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UMI®
USING MESSAGE FRAMING TO PROMOTE REGULAR PHYSICAL ACTIVITY IN COLLEGE-AGE WOMEN AND MEN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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*****

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ABSTRACT

Research to date suggested that individuals respond to positively framed health messages differently compared to health messages that are negatively framed. Rothman and Salovey (1997) proposed that a behavior that is prevention-oriented is better promoted by positive-framed messages while a behavior that is detection-oriented is better promoted by negative-framed messages. The current study sought to test this hypothesis by independently manipulating the message framing (positive vs. negative) and the perceived function (prevention-oriented vs. detection-oriented) variables and evaluating their independent and joint effects on the promotion of regular exercise and exercise testing among sedentary male and female college students. Additional potential moderators of the framing effect were examined, including stages of readiness to change, perceived susceptibility to develop heart disease, gender, and Need for Cognition (Cacioppo et al., 1984).

One hundred and ninety-two eligible participants were recruited on the basis of their lack of regular physical activity and previous participation in exercise testing. Each participant was randomly assigned to read one of eight versions of a pamphlet, which promoted either regular exercise or exercise testing. The pamphlet was either positively or negatively framed with either prevention or detection emphasis. Participants completed a questionnaire, which included their attitude, behavioral intention, and
intended frequency of participation, as well as affective, cognitive, personality, and psychosocial variables. In addition, behavioral response and follow-up questionnaires were used to assess the effects of the independent variables.

Results provided some support for Rothman and Salovey (1997) predictions in a regular exercise context. Messages perceived to be positively framed elicited greater behavioral intention to engage in regular exercise than did messages perceived to be negatively framed when the behavior was viewed as prevention-oriented. On the other hand, messages perceived to be negatively framed elicited greater behavioral intention to engage in regular exercise than did messages perceived to be positively framed when the behavior was viewed as detection-oriented. However, the majority of the dependent variables in this study (attitude, frequency of intended participation, behavioral response, and follow-up data) failed to support either hypothesis. Overall, participants appeared to prefer messages that were either positively framed or prevention-oriented. Individuals from advanced exercise stages, low-NFC scorers, and possibly women were susceptible to the framing effect. While most participants in the follow-up study reported taking some steps toward a physically active lifestyle, this was not clearly a result of the framing/function intervention.

Results from the exercise testing sample revealed that among individuals who indicated intention to participate in exercise testing prior to the intervention, messages perceived to be negatively framed elicited more favorable attitude toward exercise testing than did messages perceived to be positively framed when the behavior was viewed as detection-oriented. There was no framing effect in the prevention-context, however.
Participants did not appear to prefer one frame or function over the other. There were several significant manipulated frame x manipulated function interactions associated with “intention to participate in exercise testing within the next decade” as the dependent variable. However, none supported the stated hypotheses. Moreover, the interactions disappeared when perceived framing and perceived function were used in the analyses instead. Only test stages of change and gender interacted with the framing and/or function variables.

The present study provided some evidence suggesting that the framing effect can be found in complicated behaviors such as regular exercise and exercise testing and provided limited support for the framing x function interaction in the direction predicted by Rothman and Salovey (1997). The fact that such a simple intervention can impact relatively complicated health behaviors has important implications for delivering cost-effective cardiovascular health promotional measures in the college-age population. Stages of readiness to change and NFC proved to be important moderators of framing. In addition to replicating current findings, subsequent research should assess the framing effect with additional populations such as older adults, explore the use of other sensitive outcome measures, and employ the framing intervention both in a field and lab setting. Research should also examine the long-term effect of framing and evaluate the efficacy of message framing in conjunction with more extensive exercise interventions.
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CHAPTER 1

INTRODUCTION

As a consistent relationship between physical exercise and health outcomes begins to emerge, there is increasing need for effective interventions to increase exercise activity in the general population. Indeed, the need for exercise interventions has become urgent, given the far-reaching negative social and economic implications of a physically inactive population. One of the first steps in developing an intervention is to design effective exercise promotional messages. The research literature on persuasion documents a plethora of variables that influence the effectiveness of messages. One such variable is message framing (Tversky & Kahneman, 1981). This chapter describes the historical progression from an atheoretical to a theoretical approach to the study of exercise promotion, citing examples ranging from self-efficacy theory (Bandura, 1977, 1986) to the framing postulate (Tversky & Kahneman, 1981). In addition, the chapter reviews research to date on the utility of message framing in promoting health behavior changes, describing several major variables known to interact with framing. A rationale for examining the effectiveness of message framing in exercise promotion is provided, as well as a detailed discussion of how the framing effect should be assessed and an overview of the proposed study.
The Importance of Exercise Promotion

Regular exercise, as indicated by a growing body of evidence, is known to yield many important physical and psychological benefits. Physical benefits include cardiovascular fitness (Blumenthal et al., 1991), weight regulation (Hardman, 1996), and risk reduction for a variety of diseases such as hypertension (Hardman, 1996; Kawabe et al., 2000), osteoporosis (Swezey, Swezey, & Adams, 2000), and coronary artery disease (Blair et al., 1989), thereby improving quality of life and decreasing morbidity and mortality (Hahn, Teutsch, Paffenbarger, & Marks, 1990; Paffenbarger & Hyde, 1988; Paffenbarger, Hyde, Wing, & Hsieh, 1986). Examples of psychological benefits of regular exercise include mood improvement (Thayer, 1989), reduction in anxiety and depressive affect (Emery, Schein, Hauck, & MacIntyre, 1998), as well as enhancement in self-esteem and body image (Guinn, Semper, & Jorgensen, 1997). Additionally, regular exercise has been associated with improved cognitive performance (Emery & Blumenthal, 1991; Emery et al., 1998). These findings altogether underscore the importance of regular exercise in promoting and maintaining both physical and psychological health in men and women (Blair et al., 1996; King, Haskell, Young, Oka, & Stefanie, 1995; King, Taylor, & Haskell, 1993), as well as among different age groups, ranging from adolescents (Baranowski et al., 1992) to older adults (Emery & Blumenthal, 1990; Rowe & Kahn, 1987).

Given the central role of regular exercise in health promotion and maintenance, it has become an integral part of public health interventions. Unfortunately, despite much effort from both the private and the public sector, exercise participation in the general
population is far from optimal. Recent surveys indicate that most Americans do not exercise regularly, with 45% of adults reporting negligible amounts of leisure physical activity (Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Dishman, Sallis, & Orenstein, 1985; Martin & Dubbert, 1987). Other studies have shown that the percentage of sedentary individual may be especially high among older adults (U.S. Department of Health and Human Services [USDHHS], 1996), women (Cousins, 1996; Felton, Parsons, & Bartoces, 1997), and ethnic minorities (Kagawa-Singer, Kumanyika, Lex & Markides, 1995; Myers, Strikmiller, Webber, & Berenson, 1996). Also, a large proportion of adolescents remains physically under active despite reporting relatively higher levels of physical activity in comparison with individuals from older age groups (Bauman, Owen, & Rushworth, 1990; Centers for Disease Control and Prevention, 1990). Numerous studies have shown that girls exercise less than boys (Pate, Heath, Dowda, & Trost, 1996) and engage in less vigorous physical activities (Myers et al., 1996), and that the discrepancy increases with age (Gliksman, Dwyer, & Wlodarczyk, 1990). However, overall exercise participation declines with age for both girls and boys (Stephens & Caspersen, 1993).

These disheartening statistics regarding exercise behavior have prompted researchers to investigate the determinants of exercise activity. Many earlier studies were largely atheoretical; potential predictors of exercise in these studies were selected based on literature review, intuition, and/or common sense. This approach gradually progressed to a more theory-driven strategy where general theoretical frameworks were adopted and modified to explain exercise behavior. Prominent examples of social-cognitive theories
that have been used to serve as models of health and exercise behavior include self-efficacy theory (Bandura, 1977, 1986), the theory of reasoned action and planned behavior (Ajzen, 1985, 1988; Fishbein & Ajzen, 1975), the health belief model (Janz & Becker, 1984; Rosenstock, 1990), protection motivation theory (Rogers, 1983), and more recently, stages of change models (e.g., Prochaska & DiClemente, 1983). Among these, the two models that have guided most of the research on health and exercise behavior are self-efficacy theory (Bandura, 1977, 1986) and theory of reasoned action and planned behavior (Ajzen, 1985, 1988; Fishbein & Ajzen, 1975). Both models have been extremely useful in explaining and predicting exercise behavior change (Godin, 1994; Maddux, 1993).

Similarly, accumulating evidence has supported the utility of the Transtheoretical Model (Prochaska & DiClemente, 1983) in conceptualizing exercise behavior (Marcus & Owen, 1992; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Simkin, 1993). Several researchers have suggested that the factors that influence exercise adoption appear to be different from those that influence exercise adherence (Sallis et al., 1986; Sallis et al., 1992), suggesting the need for more studies investigating exercise adoption (Dishman, 1988). One important component influencing exercise adoption is the exercise promotion message (Rosen, 2000). A good exercise promotion message conveys information about the effects of exercise, but information alone is usually insufficient to motivate behavior change. Warnings on cigarette packaging, for example, have not stopped the smoking habit. Research on persuasion has shown that many variables influence the responsiveness of message recipients, ranging from the recipient's mood state (Bless,
Bohner, Schwarz, & Strack, 1990) to the credibility of the information source (Chaiken & Maheswaran, 1994). Concerning message-related factors, one theoretical framework utilized in health behavior research that seems particularly useful in guiding the design of exercise promotional messages is the framing postulate of the prospect theory (Tversky & Kahneman, 1981).

**Message Framing**

*What is the Framing Postulate?*

According to the framing postulate (Tversky & Kahneman, 1981), when an individual is presented with two behavioral alternatives, one risky and one non-risky, his or her preference for either alternative is influenced by how the message is framed. Individuals generally prefer the risky option when the message emphasizes possible losses (i.e., loss or negative frame) but prefer the non-risky option when the message emphasizes possible gains (i.e., gain or positive frame). The basis for the framing postulate came from experimental results obtained using a series of hypothetical scenarios. For example, Tversky and Kahneman (1981) asked participants to choose between two hypothetical medical treatments with the outcomes framed in terms of either lives lost (negative frame) or lives saved (positive frame). Within each framing condition, the two treatments differed in terms of the probability (certain vs. uncertain) and magnitude (1/3 vs. 2/3 of the lives) of outcome. In the positive-frame condition, most participants preferred the treatment that guaranteed a certain number of saved lives over the treatment associated with uncertain albeit potentially greater number of saved lives. In the negative-frame condition, by contrast, most participants preferred the
treatment associated with the possibility of losing many lives over the treatment that guaranteed certain but smaller losses. The results suggested that participants were risk-seeking in the negative-frame condition but risk-averse in the positive-frame condition (Tversky & Kahneman, 1981).

Message Framing and Health Behavior Change

The effect of message framing on health decision making was first evaluated in a study promoting breast self-examination (BSE) among college women to decrease the risk of breast cancer (Meyerowitz and Chaiken, 1987). It was proposed that while the purpose of BSE is to reduce the risk of having undetected and, hence, untreated tumors, performing BSE may appear risky to these women due to the highly salient possibility of discovering a tumor. Therefore, on the basis of the framing postulate, negative framing was hypothesized to be more efficacious in inducing BSE compliance than positive framing. Consistent with this hypothesis, results indicated a negative-frame advantage over positive-frame and information-only controls. Women who were exposed to a negatively framed message reported more frequent BSE behavior at a four-month follow-up than women in the other two experimental conditions (Meyerowitz & Chaiken, 1987).

Subsequent studies have sought to extend the findings of Meyerowitz and Chaiken (1987) by evaluating the effect of message framing in the context of various health behaviors including testicular self-examination (Steffen, Sternberg, Teegarden, & Shepherd, 1994), mammography utilization (Banks et al., 1995), sunscreen application (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman, Salovey, Antone, Keough, & Martin, 1993), HIV testing (Kalichman & Coley, 1995), and mouth rinse
usage (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999). Results have been mixed, revealing either no framing effect (Lauver & Rubin, 1990; Steffen et al., 1994), a negative-frame advantage (Banks et al., 1995; Kalichman & Coley, 1995), or a positive-frame advantage (Detweiler et al., 1999; Rothman et al., 1993). Several explanations have been proposed to account for the discrepant findings, including the degree of personal involvement, an inclination to think deeply and elaborate on persuasive messages, perceived function or purpose of the behavior, and stages of readiness to change.

*Level of Involvement.* Level of personal involvement has been shown to moderate the effect of message framing (Maheswaran & Meyers-Levy, 1990). Perceived susceptibility has been frequently used as a measure of the level of involvement in a health context. When the risk of heart disease was made personally relevant and perceived susceptibility to heart disease was high (i.e., high level of involvement), college students were more likely to sign up for cholesterol screening after being exposed to a negatively framed message than to a positively framed message. When the risk of heart disease was made personally irrelevant and perceived susceptibility to heart disease was low (i.e., low level of involvement), a positively framed message promoting cholesterol screening was more efficacious (Maheswaran & Meyers-Levy, 1990). Presumably, under low level of involvement, people do not engage in extensive information processing but base their decision on peripheral cues such as the favorableness of the message, hence giving rise to a positive-frame advantage. When the level of involvement is high, however, people process the information to a greater degree.
Negative information is perceived as more informative (Fiske, 1980) and hence receives greater weight, resulting in a negative-frame advantage (Maheswaran & Meyers-Levy, 1990).

Need for Cognition. The Need for Cognition (NFC), generally measured using an 18-item questionnaire (Cacioppo, Petty, & Kao, 1984), is defined as the degree to which individuals are dispositionally inclined to think deeply and elaborate on persuasive messages. Previous studies have shown that NFC moderates framing effect and that framing effect is typically associated with low-NFC individuals (Chatterjee, Heath, Milberg, & France, 2000; Smith & Levin, 1996; Zhang & Buda, 1999). For instance, in a study where undergraduates read a description of a new product that was either positively or negatively framed, participants who were low on NFC rated the product more favorably when the message was negatively framed than when the message was positively framed. Participants who were high on NFC showed no framing effect (Zhang & Buda, 1999).

Perceived Function of the Behavior. Another variable that may influence the relative efficacy of positive vs. negative frame is the perceived function of the health behavior being promoted. Rothman and Salovey (1997) argued that a behavior that is prevention-oriented (i.e., applying sunscreen lotion to prevent skin cancer) involves little risk and hence, may be better promoted by positively framed messages. On the other hand, a behavior that is detection-oriented (i.e., performing breast self-examination to detect potentially cancerous tumors) may be perceived as risky and, hence, is presumably better promoted by negatively framed messages. Their assertion was directly tested in
two experiments utilizing either a hypothetical disease (Study 1, Rothman et al., 1999) or an actual health problem such as gum disease (Study 2, Rothman et al., 1999). In each experiment, the framing (positive vs. negative) and the perceived function (prevention vs. detection) of the target health behavior were independently manipulated. Results from both experiments supported the proposed relationship between framing and perceived function of the target behavior. Specifically, when participants perceived a behavior to be prevention-oriented, they found positively framed messages more persuasive. On the other hand, when a behavior was perceived to be detection-oriented, it was better promoted by negatively framed messages (Rothman et al., 1999).

Stages of Change Model. Recent conceptualizations of behavior change include multistage models (Dishman, 1991; Sallis & Hovell, 1990; Sonstroem, 1988). Of the stage models proposed in the health domain, the most widely used is Prochaska and DiClemente's (1983) Transtheoretical Model of behavior change (Marcus et al., 1992; Marcus & Simkin, 1993). In this model, behavior change is depicted as a process that involves cyclical progression through five stages: precontemplation, contemplation, preparation, action, and maintenance. In precontemplation, an individual does not intend to make any changes (e.g., a sedentary individual who does not intend to start exercising). In contemplation, the individual considers whether to make a change in, for example, exercise behavior. In preparation, the individual consciously decides to make a change and prepares for it in various ways (e.g., rearranging one's schedule to fit in exercise).
action, the individual actively engages in the new behavior regularly (e.g., exercising three times a week). In maintenance, the individual sustains the new behavior over time (e.g., exercising regularly for 6 months or longer).

Stages of Change and Exercise Promotion. A number of researchers have suggested that the traditional conceptualization of exercise adoption as a two-stage process (inactive vs. active) does not adequately capture the complexity and dynamic nature of the behavior (Dishman, 1991; Sallis & Hovell, 1990; Sonstroem, 1988). Research has shown that among physically inactive individuals, there is variability with regard to motivation and readiness to start exercising. Hence, there is varied response to intervention strategies such as exposure to an exercise promotional message (Marcus et al., 1992; Marcus & Simkin, 1993; Rossi et al., 1994). To the extent that motivation to process such messages varies across the stages, responses to positive vs. negative framing may vary also.

Message Framing and Exercise Promotion

Most of the message framing studies to date have focused on relatively simple health behaviors that require little time, effort, and inconvenience. Presently, it is unclear whether the framing effect obtained in these studies can be generalized to more complicated health behaviors such as physical exercise, which requires significant time commitment, effort, and persistence. To date, only one prior study has investigated specifically the effect of framing on regular exercise promotion (Robberson & Rogers, 1988). Inactive female college students were randomly assigned to one of the following conditions: (1) no pamphlet, (2) negative-frame-only pamphlet on health and exercise,
(3) positive-frame-only pamphlet on health and exercise, (4) combination of positive-and-negative-frame pamphlet on health and exercise, (5) negative-frame-only pamphlet on self-esteem and exercise, (6) positive-frame-only pamphlet on self-esteem and exercise, (7) combination of positive-and-negative-frame pamphlet on self-esteem and exercise.

Results indicated that the positive-frame self-esteem message produced greater behavioral intention to exercise than the negative-frame self-esteem message. There was no framing effect within the health conditions. Moreover, the combination frame of health message was superior only to the negative-frame self-esteem message. Finally, the positive-frame self-esteem message was marginally more effective than the positive-frame health message.

Although the Robberson and Rogers (1988) study documents a framing effect in the context of exercise promotion, many questions remain unanswered. For example, it is not clear why the framing effect emerged in the self-esteem message but not the health message. Additionally, since the study included only female participants, it remains to be seen whether the findings would generalize to men as well. Finally, self-reports of attitude and behavioral intention to exercise, in and of themselves, may not adequately reflect the relative efficacy of message framing. Recent evidence has suggested that attitudes may be much less enduring and stable than has been assumed traditionally and that attitudes may not be closely related to behavior (Schwarz & Bohner, 1996). Hence, studies of the framing effect should include not just assessments of attitudes and behavioral intentions but also measures of actual behavioral change.

Evaluating the Effectiveness of the Framing Intervention
There are several ways to evaluate the effectiveness of the framing intervention, ranging from simple self-report of change in attitude and behavioral intention to actual behavioral response. The following outcome variables, along with their strengths and limitations, are discussed in turn: attitude and behavioral intention, follow-up behavioral assessment, behavioral response, and ancillary outcome variables.

*Attitude and Behavioral Intention*

Attitude and behavioral intention serve as the primary outcome measures in many studies of health behavior and message framing. Presumably, the more effective the framed message, the more favorable the attitude toward the target behavior and the greater the behavioral intention to engage in the target behavior. More favorable attitude and greater behavioral intention, in turn, have been found to predict behavioral change (Eagly & Chaiken, 1993; Fishbein & Ajzen, 1975). However, recent evidence suggests that attitude is highly context-dependent (Schwarz & Bohner, 1996). The degree of association between attitude and behavior appears to vary across situations (Schwarz & Bohner, 1996; Wicker, 1969). Attitude and intention have proven less predictive of behaviors requiring knowledge, skill, or resources to overcome behavioral barriers than they have for more easily enacted behaviors (Ajzen, 1988; Liska, 1984; Madden, Ellen, & Ajzen, 1992). Thus, measuring attitude and behavioral intention can yield important and useful information, but making behavioral inferences based on these variables alone may lead to erroneous conclusions.

*Follow-up Behavioral Assessment*
A number of studies have examined the effect of framed messages on subsequent behavioral change (Meyerowitz & Chaiken, 1987; Steffen et al., 1994). For example, in Meyerowitz and Chaiken's (1987) BSE study, women who were exposed to a negatively framed message were more likely to perform BSE at four-month follow-up than women who were exposed to a positively framed message, even though the two groups did not differ in behavioral intention to perform BSE immediately after the intervention. Although a longitudinal design is more costly and time consuming to conduct, this type of study is needed to establish the long-term effect of framing.

**Behavioral Response**

Instead of measuring only self-report of post-intervention changes in target behaviors, several studies have examined the effect of framing using secondary behavioral response. For example, in two studies that assessed the effect of framing on sunscreen usage, participants were given the opportunity to request a free sample of sunscreen lotion (Detweiler et al., 1999; Rothman et al., 1993). It was found that a positively framed message was associated with a greater number of requests for sunscreen than was a negatively framed message (Detweiler et al., 1999; Rothman et al., 1993). The behavioral response, complementing the outcome variables of attitudes and behavioral intentions, thus lent further support for the hypotheses.

**Ancillary Outcome Variables**

In addition to the aforementioned outcome measures, the following variables
frequently have been included in health behavior change studies to help elucidate the underlying mechanism of change: self-efficacy, outcome efficacy, perceived benefits vs. barriers, perceived severity, and perceived susceptibility.

**Self-Efficacy and Outcome Efficacy.** Self-efficacy is broadly defined as self-perception of one’s own ability to perform a behavior, and it is believed to be critical for behavior change (Bandura, 1982, 1986). Specifically, self-efficacy has been found to predict whether or not an individual will engage in a behavior, as well as the amount of effort and persistence he or she is likely to display in the course of performing that behavior (Bandura, 1977). Studies have shown that self-efficacy is a key determinant in many health-related behaviors including exercise (Sallis et al., 1986; Sallis, Pinski, Grossman, & Patterson, 1988). Exercise-specific efficacy expectations have been found to predict frequency and intensity of exercise in sedentary adults engaging in low-impact aerobic exercise programs (McAuley & Jacobson, 1991).

Along with self-efficacy, outcome efficacy is expected to play a critical role in behavior change (Bandura, 1977). Outcome efficacy is defined as the perceived efficacy of a behavior (e.g., exercise) to achieve a particular outcome (e.g., cardiovascular fitness) (Bandura, 1977). To date, research evidence in support of the relationship between outcome efficacy and behavior appears equivocal. Although cross-sectional studies have generally revealed a significant association between outcome efficacy of regular exercise and behavioral intention to exercise (Godin & Shephard, 1986; Godin, Shephard, &
Colantonio, 1986; Riddle, 1980), longitudinal studies suggest that outcome efficacy does not reliably predict future exercise behavior (Dzewaltowski, 1989; Dzewaltowski, Noble, & Shaw, 1990). Further investigation is clearly warranted.

**Perceived Benefits and Barriers.** Besides self-efficacy theory (Bandura, 1977, 1986), several other theories have contributed to identifying important predictors of health behavior. In the decisional balance theory (Janis & Mann, 1977), perceived benefits and barriers of a behavior are viewed as an important part of the decision-making process that affect subsequent behavior change. Multiple dimensions appear to underlie perceived benefits and barriers to exercise participation. Myers and Roth (1997) have identified an eight-factor solution, with four factors accounting for the variance associated with exercise benefits (psychological, social, body image, and health) and four factors accounting for the variance associated with exercise barriers (time-effort, physical effects, social, and specific obstacles).

**Perceived Severity and Perceived Susceptibility.** Two additional variables that are especially important in predicting the adoption of exercise are perceived severity and perceived susceptibility. Both variables are central constructs in the health belief model (Becker, 1974; Rosenstock, 1990) and protection motivation theory (Maddux & Rogers, 1983; Rogers, 1983). Perceived severity refers to an individual’s perception of the seriousness of a health condition. Consequences of the health concern may be physical, psychological, and/or social (Rosenstock, 1990). Perceived severity is hypothesized to have several dimensions including symptom visibility, disease time of onset, and disease rate of onset (Haefner, 1974; Klohn & Rogers, 1991). Among these dimensions,
symptom visibility appears to be the most influential (Courneya, 1995). In general, the more serious a health threat (e.g., cardiovascular disease) is perceived to be, the stronger are the intentions to engage in preventative behavior (e.g., regular exercise) (Courneya, 1995; Rogers, 1983; Sutton, 1982).

Conceptually related to perceived severity, perceived susceptibility is defined as one's subjective vulnerability to a health problem. In general, perceived susceptibility and perceived severity are positively correlated but this is not always the case. For example, a young adult may view heart disease as a very serious health condition but does not view the disease as a major health concern for people his or her age. In the aforementioned study examining the effect of framing on promoting cholesterol screening among college students, positive frame showed an advantage when perceived susceptibility to heart disease was high, and negative frame proved to be superior when the perceived susceptibility to heart disease was low (Maheswaran & Meyers-Levy, 1990). Experimental studies have shown that by increasing people's perceived susceptibility, exercise intention is subsequently elevated (Godin, Desharnais, Jobin, & Cook, 1987; Wurtele & Maddux, 1987). However, there is some evidence that the level of perceived susceptibility does not remain stable. Presumably, adoption of the recommended health behavior causes perceived susceptibility to decrease, thereby giving rise to the seemingly paradoxical findings of a negative relationship between perceived susceptibility and behavioral intention reported in cross-sectional studies (Fuchs, 1996).

Overview of the Proposed Study
Research to date suggests that individuals respond to positively framed health messages in different ways than to health messages that are negatively framed. Rothman and Salovey (1997) proposed that a behavior that is prevention-oriented is better promoted by positive-framed messages while a behavior that is detection-oriented is better promoted by negative-framed messages. The purpose of the present study was to test Rothman and Salovey’s (1997) hypothesis and extend previous research by examining health behaviors that are relatively complicated and require considerable time and effort to perform. Regular exercise and participation in an exercise test (i.e., stress test) were chosen because although they involve similar behavior, regular exercise is generally viewed as a preventative behavior while an exercise test tends to be perceived as a detection-oriented behavior. However, the perceived function of both behaviors was manipulated for this study. Thus, framing-by-perceived-function interactions were examined within each behavior. The design of the study provides a methodologically sound test of Rothman and Salovey’s (1997) hypothesis in two ways: (1) the likelihood of having confounding variables obscuring any effect of perceived function on the dependent variables was reduced, and (2) generalizability of the results was increased by simultaneously examining two different behaviors. It was hypothesized that a positive-framed message would be more effective than a negative-framed message when the behavior being promoted is perceived to serve prevention purposes, regardless of whether the behavior is regular exercise or an exercise test. On the other hand, a negative-framed message would be more effective than a positive-framed message when the behavior being promoted is perceived to serve detection purposes, regardless of whether the
behavior is regular exercise or an exercise test. Additional potential moderators of the framing effect were examined, including stages of readiness to change, perceived susceptibility to develop heart disease, gender, and NFC or Need for Cognition (Cacioppo et al., 1984).
CHAPTER 2

METHOD

Participants

A total of 192 male and female college students from introductory psychology classes with relatively low levels of physical activity (i.e., less than 3 times per week of exercise at moderate intensity for at least 20 - 30 minutes each session; Stephens & Caspersen, 1993) were recruited for the study. In calculating the sample size needed to achieve adequate power, consideration was given to both the effect size of message framing (moderate, delta = 0.3, according to pilot data and literature review) and the effect size of the perceived function of a health behavior (moderate, delta = 0.3, according to pilot data and literature review). According to the power analysis performed based on these two values, a sample size of 20 per cell was suggested. Thus, a total sample size of 160 was recommended given the 2 (frame: positive, negative) x 2 (perceived function: prevention, detection) x 2 (behavior: regular exercise, exercise test) design of the study.

Instruments

Stages of Exercise Behavior Change Questionnaire

Each participant’s exercise stages of change was measured prior to the message framing intervention using a questionnaire adapted from Marcus et al. (1992), who
adapted their questionnaire from the original stages of change measure developed by Prochaska and DiClemente (1983). Courneya (1995) and Marcus et al. (1992) reported 2-week test-retest reliabilities of .79 and .78, respectively, for the Marcus et al. (1992) measure. Concurrent validity has been demonstrated by Marcus and Simkin (1993) using the Seven Day Physical Activity Recall questionnaire (Blair, 1984). The stages of exercise behavior change questionnaire and all other assessment measures are included in Appendix A.

**Stages of Exercise Testing Behavior Change**

Stages of readiness to participate in exercise testing was measured with a single item, where participants selected one of three statements to indicate whether they had participated in an exercise test in the past and if not, whether they intended to participate in one in the near future;

**Message Framing Pamphlet**

Eight versions of a cardiovascular health promotional pamphlet were designed: regular exercise/positive frame/prevention, regular exercise/positive frame/detection, regular exercise/negative frame/prevention, regular exercise/negative frame/detection, exercise test/positive frame/prevention, exercise test/positive frame/detection, exercise test/negative frame/prevention, exercise test/negative frame/detection. Each version of the three-page pamphlet was divided into three sections. For the four regular exercise versions the sections included: (a) the importance of early prevention or detection of heart disease, (b) the role of exercise in reducing or detecting risk factors for heart disease, and (c) tips on successful exercise adoption. For the four exercise test versions
of the pamphlet the sections included: (a) the importance of early prevention or detection of heart disease, (b) the role of exercise testing in reducing or detecting risk factors for heart disease, and (c) commonly asked questions and answers about exercise tests. All eight versions were equated for length and complexity. Message framing occurred throughout the pamphlet, but mostly in sections “b” and “c”. According to some researchers, there are different ways to frame a message. A positive-framed message could be phrased as a gain or a non-loss while a negative-framed message could be phrased as a loss or a non-gain (Brendl, Higgins, & Lemm, 1995). However, others have argued that there is no significant difference between phrasing positive-framed messages as gains vs. non-losses, nor between phrasing negative-framed messages as losses vs. non-gains (Detweiler et al., 1999). Given the context of the message in the current study, the positive-framed messages contained only gain arguments and the negative-framed messages contained only non-gain arguments (see examples below). For complete versions of the pamphlets, see Appendix A.

**Regular exercise/positive frame/prevention:** Ultimately, when you engage in regular exercise, you are taking advantage of a safe and effective way to reduce your risk of heart disease and improve your cardiovascular fitness. With early prevention, you can avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Regular exercise/positive frame/detection:** Ultimately, when you engage in regular exercise, you are taking advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. With early detection, you can avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Regular exercise/negative frame/prevention:** Ultimately, when you do not engage in regular exercise, you fail to take advantage of a safe and
effective way to reduce your risk of heart disease and improve your cardiovascular fitness. Without early prevention, you miss opportunities to avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Regular exercise/negative frame/detection:** Ultimately, when you do not engage in regular exercise, you fail to take advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. Without early detection, you miss opportunities to avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Exercise test/positive frame/prevention:** Ultimately, when you participate in an exercise test, you are taking advantage of a safe and effective way to reduce your risk of heart disease and improve your cardiovascular fitness. With early prevention, you can avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Exercise test/positive frame/detection:** Ultimately, when you participate in an exercise test, you are taking advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. With early detection, you can avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Exercise test/negative frame/prevention:** Ultimately, when you do not participate in an exercise test, you fail to take advantage of a safe and effective way to reduce your risk of heart disease and improve your cardiovascular fitness. Without early prevention, you miss opportunities to avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

**Exercise test/negative frame/detection:** Ultimately, when you do not participate in an exercise test, you fail to take advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. Without early detection, you miss opportunities to avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.

*Manipulation Checks*

Two questions were used to help determine whether the message framing variable was manipulated successfully. Participants rated the tone of the information included in
the pamphlet on a 7-point scale ranging from −3 (mostly negative) to +3 (mostly positive), with the midpoint labeled “neutral”. Participants also indicated whether the pamphlet emphasized the benefits associated with engaging in the target behavior or the loss of benefits associated with not engaging in the target behavior. This rating was also made on a 7-point scale ranging from −3 (losing benefits) to +3 (gaining benefits), with the midpoint labeled “equally emphasized”. In order to determine whether the perceived function variable was manipulated successfully, participants were asked to indicate whether the pamphlet emphasized the (1) prevention and (2) detection of heart disease on a 7-point scale ranging from −3 (strongly disagree) to +3 (strongly agree), with the midpoint labeled “neutral”.

Evaluations of the Message

Four items assessed the message in terms of its credibility, interest, understandability, and persuasiveness. All items were presented as 7-point rating scales ranging from -3 = “strongly disagree” to +3 = “strongly agree”.

Attitude

Participants’ attitude toward the promoted health behavior (regular exercise or exercise test) was assessed using a twelve-item, 7-point rating scale. Each item constituted a pair of words that were polar opposites of each other. One endpoint labeled “+3”, represented positive evaluations (e.g., useful, important). The other endpoint labeled “-3”, represented negative evaluations (e.g., useless, unimportant). Participants were asked to indicate the extent to which each word pair described their overall attitude toward the target behavior by selecting a number on the rating scale. Overall scores for
the measure were computed by averaging across the items, with higher scores reflecting more positive attitudes. The attitude measure was found to be highly reliable, with Cronbach’s alpha coefficient of .93.

**Behavioral Intention**

Four items assessed participants’ behavioral intention to perform the target health behavior (regular exercise or exercise test). For each item, the possible responses ranged from −3 (strongly disagree/very unlikely) to +3 (strongly agree/very likely). Overall scores for the measure were computed by first reverse scoring two of the items and then averaging across all four items, with higher scores reflecting greater behavioral intention. The behavioral intention measure was found to be reasonably reliable, with Cronbach’s alpha coefficient of .77.

**Frequency**

Participants were asked to indicate how frequently they intended to engage in the target behavior by selecting one of seven possible responses. The data were ordinal in nature because the responses were not evenly spaced (i.e., unlike the values of a rating scale) although they ranged from lower to greater frequency of intended participation.

**Psychosocial Variables**

Participants completed several self-report psychosocial measures relevant to the intervention. All measures were presented as 7-point rating scales ranging from −3 (strongly disagree) to +3 (strongly agree), with the midpoint labeled “neutral”. Whenever a variable was assessed by two or more items, an appropriate reliability statistic (Pearson’s product moment correlation coefficient for two items and Cronbach’s alpha

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coefficient for three or more items) was calculated. For scales demonstrating fair to high reliability, an index score was created by averaging across items on the scale.

Perceived severity of heart disease was measured with a single item.

Perceived susceptibility to heart disease was measured with a single item.

Self-efficacy for participation in the target behavior was assessed with two items ($r = -.54$).

Outcome efficacy of the target behavior in reducing/detecting risk of heart disease was assessed with two items ($r = .14$).

Perceived benefits of the target behavior were measured with two items ($r = .84$).

Perceived barriers to engage in the target behavior were measured with three items (Cronbach’s alpha = .02).

Participants’ pre-intervention knowledge and experience with the target behavior were assessed with four items (Cronbach’s alpha = .92).

Participants’ perceived likelihood of injury during participation of the promoted health behavior was assessed with two items ($r = .67$).

A total of five items were used to assess the perceived severity of failing to participate in the promoted health behavior along three dimensions: visibility, time of onset, and rate of onset (Cronbach’s alpha = .68). For example, participants in the regular exercise conditions were asked to indicate the extent to which they believed a lack of regular exercise might lead to physical impairment, disfigurement, and other visible health effects. Additionally, participants were asked to indicate to what extent they believed that negative health effects from a lack of regular exercise tended to occur.
very gradually or very late in life. These items were similar to those reported elsewhere in the literature (e.g., Cournaya, 1995; Klohn & Rogers, 1991; Wurtele, 1988).

Risk Factors for Heart Disease

There were ten questions assessing participants' risk factors for heart disease, ranging from demographic variables to family history of heart disease.

The Need for Cognition Questionnaire

The short form of the NFC questionnaire (Cacioppo et al., 1984) was included as a measure of the degree to which participants were dispositionally inclined to think deeply and elaborate on persuasive messages. The 18-item questionnaire consisted of 7-point rating scales ranging from 1 = “strongly disagree” to 7 = “strongly agree” and demonstrated high reliability in the current sample (Cronbach’s alpha coefficient = .92). Each participant’s NFC score was obtained by averaging across the 18 items, with higher scores indicating a greater tendency to think deeply and elaborate on persuasive messages.

Indices of Cognitive Processing of the Pamphlet

Several indices were used to assess the extent to which participants cognitively processed the pamphlet. First, after reading the pamphlet, participants listed any thoughts they had during their reading. Two raters blind to the experimental conditions independently judged all the message-related thoughts as “positive”, “negative”, or “neutral”. Additionally, participants wrote down as much information as they could recall from the pamphlet after reading it. Two raters blind to the experimental conditions independently judged the number and accuracy of these statements. For both of these
judgment tasks, interrater agreement was assessed (.80 and .73, respectively) and discrepancies were resolved through discussion. Finally, participants estimated the percentage of their attention directed to specific sections of the pamphlet, message-related thoughts, and message-unrelated thoughts.

Indices of Affective Reactions to the Pamphlet

Participants were provided with a list of positive (e.g., happy and cheerful) and negative (e.g., fearful) adjectives. They were asked to indicate the extent to which each adjective described their affective reactions to the pamphlet on 7-point rating scales ranging from -3 = "not at all" to +3 = "very much so". Three indices were created from these items. The positive affect index constituted the average of 5 items. The negative affect index constituted the average of 9 items. The fear index constituted the average of 4 items from the negative affect index. All three scales demonstrated high reliability with Cronbach's Alpha Coefficients of .85, .86, and .84, respectively.

Behavioral Response

A postage-paid and addressed postcard was given to each participant after they had completed the questionnaire packet. Space was provided on the back of the postcard for participants to write down their name and contact information. Participants were informed that they would have a chance to win a gift certificate from a local sporting goods store by completing and returning the postcard. Returning the postcard was used as an additional measure of participants' interest in engaging in the target behavior.
Follow-Up Questionnaires

Changes in participants’ activity level were assessed via self-report once a week for four weeks following the intervention. Due to monetary and other practical constraints, only participants in the regular exercise conditions were recruited to participate in this part of the study. The primary measure used was a simplified, self-report version of the 7-day recall questionnaire (Blair, 1984), which asked for the number of hours participants spent engaging in (1) vigorous activities and (2) moderate activities during the past 7 days. At the fourth week, in addition to completing the recall questionnaire, participants indicated the number of weeks they had exercised regularly since participating in the intervention, wrote down any steps they had taken toward a more physically active lifestyle (e.g., making plans in their schedule to exercise), and listed any barriers that were preventing them from exercising regularly (e.g., lack of time). Participants’ open-ended responses were coded into separate categories by a rater blind to the experimental conditions.

Procedure

Eligible participants were selected from among introductory psychology students who completed a prescreening questionnaire for this study during the prescreening session administered by the psychology department. The prescreening questionnaire consisted of the following items: the stages of exercise behavior change measure (Marcus et al., 1992); a question asking participants to indicate whether they had participated in an exercise test in the past and if not, whether they intended to participate in one in the near future; one question assessing participants’ perceived severity of heart
disease; and one question assessing perceived susceptibility to heart disease.

Participants’ responses to the stages of exercise behavior change measure (Marcus et al., 1992) and the question on exercise test were used to determine their eligibility to participate in the current study. Participants were eligible if they met the following two conditions. First, they had to check one of the following statements reflecting lack of regular exercise behavior: (a) “I am not currently exercising and I do not intend to start exercising in the next 6 months,” (b) “I am not currently exercising but I intend to start exercising in the next 6 months.” (c) “I am currently exercising but not on a regular basis (regular exercise = 3 or more times per week for 20 minutes or longer). And I do not intend to start exercising regularly in the next 6 months.” Second, they had to indicate that they had not participated in an exercise test previously. The eligible participants were subsequently contacted by phone and invited to participate in the study for course credit.

Each participant was randomly assigned to receive one of eight versions of the pamphlet: regular exercise/positive frame/prevention, regular exercise/positive frame/detection, regular exercise/negative frame/prevention, regular exercise/negative frame/detection, exercise test/positive frame/prevention, exercise test/positive frame/detection, exercise test/negative frame/prevention, exercise test/negative frame/detection. In order to minimize expectancy response bias, participants were informed that they would be reviewing and evaluating materials designed for another study, and as part of this process, they would be asked to respond to some questions about their own knowledge and beliefs regarding the practices described in the pamphlet. Participants completed a questionnaire packet after reading the pamphlet. The packet
included all the items from the prescreening questionnaire except the stages of exercise behavior change measure (Marcus et al., 1992) and the question about exercise testing. Additionally, the packet included items that assessed the following: attitude towards and behavioral intention to engage in the target behavior, intended frequency of participation, perceived benefits and barriers associated with performing the behavior, self-efficacy of performing the behavior, outcome efficacy of the behavior to reduce or detect one's risk of heart disease, perceived severity of failing to perform the behavior, perceived risk of injury while performing the behavior, pre-intervention knowledge and experience with the target behavior, and risk factors for heart disease. Also included in the packet were indices of cognitive processing and affective reaction toward the message, evaluations of the message, manipulation checks and the NFC questionnaire (Cacioppo et al., 1984).

Upon completion of the packet, each participant was given a postage-paid and addressed postcard, which could be completed and mailed in later to enter a raffle for a gift certificate from a local sporting goods store. Additionally, participants who received regular exercise versions of the pamphlet were given the opportunity to participate in a follow-up study for which brief questionnaires were emailed to them weekly for four weeks following the intervention. Those who chose to participate were paid $10 and were included in a lottery for additional cash prizes.

Data Analyses

The data analyses were conducted in three phases. First, analysis of variance (ANOVA) was used to evaluate manipulation checks and participants' ratings of the messages. ANOVA was also used in the initial analyses of attitude, behavioral intention,
and follow-up data, as well as in evaluating all the secondary measures, which included psychosocial, cognitive, and affective variables. Second, hierarchical regression analyses were conducted to further evaluate attitude and behavioral intention by including additional independent variables that were continuous. Third, logistical regression analyses were conducted to evaluate frequency of intended participation and behavioral response and included dichotomous and continuous independent variables.

Attitude, behavioral intention, frequency of intended participation, behavioral response, and follow-up data (for regular exercise group only) were the primary outcome measures in the study. Secondary measures included psychosocial, cognitive, and affective variables.
CHAPTER 3

RESULTS

Description of the Sample

Demographic information and cardiovascular risk profile of the sample are presented in Table 1, Appendix B. Of the 192 participants, 44% were men and 56% were women. The average age was 19.24, ranging from 16 to 27. Seventy-five percent of the sample were Caucasian, 13% were African American, and the remaining 12% represented members of various other ethnic minority groups. All participants met two conditions. First, they checked one of the following statements reflecting lack of regular exercise behavior: (a) “I am not currently exercising and I do not intend to start exercising in the next 6 months,” (b) “I am not currently exercising but I intend to start exercising in the next 6 months,” or (c) “I am currently exercising but not on a regular basis (regular exercise = 3 or more times per week for 20 minutes or longer). And I do not intend to start exercising regularly in the next 6 months.” The first statement corresponded to “exercise stage 1”, the second statement corresponded to “exercise stage 2”, and the third statement reflected “exercise stage 3”. Second, participants indicated that they had not participated in an exercise test previously by endorsing either (a) “I have not participated in an exercise test and I do not intend to participate in one in the near future,” or (b) “I have not participated in an exercise test but I intend to participate in
one in the near future.” Similar to the classification of exercise stages, the first statement corresponded to “test stage 1” and the second statement corresponded to “test stage 2”.

With regard to the exercise stages, 21% were in stage 1, 59% in stage 2, and 20% in stage 3. As for the test stages, 57% were in stage 1 and 43% were in stage 2. These values are also included in Table 1.

**Manipulation Checks and Message Evaluations**

There was evidence suggesting that the framing manipulation had been successful. Participants who read positive-framed information judged the tone of the pamphlet to be significantly more positive ($M = 1.02, SD = 0.15$) than did those who read negative-framed information [$M = 0.52, SD = 0.15$], $F(1, 188) = 5.50, p < .05$]. Additionally, there was a significant behavior main effect for the positive feeling index [$F(1, 188) = 15.27, p < .01$]. Participants who read pamphlets promoting regular exercise reported more positive feelings ($M = -0.15, SD = 0.11$) than those who read about exercise testing ($M = -0.78, SD = 0.12$). Finally, there was a significant behavior by function interaction for the number of favorable thoughts toward the target behavior [$F(1, 184) = 5.09, p < .05$]. Simple effect testing revealed that participants reported a greater number of favorable thoughts toward prevention-oriented messages ($M = 1.94, SD = 0.16$) than toward detection-oriented messages ($M = 1.23, SD = 0.16$) in the exercise context [$F(1, 184) = 9.54, p < .01$]. The difference was not significant in the exercise test context ($p > .10$).

To assess whether the function manipulation was perceived as intended, participants provided two separate ratings to indicate the extent to which the pamphlets
emphasized prevention versus detection of heart disease. On the prevention rating, there was a significant main effect for function \([F(1, 188) = 10.95, p < .01]\). Participants rated prevention-oriented pamphlets higher on prevention emphasis (\(M = 1.58, SD = 0.16\)) than detection-oriented pamphlets (\(M = 0.82, SD = 0.16\)), suggesting that the function manipulation was successful. Additionally, there was a significant main effect for behavior \([F(1, 188) = 9.04, p < .01]\) with pamphlets promoting regular exercise rated higher on prevention emphasis (\(M = 1.55, SD = 0.16\)) than pamphlets promoting exercise testing (\(M = 0.86, SD = 0.17\)). On the detection rating, a significant behavior by function interaction emerged \([F(1, 188) = 20.50, p < .01]\). Simple effect tests revealed that for regular exercise, detection-oriented pamphlets (\(M = 1.24, SD = 0.19\)) were rated higher on detection emphasis than prevention-oriented pamphlets (\(M = -0.71, SD = 0.20\)) \([F(1, 188) = 50.26, p < .01]\), thus confirming the successful manipulation of function for regular exercise. In the exercise test conditions ratings of detection emphasis did not differ significantly between the detection-oriented pamphlets (\(M = 1.98, SD = 0.20\)) and the prevention-oriented pamphlets (\(M = 1.83, SD = 0.20\)), \(p > .10\).

It should be noted that the correlation between the framing manipulation (dichotomous variable: +1 = positive frame, -1 = negative frame) and perceived framing (continuous variable: the higher the value, the more positive the frame) \((r = .17, p < .01)\), and the correlation between the function manipulation (dichotomous variable: +1 = prevention, -1 = detection) and perceived function (continuous variable: the higher the
value, the greater the perceived emphasis on prevention) \((r = .23, p < .01)\) suggested that manipulation of the framing and/or function variables were not strongly associated with participant perceptions.

Participants' evaluations of the quality of the pamphlets in terms of understandability, persuasiveness, interest, and credibility were examined. Ratings of each dimension were subjected to a 2 (behavior) x 2 (frame) x 2 (function) analysis of variance (ANOVA). Results revealed that participants' ratings of the understandability and persuasiveness of the pamphlets were unaffected by the framing manipulation, by the function manipulation, by the types of behavior promoted in the pamphlets, or by the interactions among these factors (all \(p\)'s > .10). However, there were significant behavior main effects along dimensions of credibility \([F(1, 184) = 4.67, p < .05]\) and interest \([F(1, 184) = 8.58, p < .01]\). The pamphlets promoting regular exercise were viewed as more credible (\(M = 1.75, SD = 0.11\)) and interesting (\(M = 1.54, SD = 0.14\)) than those promoting exercise testing (\(M = 1.41, SD = 0.12\) and \(M = 0.96, SD = 0.14\), respectively).

Attitude

Participants completed a 12-item attitude scale regarding the health behavior presented in the pamphlets (Cronbach’s alpha = .93 in the current sample). An index score was calculated for each participant by taking the average of the 12 items. See Tables 2 and 3 for the treatment means and standard deviations across treatment conditions. A 2 (behavior) x 2 (frame) x 2 (function) ANOVA performed on the attitude index score revealed a significant main effect of behavior \([F(1, 182) = 4.44, p < .05]\). Information about regular exercise resulted in more positive attitudes (\(M = 1.84, SD =\))
than information about an exercise test ($M = 1.51$, $SD = 0.11$). However, the behavior main effect was not significant ($p > .10$) when controlling for pamphlet credibility and participants' interest in the reading as covariates. No other main effects or interactions approached significance (all $p$'s > .10).

Next, multiple regression analyses were conducted for two purposes. As indicated by correlational analyses, the manipulation of the framing and function variables was not strongly associated with participant perceptions. Hence, one purpose of the regression analyses was to evaluate the effects of perceived frame and perceived function on attitude and compare the results with that of manipulated frame and manipulated function. A second purpose of the analyses was to evaluate stages of readiness to change, perceived susceptibility, gender, and NFC, all of which have been identified by previous literature as important moderators of the framing effect.

A total of 16 hierarchical regression analyses were conducted, eight in the regular exercise sample and eight in the exercise testing sample. Attitude toward regular exercise served as the dependent variable in the regular exercise sample and attitude toward exercise testing served as the dependent variable in the exercise testing sample. For each regression analysis, three independent variables (one potential moderator plus either manipulated frame and manipulated function or perceived frame and perceived function) were entered first, followed by their two-way interactions. The three-way interaction term was entered last. Thus, each of the eight regression analyses represented one of the following combinations of main independent variables: (1) manipulated frame, manipulated function, and stages of readiness to change; (2) perceived frame, perceived
function, and stages of readiness to change; (3) manipulated frame, manipulated function, and perceived susceptibility; (4) perceived frame, perceived function, and perceived susceptibility; (5) manipulated frame, manipulated function, and gender; (6) perceived frame, perceived function, and gender; (7) manipulated frame, manipulated function, and NFC; (8) perceived frame, perceived function, and NFC. Stages of readiness to change, perceived susceptibility, gender, and NFC were evaluated separately to avoid creating extremely complex interaction terms.

Instead of running considerable number of regression analyses and risking inflated error rate, an alternative approach would be to run fewer analyses by having all the predictors in one regression equation. However, with more predictors in one equation, greater sample size is needed to achieve sufficient power to detect any possible effects of the predictors. It is difficult to accurately estimate the sample size needed to achieve sufficient power because it is difficult to accurately estimate effect size in multiple regression. According to Maxwell (2000, p. 434), “The problem of specifying an anticipated or minimally important effect size is usually even more difficult in multiple regression than in the treatment effectiveness research described by Lipsey, because regression analyses typically involve more parameters than do treatment effectiveness analyses. Yet more problematic is the fact that the parameter value associated with any specific variable typically depends on what other variables are included in the analysis, because of the interdependence of parameters in multivariate models.” Hence, while inflated error rate needs to be taken into consideration when
interpreting the results, conducting the 16 hierarchical regression analyses allows for a sufficiently robust participant-to-variable ratio of 10:1 (Pedhazur, 1982) and appears to be the superior alternative.

In the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and exercise stages of change revealed significant $R^2$ changes (.11) at the two-way interaction level ($p < .05$) but not at the three-way interaction level ($p > .10$). Further analysis confirmed that the manipulated frame x exercise stages of change contributed to the significant $R^2$ changes in attitude toward regular exercise ($p < .01$). See Table 4. There was no framing effect for individuals in exercise stages 1 and 2 ($p > .10$). However, for individuals in exercise stage 3, positive frame elicited a more favorable attitude toward regular exercise than did negative frame, $F(1, 86) = 6.96, p < .05$. Similarly, the regression analysis involving perceived frame, perceived function, and exercise stage of change revealed significant $R^2$ changes (.10) at the two-way interaction level ($p < .01$) but not at the three-way interaction level ($p > .10$). Further analysis confirmed that the perceived frame x exercise stage of change contributed to the significant $R^2$ changes in attitude toward regular exercise ($p < .01$). See Table 5. There was no framing effect for individuals in exercise stage 1 ($p > .10$). However, for individuals in exercise stages 2 and 3, positive frame elicited a more favorable attitude toward regular exercise than did negative frame, $t(94) = 4.08, p < .01$ and $t(94) = 5.58, p < .01$, respectively.

Continuing with the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed that no
predictors or their interactions explained significant amount of variance in the dependent variable \((p > .10)\). However, the regression analysis involving perceived frame, perceived function, and perceived susceptibility revealed significant \(R^2\) changes (.18) at the main effect level only \((p < .01)\). See Table 6. There was a significant main effect for perceived frame, where positive frame elicited a more favorable attitude toward regular exercise than did negative frame \((p < .01)\).

Also with the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and gender revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable \((p > .10)\). On the other hand, the regression analysis involving perceived frame, perceived function, and gender revealed significant \(R^2\) changes (.18) at the main effect level only \((p < .01)\). There was a significant main effect for perceived frame, where positive frame elicited a more favorable attitude toward regular exercise than did negative frame \((p < .01)\).

Finally, in the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and NFC revealed significant \(R^2\) changes (.08) at the main effect level only \((p < .05)\). See Table 7. There was a significant main effect for NFC, where high-NFC individuals expressed a more favorable attitude toward regular exercise than did low-NFC individuals \((p < .05)\). On the other hand, the regression analysis involving perceived frame, perceived function, and NFC revealed significant \(R^2\) changes (.09) at the two-way interaction level \((p < .01)\) but not at the three-way interaction level \((p > .10)\). Further analysis confirmed that the perceived frame x NFC
contributed to the significant $R^2$ changes in attitude toward regular exercise ($p < .01$). See Table 8. There was no framing effect for high-NFC individuals ($p > .10$). However, for low-NFC individuals, positive frame elicited a more favorable attitude toward regular exercise than did negative frame, $t(91) = 4.70, p < .01$. See Figure 1, Appendix C.

In the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and test stage of change revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). By contrast, the regression analysis involving perceived frame, perceived function, and test stage of change revealed significant $R^2$ changes (.04) at the three-way interaction level ($p < .05$). See Table 9. Further analyses indicated that there was no significant perceived frame x perceived function interaction or main effects for individuals in test stage 1 ($p > .10$). However, for individuals in test stage 2, there was a significant perceived frame x perceived function interaction ($p < .05$). Specifically, there was no significant framing effect in the prevention context ($p > .10$). In the detection context, however, negative frame elicited a more favorable attitude toward exercise testing than did positive frame, $t(33) = -2.25, p < .05$. See Figure 2.

Continuing with the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). Similarly, the regression analysis involving perceived frame, perceived function, and perceived susceptibility revealed no significant interaction or main effect ($p > .10$).
Also with the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and gender revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). Similarly, the regression analysis involving perceived frame, perceived function, and gender revealed no significant interaction or main effect ($p > .10$).

Finally, in the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and NFC revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). Similarly, the regression analysis involving perceived frame, perceived function, and NFC revealed no significant interaction or main effect ($p > .10$).

**Behavioral Intention**

Participants completed a 4-item behavioral intention scale assessing their intention to participate in the target behavior in the near future (Cronbach’s alpha coefficient = .77 in the current sample). An index score was calculated for each participant by taking the average of the 4 items. See Tables 2 and 3 for the treatment means and standard deviations across treatment conditions. A 2 (behavior) x 2 (frame) x 2 (function) ANOVA performed on the behavioral intention index score revealed a main effect for behavior, $F(1, 183) = 75.26, p < .01$, where participants reported greater behavioral intention to engage in regular exercise ($M = 1.24, SD = 0.12$) than in exercise testing ($M = -0.24, SD = 0.12$). The effect remained significant after controlling for
pamphlet credibility and participants' interest in the reading as covariates, $F(1, 181) = 64.33, p < .01$. No other main effects or interactions approached significance (all $p$'s > .10).

Next, multiple regression analyses were conducted as in the analyses of attitude. A total of 16 hierarchical regression analyses were conducted, eight in the regular exercise sample and eight in the exercise testing sample. Behavioral intention to engage in regular exercise served as the dependent variable in the regular exercise sample and behavioral intention to engage in exercise testing served as the dependent variable in the exercise testing sample. For each regression analysis, three independent variables (one potential moderator plus either manipulated frame and manipulated function or perceived frame and perceived function) were entered first, followed by their two-way interactions. The three-way interaction term was entered last. Thus, each of the eight regression analyses represented one of the following combinations of main independent variables: (1) manipulated frame, manipulated function, and stages of readiness to change; (2) perceived frame, perceived function, and stages of readiness to change; (3) manipulated frame, manipulated function, and perceived susceptibility; (4) perceived frame, perceived function, and perceived susceptibility; (5) manipulated frame, manipulated function, and gender; (6) perceived frame, perceived function, and gender; (7) manipulated frame, manipulated function, and NFC; (8) perceived frame, perceived function, and NFC. Stages of readiness to change, perceived susceptibility, gender, and NFC were evaluated separately to avoid creating extremely complex interaction terms.
In the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and exercise stages of change revealed significant $R^2$ changes (.09) at the main effect level only ($p < .05$). There were significant main effects for exercise stages of change ($p < .05$) and for manipulated function ($p < .05$). See Table 10. Specifically, individuals in exercise stage 2 indicated greater behavioral intention to engage in regular exercise than did individuals in exercise stage 1 ($p < .01$).

Additionally, individuals in the prevention context indicated greater behavioral intention to engage in regular exercise than did individuals in the detection context ($p < .05$). By contrast, the regression analysis involving perceived frame, perceived function, and exercise stages of change revealed significant $R^2$ changes (.14) at the two-way interaction level ($p < .01$) but not at the three-way interaction level ($p > .10$). Further analyses indicated that two interaction terms, perceived frame x perceived function and perceived frame x exercise stages of change, separately contributed to the significant $R^2$ changes in behavioral intention to engage in regular exercise, $p < .01$ and $p < .05$, respectively. See Tables 11 and 12. Negative frame elicited greater behavioral intention to engage in regular exercise than did positive frame in the detection context, $t(95) = -2.07$, $p < .05$.

Positive frame, however, elicited greater behavioral intention to engage in regular exercise than did negative frame in the prevention context, $t(95) = 3.37$, $p < .01$. See Figure 3. There was no framing effect for individuals in exercise stage 1 ($p > .10$).

However, for individuals in exercise stages 2 and 3, positive frame elicited greater behavioral intention to engage in regular exercise than did negative frame, $t(95) = 1.88$, $p < .05$ and $t(95) = 3.08$, $p < .01$, respectively. See Figure 4.
Continuing with the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable \( p > .10 \). However, the regression analysis involving perceived frame, perceived function, and perceived susceptibility revealed significant \( R^2 \) changes \( (.08) \) at the two-way interaction level \( p < .05 \) but not at the three-way interaction level \( p > .10 \). Further analysis confirmed that the perceived frame \( x \) perceived function contributed to the significant \( R^2 \) changes in behavioral intention to engage in regular exercise \( p < .05 \). Positive frame elicited greater behavioral intention to engage in regular exercise than did negative frame in the prevention context, \( t(95) = 3.37, p < .01 \). On the other hand, negative frame elicited greater behavioral intention to engage in regular exercise than did positive frame in the detection context, \( t(95) = -2.07, p < .05 \).

Also with the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and gender revealed significant \( R^2 \) changes \( (.076) \) at the three-way interaction level \( p < .01 \). See Table 13. Further analyses indicated that there was no significant manipulated frame \( x \) manipulated function interaction or main effects for men \( p > .10 \). However, there was a significant manipulated frame \( x \) manipulated function interaction for women \( p < .05 \). Specifically, there was no significant framing effect in the prevention context \( p > .10 \). In the detection context, however, negative frame elicited greater behavioral intention to engage in regular exercise than did positive frame, \( F(1, 91) = 7.07, p < .05 \). See Figure 5. The gender difference was not evident in the regression analysis involving perceived frame,
perceived function, and gender, which revealed significant $R^2$ changes (.11) at the two-way interaction level ($p < .01$) but not at the three-way interaction level ($p > .10$). Further analysis confirmed that the perceived frame x perceived function contributed to the significant $R^2$ changes in behavioral intention to engage in regular exercise ($p < .01$). Positive frame elicited greater behavioral intention to engage in regular exercise than did negative frame in the prevention context, $t(95) = 3.37$, $p < .01$. On the other hand, negative frame elicited greater behavioral intention to engage in regular exercise than did positive frame in the detection context, $t(95) = -2.07$, $p < .05$.

Finally, in the regular exercise sample, the regression analysis involving manipulated frame, manipulated function, and NFC revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). By contrast, the regression analysis involving perceived frame, perceived function, and NFC revealed significant $R^2$ changes (.08) at the two-way interaction level ($p < .05$) but not at the three-way interaction level ($p > .10$). Further analysis confirmed that the perceived frame x perceived function interaction contributed to the significant $R^2$ changes in behavioral intention to engage in regular exercise ($p < .01$). Positive frame elicited greater behavioral intention to engage in regular exercise than did negative frame in the prevention context, $t(95) = 3.56$, $p < .01$. On the other hand, negative frame elicited greater behavioral intention to engage in regular exercise than did positive frame in the detection context, $t(95) = -2.07$, $p < .05$.

In the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and test stages of change revealed significant $R^2$ changes
(.16) at the main effect level only ($p < .01$). See Table 14. There was a significant main effect for test stages of change ($p < .01$), where individuals in test stage 2 expressed greater behavioral intention to participate in exercise testing than did individuals in test stage 1 ($p < .01$). Similarly, the regression analysis involving perceived frame, perceived function, and test stages of change revealed significant $R^2$ changes (.16) at the main effect level only ($p < .01$). There was a significant main effect for test stages of change ($p < .01$), where individuals in test stage 2 expressed greater behavioral intention to participate in exercise testing than did individuals in test stage 1 ($p < .01$).

Continuing with the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). Similarly, the regression analysis involving perceived frame, perceived function, and perceived susceptibility revealed no significant interaction or main effect ($p > .10$).

Also with the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and gender revealed significant $R^2$ changes (.11) at the two-way interaction level ($p < .05$) but not at the three-way interaction level ($p > .10$). Further analysis confirmed that the manipulated function x gender interaction contributed to the significant $R^2$ changes in behavioral intention to participate in exercise testing ($p < .01$). See Table 15. Men reported greater behavioral intention to participate in exercise testing than did women in the prevention context $t(88) = -1.78, p < .05$, while women reported greater behavioral intention to participate in exercise testing than did
men in the detection context, $t(88) = 2.67$, $p < .01$. See Figure 6. By contrast, the regression analysis involving perceived frame, perceived function, and gender revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$).

Finally, in the exercise testing sample, the regression analysis involving manipulated frame, manipulated function, and NFC revealed that no predictors or their interactions explained a significant amount of variance in the dependent variable ($p > .10$). Similarly, the regression analysis involving perceived frame, perceived function, and NFC revealed no significant interaction or main effect ($p > .10$).

**Frequency**

Participants indicated the frequency of intended participation in the target behavior by selecting one of seven possible choices. For the regular exercise sample, the choices were “none”, “less than once a month”, “less than once a week”, “once a week”, “twice a week”, “three times a week”, and “four or more times a week”. For the exercise test sample, the choices were “never”, “less than once every 10 years”, “once every 10 years”, “once every 5 years”, “once every 2 years”, “once a year”, and “once every 6 months”. The responses were then coded into a dichotomous “intention” variable. Those in the regular exercise sample who selected “three times a week” or “four or more times a week” were categorized as “individuals intending to follow recommendation”, while the other respondents in the sample were categorized as “individuals not intending to follow recommendation.” Those in the exercise testing sample who selected “never” or “less than once every 10 years” were categorized as “individuals not intending to follow
recommendation”, while the other respondents in the sample were categorized as “individuals intending to follow recommendation.” The research question asked whether manipulated frame, manipulated function, perceived frame, perceived function, stages of readiness to change, perceived susceptibility, gender, NFC, and/or their interactions allow us to predict who does intend to follow the recommendations.

Logistic regression analysis was utilized to address the research question because it has advantages over other statistical techniques such as multiple regression analysis and discriminant analysis in predicting a binary dependent variable (Hosmer & Lemeshow, 1989). A total of 16 logistic regressions were conducted, eight in the regular exercise sample and eight in the exercise testing sample. Intention to engage in exercise at the recommended frequency served as the dependent variable in the regular exercise sample and intention to participate in exercise testing within the next decade served as the dependent variable in the exercise testing sample. For each logistic regression analysis, three independent variables (one potential moderator plus either manipulated frame and manipulated function or perceived frame and perceived function) were entered first, followed by their two-way interactions. The three-way interaction term was entered last. Thus, each of the eight logistic regression analyses represented one of the following combinations of main independent variables: (1) manipulated frame, manipulated function, and stages of readiness to change; (2) perceived frame, perceived function, and stages of readiness to change; (3) manipulated frame, manipulated function, and perceived susceptibility; (4) perceived frame, perceived function, and perceived susceptibility; (5) manipulated frame, manipulated function, and gender; (6) perceived
frame, perceived function, and gender; (7) manipulated frame, manipulated function, and NFC; (8) perceived frame, perceived function, and NFC. Stages of readiness to change, perceived susceptibility, gender, and NFC were evaluated separately to avoid creating extremely complex interaction terms. These analyses allowed for a sufficiently robust participant-to-variable ratio of 10:1 (Pedhazur, 1982).

In the regular exercise sample, the logistic regression analysis involving manipulated frame, manipulated function, and exercise stages of change revealed that no predictors or their interactions predicted intention to engage in exercise at the recommended frequency ($p > .10$). By contrast, the logistic regression analysis involving perceived frame, perceived function, and exercise stages of change revealed several significant main effects ($p < .05$). See Table 16. There were significant main effects for exercise stages of change ($\text{Wald } \chi^2 (1, 3) = 4.11, p < .05$) and for perceived function ($\text{Wald } \chi^2 (1, 3) = 4.70, p < .05$). Exercise stages of change and perceived function separately helped to predict whether an individual intended to engage in exercise at the recommended frequency. An individual would be more likely to indicate intention to follow the recommendation either if he/she was in a more advanced exercise stages of change or if he/she perceived greater prevention emphasis associated with regular exercise.

Continuing with the regular exercise sample, the logistic regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed that no predictors or their interactions predicted intention to engage in exercise at the recommended frequency ($p > .10$). Similarly, the logistic regression analysis involving
perceived frame, perceived function, and perceived susceptibility revealed that no predictors or their interactions predicted intention to engage in exercise at the recommended frequency ($p > .10$). The logistic regression analysis involving manipulated frame, manipulated function, and gender revealed that no predictors or their interactions predicted intention to engage in exercise at the recommended frequency ($p > .10$). Similarly, the logistic regression analysis involving perceived frame, perceived function, and gender revealed that no predictors or their interactions predicted intention to engage in exercise at the recommended frequency ($p > .10$). The logistic regression analysis involving manipulated frame, manipulated function, and NFC revealed a significant main effect ($p < .05$). See Table 17. There was a significant main effect for NFC ($\chi^2(1, 3) = 3.39, p < .05$). NFC helped to predict whether an individual intended to engage in exercise at the recommended frequency. An individual with higher NFC would be more likely to indicate intention to follow the recommendation than an individual with lower NFC. On the other hand, the logistic regression analysis involving perceived frame, perceived function, and NFC revealed several significant main effects ($p < .05$). In addition to a significant main effect for NFC ($\chi^2(1, 3) = 4.07, p < .05$), there was a significant main effect for perceived function ($\chi^2(1, 3) = 3.97, p < .05$). NFC and perceived function separately helped to predict whether an individual intended to engage in exercise at the recommended frequency. An individual would be more likely to indicate intention to follow the recommendation either if he/she scored relatively high on NFC or if he/she perceived substantial prevention emphasis associated with regular exercise.
In the exercise testing sample, the logistic regression analysis involving manipulated frame, manipulated function, and test stages of change revealed a significant two-way interaction effect ($p < .01$). There was a significant manipulated frame $\times$ manipulated function interaction ($Wald \chi^2 (1, 3) = 8.74, p < .01$). See Table 18. The interaction helped to predict whether an individual intended to participate in exercise testing within the next decade. Negative frame/prevention context predicted higher intention to follow the recommendation than did negative frame/detection context, and positive frame/detection context predicted higher intention to follow the recommendation than did positive frame/prevention context. By contrast, the logistic regression analysis involving perceived frame, perceived function, and test stages of change revealed only a significant main effect ($p < .05$) and no interaction effect ($p > .10$). There was a significant main effect for test stages of change ($Wald \chi^2 (1, 3) = 4.96, p < .05$). See Table 19. Test stages of change helped to predict whether an individual intended to participate in exercise testing within the next decade. An individual in a more advanced test stage of change would be more likely to indicate intention to follow the recommendation.

The logistic regression analysis involving manipulated frame, manipulated function, and perceived susceptibility revealed a significant three-way interaction effect ($p < .05$). There was a significant manipulated frame $\times$ manipulated function $\times$ perceived susceptibility interaction ($Wald \chi^2 (1, 7) = 6.19, p < .05$). See Table 20. The interaction helped to predict whether an individual intended to participate in exercise testing within the next decade. When perceived susceptibility to developing heart disease was low,
negative frame/prevention context predicted higher intention to follow the recommendation than did negative frame/detection context. Additionally, positive frame/detection context predicted higher intention to follow the recommendation than did positive frame/prevention context. When perceived susceptibility to developing heart disease was high, negative frame/detection context predicted higher intention to follow the recommendation than did negative frame/prevention context. As in the low perceived susceptibility condition, positive frame/detection context predicted higher intention to follow the recommendation than did positive frame/prevention context. By contrast, the logistic regression analysis involving perceived frame, perceived function, and perceived susceptibility revealed that no predictors or their interactions predicted intention to participate in exercise testing within the next decade ($p > .10$).

The logistic regression analysis involving manipulated frame, manipulated function, and gender revealed a significant two-way interaction effect ($p < .01$). There was a significant manipulated frame x manipulated function interaction ($Wald \chi^2 (1, 3) = 8.74, p < .01$). The interaction helped to predict whether an individual intended to participate in exercise testing within the next decade. Negative frame/prevention context predicted higher intention to follow the recommendation than did negative frame/detection context, and positive frame/detection context predicted higher intention to follow the recommendation than did positive frame/prevention context. On the other hand, the logistic regression analysis involving perceived frame, perceived function, and gender revealed a near significant main effect for perceived function, ($Wald \chi^2 (1, 3) = 5.79, p < .06$). Perceived function helped to predict whether an individual intended to
participate in exercise testing within the next decade. An individual would be more likely to indicate intention to follow the recommendation if he/she perceived substantial prevention emphasis associated with exercise testing.

Finally, with the exercise testing sample, the logistic regression analysis involving manipulated frame, manipulated function, and NFC revealed that no predictors or their interactions predicted intention to participate in exercise testing within the next decade ($p > .10$). Similarly, the logistic regression analysis involving perceived frame, perceived function, and NFC revealed that no predictors or their interactions predicted intention to participate in exercise testing within the next decade ($p > .10$).

**Behavioral Response**

All participants received a postcard to mail in for a chance to win a gift certificate at a local sporting goods store. Only a small percentage of participants from the entire sample mailed in the postcard (30%). It was predicted that participants would be more likely to mail in the postcard if they had read a positive-framed, prevention-oriented pamphlet than if they had read a negative-framed, prevention-oriented pamphlet. In addition, participants would be more likely to mail in the postcard if they had read a negative-framed, detection-oriented pamphlet than if they had read a positive-framed, detection-oriented pamphlet. Given that the behavioral data were dichotomous, logistic regression analysis was selected as the statistical approach of choice (Hosmer & Lemeshow, 1989).

A total of 16 logistic regressions were conducted, eight in the regular exercise sample and eight in the exercise testing sample. Whether or not the postcard was
returned served as the dependent variable. For each logistic regression analysis, three independent variables (one potential moderator plus either manipulated frame and manipulated function or perceived frame and perceived function) were entered first, followed by their two-way interactions. The three-way interaction term was entered last. Thus, each of the eight logistic regression analyses represented one of the following combinations of main independent variables: (1) manipulated frame, manipulated function, and stages of readiness to change; (2) perceived frame, perceived function, and stages of readiness to change; (3) manipulated frame, manipulated function, and perceived susceptibility; (4) perceived frame, perceived function, and perceived susceptibility; (5) manipulated frame, manipulated function, and gender; (6) perceived frame, perceived function, and gender; (7) manipulated frame, manipulated function, and NFC; (8) perceived frame, perceived function, and NFC. Stages of readiness to change, perceived susceptibility, gender, and NFC were evaluated separately to avoid creating extremely complex interaction terms. These analyses allowed for a sufficiently robust participant-to-variable ratio of 10:1 (Pedhazur, 1982).

Results of the analyses involving the regular exercise sample revealed that no predictors or their interactions predicted whether or not the postcard was returned ($p > .10$). Similarly, results of the analyses involving the exercise testing sample revealed that no predictors or their interactions predicted whether or not the postcard was returned ($p > .10$).

Follow-Up Analyses
Only participants from the regular exercise conditions were asked to participate in the follow-up study. Ninety-two of these individuals agreed to participate. However, due to attrition, only data from 65 participants were included in the final analyses.

Participants were contacted weekly and asked for the number of hours they had engaged in vigorous or moderate physical activities during the previous week. At the fourth week of follow-up, in addition to responding to the aforementioned question, participants estimated the number of weeks they had engaged in regular exercise since the intervention, and were asked to list the steps they had taken, if any, toward a physically active lifestyle since the intervention. They were also asked to identify the barriers currently hindering them from exercising regularly.

Repeated measures ANOVA, with time as the within-subject factor and manipulated function and frame as the between-subject factors, was used to analyze the weekly activity data. There was a significant function by frame interaction for hours of vigorous activity, \( F(1, 59) = 5.20, p < .05 \). Framing did not affect the number of vigorous hours of exercise reported by participants who received prevention-oriented messages (\( p > .10 \)). However, there was a framing effect among participants who received detection-oriented messages, with those who had the positively framed message reporting higher number of vigorous hours of exercise (\( M = 3.52, SD = 0.39 \)) than those who had the negatively framed message (\( M = 1.66, SD = 0.34 \)), as shown in Figure 7. Analyses involving hours of moderate activity did not reveal any significant main effects or interaction effects (all \( p's > .10 \)).

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A 2 (function) x 2 (frame) ANOVA of the number of weeks during which participants exercised regularly revealed a significant function main effect, $F(1, 60) = 4.60, p < .05$. Participants from the two detection conditions reported a greater number of weeks ($M = 2.10, SD = 0.26$) than participants from the two prevention conditions ($M = 1.30, SD = 0.28$).

Prior to the intervention, 18% of the participants were physically inactive and did not intend to become active, 65% of the participants were physically inactive but intended to become active, and 17% of the participants were exercising irregularly and did not intend to increase their activity level. One month after the intervention, 78% of the participants (45% men and 55% women) reported taking one or more steps toward a physically active life: 18% were from the exercise stage 1 group, 68% were from the exercise stage 2 group, and 14% were from the exercise stage 3 group. Forty-three percent of respondents indicated exercising more, exercising regularly, and resuming a past exercise habit; 27% indicated making plans to exercise more, talking to friends about exercising together, and setting goals to exercise; 17% indicated learning more about exercise via talking to others, reading, and/or watching TV and videos; and 13% indicated preparatory steps such as finding time to exercise, looking into joining a fitness club, and buying exercise tapes. ANOVA indicated no gender differences in the number of steps taken toward a physically active lifestyle ($p > .10$). Furthermore, chi-square analyses indicated no gender differences in the types of steps taken toward a physically active lifestyle ($p > .10$). Finally, according to results of logistic regression analyses,
framing, function, and their interaction did not predict participation in a physically active lifestyle ($p > .10$).

The majority of the respondents (97%) reported one or more barriers hindering them from becoming physically active. Thirty-eight percent reported one barrier, 38% percent reported two barriers, and 24% reported three or more barriers. The most common barrier identified by this sample was a lack of time due to school, work, and other commitments. The second most common barrier was either a lack of motivation/interest/desire to exercise or laziness. Women tended to endorse a lack of exercise motivation while men tended to identify themselves as “too lazy to exercise”. Other reasons included illness/injury, fatigue/lethargy, and the inaccessibility of exercise facilities due to costs, transportation problems, and bad weather. The number of barriers was evaluated in a 2 (function) x 2 (frame) ANOVA. There was a significant frame main effect, $F(1, 64) = 3.80, p < .05$, where participants from the negative-frame conditions reported more barriers ($M = 2.10, SD = 0.16$) than participants from the positive-frame conditions ($M = 1.60, SD = 0.19$).

**Psychosocial, Cognitive, and Affective Variables**

A series of 2 (behavior) x 2 (function) x 2 (frame) ANOVA’s were performed on the secondary outcome measures of the study, which were organized into psychosocial, cognitive, and affective variables. See Tables 7 and 8 for psychosocial variable treatment means and standard deviations across treatment conditions.

*Psychosocial Variables*
The psychosocial variables that were subjected to ANOVA included the following: perceived severity of heart disease, perceived susceptibility to heart disease, self-efficacy of performing the target behavior, outcome efficacy of the target behavior in reducing or detecting risk of heart disease, perceived benefits of performing the target behavior, perceived barriers to performing the target behavior, pre-intervention knowledge and experience with the target behavior, perceived likelihood of injury while performing the target behavior, and perceived severity of failing to perform the target behavior. Results indicated several significant interaction and main effects. First, there was a significant behavior x function x frame interaction on the outcome efficacy of the target behavior to reduce risk of heart disease \([F(1, 184) = 10.90, p < .01]\). Follow-up analyses revealed that in the regular exercise group, there was a significant function x frame interaction \([F(1, 184) = 4.37, p < .05]\). Simple effect tests further indicated that negative frame elicited greater perception of the outcome efficacy of regular exercise to reduce heart disease risk \((M = 2.35)\) than did positive frame \((M = 1.04)\) in the detection-oriented context \([F(1, 184) = 8.78, p < .01]\). There was also a significant function x frame interaction in the exercise testing group \([F(1, 184) = 6.64, p < .01]\).

Simple effect tests indicated that positive frame elicited greater perception of the outcome efficacy of exercise testing to reduce heart disease risk \((M = 1.09)\) than did negative frame \((M = -0.08)\) in the detection-oriented context \([F(1, 184) = 6.40, p < .05]\).

Additionally, there were several significant behavior x function interactions. The first of such interactions was on perceived benefits of performing the target behavior \([F(1, 184) = 6.77, p < .01]\). Follow-up analyses indicated that in the regular exercise
context only, the prevention-oriented message led to greater perception of benefits (M = 2.65) than did the detection-oriented message (M = 2.24) [F(1, 184) = 4.73, p < .05]. Another behavior x function interaction was on the outcome efficacy of target behavior to detect the risk of heart disease. Simple effect tests indicated that in the regular exercise context only, the detection-oriented message elicited greater perception of the outcome efficacy of regular exercise to detect heart disease risk (M = 1.42) than did the prevention-oriented message (M = -0.18) [F(1, 184) = 36.40, p < .01]. Lastly, there was a behavior x function interaction on the severity index [F(1, 184) = 4.13, p < .05]. Simple effect tests indicated that in the context of exercise testing only, the detection-oriented message elicited greater perception of the severity of failure to participate (M = 0.41) than did the prevention-oriented message (M = -1.10) [F(1, 184) = 7.07, p < .01]. In addition, there was a framing main effect [F(1, 184) = 3.87, p < .05], where negative frame elicited greater perception of severity (M = 0.26) than did positive frame (M = -0.11).

Finally, several significant main effects were found. Participants perceived a greater number of barriers associated with regular exercise (M = 0.40) than with exercise testing (M = -0.55) [F(1, 184) = 20.00, p < .01]. Participants were more likely to indicate that benefits outweigh barriers in the context of regular exercise (M = 1.62) than in exercise testing (M = 0.82) [F(1, 184) = 15.90, p < .01]. Participants perceived greater risks for injury associated with regular exercise (M = -1.20) than with exercise testing (M = -2.20) [F(1, 184) = 35.40, p < .01]. Participants reported having greater knowledge and experience with regular exercise (M = 0.71) than with exercise testing (M = -1.85) [F(1,
Participants reported a higher degree of self-efficacy to engage in exercise testing \( (M = -0.95) \) than regular exercise \( (M = -0.14) \) \( [F(1, 184) = 11.40, p < .01] \) and positive frame elicited greater perception of self-efficacy \( (M = -0.79) \) than did negative frame \( (M = -0.30) \) \( [F(1, 184) = 4.26, p < .05] \).

**Cognitive Variables**

The following cognitive variables were evaluated with ANOVA: the number of positive- vs. negative- valenced thoughts in response to the reading, the number of correctly recalled facts from the reading, and the participant-estimated percentage of attention devoted to the reading. None of the analyses yielded significant results. See Tables 21 and 22 for treatment means and standard deviations across treatment conditions.

**Affective Variables**

The three affective variables evaluated with ANOVA were the positive feeling index, the negative feeling index, and the fear index. There was a significant behavior x function x frame interaction on the positive feeling index \( [F(1, 184) = 3.83, p < .05] \). Follow-up analyses revealed that in the regular exercise group, there was a significant function x frame interaction \( [F(1, 184) = 8.10, p < .01] \). Simple effect tests further indicated that negative frame elicited more positive feelings \( (M = 0.16) \) than did positive frame \( (M = -0.54) \) in the detection-oriented context \( [F(1, 184) = 5.08, p < .05] \). No other results were significant. See Tables 21 and 22 for treatment means and standard deviations across treatment conditions.
Summary of Major Findings

Overall, the pattern of results provided some support for Rothman and Salovey (1997) predictions in a regular exercise context. They had postulated that positive-framed messages are more effective in promoting prevention-oriented behaviors and negative-framed messages are more effective in promoting detection-oriented behaviors. Both hypotheses were confirmed in the behavioral intention data when the perceived, rather than manipulated, frame and function variables were utilized in the analyses. Messages perceived to be positively framed elicited greater behavioral intention to engage in regular exercise than did messages perceived to be negatively framed when the behavior was viewed as prevention-oriented. On the other hand, messages perceived to be negatively framed elicited greater behavioral intention to engage in regular exercise than did messages perceived to be positively framed when the behavior was viewed as detection-oriented. Moreover, this interaction was not moderated by other variables including stages of readiness to change, perceived susceptibility, gender, and NFC.

Additional support for the negative-frame/detection hypothesis came from the results of the regression analysis involving manipulated frame, manipulated function, and
gender. While men's behavioral intention to engage in regular exercise was not affected by either frame or function, women's behavioral intention to engage in regular exercise was greater after reading a negative-, instead of positive-, framed message in a detection context.

Overall, participants appeared to prefer messages that were either positively framed or prevention-oriented. Positive-framed messages (both manipulated and perceived) were superior to negative-framed messages in eliciting a more favorable attitude toward regular exercise and in promoting greater behavioral intention to engage in regular exercise especially for individuals in the more advanced exercise stages, regardless of gender or level of perceived susceptibility. Positive-framed messages (perceived only) also elicited a more favorable attitude toward regular exercise among low-NFC individuals although high-NFC individuals did not show a framing effect. Prevention-oriented messages (both manipulated and perceived) were superior to detection-oriented messages. Prevention-oriented messages (manipulated only) elicited greater behavioral intention to engage in regular exercise than did detection-oriented messages. Additionally, perceiving prevention, rather than detection, emphasis associated with regular exercise increased the likelihood that individuals would indicate intention to engage in exercise at the recommended frequency.

The importance of including moderators in the evaluation was underscored by the present pattern of results. Exercise stages of change was shown to interact with framing. As indicated earlier, among individuals from advanced exercise stages, positive-framed messages elicited a more favorable attitude toward regular exercise and promoted greater
behavioral intention to engage in regular exercise than did negative-framed messages. Analyses also yielded a few gender differences. As mentioned previously, men's behavioral intention to engage in regular exercise was not affected by either frame or function. Women, on the other hand, showed a preference for negative-framed messages in a detection context as indicated by higher behavioral intention. NFC was associated with both significant interaction and main effects. High-NFC individuals expressed a more favorable attitude toward regular exercise and were more likely to engage in exercise at the recommended frequency than low-NFC individuals. High-NFC individuals were also less susceptible to the framing effect than low-NFC individuals, who indicated a more favorable attitude toward regular exercise after reading positive-, instead of negative-, framed messages. This was consistent with previous studies showing that high-NFC individuals were less sensitive to manipulations that influenced the extent of thinking of low-NFC individuals (Priester & Petty, 1995) and positive frame generated a more favorable attitude when participants' level of involvement was not high (Maheswaran & Meyers-Levy, 1990). Perceived susceptibility, contrary to expectations, did not interact with either frame or function.

In sum, the behavioral intention data provided support for the positive-frame/prevention and negative-frame/detection hypotheses (Rothman & Salovey, 1997). They were consistent with findings from previous message framing studies that focused on relatively simple health behaviors that require little time, effort, and inconvenience such as mouth rinse usage (Rothman et al., 1999). However, the majority of the dependent variables in this study (attitude, frequency of intended participation, behavioral
response, and follow-up data) failed to support either hypothesis. Moreover, while most participants in the follow-up study reported taking some steps toward a physically active lifestyle, this was not clearly a result of the framing/function intervention.

Results from the exercise testing sample provided minimal support for the Rothman and Salovey (1997) predictions. There was a significant perceived frame x perceived function x test stage interaction. Among test stage 2 individuals, who had indicated intention to participate in exercise testing prior to the intervention, there was a significant perceived frame x perceived function interaction. Consistent with the negative-frame/detection hypothesis, messages perceived to be negatively framed elicited a more favorable attitude toward exercise testing than did messages perceived to be positively framed when the behavior was viewed as detection-oriented. There was no framing effect in the prevention-context, however.

Other analyses revealed further differences between the regular exercise and the exercise testing samples. Participants in the exercise testing sample did not appear to prefer one frame or function over the other. There were several significant manipulated frame x manipulated function interactions associated with “intention to participate in exercise testing within the next decade” as the dependent variable. However, none supported the stated hypotheses. Moreover, there were no significant interactions when perceived framing and perceived function were used in the analyses. Two out of four moderators revealed significant main and/or interaction effects. As mentioned earlier, negative frame elicited a more favorable attitude toward participating in exercise testing in a detection context for test stage 2 individuals, who were also more likely to indicate
intention to participate in exercise testing within the next decade. Unlike in the regular exercise sample, men reported greater behavioral intention to participate in exercise testing in the prevention-oriented context than in the detection-oriented context. Women, on the other hand, preferred the detection-oriented context and expressed greater behavioral intention therein. Perceived susceptibility and NFC did not interact with either frame or function.

The discrepant findings between the regular exercise and the exercise testing samples suggested that participants viewed regular exercise and exercise testing as rather different behaviors. Participants indicated that engaging in regular exercise was associated with more barriers and a greater risk for injury than engaging in exercise testing. However, participants were more likely to view that the benefits outweigh the costs for regular exercise and reported greater experience and knowledge with regular exercise than with exercise testing. Interestingly, participants also reported greater self-efficacy in engaging in exercise testing than in regular exercise, perhaps partly due to the perceived greater barriers and injury risk associated with regular exercise. Finally, participants viewed the pamphlets on regular exercise as more interesting and credible than the pamphlets on exercise testing.

**Implications of the Results**

The present study provided some evidence suggesting that the framing effect can be found in complicated behaviors such as regular exercise and exercise testing that require considerable time and effort to perform compared to behaviors that have been studied previously (e.g., sunscreen application, BSE, mouth rinse wash). Results also
provided limited support for the framing x function interaction in the direction predicted by Rothman and Salovey (1997). The fact that such a simple intervention can impact relatively complicated health behaviors is staggering, and has important implications for delivering cost-effective cardiovascular health promotional measures in the college-age population.

Of course, message recipients do not always perceive the intended frame/function emphasis. As has been shown, the effective manipulation of the frame and function variables in the regular exercise and exercise test contexts proved to be a challenging task. To the extent that individuals possess preconceived notions of whether a behavior is prevention-oriented or detection-oriented, efforts directed at manipulating the function of a behavior may be compromised. In the present study, regular exercise was perceived to be more prevention-oriented ($M = 1.54, SD = 1.49$) than exercise testing ($M = 0.86, SD = 1.78$), $F(1, 190) = 8.32, p < .01$. Exercise testing was perceived to be more detection-oriented ($M = 1.90, SD = 1.18$) than regular exercise ($M = 0.28, SD = 1.81$), $F(1, 190) = 53.20, p < .01$. Moreover, when prevention and detection ratings are compared within each behavior, the prevention rating of regular exercise ($M = 1.54, SD = 1.49$) was significantly higher than its detection rating ($M = 0.28, SD = 1.81$), $F(1, 198) = 28.8, p < .01$. By contrast, the detection rating of exercise testing ($M = 1.90, SD = 1.18$) was significantly higher than its prevention rating ($M = 0.86, SD = 1.78$), $F(1, 182) = 22.00, p < .01$. This leads to some interesting speculations as to why there might be a positive-frame or prevention-context advantage in promoting regular exercise. It is possible that participants preferred information consistent with their prior expectations.
and hence, preferred messages with a prevention emphasis. Given that regular exercise was perceived as a prevention-oriented behavior, the positive-frame/prevention hypothesis would predict a positive-frame advantage. However, this does not explain why there was no negative-frame or detection-context preference despite the fact that the exercise test was clearly perceived as a detection-oriented behavior. Clearly, further evaluation is warranted.

Of the four individual difference variables examined in this study, the stages-of-readiness-to-change variable was found to play a major role, producing both main and interaction effects. Recent research in the field has supported a multi-stage behavior change perspective (Prochaska & DiClemente, 1983) rather than the traditional, two-stage behavior change model (active versus inactive). The multi-stage model has been shown to be a much more appropriate conceptualization of behavior change, including the adoption of regular physical activity (Marcus & Owen, 1992; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Simkin, 1993). The present findings underscored the importance of matching an individual’s stage of change with appropriate intervention strategies. Frame/function intervention appeared to have the most impact on individuals in the “contemplation” and “preparation” stages.

NFC showed the expected interaction with framing, at least in the regular exercise sample. Consistent with previous literature, low-NFC individuals found positive-framed messages more persuasive but high-NFC individuals were less susceptible to the framing effect. However, this might be dependent on other factors. The lack of NFC x frame interaction in the exercise testing sample raised the possibility that, with a less
familiar behavior such as exercise testing, high-NFC individuals had less knowledge and previous experience at hand to critically evaluate the arguments and therefore had to rely more on peripheral cues such as framing.

There were very few gender differences found in the present study. Needless to say, caution must be exercised when attempting to interpret these preliminary findings. It seems reasonable to continue investigating gender as a potential moderator and include both men and women in framing research.

Contrary to expectation, analyses involving perceived susceptibility did not yield any main effect or significant interaction. A possible explanation for the lack of results is that the college-age participants were not aware of their risk for heart disease despite research evidence to date suggesting that college-age adults, as well as younger age groups, may already manifest risk factors for cardiovascular disease (Adeyanju, 1990). Many participants expressed surprise, skepticism, or disbelief. Ratings of post-intervention perceived susceptibility indicated that on a scale of −3 (strongly disagree) to +3 (strongly agree), most students were “neutral” about their susceptibility to heart disease ($M = 0.31, SD = 1.5$). Hence, this group displayed restricted range of variance in their perceived susceptibility, which contributed to null findings. Perceived susceptibility may play a more prominent role in a different group of participants such as middle-aged adults, who traditionally have been the primary targets of cardiovascular health promotion campaigns. Additionally, while not an objective of this study, it was shown that many participants lacked basic knowledge about health, i.e., not knowing that there are two types of cholesterol and that one type (HDL) is good for the body. This may
indicate a serious gap in current public health knowledge. The findings altogether underscore the need to emphasize the relationship between regular exercise and reduction of cardiac risk factors among college-age individuals.

Contributions of the Study and Additional Issues to be Addressed by Future Research

The current study extends previous research by including both male and female participants, comparing and contrasting two complex health behaviors, and utilizing multiple types of outcome measures—self-report, behavioral data, and follow-up questionnaires. Furthermore, this was one of the first studies to directly test the frame-by-function hypotheses (Rothman & Salovey, 1997) with the frame and function variables directly manipulated rather than assumed.

It must be emphasized that in interpreting the results, one should keep in mind that they are preliminary findings that require replication and that they should be interpreted cautiously due to inflated error rate associated with the relatively large number of analyses conducted. As an educational intervention, this study raised many questions about message framing and exercise behavior. For example, would the effectiveness of the intervention be enhanced if appeals other than health were used? Preliminary results of the Robberson and Rogers (1988) study indicated that framed messages citing good health as the main reason for exercise produced a less strong response than framed messages citing enhanced self-esteem as the main reason for exercise. Additionally, the effectiveness of the framing intervention might also depend on the extensiveness of the message. Framing effects have been reported using short pamphlets containing a few sentences (e.g., Detweiler et al., 1999), as well as using
lengthy essays (e.g., Robberson & Rogers, 1988). In the present study the intervention pamphlets were 3 pages long and the specific sections containing frame and function manipulations were kept fairly brief. The optimal length of a framed message would probably depend on the specific target group.

Future studies should also continue to explore other viable and sensitive outcome measures to accurately assess the framing/function effect. Some of the outcome measures in the present study are problematic. For example, frequency of intended participation is an inappropriate dependent variable for measuring exercise testing participation since such testing is usually initiated by a physician’s order. Assessment of the frequency of intended exercise participation can be useful, as long as the goal is to promote adequate, rather than excessive exercise. Additionally, it is difficult to find an appropriate behavioral response for exercise behavior. The chance to win a gift certificate to a local sporting goods store has a number of attractive features such as good face validity and cost-effectiveness. However, it is not comparable to the behavioral response used in studies promoting sunscreen lotion application, which consisted of participants sending in a request for a sample of sunscreen lotion. After all, exercise is a much more complicated behavior and could have many varied preparatory steps.

The long-term effect of framing on exercise behavior is another issue to be assessed in future studies. The lack of framing effect in the follow-up data may suggest that message framing has a time-limited impact on message recipients. One issue of interest is to evaluate whether additional framing intervention during follow-up would have increased its positive effect. The follow-up component of this study has been
limited to one month due to practical concerns such as the mobility of a college population. Given the small sample size, attrition would render longer follow-up unfeasible. An additional difficulty with tracking long-term framing effects on exercise behavior in college students is that this group is highly susceptible to cyclic changes in behavior (e.g., beginning and ending of a school term, midterms and finals).

For this reason and other considerations (e.g., greater variability in perceived susceptibility), subsequent research should assess the framing effect with additional populations such as older adults and employ the framing intervention both in a field and lab setting. Furthermore, evaluating the efficacy of message framing in conjunction with more extensive exercise interventions may prove to be profitable, as the nature of message framing lends itself to be incorporated into existing exercise programs.

Conclusion

The framing postulate offers a promising model to develop effective health communications. While researchers have been investigating the effect of message framing on a variety of health behaviors for over a decade, this study is one of the first to examine the effect of message framing on promoting physical exercise, an extremely complex behavior that is crucial to an individual's physical and psychological well-being. In order to clarify the underlying mechanism of how framing might affect exercise behavior, future research should identify predictors of exercise behavior and examine the effect of message framing on these predictors. The current study is the first step toward that goal. It is hoped that the present results would be expanded by future research guided by a theoretically sound framework.
LIST OF REFERENCES


APPENDIX A

MEASURES
The Importance of Early Detection of Heart Disease

What do you know about cholesterol?
Here is an interesting fact about cholesterol—you need it! Cholesterol is a waxy-looking fat made by your liver. Your body uses it to help make hormones and build healthy cell membranes, among other things.

So what’s the problem?
Problems can occur when you have more cholesterol than your body can use. Over time, excess cholesterol can attach to and build up on the walls of your arteries (a condition called atherosclerosis). This can damage the arteries and decrease or even stop the blood flow to important organs such as your heart and brain.

How many types of cholesterol are there?
LDL, or low density lipoprotein, is the “bad” cholesterol that can stick to the walls of your arteries. You want less LDL in your body.
HDL, or high density lipoprotein, is the “good” cholesterol. It is used as needed and the excess is discarded. HDL may also remove excess LDL cholesterol from artery walls. You want more HDL in your body.

Heart disease: You’re never too young to be wary
Elevated LDL cholesterol is a major risk factor for heart disease, the number 1 killer in America. About 960,000 Americans died of heart disease in 1995, so heart disease accounted for about 41.5 percent of all deaths. Contrary to popular opinion, accumulating scientific evidence suggests that heart disease is not something that should concern only middle-aged and older adults. Susceptibility to heart disease later in life is established early in life when people are in their late teens and twenties. According to a large landmark study conducted by researchers at Harvard Medical School and the National Heart, Lung, and Blood Institute (part of the National Institute of Health), the accumulation of fatty deposits in arteries (atherosclerosis) often starts in the teens and young adulthood regardless of gender and race. Thus, the risk of becoming a victim of a heart disease is real, increasing, and important to be aware of even if you are under twenty-five years of age.

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The Importance of Early Detection

Heart disease detection and regular exercise

Researchers at the Ohio State University and other institutions of higher learning are studying how to effectively detect heart disease. A growing body of evidence suggests that there are several ways to detect one’s risk of heart disease. Among these, it has been shown that regular exercise is a highly effective measure for detecting heart disease. The fact that exercise is one of the best means of heart disease detection is so widely recognized that most doctors recommend that everyone participate in regular exercise.

What can I lose from failure to engage in regular exercise?

There are important health benefits that can be lost from failure to engage in regular exercise. By not engaging in regular exercise, you cannot effectively assess how your heart and blood vessels respond to physical exertion. As the body works harder during exercise, it requires more oxygen and the heart has to pump more blood. Thus, by not engaging in regular exercise, you cannot effectively find out early if there is a lack of blood supply through the arteries that go to the heart.

Ultimately, when you do not engage in regular exercise, you fail to take advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. Without early detection, you miss opportunities to avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.
Things to Consider
When Starting a Regular Exercise Program

To get the greatest benefit from an exercise program, you should exercise for at least 20 minutes at moderate intensity for at least 3 times a week.

Some practical tips to keep you moving forward

1. Be realistic: set attainable goals to prevent you from becoming frustrated later.
2. Build on success—start with small goals and reward yourself for reaching them. This will encourage you to set larger goals.
3. Keep a journal: you will be able to see how far you’ve progressed and evaluate what works and what doesn’t.
4. Find a role model: someone who started where you are. Feel inspired by their success.
5. Create variety: as you learn the basics, add new exercises and activities into your program. This will help keep you from becoming bored with your routine.
6. Try not to focus on what you are giving up, but on new options that you will have after you become more fit.
7. Educate yourself: the more you know the less likely you are to be injured or to get stuck in a rut.

Heart disease is a common and serious disease. Many Americans live an unhealthy, restrictive lifestyle by failing to take measures such as regular exercise that allow them to detect heart problems early and thereby obtain effective treatment without delay. You can miss important health benefits by not spending a relatively short amount of time each week exercising. Do not fail to take advantage of this opportunity to detect early development of a health problem and avoid an unhealthy and restrictive lifestyle!
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So what's the problem?

Problems can occur when you have more cholesterol than your body can use. Over time, excess cholesterol can attach to and build up on the walls of your arteries (a condition called atherosclerosis). This can damage the arteries and decrease or even stop the blood flow to important organs such as your heart and brain.

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Ultimately, when you engage in regular exercise, you are taking advantage of a safe and effective way to detect your risk of heart disease and improve your cardiovascular fitness. With early detection, you can avoid expensive medical treatment and unnecessary suffering caused by heart problems later on.
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**What can I lose from failure to engage in regular exercise?**

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**Things to Consider**

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To get the greatest benefit from an exercise program, you should exercise for at least 20 minutes at moderate intensity for at least 3 times per week.

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1. Be realistic: set attainable goals to prevent you from becoming frustrated later.
2. Build on success--start with small goals and reward yourself for reaching them. This will encourage you to set larger goals.
3. Keep a journal: you will be able to see how far you’ve progressed and evaluate what works and what doesn’t.
4. Find a role model: someone who started where you are. Feel inspired by their success.
5. Create variety: as you learn the basics, add new exercises and activities into your program. This will help keep you from becoming bored with your routine.
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Prescreening Measure

Please complete this questionnaire. Your response will be kept completely confidential. We need the following information to invite you to participate. Your name and personally identifying information will be separated from the other information as soon as the responses have been recorded.

1. Your name (please print): ___________________________
2. Phone number: ______________________(we need this to invite you to participate)
3. E-mail address(es): ___________________________ (so we can reach you quickly)
4. Are you fluent in English? (please circle one) Yes   No
5. What is your gender? ______ male      ______ female
6. What is your age? _____
7. Please check ONE of the following statements that best describes you:
   ___ I am not currently exercising and I do not intend to start exercising in the next 6 months.
   ___ I am not currently exercising but I intend to start exercising in the next 6 months.
   ___ I am currently exercising but not on a regular basis (regular exercise = 3 or more times per week for 20 minutes or longer). And I do not intend to start exercising regularly in the next 6 months.
   ___ I am currently exercising but not on a regular basis (regular exercise = 3 or more times per week for 20 minutes or longer). However, I intend to start exercising regularly in the next 6 months.
   ___ I am currently exercising regularly (regular exercise = 3 or more times per week for 20 minutes or longer). However, I have done so for less than 6 months.
   ___ I am currently exercising regularly (regular exercise = 3 or more times per week for 20 minutes or longer). And I have done so for 6 months or longer.
8. Please check ONE of the following statements that best describes you:
   ___ I have not participated in an exercise test (stress test) and I do not intend to participate in one in the near future.
   ___ I have not participated in an exercise test (stress test) but I intend to participate in one in the near future.
   ___ I have participated in an exercise test (stress test) in ________ (indicate the year of participation).
9. Heart disease is a frightening, dangerous, and severe health problem.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree
10. The likelihood that I will develop heart disease is
    -3........-2........-1........0........1........2........3
    very unlikely neutral very likely
INSTRUCTIONS

We are interested in your reactions to the pamphlet on the next few pages. Please spend as much time reading the pamphlet as you like. After you are finished, we will ask you questions on what you just read. Once you have finished reading the pamphlet, please do not refer to it again.
1. Using the space below, please write down the thoughts that crossed your mind as you were reading the pamphlet. **DO NOT** describe what was in the reading but rather your thoughts that occurred while you were reading. These thoughts may or may not be related to the pamphlet. Please list up to 10 thoughts, one line for each thought. You do not have to write in full sentences; short phrases will do.

1) ____________________________________________________________

2) ____________________________________________________________

3) ____________________________________________________________

4) ____________________________________________________________

5) ____________________________________________________________

6) ____________________________________________________________

7) ____________________________________________________________

8) ____________________________________________________________

9) ____________________________________________________________

10) ____________________________________________________________
2. On this page, please write down as much as you can recall from the pamphlet. Here we are NOT asking you about what you were thinking, but what was in the pamphlet itself.
3. Please estimate how you divided your attention among the following items while you were reading the pamphlet. Make sure your percentages add up to 100%.

How much attention was paid to the following:

a) Information about cholesterol + _____%
b) Information about how regular exercise is related to your health + _____%
c) Suggestions about starting a regular exercise routine + _____%
d) Your thoughts about any of the information + _____%
e) Other thoughts not directly related to the information + _____%

Total = 100%

4. Please rate how you were feeling while you were reading the pamphlet. Circle a number on each scale.

I FOUND MYSELF

<table>
<thead>
<tr>
<th>Feeling</th>
<th>Not at all</th>
<th>Neutral</th>
<th>Very much so</th>
</tr>
</thead>
<tbody>
<tr>
<td>feeling sad and sorrowful</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling angry and irritated</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling happy and cheerful</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling distrustful and skeptical</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling distrustful and active</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling affectionate and caring</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling lighthearted and playful</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling distracted and restless</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling warm and loving</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling fearful</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling nervous</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling scared</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling nauseated</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>feeling uncomfortable</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
5. Regular exercise is defined as 20+ minutes of physical activity at moderate intensity for at least 3 times per week. Please rate how you feel about regular exercise on next page.

Regular exercise is...(circle a number on each scale).

| a) Useless     | -3...-2...-1...0...1...2...3   | Useful     |
| b) Unimportant | -3...-2...-1...0...1...2...3   | Important  |
| c) Worthless   | -3...-2...-1...0...1...2...3   | Valuable   |
| d) Not helpful | -3...-2...-1...0...1...2...3   | Helpful    |
| e) Harmful     | -3...-2...-1...0...1...2...3   | Beneficial |
| f) Bad         | -3...-2...-1...0...1...2...3   | Good       |
| g) Negative    | -3...-2...-1...0...1...2...3   | Positive   |
| h) Disagreeable| -3...-2...-1...0...1...2...3   | Agreeable  |
| i) Unpleasant  | -3...-2...-1...0...1...2...3   | Pleasant   |
| j) Risky       | -3...-2...-1...0...1...2...3   | Not risky  |
| k) Dangerous   | -3...-2...-1...0...1...2...3   | Safe       |
| l) Undesirable | -3...-2...-1...0...1...2...3   | Desirable  |

6. I have no intention of engaging in regular exercise.

\[-3...-2...-1...0...1...2...3\]

strongly disagree neutral strongly agree

7. I will give my best effort to becoming a regular exerciser.

\[-3...-2...-1...0...1...2...3\]

strongly disagree neutral strongly agree

8. How likely are you to exercise in the next six months?

\[-3...-2...-1...0...1...2...3\]

very unlikely neutral very likely

9. How tempted would you be to put off exercising regularly?

\[-3...-2...-1...0...1...2...3\]

very unlikely neutral very likely
10. How often do you think you will exercise? (check one)
   ____ none
   ____ less than once a month
   ____ less than once a week
   ____ once a week
   ____ twice a week
   ____ three times a week
   ____ four or more times a week

11. Regular exercise has many benefits.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

12. Regular exercise has important health benefits.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

13. There are many barriers to my participating in regular exercise.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

14. There are more barriers than benefits for me to exercise regularly.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

15. The benefits of regular exercise outweigh its costs.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

16. Heart disease is a frightening, dangerous, and severe health problem.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

17. The likelihood that I will develop heart disease is
    -3........-2........-1........0..........1........2........3
    very unlikely       neutral       very likely

18. Exercise is effective in reducing my risk of developing heart disease.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree

19. Exercise is effective in detecting my risk of developing heart disease.
    -3........-2........-1........0..........1........2........3
    strongly disagree       neutral       strongly agree
20. Beginning a regular program of exercise would be very difficult for me to do.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

21. I am confident in my ability to exercise regularly.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

22. Regular exercise is risky because one could get seriously injured while exercising.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

23. The likelihood that I will be injured during regular exercise is
   -3........-2........-1.........0........1........2........3
   very unlikely            neutral        very likely

24. The results of a lack of regular exercise can be quite severe.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

25. A lack of regular exercise could have a major negative impact on my health.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

26. A lack of regular exercise may lead to physical impairment, disfigurement, and other visible health effects.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

27. Negative health effects from a lack of regular exercise tend to occur very gradually rather than suddenly.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

28. Negative health effects from a lack of regular exercise tend to occur very late in life, if at all.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree

Please answer the following questions regarding the pamphlet you just read.

29. The pamphlet was credible.
   -3........-2........-1.........0........1........2........3
   strongly disagree        neutral        strongly agree
30. The pamphlet held my interest.
   -3...........-2...........-1........0........1..........2........3
   strongly disagree neutral strongly agree

31. The pamphlet was easy to understand.
   -3...........-2...........-1........0........1..........2........3
   strongly disagree neutral strongly agree

32. The pamphlet was persuasive.
   -3...........-2...........-1........0........1..........2........3
   strongly disagree neutral strongly agree

33. The pamphlet emphasized the prevention of heart disease.
   -3...........-2...........-1........0........1..........2........3
   strongly disagree neutral strongly agree

34. The pamphlet emphasized the detection of heart disease.
   -3...........-2...........-1........0........1..........2........3
   strongly disagree neutral strongly agree

35. The tone of the information in the pamphlet was
   mostly negative neutral mostly positive

36. The information in the pamphlet was mostly emphasizing
   losing benefits neutral gaining benefits

37. What is your gender?
   _____ Male
   _____ Female

38. What is your age? ________

39. What is your racial or ethnic group? (check one)
   _____ Black/African American
   _____ White/Caucasian
   _____ Hispanic/Chicano/Latino
   _____ Asian or Pacific Islander/Asian American
   _____ American Indian or Alaskan Native
   _____ Other (please specify) ____________________________

40. What is your present weight? ________ Height? ________
41. Does/did either of your biological parents have heart disease?
   _____ Yes
   _____ No

42. Do you have diabetes?
   _____ Yes
   _____ No

43. Do you smoke cigarettes? _____ Yes  _____ No

44. How much stress have you been experiencing during the past week, including today?
   1  2  3  4  5
   none very little moderate quite a bit extreme

45. I have had a lot of experiences exercising.
   -3............-2............-1............0............1............2............3
   strongly disagree neutral strongly agree

46. I used to exercise more than the average person.
   -3............-2............-1............0............1............2............3
   strongly disagree neutral strongly agree

47. I know a lot about exercising.
   -3............-2............-1............0............1............2............3
   strongly disagree neutral strongly agree

48. I know more about exercising than the average person.
   -3............-2............-1............0............1............2............3
   strongly disagree neutral strongly agree

Please continue on the next page
For the following statements, please indicate how well each statement describes YOU by circling the appropriate number on the scales below.

1. Thinking is not my idea of fun.
   Not at all 1 2 3 4 5 6 7 Very much

2. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
   Not at all 1 2 3 4 5 6 7 Very much

3. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.
   Not at all 1 2 3 4 5 6 7 Very much

4. I find satisfaction in deliberating hard and for long hours.
   Not at all 1 2 3 4 5 6 7 Very much

5. I prefer to think about small, daily projects to long-term ones.
   Not at all 1 2 3 4 5 6 7 Very much

6. I only think as hard as I have to.
   Not at all 1 2 3 4 5 6 7 Very much

7. I like tasks that require little thought once I’ve learned them.
   Not at all 1 2 3 4 5 6 7 Very much

8. The idea of relying on thought to make my way to the top appeals to me.
   Not at all 1 2 3 4 5 6 7 Very much

9. I really enjoy a task that involves coming up with new solutions to problems.
   Not at all 1 2 3 4 5 6 7 Very much
10. Learning new ways to think doesn't excite me very much.

   Not at all 1....2....3....4....5....6....7  Very much

11. I prefer my life to be filled with puzzles that I must solve.

   Not at all 1....2....3....4....5....6....7  Very much

12. The notion of thinking abstractly is appealing to me.

   Not at all 1....2....3....4....5....6....7  Very much

13. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

   Not at all 1....2....3....4....5....6....7  Very much

14. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.

   Not at all 1....2....3....4....5....6....7  Very much

15. It's enough for me that something gets the job done; I don't care how or why it works.

   Not at all 1....2....3....4....5....6....7  Very much

16. I usually end up deliberating about issues even when they do not affect me personally.

   Not at all 1....2....3....4....5....6....7  Very much

17. I like to have the responsibility of handling a situation that requires a lot of thinking.

   Not at all 1....2....3....4....5....6....7  Very much

18. I would prefer complex to simple problem.

   Not at all 1....2....3....4....5....6....7  Very much
INSTRUCTIONS

We are interested in your reactions to the pamphlet on the next few pages. Please spend as much time reading the pamphlet as you like. After you are finished, we will ask you questions on what you just read. Once you have finished reading the pamphlet, please do not refer to it again.
1. Using the space below, please write down the thoughts that crossed your mind as you were reading the pamphlet. **DO NOT** describe what was in the reading but rather your thoughts that occurred while you were reading. These thoughts may or may not be related to the pamphlet. Please list up to 10 thoughts, one line for each thought. You do not have to write in full sentences; short phrases will do.

1) _______________________________________________________________________
2) _______________________________________________________________________
3) _______________________________________________________________________
4) _______________________________________________________________________
5) _______________________________________________________________________
6) _______________________________________________________________________
7) _______________________________________________________________________
8) _______________________________________________________________________
9) _______________________________________________________________________
10) _______________________________________________________________________
2. On this page, please write down as much as you can recall from the pamphlet. Here we are NOT asking you about what you were thinking, but what was in the pamphlet itself.
3. Please estimate how you divided your attention among the following items while you were reading the pamphlet. Make sure your percentages add up to 100%.

How much attention was paid to the following:

a) Information about cholesterol
   
   b) Information about how exercise test is related to your health
   
   c) Suggestions about participating in an exercise test
   
   d) Your thoughts about any of the information
   
   e) Other thoughts not directly related to the information

   Total = 100%

4. Please rate how you were feeling while you were reading the pamphlet. Circle a number on each scale.

I FOUND MYSELF

<table>
<thead>
<tr>
<th>Feeling</th>
<th>Not at all</th>
<th>Neutral</th>
<th>Very much so</th>
</tr>
</thead>
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<tr>
<td>a) feeling sad and sorrowful</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>b) feeling angry and irritated</td>
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<tr>
<td>c) feeling happy and cheerful</td>
<td>-3</td>
<td>-2</td>
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<tr>
<td>d) feeling distrustful and skeptical</td>
<td>-3</td>
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<td>-1</td>
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<tr>
<td>e) feeling aroused and active</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>f) feeling affectionate and caring</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>g) feeling lighthearted and playful</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>h) feeling distracted and restless</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>i) feeling warm and loving</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>j) feeling fearful</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>k) feeling nervous</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>l) feeling scared</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>m) feeling nauseated</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>n) feeling uncomfortable</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
</tbody>
</table>
5. Please rate how you feel about an exercise test on next page.

**An exercise test is...(circle a number on each scale).**

a) Useless  
-3........-2........-1........0........1........2........3  
Useful

b) Unimportant  
-3........-2........-1........0........1........2........3  
Important

c) Worthless  
-3........-2........-1........0........1........2........3  
Valuable

d) Not helpful  
-3........-2........-1........0........1........2........3  
Helpful

e) Harmful  
-3........-2........-1........0........1........2........3  
Beneficial

f) Bad  
-3........-2........-1........0........1........2........3  
Good

g) Negative  
-3........-2........-1........0........1........2........3  
Positive

h) Disagreeable  
-3........-2........-1........0........1........2........3  
Agreeable

i) Unpleasant  
-3........-2........-1........0........1........2........3  
Pleasant

j) Risky  
-3........-2........-1........0........1........2........3  
Not risky

k) Dangerous  
-3........-2........-1........0........1........2........3  
Safe

l) Undesirable  
-3........-2........-1........0........1........2........3  
Desirable

6. I have no intention of participating in an exercise test.  
-3........-2........-1........0........1........2........3  
strongly disagree neutral strongly agree

7. I will give my best effort to participate in an exercise test.  
-3........-2........-1........0........1........2........3  
strongly disagree neutral strongly agree

8. How likely are you to participate in an exercise test in the next six months?  
-3........-2........-1........0........1........2........3  
very unlikely neutral very likely

9. How tempted would you be to put off participating in an exercise test?  
-3........-2........-1........0........1........2........3  
very unlikely neutral very likely
10. How often do you think you will participate in an exercise test? (check one)
   ___ never
   ___ less than once every 10 years
   ___ once every 10 years
   ___ once every 5 years
   ___ once every 2 years
   ___ once a year
   ___ once every 6 months

11. An exercise test has many benefits.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

12. An exercise test has important health benefits.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

13. There are many barriers to my participating in an exercise test.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

14. There are more barriers than benefits for me to participate in an exercise test.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

15. The benefits of an exercise test outweigh its costs.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

16. Heart disease is a frightening, dangerous, and severe health problem.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

17. The likelihood that I will develop heart disease is
   -3........-2........-1........0........1........2........3
   very unlikely neutral very likely

18. An exercise test is effective in reducing my risk of developing heart disease.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

19. An exercise test is effective in detecting my risk of developing heart disease.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree
20. Participating in an exercise test would be very difficult for me to do.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

21. I am confident in my ability to participate in an exercise test.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

22. An exercise test is risky because one could get seriously injured while participating.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

23. The likelihood that I will be injured during an exercise test is
   
   -3........-2..........-1..........0..........1..........2...........3
   
   very unlikely  neutral  very likely

24. The results of not participating in an exercise test can be quite severe.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

25. Failure to participate in an exercise test could have a major negative impact on my health.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

26. Failure to participate in an exercise test may lead to physical impairment, disfigurement, and other visible health effects.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

27. Negative health effects from failure to participate in an exercise test tend to occur very gradually rather than suddenly.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

28. Negative health effects from failure to participate in an exercise test tend to occur very late in life, if at all.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree

Please answer the following questions regarding the pamphlet you just read.

29. The pamphlet was credible.
   
   -3........-2..........-1..........0..........1..........2...........3
   
   strongly disagree  neutral  strongly agree
30. The pamphlet held my interest.
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   strongly disagree neutral strongly agree

31. The pamphlet was easy to understand.
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   strongly disagree neutral strongly agree

32. The pamphlet was persuasive.
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   strongly disagree neutral strongly agree

33. The pamphlet emphasized the **prevention** of heart disease.
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   strongly disagree neutral strongly agree

34. The pamphlet emphasized the **detection** of heart disease.
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   strongly disagree neutral strongly agree

35. The tone of the information in the pamphlet was
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   mostly negative neutral mostly positive

36. The information in the pamphlet was mostly emphasizing
   -3 ...........-2 ...........-1 ...........0 ...........1 ...........2 ...........3
   losing benefits neutral gaining benefits

37. What is your gender?
   ___ Male
   ___ Female

38. What is your age? ________

39. What is your racial or ethnic group? (check one)
   ___ Black/African American
   ___ White/Caucasian
   ___ Hispanic/Chicano/Latino
   ___ Asian or Pacific Islander/Asian American
   ___ American Indian or Alaskan Native
   ___ Other (please specify) ____________________

40. What is your present weight? ________ Height? ________
41. Does/did either of your biological parents have heart disease?
   ____ Yes
   ____ No

42. Do you have diabetes?
   ____ Yes
   ____ No

43. Do you smoke cigarettes?
   ____ Yes  ____ No

44. How much stress have you been experiencing during the past week, including today?
   1  2  3  4  5
   none very little moderate quite a bit extreme

45. I have had a lot of experiences with exercise testing.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

46. I have more experience with exercise testing than the average person.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

47. I know a lot about exercise testing.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

48. I know more about exercise testing than the average person.
   -3........-2........-1........0........1........2........3
   strongly disagree neutral strongly agree

Please continue on the next page
For the following statements, please indicate how well each statement describes YOU by circling the appropriate number on the scales below.

1. Thinking is not my idea of fun.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

2. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

3. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

4. I find satisfaction in deliberating hard and for long hours.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

5. I prefer to think about small, daily projects to long-term ones.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

6. I only think as hard as I have to.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

7. I like tasks that require little thought once I've learned them.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

8. The idea of relying on thought to make my way to the top appeals to me.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much

9. I really enjoy a task that involves coming up with new solutions to problems.
   Not at all 1. . . . . . 2. . . . . . 3. . . . . . 4. . . . . . 5. . . . . . 6. . . . . . 7. Very much
10. Learning new ways to think doesn't excite me very much.
   Not at all 1........2........3........4........5........6........7 Very much

11. I prefer my life to be filled with puzzles that I must solve.
   Not at all 1........2........3........4........5........6........7 Very much

12. The notion of thinking abstractly is appealing to me.
   Not at all 1........2........3........4........5........6........7 Very much

13. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
   Not at all 1........2........3........4........5........6........7 Very much

14. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.
   Not at all 1........2........3........4........5........6........7 Very much

15. It's enough for me that something gets the job done; I don't care how or why it works.
   Not at all 1........2........3........4........5........6........7 Very much

16. I usually end up deliberating about issues even when they do not affect me personally.
   Not at all 1........2........3........4........5........6........7 Very much

17. I like to have the responsibility of handling a situation that requires a lot of thinking.
   Not at all 1........2........3........4........5........6........7 Very much

18. I would prefer complex to simple problem.
   Not at all 1........2........3........4........5........6........7 Very much
APPENDIX B

TABLES
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<th>Characteristic</th>
<th>Percentage</th>
<th>Mean (SD)</th>
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<tr>
<td><strong>Exercise stages of change</strong></td>
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<tr>
<td>Stage 1: Not active and do not intend to change</td>
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<td>Stage 2: Not active but intend to change</td>
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<td>Stage 3: Active but do not intend to do so on a</td>
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<td><strong>Stress test stages of change</strong></td>
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<tr>
<td>intend to participate</td>
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<td>Stage 2: No previous participation but intend to</td>
<td>43</td>
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<tr>
<td>participate</td>
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<tr>
<td><strong>Either biological parent with heart disease</strong></td>
<td></td>
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<tr>
<td>Yes</td>
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<td>Nonsmoker</td>
<td>73</td>
<td>---</td>
</tr>
<tr>
<td><strong>Current stress level</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>---</td>
<td>3.44 (1.01)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Age range: 16 to 27.

<sup>b</sup> Assessed using a 5-point Likert scale, ranging from 1 = none to 5 = extreme.

Table 1: Demographic Characteristics and Cardiovascular Risk Profile (N = 192).
Manipulated Function:

<table>
<thead>
<tr>
<th>Manipulated Frame:</th>
<th>Positive Framing (n = 24)</th>
<th>Negative Framing (n = 25)</th>
<th>Positive Framing (n = 25)</th>
<th>Negative Framing (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>2.1 (0.23)</td>
<td>1.4 (0.22)</td>
<td>1.9 (0.22)</td>
<td>1.9 (0.21)</td>
</tr>
<tr>
<td>Behavioral intentions</td>
<td>1.5 (0.22)</td>
<td>1.5 (0.22)</td>
<td>0.82 (0.22)</td>
<td>1.2 (0.21)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>2.7 (0.20)</td>
<td>2.6 (0.20)</td>
<td>2.1 (0.20)</td>
<td>2.4 (0.19)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>0.79 (0.32)</td>
<td>0.56 (0.31)</td>
<td>-0.12 (0.31)</td>
<td>0.38 (0.30)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>2.4 (0.27)</td>
<td>2.4 (0.26)</td>
<td>1.9 (0.26)</td>
<td>2.0 (0.26)</td>
</tr>
<tr>
<td>Perceived susceptibility to heart disease</td>
<td>0.29 (0.32)</td>
<td>0.56 (0.31)</td>
<td>0.52 (0.31)</td>
<td>0.31 (0.30)</td>
</tr>
<tr>
<td>Outcome efficacy of regular exercise to reduce risk</td>
<td>2.2 (0.24)</td>
<td>2.2 (0.24)</td>
<td>1.0 (0.24)</td>
<td>2.3 (0.23)</td>
</tr>
<tr>
<td>Outcome efficacy of regular exercise to detect risk</td>
<td>0.17 (0.31)</td>
<td>-0.52 (0.31)</td>
<td>1.1 (0.31)</td>
<td>1.7 (0.30)</td>
</tr>
<tr>
<td>Self-efficacy to exercise regularly</td>
<td>1.2 (0.29)</td>
<td>0.88 (0.28)</td>
<td>0.72 (0.28)</td>
<td>0.96 (0.27)</td>
</tr>
<tr>
<td>Risk of injury</td>
<td>-1.4 (0.29)</td>
<td>-1.1 (0.28)</td>
<td>-0.88 (0.28)</td>
<td>-1.3 (0.28)</td>
</tr>
<tr>
<td>Perceived severity of a lack of regular exercise</td>
<td>0.75 (0.26)</td>
<td>1.1 (0.26)</td>
<td>0.68 (0.26)</td>
<td>1.1 (0.25)</td>
</tr>
</tbody>
</table>

NOTE: Standard deviations in parentheses.
a. All variables were measured on scales ranging from -3 to +3; higher numbers indicate greater endorsement.

Table 2: Treatment Means and Standard Deviations for Attitudes, Behavioral Intentions, and Psychosocial Variables in the Regular Exercise Sample.³
<table>
<thead>
<tr>
<th>Manipulated Frame:</th>
<th>Manipulated Function:</th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive framing</td>
<td>(n = 22)</td>
<td>Negative framing</td>
</tr>
<tr>
<td>Attitudes</td>
<td>1.4 (0.22)</td>
<td>1.4 (0.22)</td>
<td>1.6 (0.22)</td>
</tr>
<tr>
<td>Behavioral intentions</td>
<td>-0.5 (0.27)</td>
<td>-0.15 (0.26)</td>
<td>0.02 (0.27)</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>1.8 (0.19)</td>
<td>1.8 (0.18)</td>
<td>2.1 (0.19)</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>-0.86 (0.30)</td>
<td>-0.21 (0.28)</td>
<td>-0.46 (0.30)</td>
</tr>
<tr>
<td>Perceived severity of heart disease</td>
<td>2.0 (0.22)</td>
<td>2.4 (0.21)</td>
<td>2.3 (0.22)</td>
</tr>
<tr>
<td>Perceived susceptibility to heart disease</td>
<td>0.36 (0.31)</td>
<td>-0.08 (0.30)</td>
<td>0.36 (0.31)</td>
</tr>
<tr>
<td>Outcome efficacy of stress test to reduce risk</td>
<td>-0.18 (0.40)</td>
<td>0.33 (0.39)</td>
<td>1.1 (0.40)</td>
</tr>
<tr>
<td>Outcome efficacy of stress test to detect risk</td>
<td>1.9 (0.23)</td>
<td>1.8 (0.22)</td>
<td>2.0 (0.23)</td>
</tr>
<tr>
<td>Self-efficacy to engage in stress testing</td>
<td>1.5 (0.33)</td>
<td>1.2 (0.31)</td>
<td>1.5 (0.33)</td>
</tr>
<tr>
<td>Risk of injury</td>
<td>-2.2 (0.19)</td>
<td>-2.0 (0.18)</td>
<td>-2.3 (0.19)</td>
</tr>
<tr>
<td>Perceived severity of not engaging in stress testing</td>
<td>-1.2 (0.29)</td>
<td>-1.0 (0.28)</td>
<td>-0.65 (0.29)</td>
</tr>
</tbody>
</table>

NOTE: Standard deviations in parentheses.
a. All variables were measured on scales ranging from −3 to +3; higher numbers indicate greater endorsement.

Table 3: Treatment Means and Standard Deviations for Attitudes, Behavioral Intentions, and Psychosocial Variables in the Exercise Testing Sample.\(^a\)

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<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated frame</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Manipulated frame x Exercise stage of change</td>
<td>0.29</td>
<td>0.11</td>
<td>0.08</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Table 4: Hierarchical Regression Analysis of Manipulated Frame and Exercise Stages of Change in Predicting Attitude toward Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>0.36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td>-0.17</td>
<td>0.17</td>
<td>0.17</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Perceived frame x</td>
<td>0.35</td>
<td>0.26</td>
<td>0.09</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Hierarchical Regression Analysis of Perceived Frame and Exercise Stages of Change in Predicting Attitude toward Regular Exercise.
Table 6: Hierarchical Regression Analysis of Perceived Frame in Predicting Attitude toward Regular Exercise.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>0.41</td>
<td>0.17</td>
<td>0.17</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Predictor</td>
<td>Standardized beta weights</td>
<td>$R^2$</td>
<td>$R^2$ change</td>
<td>p</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------</td>
<td>-------</td>
<td>--------------</td>
<td>-----</td>
</tr>
<tr>
<td>NFC</td>
<td>0.21</td>
<td>0.04</td>
<td>0.04</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

Table 7: Hierarchical Regression Analysis of NFC in Predicting Attitude toward Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>1.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFC</td>
<td>0.43</td>
<td>0.21</td>
<td>0.21</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Perceived frame x NFC</td>
<td>-1.21</td>
<td>0.30</td>
<td>0.09</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Table 8: Hierarchical Regression Analysis of Perceived Frame and NFC in Predicting Attitude toward Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>R²</th>
<th>R² change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>-0.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived function</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test stage of change</td>
<td>-0.18</td>
<td>0.003</td>
<td>0.003</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Perceived frame x Perceived function</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived frame x Test stage of change</td>
<td>-0.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived function x Test stage of change</td>
<td>0.18</td>
<td>0.01</td>
<td>0.01</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Perceived frame x Perceived function x Test stage of change</td>
<td>0.31</td>
<td>0.06</td>
<td>0.04</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

Table 9: Hierarchical Regression Analysis of Perceived Frame, Perceived Function, and Test Stages of Change in Predicting Attitude toward Exercise Testing.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated function</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td>0.21</td>
<td>0.09</td>
<td>0.09</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Table 10: Hierarchical Regression Analysis of Manipulated Function vs. Exercise Stages of Change in Predicting Behavioral Intention to Engage in Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>-0.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived function</td>
<td>-0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Perceived frame x</td>
<td>0.50</td>
<td>0.13</td>
<td>0.07</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Perceived function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11: Hierarchical Regression Analysis of Perceived Frame and Perceived Function in Predicting Behavioral Intention to Engage in Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived frame</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Perceived frame x Exercise stage of change</td>
<td>0.24</td>
<td>0.14</td>
<td>0.04</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

Table 12: Hierarchical Regression Analysis of Perceived Frame and Exercise Stages of Change in Predicting Behavioral Intention to Engage in Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>R²</th>
<th>R² change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated frame</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated function</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.10</td>
<td>0.06</td>
<td>0.06</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Manipulated frame x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated function</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated frame x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated function x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.04</td>
<td>0.07</td>
<td>0.02</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Manipulated frame x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated function x</td>
<td>0.28</td>
<td>0.15</td>
<td>0.08</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 13: Hierarchical Regression Analysis of Manipulated Frame, Manipulated Function, and Gender in Predicting Behavioral Intention to Engage in Regular Exercise.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test stage of change</td>
<td>0.39</td>
<td>0.15</td>
<td>0.15</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Table 14: Hierarchical Regression Analysis of Test Stages of Change in Predicting Behavioral Intention to Participating in Exercise Testing.

143
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized beta weights</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated function</td>
<td>-0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.06</td>
<td>0.007</td>
<td>0.007</td>
<td>&gt;.10</td>
</tr>
<tr>
<td>Manipulated function x</td>
<td>-0.31</td>
<td>0.10</td>
<td>0.10</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 15: Hierarchical Regression Analysis of Manipulated Function and Gender in Predicting Behavioral Intention to Participate in Exercise Testing.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Beta Wts.</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived function</td>
<td>0.75</td>
<td>0.37</td>
<td>3.99</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Exercise stage of change</td>
<td>0.38</td>
<td>0.18</td>
<td>4.71</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

Table 16: Logistical Regression Analysis of Perceived Function and Exercise Stages of Change in Predicting Intention to Engage in Regular Exercise at the Recommended Frequency.
### Table 17: Logistical Regression Analysis of NFC in Predicting Intention to Engage in Regular Exercise at the Recommended Frequency.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Beta Wts.</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC</td>
<td>0.45</td>
<td>0.24</td>
<td>3.62</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Predictor</th>
<th>Beta Wts.</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated frame</td>
<td>-0.06</td>
<td>0.23</td>
<td>0.06</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated function</td>
<td>0.14</td>
<td>0.23</td>
<td>0.37</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated frame x</td>
<td>-0.69</td>
<td>0.23</td>
<td>8.74</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Manipulated function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 18: Logistical Regression Analysis of Manipulated Function and Manipulated Frame in Predicting Intention to Participate in Exercise Testing Within the Next Decade.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Beta Wts.</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test stages of change</td>
<td>0.71</td>
<td>0.25</td>
<td>8.09</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

Table 19: Logistical Regression Analysis of Test Stages of Change in Predicting Intention to Participate in Exercise Testing Within the Next Decade.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Beta Wts.</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated frame</td>
<td>0.29</td>
<td>0.27</td>
<td>1.18</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated function</td>
<td>-0.09</td>
<td>0.27</td>
<td>0.12</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>0.00</td>
<td>0.21</td>
<td>0.00</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated frame x Manipulated function</td>
<td>-0.82</td>
<td>0.27</td>
<td>9.14</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Manipulated frame x Perceived susceptibility</td>
<td>-0.30</td>
<td>0.21</td>
<td>1.92</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated function x Perceived susceptibility</td>
<td>-0.24</td>
<td>0.21</td>
<td>1.21</td>
<td>&gt; .10</td>
</tr>
<tr>
<td>Manipulated frame x Manipulated function x Perceived susceptibility</td>
<td>0.53</td>
<td>0.21</td>
<td>6.19</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

Table 20: Logistical Regression Analysis of Manipulated Frame, Manipulated Function, and Perceived Susceptibility in Predicting Intention to Participate in Exercise Testing Within the Next Decade.
<table>
<thead>
<tr>
<th>Manipulated Function:</th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulated Frame:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive framing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative framing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive framing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative framing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 26)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Affective reactions

<table>
<thead>
<tr>
<th></th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive feelings</td>
<td>2.1 (0.23)</td>
<td>1.9 (0.22)</td>
</tr>
<tr>
<td>Negative feelings</td>
<td>-1.2 (0.24)</td>
<td>-1.0 (0.24)</td>
</tr>
</tbody>
</table>

Thought reactions

<table>
<thead>
<tr>
<th></th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention to pamphlet (%)</td>
<td>90 (1.7)</td>
<td>88 (1.6)</td>
</tr>
<tr>
<td>Number of favorable thoughts</td>
<td>2.2 (0.26)</td>
<td>1.3 (0.25)</td>
</tr>
<tr>
<td>Number of unfavorable thoughts</td>
<td>0.29 (0.20)</td>
<td>0.42 (0.20)</td>
</tr>
<tr>
<td>Number of correctly recalled statements about heart disease</td>
<td>2.8 (0.22)</td>
<td>2.8 (0.21)</td>
</tr>
<tr>
<td>Number of correctly recalled statements about exercise</td>
<td>2.8 (0.32)</td>
<td>2.3 (0.30)</td>
</tr>
</tbody>
</table>

NOTE: Standard deviations in parentheses.
a. Measured on scales ranging from -3 to +3; higher numbers indicate greater endorsement.

Table 21: Treatment Means and Standard Deviations for Affective and Thought Reactions in the Regular Exercise Sample.

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<table>
<thead>
<tr>
<th>Manipulated Frame:</th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive framing</td>
<td>(n = 22)</td>
<td>(n = 24)</td>
</tr>
<tr>
<td>Negative framing</td>
<td>(n = 24)</td>
<td>(n = 22)</td>
</tr>
</tbody>
</table>

### Affective reactions\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive feelings</td>
<td>-0.94 (0.24)</td>
<td>-0.94 (0.24)</td>
</tr>
<tr>
<td>Negative feelings</td>
<td>-1.1 (0.23)</td>
<td>-1.2 (0.22)</td>
</tr>
</tbody>
</table>

### Thought reactions

<table>
<thead>
<tr>
<th></th>
<th>Prevention</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention to pamphlet (%)</td>
<td>91 (2.9)</td>
<td>87 (3.0)</td>
</tr>
<tr>
<td>Number of favorable thoughts</td>
<td>0.68 (0.21)</td>
<td>0.75 (0.20)</td>
</tr>
<tr>
<td>Number of unfavorable thoughts</td>
<td>0.50 (0.19)</td>
<td>0.17 (0.18)</td>
</tr>
<tr>
<td>Number of correctly recalled statements about heart disease</td>
<td>2.7 (0.22)</td>
<td>2.5 (0.21)</td>
</tr>
<tr>
<td>Number of correctly recalled statements about stress test</td>
<td>2.0 (0.26)</td>
<td>2.2 (0.25)</td>
</tr>
</tbody>
</table>

**NOTE:** Standard deviations in parentheses.

a. Measured on scales ranging from -3 to +3; higher numbers indicate greater endorsement.

Table 22: Treatment Means and Standard Deviations for Affective and Thought Reactions in the Exercise Testing Sample.
APPENDIX C

FIGURES

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Figure 1: Perceived Frame x NFC Interaction on Attitude toward Regular Exercise.
Figure 2: Perceived Function x Perceived Frame Interaction on Attitude toward Exercise Testing among Test Stage 2 Individuals.
Figure 3: Perceived Function x Perceived Frame Interaction on Behavioral Intention to Engage in Regular Exercise.
Figure 4: Perceived Frame x Exercise Stages of Change Interaction on Behavioral Intention to Engage in Regular Exercise.
Figure 5: Perceived Frame x Perceived Function Interaction on Behavioral Intention to Engage in Regular Exercise among Female Participants.
Figure 6: Manipulated Function x Gender Interaction on Behavioral Intention to Participate in Exercise Testing.

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Figure 7: Manipulated Frame x Manipulated Function Interaction on the Average Number of Hours of Vigorous Activity since Intervention (Regular Exercise Sample Only).