoints revealed no significant interaction between the framed letters and family history. The first hypothesis was not supported.

To assess the overall impact of the intervention, in our second analysis we examined the framed letters as well as the standard letter. Again, we used indicator contrasts to code the type of letter and family history; the standard letter was the reference category for type of letter and negative family history was the reference category for family history. Again, we found no significant interaction between family history and the 3 types of letters. However, logistic regression at the 2-month endpoint revealed greater odds of

compliance among women with a positive family history of breast cancer compared with women with a negative family history of breast cancer (see Table 3). This led us to evaluate the alternative hypothesis.

According to the alternative hypothesis, women with a positive family history of breast cancer would show greater compliance in response to the negatively framed letter than women with a negative family history; no difference would be found in compliance between the groups in response to the positively framed letter. As predicted, our examination of main effects revealed differences in compliance in response to the reminder letters among women with a positive family history. The pattern of results was similar at 1-month and 2-month endpoints (see Figure 1). At the 1-month endpoint, women with a positive family history of breast cancer who



received the negatively framed letter demonstrated slightly higher compliance than those women who received the positively framed reminder, $\chi^2(1, N = 211) = 2.34$, 1-tail, $p = .06$, 2-tail, $p = .12$. Women with positive and negative family histories responded similarly to the positively framed letter. At the 1-month endpoint, we identified no differences in women with a positive family history of breast cancer, and no differences in compliance with the various reminders in the women with negative family histories.

The marginally significant difference between the negative and positive letters we identified at the 1-month endpoint was not replicated at the 2-month endpoint. Interestingly, at the 2-month endpoint, we found a significant difference in compliance that favored the standard reminder letter over the positively framed reminder, $\chi^2(1, N = 204) = 3.87$, 1-tail, $p < .05$, 2-tail, $p = .05$. This finding is consistent with the finding we obtained after 8 months of data collection, when we decided to withdraw the intervention. We found no other significant differences between letters at the 2-month endpoint. Although the 1-month compliance rates offer some support for the alternative hypothesis, the data at 2 months do not.

COMMENT

The marginally significant difference we found between the positive and negative letters for women with a positive family history of breast cancer is consistent with our predictions. The superiority of the negatively framed letter in contrast to the positively framed letter was not replicated at the 2-month endpoint, suggesting that any effect of message framing had been short lived. The only significant difference in compliance that emerged at the 2-month endpoint indicated that the standard hospital letter elicited higher compliance among women with a positive family history than the positively framed letter. This finding suggests that for women with a positive family history of breast cancer, the framed reminder letters not only fail to increase compliance, but they may actually decrease compliance. These results suggest that the increased effort of framing reminder letters is not cost effective and is potentially harmful.

Several past investigations that have examined the impact of message framing on health recommendations have not compared framed reminders with a standard reminder.^{6,7,10,13} Meyerowitz and Chaiken⁹ compared the effectiveness of pamphlets containing framed arguments about the importance of BSE to a "no arguments" condition. Participants in the "no arguments" condition received a pamphlet containing the same information about BSE and breast cancer as the framed pamphlets without framed arguments. Results of that investigation revealed that negatively framed arguments had more effect on self-reported BSE behavior than the no-argu-

ments condition. Steffen et al¹¹ reported an investigation that examined the effect of positive, negative, and neutral recommendations for testicular self-examination that did not reveal any significant differences in self-reported behavioral compliance, intentions, or attitudes. Neither of these studies examined the mediating effect of issue involvement, which we operationalized in the current study as presence versus absence of a family history of breast cancer. Our findings in the current study suggest that the potentially negative effect of a framed message compared with a standard message would be diluted when the samples include participants with both high and low levels of issue involvement.

The paucity of investigations that have explored the relative effectiveness of framed health recommendations compared with standard recommendations, coupled with the lack of strong evidence that framed recommendations are superior to standard recommendations, highlights the importance of testing theory in applied contexts. This lack of research also suggests that framing manipulations may not be effective in certain applied settings. Although framing manipulations may elicit predictable responses to persuasive messages, it is essential to ascertain whether framing in terms of prospect theory elicits a greater response when compared with a standard message. The increased effort that framing requires warrants consideration of whether the effort is necessary or cost effective.

One explanation for the absence of support for prospect theory in our current investigation stems from the use of a behavioral-outcome measure. Previous investigations have explored attitudes about or intentions to perform a recommended health action,^{8,10,11} self-reported performance of a recommended health action,^{6,9,23,24} or fairly simple behaviors,¹³ rather than exploring the effect of message framing on actual behavior. In the literature we reviewed, we found only 1 investigation that explored the impact of a message-framing intervention on a behavioral outcome comparable to what we assessed in this investigation; Lauer and Rubin⁷ found that a message-framing intervention did not influence follow-up for abnormal Papanicolaou tests. Our results are consistent with their finding that message framing had no impact on actual compliance.

The potential practical and emotional costs associated with mammography screening render this behavioral-outcome measure distinct from outcome measures that assess intentions, self-reported behavior, or simple behaviors that are not associated with equivalent practical or emotional costs. The most decisive conclusion that may be drawn from earlier investigations of the factors associated with mammography-screening compliance is that women's decisions about mammography screening are multifarious and

complex.^{1,19,25–29} The apparent subtlety of the message-framing manipulation may be easily diffused amidst the competing forces that determine actual mammography-screening compliance.

Although our investigation explored message framing as part of an ongoing patient reminder system in a hospital setting, a number of previous investigations involving message framing have examined the manipulation with more extensive interventions in more controlled laboratory settings with undergraduate students as participants.^{9–11,15,30} It is not clear that this manipulation readily generalizes to nonlaboratory settings. Sears³¹ has raised concerns about the generalizability of research findings that have been generated from the narrow database derived from undergraduate student samples. Furthermore, a direct test of the appropriateness of generalizing the results of a message-framing intervention conducted in a laboratory setting with those carried out in a natural setting revealed that the same manipulation in the two different settings elicited very different responses.³² The varying results others have obtained with the identical framing manipulation in the laboratory and natural settings suggest that this manipulation is greatly influenced by the setting in which it is applied and the population toward which it is directed. We believe that more research should be done to assess the impact of the message-framing manipulation in applied settings.

Strengths of the Present Investigation

Incorporating the framing manipulation in the existing patient-reminder system offers an ecologically valid approach to investigating the effects of message framing on mammography use. Application of the theory in an existing patient-reminder system provides insight into the logistics of integrating theory into practice and evaluates the effectiveness of theory-driven efforts compared with standard practices. Implementation of the intervention in an applied setting reveals the importance of evaluating ongoing patient recruiting efforts (the standard letter) and emphasizes the merits of evaluation in disconfirming untested assumptions. To this end, our collaboration with the participating hospital proved mutually beneficial.

Interestingly, that hospital's clinicians had never assessed the rate of compliance with their reminder letters. Initial discussions with the screening director, nursing staff, and mammography technicians revealed their impression that reminder letters resulted in extremely high patient compliance. Estimates of compliance based on casual observation were not confirmed by the data. Although the compliance rates we observed in our investigation were consistent with those reported in previous investigations,^{20–22} hospital personnel

were surprised by the observed compliance rate, which was considerably lower than their preliminary estimates.

Another interesting issue that arose in negotiations with hospital personnel concerned the initial impressions of the variously framed reminder letters. When they first saw the messages, hospital personnel were concerned about the negatively framed letter; they were quite enthusiastic, however, about the positively framed letter. The findings from our investigation were inconsistent with these initial impressions, indicating that the positively framed letter is less effective than either the negatively framed or standard letter among women who are considered at an increased risk for developing breast cancer because of a positive family history of breast cancer.

Our sample size in this investigation is larger than those reported in previous message-framing interventions.^{6,7,9–13} The availability of an adequate sample provides more power for assessing the message-framing effect, and the use of an objective behavioral outcome measure, which has been rare in previous tests of message framing and health behavior outcomes, is another strength of the present investigation

Limitations

The small number of minority women we included in the sample precludes generalization of the results to minority populations. Another limitation of the message-framing intervention is a product of the intention-to-treat paradigm used to evaluate exposure to the intervention. Although we included all women to whom we mailed a letter in the sample on the assumption that they had received and read the letter and thus were exposed to the intervention, it is possible that some may not have received the letter or may not have read it. All of those in the sample had previously received mammograms at the participating hospital and may have received similar annual reminders in the past; therefore, they may have simply skimmed the letter to read the pertinent information (when they were due for a mammogram). In that case, they would not have been exposed to the framing manipulation. This limitation seems inherent in attempts to use the message-framing manipulation as part of ongoing patient-reminder systems and emphasizes the problems with using a message-framing manipulation in a natural setting.³² However, the significant differences across letters we found for women with a family history of breast cancer could suggest that these women did read the letters.

Implications and Future Directions

Our findings do not support predictions from the framing postulate of prospect theory, which raises important considerations about generalization of laboratory findings to

applied settings. Although the message-framing manipulation has experienced success in laboratory-based investigations^{9-11,15,30} and in investigations using nonbehavioral outcome variables,^{6,8,9,11,23} the evidence for its usefulness in applied settings remains scarce. The subtlety of the message-framing manipulation may limit its integration into applied settings.

Future investigations of mammography-screening compliance should examine the extent to which theory developed and previously tested in laboratory settings can be usefully extended to applied efforts. Although the current application of prospect theory fails to capture the complexity of mammography-screening behavior fully, the effort demonstrates a merger of applied and theoretical considerations in an attempt to improve our understanding of women's health behavior.

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NOTE

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