Health Psychology
2005, Vol. 24, No. 1, 58–67

0278-6133/05/$12.00 DOI: 10.1037/0278-6133.24.1.58

Matching Health Messages to Monitor–Blunter Coping Styles to Motivate Screening Mammography

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This study examined whether providing messages matched to women's monitor–blunter coping styles is effective in encouraging mammography utilization. Female callers to a cancer information hotline were assessed at the end of their regular telephone call and classified as *monitors* or *blunters*. A randomly assigned message promoting mammography utilization, tailored for monitors or blunters, was delivered on the telephone, and a similarly tailored brochure and refrigerator magnet were mailed to participants immediately after their call. Women were telephoned 6 and 12 months later to determine whether they had obtained a mammogram. Messages matched to a woman's monitor–blunter coping style encouraged mammography after 6 months more effectively than mismatched messages and were significantly more effective for blunters but not for monitors.

Keywords: mammography, tailored messages, coping styles, monitoring, persuasion, breast cancer

Breast cancer is the second leading cancer killer among American women. It is estimated that there were approximately 212,600 new cases of breast cancer and 40,200 deaths from breast cancer in the United States in 2003 (American Cancer Society, 2003). The most effective way to detect breast cancer is through the use of regular screening mammography (Kerlikowske & Barclay, 1997). According to the guidelines proposed by the National Cancer Institute (NCI), the American Cancer Society, and other national health agencies at the time this experiment was conducted, women between the ages of 40 and 50 should obtain a mammogram every 1 to 2 years. After age 50, women should be screened annually. However, only 67% of women 40 years and older reported obtaining a mammogram within the past 2 years (NCI, 2001). Although not all data support the efficacy of regular mammography screening for reducing breast cancer mortality for women in their 40s (e.g., A. B. Miller, To, Baines, & Wall, 2002; Olsen & Gotzsche, 2001), the underutilization of screening mammography can result in diagnosis of breast cancer at later and more advanced stages of the disease (Mandelblatt, Andrews, Kerner, Zauber, & Burnett, 1991; McCarthy et al., 1998; Wells & Horm, 1992).

Message tailoring has been identified as one method of influencing mammography utilization (Bastani, Maxwell, Bradford, Prabhu Das, & Yan, 1999; Skinner, Campbell, Rimer, Curry, & Prochaska, 1999; Skinner, Strecher, & Hospers, 1994; but see Drossaert, Boer, & Seydel, 1996; Rimer et al., 1999). Tailored messages present information to recipients based on specific characteristics of the individual recipients in an effort to draw attention to the information by making it more personally relevant (Kreuter, Strecher, & Glassman, 1999). For example, messages have been tailored to recipients' psychological characteristics, such as their stage in the behavioral change process (e.g., Rakowski et al., 1998).

Recipients may be more likely to respond emotionally, cognitively, and behaviorally to messages tailored to match the ways that they typically process health information (S. M. Miller, 1995; Skinner et al., 1994). Some of the information-processing styles we have investigated include individual variability in (a) the willingness to ponder complex arguments (need for cognition; Cacioppo & Petty, 1982); (b) the tendency to attribute the responsibility for maintaining good health to one's self, to others, or to chance (health locus of control; Wallston, Wallston, & DeVellis, 1978); and (c) the tendency to attend to or avoid threatening information (monitor–blunter coping style; S. M. Miller, 1987). Other experiments have confirmed the utility of tailoring to need for cognition and health locus of control in influencing mammography utilization (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003, 2004). In the present experiment, we focused on tailoring messages to monitor–blunter coping styles, as this construct is related to the type and amount of health information desired (S. M. Miller, 1996; S. M. Miller, Fang, Deifenbach, & Bales, 2001), emotional reactions to health information (Muris & de Jong, 1993; Petersson et al., 2002), and subsequent health

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Research reported in this article was funded by a grant from the Ethel Donaghue Foundation Women's Health Investigator Program at Yale University. Preparation of the manuscript was also facilitated by National Cancer Institute Grant R01-CA68427, National Institute of Mental Health Grant P01-MH/DA56826, and National Institute on Drug Abuse Grant P50-DA13334.

We gratefully acknowledge Ashley Cox, Sharon Garcia, Nikki Katulak, David Pizarro, and the information specialists at the Cancer Information Service for their contributions to this research. Copies of the messages used in this research are available on request.

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behaviors and adherence (Christensen, Smith, Turner, & Cundick, 1994; S. M. Miller, 1987; S. M. Miller, Brody, & Summerton, 1988; Sparks & Spirek, 1988; Steptoe & O'Sullivan, 1986; but see Muris, van Zuuren, & De Vries, 1994; van Zuuren & Muris, 1993).

The cognitive–social health information-processing (C-SHIP) model (S. M. Miller, Shoda, & Hurley, 1996) describes how individuals process health information cognitively and emotionally and how it, in turn, motivates health behaviors. Further, the model describes the monitor–blunter coping style as a stable individual difference in how individuals attend to and process health information. Information that matches the way individuals cognitively and emotionally process health information is expected to be more likely accessed and to affect subsequent behavior (S. M. Miller & Deifenbach, 1998).

Individuals differ in how they "monitor" or "blunt" personally threatening information, especially health information (S. M. Miller, Combs, & Stoddard, 1989). *Monitors* are more concerned and distressed about their risk for disease, including cancer (S. M. Miller, Roussi, Altman, Helm, & Steinberg, 1994). They scan for and amplify threatening cues in health information and worry about these threats or risks for extended periods of time (S. M. Miller, 1995). Further, monitors experience greater anxiety about health risks and ruminate about threatening information (S. M. Miller, Rodoletz, Schroeder, Mangan, & Sedlacek, 1996; Muris, de Jongh, van Zuuren, & ter Horst, 1994). Therefore, to motivate monitors, it is important to provide them with messages that include detailed information about health risks or their specific condition, as well as strategies or means of reducing risk and alleviating anxiety (S. M. Miller, 1995).

Blunters, on the other hand, do not seek detailed information about their health risks or medical condition. They are more likely to follow health and medical directives if provided with less comprehensive information, particularly less-threatening information (S. M. Miller, 1995). Blunters tend to become overwhelmed by health information they interpret as threatening. They generally find a greater quantity of information to be stressful, especially if it includes statistics and risk factors and, therefore, they "blunt" or block it from their attention. Thus, blunters may avoid medical screening procedures or choose not to engage in important health behaviors depending on how health information is presented and, consequently, interpreted by them (S. M. Miller, 1996). Effective health messages presented to blunters should be short and succinct, utilize nonthreatening and basic information, and provide a suggested course of action in simple terms.

This experiment was conducted to determine if matching a set of messages about mammography to women's monitor–blunter coping styles is more effective in persuading women to obtain a mammogram than mismatched messages. We hypothesized that a more detailed but reassuring message presenting the risks of breast cancer and the benefits of mammography would be more effective in motivating monitors to obtain regular mammograms. And we hypothesized that a simple, compendious, and direct message with an overview of the risks of breast cancer and the benefits of mammography would be more effective in motivating blunters to obtain mammograms. This experiment necessitated a two-way factorial design: Participant Coping Style (monitor/blunter) × Message Type (monitor/blunter). Mammography utilization was assessed 6 and 12 months after presenting the initial health messages.

Method

Participants

Participants were female callers to the New England regional office of the Cancer Information Service (CIS), a public service program of the NCI, from March 7, 2001, to December 7, 2001. We aimed to recruit a sample of approximately 520 women, about 130 participants per condition. We assumed power of .80 and, based on our previous research, an odds ratio (OR) of approximately 1.85 for the influence of more versus less effective messages. Women were considered eligible for the experiment if they (a) had not previously participated in the study; (b) did not call the CIS for breast cancer information for themselves; (c) were between 41 and 80 years old; (d) were not current cancer patients, waiting for test results to determine cancer status, or taking tamoxifen; and (e) had received fewer than 50% of the lifetime mammograms they should have had for their age, if following the recommended guidelines. These eligibility criteria were selected to administer the intervention proactively and to recruit callers who were not meeting the recommended guidelines. In the past, we have had success in recruiting samples of women who have received less than half of their lifetime mammograms and whose behavior could (and ought to) be influenced (Banks et al., 1995; Schneider et al., 2001).

If, during the course of the regular service call, women were deemed ineligible based on the aforementioned criteria, they were not asked the eligibility questions. Of the 3,261 callers who were assessed for eligibility, those who had already participated in the study were excluded (3%), as were those who were current cancer patients, waiting for test results to determine cancer status, or taking tamoxifen (3%). In keeping with eligibility criteria, those who refused to report their age and those younger than 41 years of age were excluded (26%), as were callers who had received at least 50% of the lifetime mammograms they should have had given their age (67%). Of the 742 women who met all of the eligibility criteria, 509 (69%) agreed to participate and completed part of the baseline questionnaire. Five hundred women completed the baseline assessment and were randomized to one of the intervention arms, as displayed in Figure 1.

Of the 500 women randomized to condition, 217 received the monitor message and 283 received the blunter message. Six months later, 272 (272/500 = 54%) women were reached for the follow-up, including 129 from the monitor message condition and 143 from the blunter message condition. By the 12-month follow-up, we obtained follow-up data on a total of 339 (339/500 = 68%) women, including 147 from the monitor message condition and 192 from the blunter message condition. Three hundred and seven (307/500 = 61%) women completed and returned at least part of the follow-up survey. Complete data were obtained for 190 (190/500 = 38%) women.

Procedure

Cancer information specialists at the CIS invited female callers to participate in the experiment after finishing their regular service call. Eligible and consenting callers completed a brief baseline telephone survey, including assessment of monitor–blunter coping style, and then listened to a short, randomly assigned message promoting mammography (tailored toward either a monitor or blunter coping style). To avoid any bias in randomization, research staff alternated interview packets containing either the monitor or blunter message one by one before the start of the study and presented them to the cancer information specialists who conducted the interviews in this order, thereby randomly assigning participants to condition. Within a few days, participants were mailed a packet that included a tailored brochure (consistent with the type of message delivered over the phone), a similarly tailored refrigerator magnet, and a survey to complete after reading the brochure. Participants received $10 compensation when they returned the survey.

Six months following baseline data collection, trained research assistants who remained blind to condition contacted participants for brief follow-up

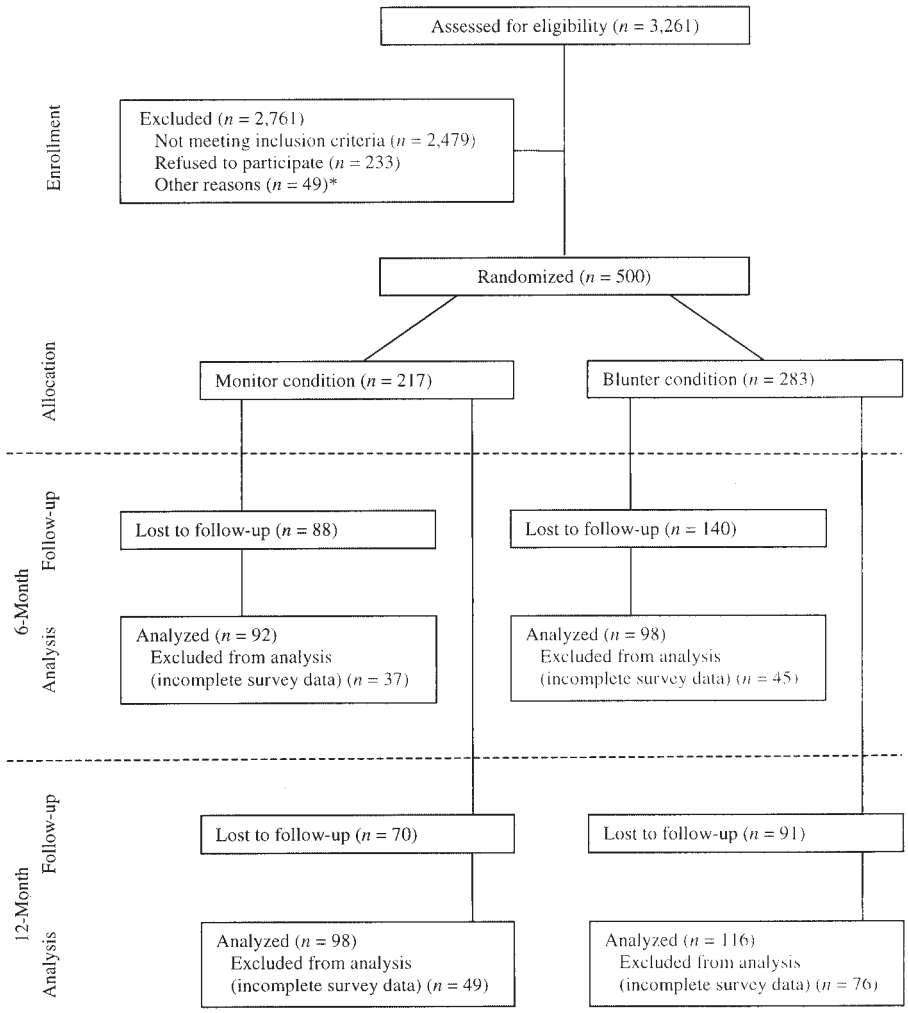

Figure 1. Flow diagram of participants through the phases of the study. Asterisk (*) indicates participants refused to answer all of the eligibility questions ($n = 40$) or refused to answer all of the baseline questions ($n = 9$).

telephone interviews assessing mammography utilization since baseline. Participants who had not yet obtained a mammogram by the 6-month interview were contacted again 12 months after the baseline assessment. Participants who were unreachable by telephone for the 6- and/or 12-month follow-up calls after eight attempts were mailed a stamped, preaddressed postcard on which to indicate their mammography utilization status. Participants reached at either follow-up point or both were included in analyses cumulatively.

Message Development

To develop the tailored messages delivered in the baseline telephone interview, the mailed brochure, and the refrigerator magnets, we used the NCI's existing mammography publications as a foundation. Then, we tailored these messages to be oriented toward either monitors or blunters. The presentation style of the brochure titled "Facts About Breast Cancer and Mammography" was adapted to be most persuasive for monitors. The message emphasized the evidence and details related to cancer and mammography utilization, including the risk factors for and symptoms of breast cancer and explanations of mammography and early detection. It contained additional statistics related to mammography use and breast cancer, as well as a table of breast cancer risk by age. The information was presented in a booklike fashion with a table of contents and was longer than the blunter brochure. It also included reassuring statements to address the anxiety that is characteristic of monitors. In contrast, the blunter brochure, titled "The Basics About Mammography: It Can Save Your Life," was short and succinct. Nonthreatening, basic information was presented in an outline format and incorporated the use of bold fonts and capitalization to emphasize key points. Samples of the two types of messages presented in the brochures are provided in Table 1.

Quality Assurance

As part of message development, we obtained feedback on the messages from various collaborators. The cancer information specialists at the New England regional office of the CIS, who answer the phones daily, were especially helpful in detecting wording in the telephone-delivered messages that might be problematic. Then, the NCI's CIS branch staff provided a final review of the messages. Finally, a pilot study was conducted for 1 week so we could address any problems with the messages, interview questions, or study protocol.

To make certain that study protocol was followed exactly, and as part of the CIS's policy of ensuring quality service, a research associate or CIS phone manager monitored the baseline interview calls. Calls were moni-

Table 1
Samples of the Content of the Tailored Messages

Monitor message	Blunter message
The key to finding breast cancer is early detection, and the key to early detection is getting regular screening mammograms. Cancers found with mammograms are usually smaller than cancers that can be felt, and they are less likely to have spread. For some women, early detection may prevent the need to remove the entire breast or receive chemotherapy. Regularly scheduled screening mammograms, together with clinical breast exams, offer the best chance of finding and treating breast cancer early.	**The Evidence Adds Up** The key to finding breast cancer is early detection, and the key to early detection is getting regular screening mammograms. Breast cancer can be detected early with mammography, long before lumps can be felt by hand.
There is no reason for you to take unnecessary chances with your health. Early detection is your best protection. Regular mammography reduces mortality from breast cancer by up to 30%, so schedule a mammogram today!	Early detection is your best protection. Get a mammogram. It can save your life!

Note. Bold font and capitalization were used in the blunter message to emphasize key points.

tored 100% of the time during the pilot study and (randomly) 50% of the time throughout the remainder of the study. We noted very few deviations from the study protocol, and none threatened the quality of the data collected. To be sensitive to participants, we halted data collection for 1 month following the September 11, 2001, terrorist attacks because one of the scenarios used to assess monitor–blunter coping styles explicitly asks participants to imagine vividly a terrorist situation, and a second scenario involves a sudden decrease in altitude during an airplane flight. We received no complaints regarding the subsequent use of these scenarios.

Measures

Baseline measures. The cancer information specialists at the CIS gathered all baseline data as part of the telephone interview. Baseline levels of psychological variables suggested by the C-SHIP model (S. M. Miller, Shoda, & Hurley, 1996) were assessed prior to the intervention so their influence on mammography could be accounted for. Because CIS restrictions limited the length of the telephone call to 7 min, each of these constructs was assessed using a single item with a scale ranging from *strongly disagree* (1) to *strongly agree* (5) instead of multiple-item measures. To assess *worry,* we asked participants if they worried about developing breast cancer. *Intentions* were measured by asking if they expected to schedule a mammogram when next due for one. *Perceived risk* was determined by asking if they thought it was likely that they would get breast cancer in the future.

Monitor and blunter coping styles were assessed with an abbreviated version of the Monitoring–Blunting Style Scale (MBSS; S. M. Miller, 1987). Participants were presented with two potentially stress-provoking scenarios (e.g., "Vividly imagine that you are afraid of the dentist and have to get some dental work done"). Then, they were asked to indicate (yes/no) which of eight different reactions to each scenario they would choose. Four of the statements were of the monitoring type (e.g., "I would ask the dentist exactly what he was going to do"). Four reactions were of the blunting type (e.g., "I would do mental puzzles in my mind"). The two scenarios used in this study (i.e., the dentist and airplane scenarios) were selected because they were scenarios that most CIS callers could easily imagine, and the phone call was time limited, precluding administration of the full scale.

A total monitoring minus blunting score was calculated by subtracting the sum of the responses to the blunting items from the sum of the responses to the monitoring items (range = −8 to 8 for the abbreviated version of the scale; higher scores indicate more monitoring). The Spearman–Brown split-half reliability of the total monitoring minus blunting scale in our sample was adequate, though not ideal, $r(480) = .54$. The MBSS's dichotomous response options, together with our use of only two of the four scenarios in the full scale, attenuated reliability. The monitoring minus blunting scores on this abbreviated scale were correlated with the full measure administered later as part of the follow-up survey, $r(237) = .39$, $p < .001$. Therefore, participants were stratified on their total monitoring minus blunting scores. Those above the median were considered monitors and those below it blunters.

Immediately after the cancer information specialists delivered the tailored telephone message, participants were asked if they found the message to be interesting and their intentions to schedule a mammogram in the next 12 months. Their responses to each of these items were made on scales ranging from *strongly disagree* (1) to *strongly agree* (5).

Follow-up survey measures. As part of the follow-up survey that participants received in the mail along with the tailored brochure, they evaluated the brochure on how interesting and believable it was. Two additional questions about the amount of detail in the brochure served as a manipulation check. The two detail items were combined, $r(293) = .53$, $p < .001$, such that higher scores reflected greater agreement that the brochure was detailed. It was expected that the group who received the monitor message would rate the brochure as being more detailed than the group who received the blunter message. Participants also rated their emotional reactions to the brochure on three items, including how reassured, anxious, and hopeful the brochure made them feel (1 = *not reassured/anxious/hopeful,* 5 = *extremely reassured/anxious/hopeful*).

We also assessed psychological factors involved in processing and responding to health messages as suggested by the C-SHIP model. These included knowledge about breast cancer and mammography, negative affect associated with breast cancer and mammography, perceptions of the likelihood of getting breast cancer, the severity of breast cancer, and the ease of treating breast cancer. We assessed knowledge with four multiple-choice items asking how often women over 40 should get mammograms, what the benefits of mammograms are, who is most likely to get breast cancer, and what group of women accounts for the most cases of breast cancer. For each correct response, participants were given 1 point, and their total served as their knowledge score. Negative affect was measured with three items assessing worry, anxiety, and nervousness associated with breast cancer and mammography findings. These items formed a reliable scale (Cronbach's $\alpha = .71$). Perceptions of the likelihood of getting breast cancer (risk perceptions), the severity of breast cancer, and the ease of treating breast cancer were each assessed with single items on 5-point

response scales. In addition, demographics were assessed, including age, race, education, marital status, and insurance status.

Follow-up. Six months after the baseline assessment, participants were telephoned and asked whether they had obtained a mammogram. Participants who reported that they had not obtained a mammogram after 6 months, or who could not be reached, were contacted after 12 months. Previous research has shown that self-reported mammography utilization correlates highly with objective sources such as medical records (Barratt, Cockburn, Smith, & Redman, 2000; King, Rimer, Trock, Balshem, & Engstrom, 1990).

Analysis Plan

First, we examined the characteristics of the sample and the evaluations of and emotional reactions to the message manipulation. Then, we examined the impact of the intervention on key psychological variables involved in processing health messages and differences between monitors and blunters on these variables. Finally, we assessed differences in mammography utilization at 6 and 12 months due to matching the message type to coping style using chi-square tests and logistic regression analyses, including an examination of the Wald test for improvement in model fit. Separate logistic regression models were calculated for 6- and 12-month follow-ups. Only those individuals for whom we had received the follow-up questionnaire (i.e., those with complete data) were included in the analyses examining mammography utilization status at the 6- and 12-month follow-ups.

Results

Sample Characteristics

The mean age of participants was 57 years old (range = 41–80 years). Eighty-eight percent of the women callers were White, 3% African American, 3% Asian or Pacific Islander, 3% American Indian or Alaskan Native, 2% Hispanic, and 1% from other ethnic groups. The sample was fairly well educated. Approximately equal percentages of participants had attended graduate school (21%), graduated from college (22%), attended some college (19%), and graduated from high school (27%). Only 8% of participants reported that they had attended some high school only, and 2% attended grade school only. The majority of participants were married (62%), 6% were never married, 17% were separated or divorced, 14% were widowed, and 1% reported other relationships. Finally, most participants had HMO or private medical insurance (57%), 14% had both HMO and Medicare insurance, 17% had Medicare only, 4% had Medicaid only, and 7% had no medical insurance. (Values may not sum to 100% because of some rounding error.)

A comparison of message manipulation groups indicated that there were no differences between the groups in worry, intentions, or perceived risk at baseline. However, monitors reported significantly more worry about developing breast cancer ($M = 3.34$, $SD = 1.09$) than blunters ($M = 3.05$, $SD = 1.14$), $F(1, 476) = 8.79$, $p < .01$. In addition, there was a Message Type × Coping Style interaction showing a baseline difference in reported worry between those receiving a matched versus a mismatched message, $F(1, 476) = 5.23$, $p < .05$. Therefore, baseline worry was entered as a covariate in a subsequent logistic regression analysis. No other differences between monitors and blunters or the interaction of coping style and message type were found for variables assessed at baseline, including demographics. Table 2 shows correlations between preexisting (preintervention) variables and obtaining a mammogram after 6 months.

Message Evaluations

There were no differences between message manipulation groups in terms of their ratings of the interestingness of the CIS-delivered telephone message or the follow-up brochure. As expected, there were significant differences between groups in their ratings of the amount of detail in the follow-up brochure, which served as a manipulation check. Participants who read the brochure tailored for monitors thought the brochure provided details beyond the basic facts about breast cancer and mammography ($M = 3.31$, $SD = 0.98$), and those who read the blunter brochure thought it provided the basic facts about breast cancer and mammography ($M = 2.95$, $SD = 1.03$), $F(1, 286) = 9.00$, $p < .01$. There were no differences between the groups in terms of their

Table 2
Correlations Among Preexisting Variables and Obtaining a Mammogram 6 Months After Receiving the Messages

	Obtained mammogram	1	2	3	4	5	6	7	8	9	10	11
1. Marital status	.09	—										
2. Insurance	.15*	.23***	—									
3. Education	−.04	.06	.24***	—								
4. Race	−.02	.03	.03	.00	—							
5. Age	.17**	−.07	−.24***	−.19**	.16**	—						
6. Prior mammogram use	.30***	−.01	−.06	−.08	.15**	.65***	—					
7. Worry	−.02	.03	.07	−.02	−.17**	−.13**	.03	—				
8. Intentions	.22***	.06	.16**	.02	−.01	.02	.32***	.25***	—			
9. Perceived risk	.05	−.01	−.01	−.05	−.03	−.07	.06	.44***	.17***	—		
10. Coping style	.01	.12*	.07	.08	−.09	.02	.03	.13**	.02	.01	—	
11. Message type	.08	.01	.04	−.01	−.05	−.07	−.07	−.03	−.07	.01	−.09*	—

Note. These are Pearson's correlations, except for those with marital status, insurance, education, race, coping style, message type, and obtained mammogram, which are point-biserial correlations. $207 < N < 267$. The response codes for the variables were as follows: marital status, 1 = not married, 2 = married; insurance, 1 = no HMO or private insurance, 2 = HMO or private insurance; education, 1 = high school graduate or less, 2 = some college or more; race, 1 = non-White, 2 = White; for age and prior mammography use, open-ended; for worry, intentions, and perceived risk, 1 = *strongly disagree* to 5 = *strongly agree*; and for coping style and message type, 1 = *monitor,* 0 = *blunter.*
* $p < .05$. ** $p < .01$. *** $p < .001$.

evaluations of the believability of the brochure or in their emotional reactions to the brochure.

Differences on Variables Suggested by the C-SHIP Model

An examination of between-groups differences in intentions assessed immediately following the telephone message revealed no differences between message manipulation groups, between coping style groups, or their interaction. Results of a repeated measures analysis of variance showed that the intentions of all participants to schedule a mammogram increased over time, $F(1, 457) = 5.01$, $p < .05$, although there were no significant Time × Group differences.

There were some differences in breast cancer knowledge between groups. There was a marginally significant difference in knowledge due to message type: The blunter message increased knowledge somewhat more ($M = 3.05$, $SD = 0.84$) than the monitor message ($M = 2.86$, $SD = 0.82$), $F(1, 261) = 3.05$, $p = .08$. There was also a difference in knowledge between the coping style groups: The monitors scored better on the knowledge test ($M = 3.08$, $SD = 0.80$) than the blunters ($M = 2.86$, $SD = 0.85$), $F(1, 261) = 5.24$, $p < .05$. The Message Type × Coping Style interaction was not significant.

An examination of the impact of the intervention on negative affect associated with breast cancer and mammography revealed a borderline significant Message Type × Coping Style interaction, $F(1, 288) = 3.44$, $p = .07$. Blunters who experienced the blunter message reported the least negative affect ($M = 2.24$, $SD = 0.87$), and monitors who experienced the blunter message reported the greatest negative affect ($M = 2.63$, $SD = 1.00$), $t(158) = 2.62$, $p < .01$. The reported negative affect of the monitors and blunters who experienced the monitor message fell in between ($M = 2.46$, $SD = 0.96$ vs. $M = 2.50$, $SD = 1.11$), $t(130) = 0.23$, $p = .82$.

There were no differences in the reported risk perceptions between message manipulation groups. However, monitors perceived breast cancer as a more severe disease ($M = 4.53$, $SD = 0.61$) compared with blunters ($M = 4.39$, $SD = 0.70$), $F(1, 286) = 3.56$, $p = .06$, and perceived breast cancer as being less easy to treat ($M = 2.11$, $SD = 1.09$ vs. $M = 2.51$, $SD = 1.16$), $F(1, 265) = 8.73$, $p < .01$. Participants who experienced the monitor message reported that breast cancer is easier to treat ($M = 2.48$, $SD = 1.16$) than those who experienced the blunter message ($M = 2.20$, $SD = 1.11$), $F(1, 265) = 4.05$, $p < .05$.

Follow-Up

After 6 months, 40.5% of the participants reported that they had obtained a mammogram. We conducted logistic regression analyses to test the hypothesis that matched messages would be more persuasive than mismatched messages after 6 months. First, we ran a logistic regression model that included message type (1 = *monitor*, 0 = *blunter*), coping style (1 = *monitor*, 0 = *blunter*), and their interaction, and also controlled for demographic and other psychological variables assessed at baseline that were thought to predict mammography utilization. These control variables included age, marital status, insurance status, education, race, prior mammography utilization, baseline intentions, baseline worry, and baseline perceived risk, as shown in Table 2. The addition of the Message Type × Coping Style interaction to the logistic regression model significantly improved the model fit over a model that only included the control variables and main effects, $\Delta\text{Wald } \chi^2(1) = 9.69$, $p < .01$. As can be seen in Table 3, women were more likely to report obtaining a mammogram when the message was matched than mismatched.

Next, we conducted an identical analysis with coping style as a continuous variable, instead of using a median split, to provide a potentially more sensitive test of its effects. This analysis produced similar findings: The addition of the interaction of message type and coping style to the logistic regression model produced a significant improvement in the model fit over a model that only included the control variables and main effects, $\Delta\text{Wald } \chi^2(1) = 5.24$, $p < .05$. In the final step of the model, message type ($b = 0.99$, $SE = 0.47$, OR = 2.68, $p < .05$), coping style ($b = -0.20$, $SE = 0.10$, OR = 0.82, $p = .05$), and their interaction ($b = 0.34$, $SE = 0.15$, OR = 1.41, $p < .05$) were significant predictors. Matched messages were associated with mammography use after 6 months.

We also analyzed the data using an intent-to-treat analysis, in which those callers who were unable to be reached for the 6-month follow-up were coded as not obtaining a mammogram. In this analysis, the addition of the interaction of message type and coping style to the logistic regression model also resulted in a significant improvement in the model fit over a model that only included the control variables and main effects, $\Delta\text{Wald } \chi^2(1) = 9.27$, $p < .01$. Message type ($b = 0.97$, $SE = 0.46$, OR = 2.63, $p < .05$), coping style ($b = 1.13$, $SE = 0.42$, OR = 3.09, $p < .01$), and their interaction ($b = 1.81$, $SE = 0.61$, OR = 6.10, $p < .01$) were significant predictors in the final step of this intent-to-treat model.

The pattern of mammography use by coping style and message type displayed in Figure 2 decomposes the significant matching effect found in the logistic regression models. Blunters were significantly more likely to report obtaining a mammogram when the message was matched (48.8%) versus mismatched (29.2%), $\chi^2(1, N = 147) = 5.77$, $p < .05$. Similarly, monitors who received a matched, monitor message were more likely to obtain a mammogram (43.5%) than monitors who received a mismatched, blunter message (37.9%), although this comparison was not statistically reliable, $\chi^2(1, N = 120) = 0.39$, *ns*.

After 12 months, the overall mammography utilization rate had risen to 57.8%. However, matching the message type to coping style no longer had a differential influence on mammography utilization. A logistic regression analysis conducted on the 12-month data indicated no significant effects of message type, coping style, or their interaction on mammography utilization.

Discussion

The goal of the field experiment reported here was to test the effect of matching messages to women's monitor–blunter coping styles in increasing regular mammography utilization. The findings support the hypothesis that messages tailored to monitor–blunter coping styles tend to be better at encouraging mammography utilization than mismatched messages 6 months later. The matched messages were especially effective for blunters. For monitors, the matched message was more effective than the mismatched message, but this difference was not statistically significant. It is difficult to speculate why the matching effect was stronger for the blunters. It is possible that the style of presenting

Table 3
Hierarchical Logistic Regression Analyses of Monitor–Blunter Coping Style, Message Type, and Their Interaction as Predictors of Obtaining a Mammogram After 6 Months, Including Baseline Variables

Predictor	*b*	*SE*	OR	95% CI	Model $\Delta\chi^2$
Step 1					
Age	−0.01	0.02	0.99	0.94–1.03	
Prior mammography use	0.13	0.06	1.14*	1.02–1.28	
Baseline worry	−0.19	0.17	0.83	0.60–1.16	
Baseline intentions	0.21	0.20	1.24	0.84–1.81	
Baseline perceived risk	0.24	0.19	1.27	0.88–1.84	
Marital status	0.06	0.33	1.06	0.55–2.04	
Insurance status	0.76	0.40	2.14	0.98–4.65	
Education	−0.25	0.34	0.78	0.40–1.53	
Race	−0.41	0.50	0.67	0.25–1.76	20.81*
Step 2					
Age	−0.01	0.02	0.99	0.95–1.03	
Prior mammography use	0.13	0.06	1.14*	1.02–1.28	
Baseline worry	−0.17	0.17	0.84	0.60–1.17	
Baseline intentions	0.23	0.20	1.25	0.85–1.85	
Baseline perceived risk	0.23	0.19	1.25	0.86–1.82	
Marital status	0.09	0.34	1.10	0.56–2.13	
Insurance status	0.73	0.40	2.07	0.95–4.52	
Education	−0.21	0.35	0.78	0.41–1.61	
Race	−0.42	0.51	0.65	0.24–1.77	
M-B	−0.11	0.33	0.89	0.47–1.71	
MT	−0.28	0.33	0.75	0.40–1.43	0.91
Step 3					
Age	−0.01	0.02	0.99	0.94–1.04	
Prior mammography use	0.14	0.06	1.15*	1.02–1.29	
Baseline worry	−0.25	0.18	0.78	0.55–1.10	
Baseline intentions	0.23	0.20	1.26	0.85–1.87	
Baseline perceived risk	0.25	0.20	1.28	0.87–1.88	
Marital status	0.02	0.35	1.02	0.52–2.02	
Insurance status	0.80	0.41	2.22	0.99–4.95	
Education	−0.23	0.36	0.79	0.39–1.59	
Race	−0.43	0.52	0.65	0.24–1.80	
M-B	−1.09	0.48	0.34*	0.13–0.85	
MT	0.92	0.52	2.50	0.90–6.91	
Interaction of M-B × MT	2.07	0.68	7.94**	2.09–20.30	9.69**

Note. $N = 190$, due to missing data. OR = odds ratio; CI = confidence interval; M-B = monitor–blunter coping style; MT = message type.
* $p < .05$. ** $p < .01$.

health information is more important for motivating blunters than it is for motivating monitors. The findings related to negative affect seem to provide support for this explanation, as blunters who received the matched, blunter messages reported the least negative affect. Monitors may have been more motivated to act, in general, because of their characteristically higher level of attentiveness to threat, contributing to this finding (S. M. Miller et al., 1999).

The MBSS itself has both strengths and limitations. The scale is easy to administer, is accepted in applied research settings, and is readily applicable to real-world assessment and dissemination. However, the constructs of monitor and blunter coping styles are complex. There is some evidence that the MBSS is limited in its ability to capture the context in which monitor–blunter coping strategies are applied in real life and the extent to which the strategies are used (Steptoe, 1989; van Zuuren, 1994; van Zuuren & Wolfs, 1991; but see S. M. Miller, 1996; Rees & Bath, 2000). The internal consistency of the monitoring scale has been acceptable (S. M. Miller, 1987; S. M. Miller, Leinback, & Brody, 1989), but alpha coefficients for the blunting scale have not always been (Rees & Bath, 2000; van Zuuren & Wolfs, 1991). We exacerbated this problem in the present study by shortening the scale. However, there is some evidence supporting the use of an abbreviated version of the MBSS (Steptoe, 1989).

Although we clearly found robust tailoring effects after 6 months, the effectiveness of matched information faded after 12 months. It seems reasonable that the effect of such a minimal intervention would fade over time, as participants were only given a brief tailored message over the telephone and one tailored pamphlet over the 12-month period. It is likely that the women received other information related to mammography or experienced other influences that affected their decision whether to obtain a mammogram during the 12 months; therefore, the differential impact of the matched information was attenuated. However, recall that every woman in this sample was recruited because her prior probability of obtaining a mammogram was less than 50%. The grand mean of 57.8% at the 12-month follow-up repre-

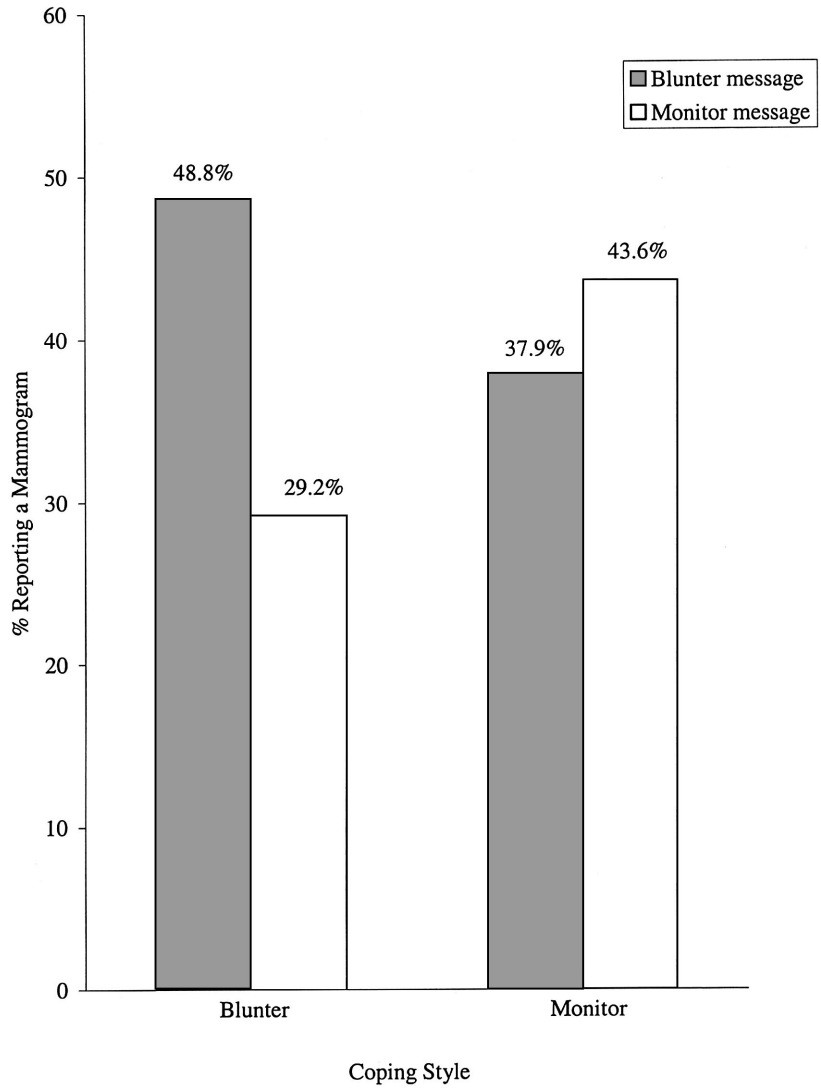

Figure 2. Percentage of women who reported obtaining a mammogram 6 months after receiving the messages, by monitor–blunter coping style and message type.

sents a significant increase over baseline, $\chi^2(1, N = 232) = 3.06$, $p < .05$, one-tailed, suggesting that over longer periods of time both of the message types were persuasive.

The lack of an effect of message type or matched messages on intentions to obtain a mammogram immediately after the telephone intervention was somewhat unexpected. Intentions may be a better predictor of some health behaviors than others. In some of our studies, we have found intervention effects on mammography utilization without evidence of changes in intentions (e.g., Banks et al., 1995; Williams-Piehota et al., 2003). For health behaviors with strong social expectations, like mammography use, people tend to report intentions to perform the behavior, but behavior change does not necessarily follow. In this study, intentions were uniformly strong at baseline and after the telephone intervention, leaving little room for improvement. Further, intentions were assessed after just a brief telephone message, with mere minutes separating the baseline and follow-up intention measures.

It is important to note the following study limitations. First, the sample comprised mostly White, relatively educated, married women with adequate medical insurance. Because there was limited heterogeneity in some of their demographic characteristics, the findings may not generalize to other ethnic and demographic groups. In addition, these women were looking for cancer-related information when they called the CIS. The tailoring technique used in this study may not be as effective with other groups of individuals who are less concerned about or less motivated to seek out cancer information. Further, this field experiment's primary outcome measure relies on self-reported mammography use. Although self-report must always be interpreted with some degree of caution, self-report of mammography utilization is likely to be valid and reliable (Barratt et al., 2000; King et al., 1990). Finally, despite multiple attempts to reach participants (by telephone and by mail) and a financial incentive, there was some attrition from the study. Participants may have been less committed to the study

because there was no face-to-face contact, as all contact was made over the telephone or through the mail. In addition, these women were often dealing with the stress of a sick or dying relative or friend, which prompted their initial call to the CIS. Finally, the inclusion of a "standard of care" control group would have provided another kind of baseline. In our study, the mismatched message group served as a comparison group for the matched message group, but the inclusion of a control group would have allowed us to rule out any speculation that the significant matching effect was driven by the mismatched messages reducing the likelihood of blunters obtaining a mammogram, instead of the matched messages increasing the likelihood, as we have claimed.

The findings from this experiment are, for the most part, consistent with other mammography-related tailoring experiments (Bastani et al., 1999; Skinner et al., 1994; Skinner et al., 1999; but see Drossaert et al., 1996; Rimer et al., 1999) and suggested that tailoring messages to information-processing styles is an effective technique for motivating screening mammography among underutilizers (see Williams-Piehota et al., 2003). One next step is to see if tailoring messages to information-processing styles, such as monitor–blunter coping styles, the need for cognition (Cacioppo & Petty, 1982), and health locus of control (Wallston, Wallston, & DeVellis, 1978), is effective for encouraging other cancer-related behaviors. Future research will also need to be directed toward specifying the importance of different message channels (e.g., telephone vs. print) and, especially, the precise mechanism by which properly tailored messages are persuasive.

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