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Tailoring Messages to Individual Differences in Monitoring-Blunting Styles to Increase Fruit and Vegetable Intake

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Abstract

Objective—To examine whether messages matched to individuals' monitoring-blunting coping styles (MBCS) are more effective in increasing fruit and vegetable intake than mismatched messages. MBCS refers to the tendency either to attend to and amplify, or distract oneself from and minimize, threatening information.

Design/Setting—Randomly-assigned messages that were tailored to resonate with either monitors or blunters were delivered at baseline, 1 week, and 2 and 3 months later. Surveys were conducted at baseline and 2 and 4 months later.

Participants—531 callers to a cancer information hotline who did not meet the 5 A Day guideline.

Intervention(s)—A brief telephone-delivered message and three mailings of booklets and promotional items encouraging fruit and vegetable intake, tailored for either monitors or blunters.

Main Outcome Measure(s)—Fruit and vegetable intake 2 and 4 months post-baseline.

Analysis—Hierarchical regression modeling.

Results—Messages matched to MBCS were more effective than mismatched messages, particularly for the monitor message, in increasing intake at 2 months but not at 4 months.

Conclusions and Implications—These minimal interventions influenced fruit and vegetable intake. MBCS may be a promising target for developing tailored messages aimed at increasing intake, although additional research is needed to verify the robustness of these findings.

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Keywords

persuasive communication; nutrition education; tailoring; monitor; coping styles

INTRODUCTION

A diet rich in fruits and vegetables is associated with a decreased risk of some chronic diseases, such as certain types of cancers [1]. Given this benefit, the United States launched a national campaign to disseminate messages encouraging Americans to consume at least 5 servings of fruits and vegetables per day, the 5 A Day for Better Health Program [2]. The campaign, however, has met limited success: Few Americans meet the dietary guideline [3]. These findings underscore the need for novel approaches to improve the persuasiveness of messages promoting fruit and vegetable intake.

One approach used to increase the persuasiveness of nutrition education messages is to tailor messages to unique characteristics of individual recipients [4]. The effectiveness of tailored messages is believed to be due, in part, to the increased scrutiny that recipients give these messages [5], thereby increasing the likelihood of subsequent behavior change [6]. Some studies have reported significant effects of tailored messages on increasing fruit and vegetable intake [7–9]. However, others reported no tailoring effect on intake [10], but found support for changes in attitudes and intentions toward increasing intake [11–12]. These studies tailored messages to variables important in social cognition such as attitudes, self-efficacy expectations, intentions, and stages of change. The social intelligence theory of personality may help to account for the inconsistencies in these findings [13]. According to this theory, information processing styles and competencies distinguish individuals from each other more so than personality traits. Hence, tailoring messages to information processing styles may be a particularly effective strategy for making health messages more persuasive.

Monitoring-blunting coping styles (MBCS) [14] are the tendency to either attend to and amplify, or to distract oneself from and minimize, threatening health information. They reflect stable individual differences in the way people respond cognitively and emotionally to potentially threatening health information [14]. The information could be a cancer diagnosis or personal risk information, for example. Monitors seek out and monitor threatening or stressful information, but blunters tend to distract themselves in order to blunt the information's psychological impact [15]. Research on MBCS has focused on the informational preferences of these two groups of individuals, including their health-related cognitions. Overall, as compared with blunters, monitors are more interested in reading medical information [16], concerned and distressed about health risks, perceive themselves to be at greater risk for developing disease (independent of their true level of risk), assign a greater degree of value to their personal health [17], and tend to be more adherent to medical recommendations [15]. However, they also report more intrusive, ruminative thoughts about their health [18]. With respect to health information, monitors generally prefer detailed and voluminous information [19] (even if it is negative, potentially painful, or concerning danger) as well as advice and reassurance about their problems. In contrast, blunters prefer minimal information and appreciate opportunities to be distracted from the message [17].

According to the cognitive-social health information-processing (C-SHIP) model [20], health information that is tailored to the cognitive and affective processes that distinguish monitors and blunters facilitates the likelihood of subsequent behavior change. Indeed, individuals who receive messages tailored to their MBCS are more likely to engage in disease-detection behaviors (e.g., colposcopy, mammography) than individuals who receive incongruent messages [21–22]. However, to date, no one has examined the effectiveness of tailoring

messages to MBCS to encourage disease-prevention behaviors where the health threat is not as explicit. The influence of messages on disease-detection behaviors that contain the risk of finding an abnormality has been shown to differ from disease-prevention behaviors that are performed to deter the onset of a health problem [23]. We examined whether messages matched to individuals' MBCS are more effective than mismatched messages in increasing fruit and vegetable intake as a disease-prevention strategy. We tested the hypothesis that (a) when given a monitor-focused message (detailed information and reassuring statements about the health risks associated with a diet that does not include adequate fruits and vegetables), monitors would consume more servings of fruits and vegetables than blunters and (b) when given a blunter-focused message (simple direct information highlighting the health benefits of fruit and vegetable consumption), blunters would consume more servings of fruits and vegetables than monitors. Secondly, we examined the differential impact of matched versus mismatched messages on relevant health-related cognition.

METHODS

Participants

Five hundred and thirty-one participants were recruited at the end of their service call to the National Cancer Institute's (NCI) Cancer Information Service (CIS) (see Figure 1). The CIS is the NCI's link to the public, serving cancer survivors and their family and friends by interpreting and explaining research findings in a clear understandable manner, and providing personalized responses to specific questions about cancer [24]. Participants accessed the CIS by calling a toll-free number. All participants were 18 years of age or older and reported fruit and vegetable intake below the 5 A Day guideline. The majority had no personal history of cancer (88.3%), was white, and had completed at least some college (see Table 1). Self-reported exclusion criteria included: (a) being a cancer patient awaiting or receiving treatment, (b) being terminally ill, (c) undergoing testing for a potential cancer diagnosis, and (d) following a physician-prescribed diet limiting fruit and vegetable intake.

Procedure

All research protocols were approved by Yale's Faculty of Arts and Sciences Institutional Review Board (IRB) prior to data collection. After determining eligibility and gaining informed consent, participants completed a 7-minute telephone interview and were presented with a randomly assigned fruit and vegetable promotional message tailored to either a monitor or blunter coping style. To avoid any bias in randomization, a member of the research staff randomized materials prior to the start of the study by alternating interview packets containing either a monitor or blunter message. Interviews were conducted in this alternating order, thereby assigning participants randomly to condition.

All subsequent messages were tailored consistently with the participants' condition established at baseline. Within 1 week of baseline, a packet including a tailored instructional letter, a tailored booklet, and a 5 A Day pencil were mailed to them. At two months, another packet of information was sent containing a second tailored booklet, a tailored magnet, and a brief follow-up survey with a pre-addressed stamped envelope. Participants who returned at least a partially-completed survey were compensated with \$10. A final informational packet was mailed at 3 months and included a tailored instructional letter, tailored bookmark, and five non-tailored recipe cards. Research assistants blind to participant condition conducted brief follow-up telephone interviews 4 months following baseline. All participants were contacted for interviews regardless of whether they had completed the survey at 2 months.

Messages

In order to engage participants with a monitoring or blunting coping style, otherwise innocuous fruit and vegetable recommendations were made to be stressful by first presenting a cancer death rate in all messages, “Cancer accounts for 25% of all deaths in the United States.” The essential information provided (e.g., definition of serving sizes, ways to address barriers to fruit and vegetable intake, a list of recipes) was consistent in both message conditions. However, the presentation of this information was tailored in each message condition in accordance with MBCS [15].

Overall, the messages tailored to a monitor coping style were lengthy, highly detailed explanations of why one should eat more fruits and vegetables. The monitor messages were crafted with extra reassurances to alleviate the heightened anxiety that is characteristic of monitors. For example, “Moreover, one-third of annual cancer deaths are related to preventable factors such as physical inactivity, obesity, and nutrition. *There is something you can do!* Research suggests that people who eat diets rich in fruits and vegetables live longer cancer-free lives...” (emphasis added). The monitor booklets contained additional statistical charts on important nutrients found in fruits and vegetables. In contrast, messages tailored to a blunter coping style succinctly presented reasons to eat more fruits and vegetables in short narrative form, leaving out statistics and details that blunTERS tend to ignore (e.g., “Many cancer deaths are linked to preventable factors, such as physical inactivity, obesity, and nutrition.”).

The CIS-delivered telephone message and the tailored instructional letters imparted the importance of increasing fruit and vegetable intake, describing its association with lowered cancer risk. The tailored booklets, based on *Take Five: A Healthful Guide to Eating* designed by the Fred Hutchinson Cancer Research Center [25], encouraged increased fruit and vegetable intake by addressing common barriers and facilitators. The booklets also included reasoning behind the 5 A Day recommendation, tips to increase intake, and recipes. The magnets displayed a fruit and vegetable graphic and a short tailored statement encouraging fruit and vegetable intake. The tailored bookmarks were based on *Eat More Salads!* [26] and included tips on meeting the 5 A Day recommendation through increased salad intake.

Baseline Measures

Because the length of the telephone interview and intervention was limited to 7 minutes as per CIS guidelines, it was not possible to assess baseline constructs using multi-item scales. Thus, *fruit and vegetable intake* was assessed using a single, open-ended question. Participants were provided with a definition of serving sizes (a medium-sized apple, ½ cup of chopped vegetables or fruit, or half a cup of juice) and asked to indicate how many servings they eat on an average day. This item from the Block food frequency questionnaire [27] has been successfully employed in other studies with CIS-based samples [9,28]. *Knowledge of the guidelines for fruit and vegetable intake* was assessed by asking participants “How many servings of fruits and vegetables do you think a person should eat each day for good health?” Participants’ responses were coded as either correct (≥ 5 servings) or incorrect (≤ 4 servings). This knowledge item has demonstrated construct validity within samples of CIS callers [9]. Knowledge and baseline fruit and vegetable intake were used as covariates in the models predicting intake at two and four months.

Follow-up Measures

The 2-month follow-up survey and 4-month telephone interview assessed intake by repeating the baseline measure. The 2-month follow-up survey also measured monitoring-blunting coping style (MBCS), health-related cognitions, effectiveness of the message manipulation, and social desirability.

Monitoring-blunting coping style (MBCS) was assessed using the 32-item version of the Monitoring-Blunting Style Scale (MBSS) [14]. Four stressful scenarios were presented (e.g., being on a turbulent airplane ride). For each scenario, participants were read eight statements; four monitor-type coping strategies (e.g., “I’d carefully read the information provided about safety features in the plane and make sure I knew where the emergency exits were”) and four blunter-type strategies (e.g., “I’d make small talk with the passenger beside me”). Participants indicated (yes/no) whether each statement described how they would act in the given situation.

The MBCS 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 = -16 to 16; higher scores indicate more monitoring, lower scores indicate more blunting). The Kuder-Richardson (KR20) coefficients indicated that the internal consistency of each subscale as well as for the composite scale was adequate, though not ideal, $KR20_{\text{monitor}} = 0.65$; $KR20_{\text{blunter}} = 0.57$; $KR20_{\text{composite}} = 0.67$. The MBSS has demonstrated reliability and construct validity within health-related contexts [14].

Monitoring-blunting coping style was measured fully in the 2-month survey rather than at baseline due to the time restrictions placed on the baseline interview by the CIS. Responses to the MBSS were unlikely to have been affected by the intervention as theory and empirical evidence suggest the MBSS is a measure of individuals’ stable, dispositional monitoring-blunting coping style [14], and the MBSS has appropriate test-retest reliability [14]. Additionally, participants completed an abbreviated version of the MBSS at baseline including only 2 of the 4 scenarios. The abbreviated 16-item baseline assessment of MBSS demonstrated attenuated reliability compared to the full 32-item scale administered at follow-up ($KR20_{16\text{-item}} < .56$ vs. $KR20_{32\text{-item}} < .66$). Thus, the full 32-item scale was used in all subsequent analyses. Scores for the scenarios administered at baseline and follow-up correlated strongly, $r(n = 327) = .61, p < .001$, suggesting that, as expected, MBSS scores are resistant to influence by monitor and blunter messages.

Health-related cognition, an important predictor of health behaviors [29], was examined using two single-item measures rated on a 5-point scale. To measure *perception of cancer risk*, participants indicated how likely it was that they would die of cancer (1 = *not likely*; 5 = *extremely likely*). To measure *perceived value of health*, participants indicated whether being healthy was important to them (1 = *not important*; 5 = *extremely important*).

A *manipulation check* of the print materials delivered at Month 2 was conducted using four items modified from existing process evaluations of CIS-based campaigns encouraging fruit and vegetable intake (e.g., [30]). Participants were asked to rate whether the booklets were (a) interesting, (b) informative, (c) detailed, and (d) provided details beyond the basic facts about fruit and vegetable intake and cancer prevention. Each item was rated on a 5-point scale ranging from 1 (*not interesting/informative/detailed/disagree a lot*) to 5 (*extremely interesting/informative/detailed/agree a lot*). We expected the messages to be considered equally interesting and informative, but the monitor brochure to be rated as more detailed.

Social desirability was evaluated using an abbreviated 13-item version of the Marlowe-Crowne Social Desirability scale [31]. It is useful for detecting and controlling for response bias in self-report measures of fruit and vegetable intake [32], and was included as a covariate in the models predicting fruit and vegetable intake. Participants indicated (yes/no) how they tend to act in 13 social situations (e.g., I’m always willing to admit it when I make a mistake). The scale demonstrated adequate internal consistency in the current study ($KR20 = .71$).

Statistical Analyses

Between-group comparisons [i.e., analyses of variance (ANOVAs), chi-squares] of baseline sample characteristics and intervention message type groups were conducted to assess the success of the randomization process and to identify participant characteristics associated with study attrition. The effects of matching messages to monitoring-blunting coping style (MBCS) were tested separately using hierarchical regression analyses. In each regression model, message type, participant MBCS, and the interaction term (message type by participant MBCS) were entered separately. In the models predicting fruit and vegetable intake, social desirability and baseline fruit and vegetable intake and knowledge were included as covariates. In the model predicting perceived risk, history of cancer was included as a covariate. Prior to conducting these analyses, MBSS scores were zero-centered [33], and message type was dummy-coded (blunter = 0, monitor = 1). Two restructured regression equations (one for each message condition) were calculated to provide a conservative interpretation of significant message type by participant MBCS interactions. Level of significance was set at $p < .05$.

RESULTS

Study Attrition and Manipulation Check

Between-message group comparisons of sample characteristics revealed no significant message type by MBCS interactions, suggesting that randomization was successful, $ps > .05$. Compared to participants who returned the 2-month follow-up survey, participants who did not return the survey consumed fewer servings of fruits and vegetables at baseline ($p < .05$), and were more likely to be younger ($p < .001$), non-white ($p < .05$), and less educated ($p < .01$). At 4 months, participants who did not complete the interview also consumed fewer servings at baseline ($p < .05$) and were younger ($p = .001$) than participants who completed the interview. Loss to attrition at either follow-up was not associated with experimental condition, $p > .05$.

Manipulation check—Separate hierarchical linear regression models revealed a main effect of message type on the items assessing whether the print materials were interesting, $F(2, 314) = 3.05, p < .05, \beta = .13, p < .05$, and provided details beyond the basic facts, $F(2, 310) = 3.98, p < .05, \beta = .14, p < .05$. Individuals who received the monitor booklets were in stronger agreement that their booklets were interesting and provided details beyond the basic facts than participants who received the blunter booklets (refer to Table 1). No differences were found between message types with regard to ratings of whether the booklets were detailed or informative. Participant MBCS and the interaction term did not emerge as a significant predictor of the manipulation check items.

Outcomes

Fruit and vegetable intake—Overall, a repeated measures ANOVA revealed that participants made significant positive changes in their intake from baseline to follow-up, $F(2, 526) = 169.48, p < .001$. Post hoc t-tests indicated fruit and vegetable intake increased from baseline ($M_{servings} = 2.60, SD = 1.12$) to 2 months ($M_{serving} = 3.88, SD = 1.55$) and again from 2 to 4 months ($M_{serving} = 4.04, SD = 1.57$), $ps < .05$.

In a test of the hypothesis that individuals who received matched messages would be especially motivated to consume fruits and vegetables, the overall hierarchical model predicting intake at the 2-month follow-up was significant, $R^2_{adjusted} = .21, F(6, 255) = 12.56, p < .001$. Controlling for covariates, the message type by participant MBCS interaction emerged as a significant predictor of intake ($R^2_{change} = .01, \beta = .16, p < .05$) (see Figure 2). As predicted, in the monitor message condition intake was related positively to participant MBCS suggesting that the effectiveness of the monitor message increased when a monitor coping style was more

predominant, $R^2_{\text{change}} = .03, \beta = .16, p < .05$. For the blunter message, the relationship between participant MBCS was in the predicted negative direction but was not statistically significant, $R^2_{\text{change}} = .003, \beta = -.06, ns$. At 4 months, although the model was significant, $F(6, 261) = 13.24, p < .001$, neither the main effect nor the message type by participant MBCS interaction emerged as significant predictors of intake. Thus, no tailoring effect was found at 4 months.

Health-related cognition

Separate regression models were conducted to examine the effects of matched messages on perceived risk and perceived value of health. The overall models for both perceived risk, $R^2_{\text{adjusted}} = .03, F(4, 301) = 3.45, p < .01$, and perceived value, $R^2_{\text{adjusted}} = .02, F(3, 315) = 3.25, p < .05$, were significant. In a model predicting perceived risk while controlling for cancer history, a main effect for participant MBCS emerged, $\beta = .27, p = .001$; a stronger monitor coping style was associated with greater concern of dying from cancer. The message type by participant MBCS interaction also was significant ($R^2_{\text{change}} = .02, \beta = -.20, p < .05$). As expected, in the blunter message condition, perceived risk of dying from cancer was correlated positively with participant MBCS. Perceived risk was lower among blunTERS who received a blunter message than monitors who received the same message ($\beta = .25, p < .01$). In the monitor message condition, however, perceived risk was not related to participant MBCS ($\beta = -.006, ns$).

In the model predicting perceived value of health, a main effect for message type emerged ($\beta = .12, p < .05$). The importance of being healthy was greater for participants who received the monitor message versus participants who received the blunter message. There was a significant message type by participant MBCS interaction ($R^2_{\text{change}} = .01, \beta = .16, p < .05$). In the monitor message condition, the importance of being healthy increased as a monitor coping style was more predominant ($\beta = .19, p < .05$). In the blunter message condition, the importance of being healthy tended to increase as a blunter coping style was more predominant; although this effect was not significant ($\beta = -.05, ns$).

DISCUSSION

This study examined whether messages matched to individuals' monitoring-blunting coping styles are especially effective at increasing fruit and vegetable intake. As hypothesized, matched messages were somewhat more successful than mismatched messages in increasing intake, particularly for the monitor message. The effectiveness of the monitor-focused messages for encouraging intake tended to increase as coping styles became predominantly monitor-oriented. However, the blunter-focused message was not significantly more effective in increasing intake as coping styles became predominantly blunter-oriented. An overall tailoring effect was found after 2 months, but the effectiveness of matched information diminished after 4 months. The impact of this minimal intervention faded over time, a reasonable outcome given that participants listened to a brief tailored message over the telephone and received three tailored sets of materials over four months. It is likely that participants received other information related to fruit and vegetable intake that affected their intake during the study period, attenuating the differential impact of the matched information.

Consistent with both the social intelligence theory of personality [13] and the C-SHIP model [20], the information processing styles examined in this study (i.e., individuals' monitoring-blunting coping styles) appear to be suitable for tailoring to facilitate behavior change. However, the findings were not entirely straightforward, as we obtained a stronger matching effect for the monitor message as opposed to the blunter message. The nature of the health behavior under study may account for this difference. Previous research has shown that for one disease-detection behavior, mammography utilization, messages matched to women's MBCS tended to be especially effective among *blunTERS* [22]. Monitors may have been more

motivated to act because of their characteristically higher level of attentiveness to threat [15] regardless of the coping style to which the information was tailored. However, for a disease-prevention behavior, like fruit and vegetable intake, where a health threat is less explicit, perhaps monitors were not feeling particularly distressed and thus were sensitive to message cues and content rather than mere threat information [17]. Indeed, the results from the current study showed that monitors who received matched as opposed to mismatched messages reported greater importance of being healthy. Plus, blunters do not engage in health behaviors in general because they downplay the personal relevance of health threats [17]. Accordingly, these findings showed that blunters who received matched as opposed to mismatched messages reported a lower likelihood that they would die of cancer.

The present findings are based on a sample of relatively educated, white, female callers to the CIS. The restricted heterogeneity in participant demographic characteristics limits the generalizability of these findings. In addition, the messages and the matching technique may not be as effective with other groups of individuals who are less motivated to seek out health information. For logistical reasons, this experiment's primary outcome measure relied on self-reported fruit and vegetable intake. Although self-report must always be interpreted with some degree of caution, social desirability has limited influence on self-reported dietary intake [34]. Indeed, social desirability was only weakly correlated with self-reported fruit and vegetable intake at follow-up ($.11 < rs < .14$), and we statistically controlled for social desirability in our models. Participant attrition rates were high, but corresponded to those typical of CIS-based behavior change interventions [9,22,28]. The attrition rates may have been due to the stress many participants were experiencing while managing the care of a sick or dying relative (e.g., a spouse with cancer for whom they initially contacted the CIS). Thus, attrition rates might be reduced if these studies were conducted in a different population.

The study was also limited by the lack of a "standard-treatment" control group; rather, the mismatched message condition served as a comparison for the matched message group. The assumption underlying this design is that similar to a control condition, the messages in the mismatched condition included information that would not be salient to the recipient and would lead to less behavior change than a matched message. Research and practice would benefit from the inclusion of a standard treatment control condition in future message-matching studies.

Lastly, the MBSS measure has limitations. True, the scale is simple to administer, acceptable for applied research settings, and appropriate to real-world assessment and dissemination. However, the constructs underlying the scale are complex. The MBSS may be 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 [35]. The internal consistency of the monitoring scale has been acceptable [14], but not necessarily for the blunting scale [35].

IMPLICATIONS FOR RESEARCH AND PRACTICE

Despite their limitations, these findings have practical applications for nutrition education research. Nutrition information tailored both to the cognitive (e.g., amount of information, level of detail) and affective (e.g., reassurance about health risks) processes that distinguish monitors and blunters may facilitate dietary change. Blunters who received matched messages had the least worry about dying from cancer. Monitors who received matched messages thought it was most important to be healthy. The evidence from this study suggests that messages tailored to individuals' monitoring-blunting coping styles should be considered as a potential strategy for bolstering the effectiveness of nutrition education campaigns although additional research is warranted to confirm the robustness of these findings. While this study was related to tailoring nutrition information for cancer prevention, tailoring information to monitoring-blunting styles

could be used for conveying other types of health information, such as about diseases or conditions that may have different levels of threat or fear attached.

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References

1. Stewart, BW.; Kleihues, P. World Health Organization World Cancer Report. Geneva: World Health Organization; 2003.
2. Heimendinger J, Van Duyn MA, Chapelsky D, et al. The national 5 A Day for Better Health Program: a large-scale nutrition intervention. *J Public Health Manag Pract* 1996;2:27–35. [PubMed: 10186666]
3. Casagrande SS, Wang Y, Anderson C, et al. Have Americans increased their fruit and vegetable intake? The trends between 1988 and 2002. *Am J Prev Med* 2007;32:257–263. [PubMed: 17383556]
4. Brug J, Oenema A, Campbell M. Past, present, and future of computer-tailored nutrition education. *Am J Clin Nutr* 2003;77:1028S–1034S. [PubMed: 12663313]
5. Updegraff JA, Sherman DK, Luyster FS, et al. Understanding how tailored messages work: the effects of message quality and congruency on perceptions of health messages. *J Exp Soc Psychol* 2006;43:249–257. [PubMed: 18958299]
6. Petty, RE.; Wegener, DT. Attitude change: multiple roles for persuasion variables. In: Gilbert, D.; Fiske, S.; Lindsay, G., editors. *The Handbook of Social Psychology*. Vol. 4. New York: McGraw Hill; 1998. p. 323-390.
7. Brug J, Steenhuis I, Van Assema P, et al. Computer-tailored nutrition education: differences between two interventions. *Health Educ Res* 1999;14:249–256. [PubMed: 10387504]
8. Marcus AC, Heimendinger J, Wolfe P, et al. A randomized trial of a brief intervention to increase fruit and vegetable intake: a replication study among callers to the CIS. *Prev Med* 2001;33:204–216. [PubMed: 11522161]
9. Williams-Piehota P, Pizarro J, Mowad L, et al. Need for cognition and message complexity in motivating fruit and vegetable intake among callers to the Cancer Information Service. *Health Commun* 2006;19:75–84. [PubMed: 16519594]
10. Campbell MK, DeVellis BM, Strecher VJ, et al. Improving dietary behavior: the effectiveness of tailored messages in primary care settings. *Am J Public Health* 1994;84:783–787. [PubMed: 8179049]
11. Brug J, Steenhuis I, van Assema P, et al. The impact of a computer-tailored nutrition intervention. *Prev Med* 1996;25:236–242. [PubMed: 8781000]
12. Quintiliani LM, Carbone ET. Impact of diet-related cancer prevention messages written with cognitive and affective arguments on message characteristics, stage of change, and self-efficacy. *J Nutr Educ Behav* 2005;37:12–19. [PubMed: 15745651]
13. Cantor, N.; Kihlstrom, JF. *Personality and Social Intelligence*. Englewood Cliffs, NJ: Prentice-Hall; 1987.
14. Miller SM. Monitoring and blunting: validation of a questionnaire to assess styles of information seeking under threat. *J Pers Soc Psychol* 1987;52:345–353. [PubMed: 3559895]
15. Miller SM. Monitoring versus blunting styles of coping with cancer influence the information patients want and need about their disease—implications for cancer screening and management. *Cancer* 1995;76:167–177. [PubMed: 8625088]
16. Koo M, Krass I, Aslani P. Enhancing patient education about medicines: factors influencing reading and seeking of written medical information. *Health Expectations* 2006;9:174–187. [PubMed: 16677196]

17. Miller, SM.; Fang, CY.; Diefenbach, MA., et al. Tailoring psychosocial interventions to the individual's health information-processing style. In: Baum, A.; Anderson, B., editors. *Psychosocial Interventions for Cancer*. Washington, DC: American Psychological Association; 2001.
18. Miller SM, Rodoletz M, Schroeder CM, et al. Applications of the monitoring process model to coping with severe long-term medical threats. *Health Psychol* 1996;15:216–225. [PubMed: 8698036]
19. Wakefield CE, Homewood J, Mahmut M, et al. Usefulness of the Threatening Medical Situations Inventory in individuals considering genetic testing for cancer risk. *Pt Educ & Counseling* 2007;69:29–38.
20. Miller SM, Shoda Y, Hurley K. Applying cognitive-social theory to health-protective behavior: breast self-examination in cancer screening. *Psychol Bull* 1996;119:70–94. [PubMed: 8559860]
21. Miller SM, Roussi P, Altman D, et al. Effects of coping style on psychological reactions of low-income, minority women to colposcopy. *J Reprod Med* 1994;39:711–718. [PubMed: 7807485]
22. Williams-Piehota P, Pizarro J, Schneider TR, et al. Matching health messages to monitor-blunter coping styles to motivate screening mammography. *Health Psychol* 2005;24:58–67. [PubMed: 15631563]
23. Salovey P, Williams-Piehota P. Field experiments in social psychology: message framing and the promotion of health protective behaviors. *American Behavioral Scientist* 2004;47:488–505.
24. Squiers, L.; Treiman, K. The cancer information service research agenda [the National Cancer Institute's Cancer Information Service Web site]. 2005 [Accessed January 3, 2008]. Available at: http://cis.nci.nih.gov/research/agenda_book.pdf
25. Leader, JK.; Thompson, B.; Kristal, AR., et al. *Take Five – A Guide to Healthful Eating*. Fred Hutchinson Cancer Research Center; Seattle, WA: 1994.
26. Marcus AC, Morra M, Rimer BK, et al. A feasibility test of a brief intervention to increase fruit and vegetable consumption among callers to the Cancer Information Service. *Prev Med* 1998;27:250–261. [PubMed: 9579004]
27. Block G, Hartman AM, Dresser CM, et al. A data-based approach to diet questionnaire design and testing. *Am J Epidemiol* 1986;124:453–469. [PubMed: 3740045]
28. Williams-Piehota P, Cox A, Navarro S, et al. Casting health messages in terms of responsibility for dietary change: promoting fruit and vegetable consumption. *J Nutr Educ Behav* 2004;36:114–120. [PubMed: 15202986]
29. Wallston KA. Hocus-pocus, the focus isn't strictly on locus: Rotter's social learning theory modified for health. *Cognit Ther Res* 1992;16:183–199.
30. Heimendinger J, O'Neil C, Marcus A, et al. Multiple tailored messages are effective in increasing fruit and vegetable consumption among callers to the cancer information service. *J Health Commu* 2005;10:s65–s82.
31. Marlowe D, Crowne DP. Social desirability and response to perceived situational demands. *J Consult Psychol* 1961;25:109–115. [PubMed: 13766997]
32. Hebert JR, Peterson KE, Hurley TG, et al. The effect of social desirability trait on self-reported dietary measures among multi-ethnic female health center employees. *Ann Epidemiol* 2001;11:417–427. [PubMed: 11454501]
33. CohenJCohenPWestSGApplied and Multiple Regression/Correlation Analysis for the Behavioral SciencesMahwah, NJErlbaum2003
34. Smith, AF.; Thompson, FE.; Subar, AF. Social desirability, social approval, and reports of food frequency. Paper presented at: the Third International Conference on Dietary Assessment Methods; May 1998; Arnhem, The Netherlands.
35. Van Zuuren FJ, Wolfs HM. Styles of information seeking under threat: personal and situational aspects of monitoring and blunting. *Pers Individ Dif* 1991;12:141–149.

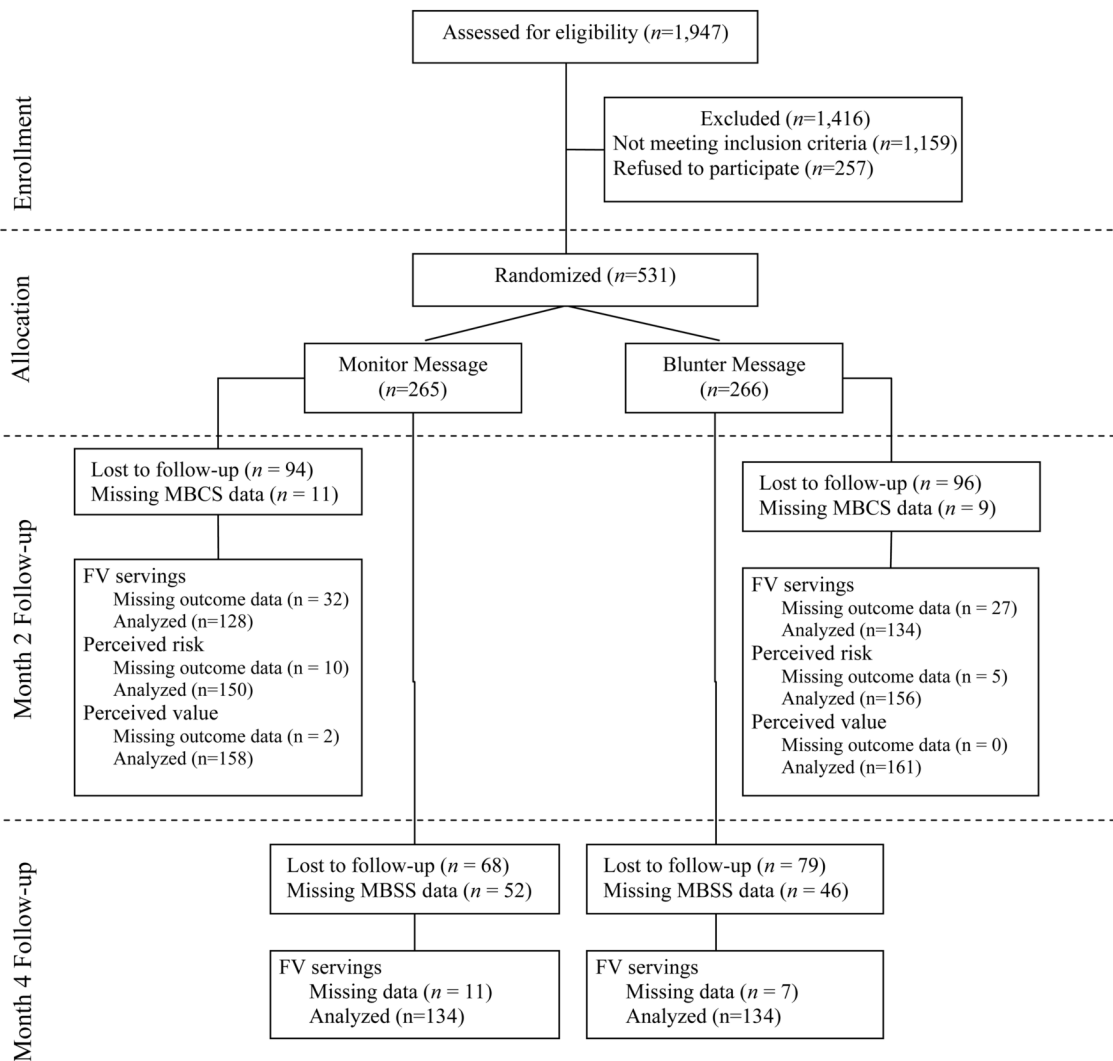
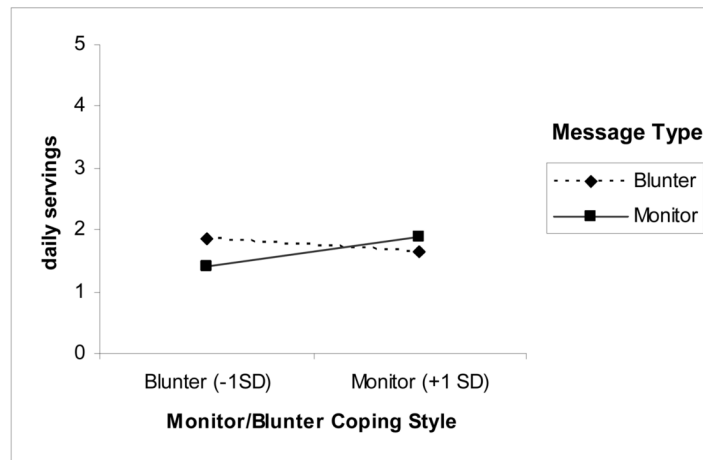


Figure 1.

Flow of participants through the study for fruit and vegetable intake, perceived risk and perceived value outcome. At Month 2, missing monitoring-blunting coping styles (MBCS) data includes participants who were reached for the 2-month follow-up but failed to respond to items on the MBCS. At Month 4, missing MBCS data includes participants who completed the four-month follow-up but either were not reached at Month 2 or failed to respond to items on the MBCS at Month 2.



Note. The lines were plotted using unstandardized beta weights (monitor $b = .06$; blunter $b = -.02$). This analysis controlled for baseline servings of fruits and vegetables, baseline knowledge, and social desirability as covariates.

Figure 2.

The message type by participant monitoring-blunting coping styles (MBCS) interaction predicting fruit and vegetable intake at the 2-month follow-up.

Table 1
Demographic and Outcome Data for the Full Sample and the Message Type Groups

	Full		Blunter		Message Type		Monitor	
	M or n	SD or %	M or n	SD or %	M or n	SD or %	M or n	SD or %
Age (yrs)	49.77	14.09	49.74	14.51	49.81	13.69	49.81	13.69
MBCS (range: -4 to 15)	5.49	3.87	5.37	3.78	5.61	3.97	5.61	3.97
Gender (% male)	152	28.63	77.00	28.90	75.00	28.30	75.00	28.30
Race (% white)	444	83.62	215.00	80.83	229.00	86.42	229.00	86.42
Education (%) [†]								
≤ HS grad	117	22.03	60.00	22.56	57.00	21.51	57.00	21.51
Some college	126	23.73	57.00	21.43	69.00	26.04	69.00	26.04
College grad	161	30.32	91.00	34.21	70.00	26.42	70.00	26.42
Post grad	120	22.60	57.00	21.43	63.00	23.77	63.00	23.77
Income (%) [†]								
< \$40,000	174	32.77	87.00	32.71	87.00	32.83	87.00	32.83
\$40–59,000	107	20.15	48.00	18.05	59.00	22.26	59.00	22.26
\$60–79,000	74	13.94	28.00	10.53	46.00	17.36	46.00	17.36
\$80,000 +	140	26.37	76.00	28.57	64.00	24.15	64.00	24.15
FV intake (servings/day)								
Baseline	2.60	1.12	2.58	1.10	2.61	1.34	2.61	1.34
Month 2	3.88	1.55	3.83	1.61	3.92	1.50	3.92	1.50
Month 4	4.04	1.57	4.01	1.52	4.07	1.62	4.07	1.62
Manipulation Check								
Interesting	3.68	0.78	3.58*	0.76	3.77	0.79	3.77	0.79
Informative	3.76	0.80	3.70	0.84	3.83	0.76	3.83	0.76
Detailed	3.64	0.86	3.57	0.86	3.72	0.85	3.72	0.85
Details beyond basics	4.06	1.01	3.92*	1.00	4.20	1.00	4.20	1.00
Month 2: Perceived risk	2.66	0.97	2.64	1.02	2.67	0.91	2.67	0.91
Month 2: Perceived value	4.50	0.60	4.42	0.64	4.57	0.55	4.57	0.55

* *Note.* $p < .05$.

† some did not report. HS = high school. MBCS = Monitoring-blunting coping style. Grad=graduate. FV= fruit and vegetable.