EFFECTS OF DIRECTED THINKING ON EXERCISE AND CARDIOVASCULAR FITNESS

by

LAURA LEA TEN EYCK

Bachelor of Arts, 1999
Texas Wesleyan University
Fort Worth, Texas

Master of Arts, 2001
Stephen F. Austin State University
Nacogdoches, Texas

Master of Science, 2003
Texas Christian University
Fort Worth, Texas

Submitted to the Graduate Faculty of the
College of Science and Engineering
Texas Christian University
in partial fulfillment of the requirements
for the degree of

Doctor of Philosophy

December 2006

ACKNOWLEDGEMENTS

I would like to express my gratitude to the faculty and staff of the Department of Psychology at Texas Christian University for supporting and encouraging my academic endeavors. I would like to acknowledge the invaluable guidance of my mentor, Dr. Charles Lord, and thank my committee members Dr. Charles Bond, Dr. David Cross, Dr. Donald Dansereau, Dr. Melody Phillips (Department of Kinesiology), and Dr. Christie Scollon. I would also like to extend special thanks to Dana Gresky, Angela Junemann, Chelsea Barnoski-Smith, and Victoria McKee for assisting me in conducting the research. Most importantly, I would like to thank the people who have continued to provide moral, emotional, and financial support throughout the pursuit of my goals: my family and friends.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Effects of directed thinking on exercise and cardiovascular fitness

One question that concerns Americans, who are increasingly in poor health, is how to successfully increase beneficial activities such as exercise. Most people are aware of the benefits of regular physical activity. The Centers for Disease Control and Prevention (CDC) report that exercise aids in the prevention of bone loss, heart disease, obesity, and type II diabetes (2005). According to the CDC (2004), however, only 26.2% of Americans engaged in regular physical activity during 2003. As consumers we are inundated with advertising, news reports, television programs and magazine articles that all provide possible causes and solutions to improve our overall fitness and health. Television commercials hawk everything from special diets to exercise equipment as the ideal solution to being healthy. Used properly, many of the products designed to help us become healthier could prove effective; however, most are not designed to target the underlying factors that might be contributing to the problems. We might purchase a treadmill or a gym membership with every intention of starting a program of regular exercise. However, if we do not change the maladaptive behavior patterns associated with our poor habits, it is unlikely that we will be successful in our attempts to increase the performance of a self-beneficial activity such as exercise. In addition, our attitudes toward a behavior such as exercise might also be problematic in that they could contain negative aspects that interfere with our ability to view the behavior in a more positive way. The present experiments are based on the premise that successfully increasing the performance of beneficial behaviors entails implementing techniques that alter attitudes toward the behavior and developing active strategies to engage in the behavior. The discussion will therefore begin by examining how attitudes toward individuals, groups, and activities are formed, maintained, and expressed.

ATTITUDE REPRESENTATION THEORY

One of the theories that explains the formation and expression of our attitudes toward people, groups, and social issues is attitude representation theory (Lord & Lepper, 1999). Attitude representation theory contends that when people encounter an attitude object (e.g., politicians), they spontaneously bring to mind assumptions about the attitude object's exemplars (e.g., Bill Clinton), characteristics (e.g., charismatic), emotions (e.g., happiness), actions (e.g., voted), and contexts (e.g., my friends like politicians too). These spontaneous associations are termed an "attitude object representation," which affects how people behave toward the attitude object.

Eagly and Chaiken (1993) suggest that there are two types of attitude objects: social groups or issues (e.g., politicians, capital punishment), and behaviors (e.g., exercise, voting). Until recently, research testing the components of attitude representation theory has focused only on attitudes toward social groups or issues (e.g., Lord, Desforges, Fein, Pugh, & Lepper, 1994; Lord, Paulson, Sia, Thomas, & Lepper, 2004; Ramsey, Lord, Wallace, & Pugh, 1994; Sia, Lord, Blessum, Ratcliff, & Lepper, 1997; Sia, Thomas, Lord, & Lepper, 1998). It is possible, nonetheless, to make some predictions about attitudes toward behaviors by examining relevant research within attitude representation theory (Lord & Lepper, 1999).

Exemplars

Attitude representation theory is based on the premise that when asked to think about an attitude object, people spontaneously activate various evaluative associations (Lord & Lepper, 1999). For example, when asked to think of the social category "nurses," many people would spontaneously imagine a woman in a white uniform. In other words, they have a typical exemplar for a nurse that easily comes to mind. What might occur if people come in contact with

a member of a social category that does not fit their exemplar for the typical member of the category? In a relevant study, participants answered an open-ended question in which they were asked to describe the 'typical former mental patient' (Ramsey, et al., 1994, Study 1). Most participants included a specific diagnosis (e.g., schizophrenic, paranoid, depressed). They also reported their attitudes toward many social categories, including former mental patients. Later, participants were given the opportunity to choose a potential interaction partner for a future experimental session. Participants read ostensible background information about two potential partners before choosing which one they would prefer. All participants read about one potential partner who was depicted as normal. For half of the participants the other partner was depicted as having been treated for the specific type of disorder the participants had described. The remaining participants read about another potential partner who was depicted as having been treated for a disorder different from the one they had described.

Participants with positive attitudes toward former mental patients were willing to engage in more activities with their potential partners when they were depicted as having been treated for the disorder that the individual participant had spontaneously associated with former mental patients (Ramsey, et al., 1994, Study 1). In other words, participants behaved more in line with their attitudes when the potential partner matched the type of former mental patient in their 'mind's eye.' There is no research that makes parallel predictions for a behavior such as exercise; but one could imagine that people have a 'typical' exemplar that comes to mind when they think about a behavior such as exercise. For example, when asked to think about exercising, some people might have weightlifting as their typical exemplar, while others might have swimming as their typical exemplar. Hence, any attempt at changing attitudes toward a behavior such as exercise needs to be aimed at specific behavior. The present experiments accounted for different

exemplars by allowing participants to select a target behavior that best fit their exercise exemplar.

Characteristics

Attitude representation theory also contends that people spontaneously associate specific characteristics with members of social categories. For the category 'nurses,' the characteristics 'kind,' 'warm,' and 'caring' might spontaneously come to mind. What happens when the characteristics of an attitude target do not match a person's expectations? Participants in a relevant study were asked to report the characteristics of the typical member of several social categories, including homosexuals (Lord, Lepper, & Mackie, 1984, Expt. 2). Later, participants returned under the guise of a different experiment, where they had the opportunity to interact with a prospective transfer student. Each participant was provided with a 'counselor's profile' of the incoming student that contained information about his personality traits. Some participants read a description in which the transfer student possessed characteristics that they had reported commonly associating with homosexuals. Other participants read a description in which the transfer student possessed characteristics they did not commonly associate with homosexuals. After reading the descriptions, participants rated the likeability of the transfer student, and indicated their willingness to interact with the student in various situations.

Participants with positive attitudes toward homosexuals were more willing to interact with the transfer student when the student's characteristics matched those they had listed earlier. When the transfer student's characteristics did not match as well, participants were less willing to interact with the transfer student. In other words, participants demonstrated greater attitude-behavior consistency toward the target (homosexual) when his characteristics matched their expectations. Again, there is no research that makes parallel predictions for a behavior such as

exercise; however, one could imagine that people possess very different ideas about the characteristics of exercise. Some might consider exercise invigorating and energizing, while others might consider it boring and exhausting. The present experiments were therefore designed to account for individual differences in the perceived characteristics of exercise by measuring attitudes toward and characteristics of different cardiovascular exercises.

Actions

Attitude representation theory also accounts for the influence of our past actions on our future attitude-relevant behavior (Lord & Lepper, 1999). For the social category 'politicians,' a person might spontaneously activate past actions that include 'voted for' or 'supported.' In one case, the past action was active (voted for), while the other was passive (supported). Do past actions predict future behavior better when they match (active-active) than when they do not match (active-passive)? Paulson (2004) tested this question by asking participants to think about actions they had done toward groups in the past, including gay men. The past actions were classified as either active (e.g., hugged) or passive (e.g., accepted). Later participants were given the opportunity to interact with a gay man in the future, in either an active or a passive way.

Participants with positive attitudes who reported doing active actions toward gay men in the past were more willing to interact with a gay man when the proposed action was also active (Paulson, 2004). They were less willing to interact with the gay man when their past action (e.g., active) did not match the proposed action (e.g., passive). How might such findings apply to actions associated with a behavior such as exercise? There are many ways that people might express their attitudes toward members of a social category, such as supporting their cause, working with them, having close relationships with them, and making positive comments about them to others. When looking at behavior, one obvious way to express an attitude is by doing the

behavior or not doing the behavior. Doing a behavior, however, could have different meanings. When some people are asked to think about 'me doing exercise,' they might spontaneously associate the action 'going to the gym and getting on the treadmill.' Others might spontaneously associate 'me doing exercise' with 'going with a friend to make it more enjoyable.' Still others might spontaneously associate 'me doing exercise' with 'I will feel great once I finish.' To make attitudes toward exercise more positive, it may be necessary to change the types of thoughts that spontaneously come to mind when people think about doing exercise. The present experiments are based on the assumption that there are at least two general types of thoughts that spontaneously come to mind when people think about exercising: motivational thoughts and action strategies.

MOTIVATIONAL THOUGHTS AND ACTION STRATEGIES

McGuire and McGuire (1991) investigated the types of thoughts people are likely to generate spontaneously when asked to free associate to an event. When people think about events that might happen, it is adaptive for them to consider the consequences and the antecedents. Thinking about the likely consequences of an event helps people become motivated and prepared. Thinking about antecedent actions that might lead to the event, in contrast, helps people plan and control. Because these two types of thinking are so adaptive, McGuire and McGuire (1991) predicted that people who were simply asked to list all their thoughts about various events would list primarily consequences and antecedents. Their predictions were supported in several studies. In one study, for instance, participants were asked to list all their associations to personal events such as "Your having a satisfying social life next term." Seventy-seven percent of the spontaneously listed thoughts involved either antecedents (e.g., "I join some clubs"), or consequences (e.g., "I feel less stressed"), with

antecedents and consequences approximately equal in frequency. Since antecedents (actions) and consequences (reasons) are commonly generated when individuals are asked to think about personal events, it makes sense that they would provide a good format by which we can test the efficacy of each approach for increasing exercise intentions, actual behavior, and cardiovascular fitness. Which would be more effective?

What types of thoughts about self-beneficial activities would be most likely to influence people's attitudes and behaviors regarding those activities? If you asked most people what types of thoughts would increase the probability that a person would perform a self-beneficial activity, they would probably tell you that considering the benefits of doing the activity and the costs of not doing the activity would be most effective. In other words, many people believe that the most promising route to increasing self-beneficial behaviors runs through changing motivation.

Motivational Thoughts

There is evidence to suggest that motivational approaches to changing behavior are effective. Janis and Mann's (1977) model of decision-making contends that people weigh the pros and cons of performing a behavior such as exercise before deciding to begin. In other words, there is a decisional balance between the perceived costs and rewards. Research examining decisional balance and exercise demonstrates that regular exercisers place more importance on the pros, whereas non-exercisers place more importance on the cons (e.g., Prochaska et al., 1994). The types of thoughts associated with the pros of a behavior such as exercise are often motivational statements such as "I will live a longer life," "I will have more energy," or "I will maintain a healthy weight." Thus, motivational statements are viewed as a viable technique for increasing a self-beneficial activity like exercise.

Another motivational approach to changing attitudes toward and performance of self-beneficial behaviors entails using fear appeals. Fear appeals are messages designed to increase people's motivation to prevent health problems by taking actions to protect themselves (Ruiter, Abraham, & Kok, 2001). Such messages are typically comprised of a threat intended to arouse fear (e.g., "lack of exercise increases your risk of developing heart disease, which could lead to a fatal heart attack"), and an action that could prevent the threat (e.g., "regular exercise reduces the risk of heart disease"). Some research indicates that fear appeals are effective for changing health behaviors, but only when accompanied by ways to avoid the negative consequences (e.g., Leventhal, Singer, & Jones, 1965).

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) contends that motivation to perform a behavior is influenced by the degree to which it meets an individual's psychological needs (i.e., autonomy, competence, and relatedness). In addition, SDT differentiates between two different types of goals: intrinsic (e.g., health, self-improvement) and extrinsic (e.g., financial success, recognition). Research examining SDT and exercise has shown that intrinsically-based motivation to exercise predicts both behavioral intentions and actual exercise behavior (Wilson & Rodgers, 2004).

Although there is some empirical support for the use of motivational thoughts to increase the performance of, and attitudes toward, self-beneficial behaviors like exercise, there are some problems with using a purely motivational approach. Decisional balance does provide a way to differentiate between regular exercisers and non-exercisers (e.g., Velicer, DiClemente, Prochaska, & Brandenburg, 1985). Knowing that regular exercisers view the pros of exercise as more important than the cons is useful; yet, identifying the action strategies they use to maintain their behavior might be at least as useful in attempting to change the behavior of non-exercisers.

Similarly, fear appeals have been shown to be effective for increasing health behaviors; but, the appeals were only effective when accompanied by instructions detailing how, when, where to perform the behaviors (Leventhal et al., 1965). In other words, fear appeals must be paired with action strategies in order to be effective. Finally, research examining SDT shows that intrinsic motivation increases the likelihood that individuals will perform a self-beneficial behavior (Wilson & Rodgers, 2004). SDT, nevertheless, focuses only on cognitions regarding the behavior, and does not attempt to identify actions that might also influence performance of a behavior (Deci & Ryan, 1985, 2000). Because of the apparent limitations in relying solely on motivational thoughts to increase behavioral intentions and behaviors, the following section reviews a different approach: action strategies.

Action Strategies

Interestingly, much research suggests that, although the motivational route clearly has advantages (e.g., Leventhal et al., 1965; Wilson & Rodgers, 2004), it might not be the most effective route to increasing levels of and involvement in self-beneficial behaviors. It might be even more effective to change another aspect of the attitude object representation – namely, actions that individuals can take to engineer their environments. It might prove more effective for an individual to associate "going out for a jog" with an action strategy such as "wear headphones to listen to my favorite music while jogging" than with a motivational thought such as "get in shape." One type of association involves ways to change the individual's environment; the other involves ways to change the individual's motivation. When it comes to increasing level of and involvement in self-beneficial behaviors, encouraging associations to action strategies that change the environment might prove more effective than instilling associations to costs and gains that change motivation.

Bandura (1986), unlike early behaviorists, contended that people can gain control over their own environments and permanently change their behavior. For example, a standard behaviorally-based approach to controlling behavior in humans might entail using a token economy. Such techniques are intended simply to control behavior without any real attempts to encourage self-initiated changes in behavior. From Bandura's perspective, however, positive behavior change could be facilitated in a number of ways, including self-reinforcement which restores control to the individual.

Gollwitzer and his colleagues have identified a specific technique that increases the performance of goal-directed behavior (e.g., Gollwitzer, 1993; Gollwitzer & Brandstätter, 1997; Gollwitzer & Schaal, 1998). The strategy, referred to as implementation intentions, differentiates between statements such as "I intend to exercise" and "I intend to exercise for 30 minutes at 3 p.m. today." The former statement is a goal intention, while the latter represents an implementation intention. Research comparing the efficacy of implementation intentions and goal intentions shows that implementation intentions are more effective for finishing school projects (Gollwitzer & Brandstätter, 1997), reducing dietary fat intake (Armitage, 2004), increasing exercise frequency (Prestwich, Lawton, & Conner, 2003), improving training course attendance (Sheeran & Silverman, 2003) and consistent condom use (Svenson, Östergren, Merlo, & Rastam, 2002). The evidence strongly suggests that implementation intentions, which are similar to action strategies, are highly effective for increasing a number of self-beneficial activities.

Anderson (1983) demonstrated the effectiveness of imagining action strategies by having participants draw cartoons depicting the performance of beneficial activities such as blood donation and tutoring another student. Participants drew cartoons depicting either 'yourself,'

'your best friend,' or 'a person you know and don't like' (p. 296). Additionally, participants drew cartoons in which the main character either completed the behavior (e.g., donated blood) or did not complete the behavior (e.g., chose not to donate blood). Participants who drew cartoons of themselves completing the behavior demonstrated greater behavioral intentions to perform the behavior in the future. Interestingly, the increased intentions were present three days after the initial manipulation. In a similar vein, Gregory, Cialdini, and Carpenter (1982) examined subscription to cable television. Participants were residents of a neighborhood where cable television service was being introduced (Expt. 4). Some participants were asked to read about the benefits of cable television. Other participants were instead asked to imagine themselves enjoying cable television. Participants who imagined themselves enjoying the benefits of cable television expressed more positive attitudes toward cable television, a greater likelihood of wanting cable television, greater intentions to subscribe to cable television, and greater actual subscription rates than participants who only read information about the service. Thus, imagining yourself engaging in an action increases your intentions to perform the action.

Pham and Taylor (1999) also explored the effects of imagining behavioral outcomes by comparing process- and outcome-based mental simulations. They describe mental simulations as "imitative representations of real or hypothetical events" (p. 250), and further differentiate between process-based mental simulations (i.e., imagining the steps leading up to the achievement of a desired goal) and outcome-based mental simulations (i.e., imagining one has achieved the goal). To test which type of mental simulation is more effective in obtaining a desirable behavioral result, the researchers had some students mentally simulate themselves studying for a midterm exam which was scheduled for the following week. For instance, these students were asked to "imagine how you would study to get a high grade on your psychology

midterm." Other students were instructed to "visualize yourself getting a high grade on your psychology midterm" (p. 252). Interestingly, students who engaged in process-based mental simulations studied longer for the exam than did students who engaged in outcome-based mental simulations. Students in the process-based group also achieved higher grades on the psychology midterm exam than students in the outcome-based group. In other words, imagining action strategies proved more effective than imagining the end result.

Research clearly provides support for the utility of action strategies, which might prove even more effective than motivational thoughts. Gollwitzer and others have shown that formulating implementation intentions increases the likelihood that people will perform a variety of self-beneficial behaviors (e.g., Armitage, 2004; Gollwitzer & Brandstätter, 1997; Prestwich et al., 2003; Sheeran & Silverman, 2003; Svenson et al., 2002). The question remains, however, how we might best encourage motivational thoughts and action strategies.

DIRECTED THINKING ABOUT BENEFICIAL BEHAVIORS

Researchers in one relevant study were interested in the effects of self-generated actions on behavioral intentions to study (Ratcliff, Czuchry, Scarberry, Thomas, Dansereau, & Lord, 1999). About half way through the semester, participants engaged in a brainstorming task in which they generated ideas about studying. Half of the participants generated actions that they or another student could take to make studying more enjoyable and worthwhile (e.g., listen to music, study with friends). The remaining participants generated reasons why they or another student should consider studying an enjoyable and worthwhile activity (e.g., learn more, better job in future). After the brainstorming task, participants reported their intentions to study in the second half of the semester.

Participants who generated actions to make studying more enjoyable and worthwhile reported greater study intentions than did participants who generated reasons why studying should be considered enjoyable and worthwhile (Ratcliff et al., 1999). One could view the self-generated actions as strategies to change the environment so that it is more conducive to studying. Reasons, on the other hand, could be viewed as self-generated attempts to motivate individuals to study. The self-generated action strategies route was more effective than the self-generated motivational thoughts route.

In another relevant study, Ten Eyck and her colleagues explored the efficacy of environmental and motivational routes to increasing intentions to study by further differentiating between idea generation and mental simulation as possible mechanisms underlying Ratcliff et al.'s (1999) results (Ten Eyck, Labansat, Gresky, Dansereau, & Lord, 2006). Participants generated either actions or reasons using instructions identical to those used by Ratcliff et al. (1999). One half of the participants in each condition then vividly imagined each idea and rated its vividness (mental simulation). The remaining participants in each condition rated the subjective ease of generating each idea (ease of generation). Participants reported their study intentions immediately following the manipulation and one week later.

Participants who generated actions and then vividly imagined them reported greater intentions to study than did participants in the other conditions (Ten Eyck et al., 2006). Although the effect was not apparent immediately following the manipulation, it was one week later. These results mirrored those found by Anderson (1983), in which participants who drew cartoons of themselves performing a behavior (e.g., donating blood) reported greater intentions to perform the behavior three days after the manipulation. Ten Eyck et al. concluded that vividly imagining

or mentally simulating actions was more effective than focusing on the subjective ease of generation.

In a final relevant study, Labansat and her colleagues tested the effects of directed thinking on intentions to study in students who were in various stages of readiness to change their regular studying behavior (Labansat, Ten Eyck, Gresky, Dansereau, & Lord, Expt. 1, in press). Some participants were categorized as early stage studiers because they expressed little or no intentions to study regularly in the near future (Prochaska, 1979). The remaining participants were categorized as late stage studiers because they were already studying regularly, or preparing to do so in the near future (Prochaska, 1979). Following Ratcliff et al.'s (1999) design, participants were asked to generate reasons or actions that might persuade another student that studying is an enjoyable and worthwhile activity; after which they reported their study intentions.

Generating actions or reasons had no effect on intentions to study when participants were in the early stages of change (Labansat et al., in press). Generating actions, however, proved more effective for participants in the later stages of change than did generating reasons. Labansat et al. concluded that generating and thinking about actions one can take to increase studying is more effective for students who are already engaged in at least some regular study activity.

EXPERIMENTAL DESIGNS

Research examining the efficacy of different types of directed thinking has often focused on one beneficial behavior: studying (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006). This prior research, however, has measured behavioral intentions rather than actual behavior. It was important to extend this research to examine exercise, and to move from intentions to actual behavior. The present experiments were therefore designed to meet these goals.

Experiments 1 and 2 examined the effects of thinking on cardiovascular fitness and self-reported exercise behavior, by having participants generate either action strategies or motivational thoughts (reasons) over several weeks. For comparison purposes, the experimental design included a control group that did not generate any ideas during the course of the experiments. On all dependent measures, the control group's level of and involvement in exercise was predicted to be the least, and the action strategy group's level of and involvement in exercise was predicted to be the greatest.

The evidence also suggests that motivational routes (e.g., reasons) to increasing behavior are effective in some situations (e.g., Petty & Cacioppo, 1986), however environmental routes (e.g., actions) have also been shown to be effective (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006). Further, research on persuasion shows that fear appeals from outside sources can affect behavior change, but only when accompanied by an effective coping strategy (Leventhal et al., 1965). Self-generated ideas are remembered better (Slameka & Graf, 1978) and illicit less psychological reactance than other-generated ideas (Brehm, 1972; Mussweiler & Newman, 2000). Consequently, Experiment 3 crossed two types of associations (action strategies versus reasons) with two sources of the ideas (self-generated versus other-generated) in an effort to increase participants' attitudes toward and intentions to engage in regular exercise.

Possible Moderators

The present experiments included several factors that might have moderated the effects of the manipulation.

Stage of Change

Research on the transtheoretical model of behavior change (Prochaska, 1979) has identified five stages of change that have important implications for behavioral interventions: precontemplation, contemplation, preparation, action, and maintenance. Individuals in the precontemplation stage have no intention to change in the near future. Those in the contemplation stage are aware that a problem exists but have not yet made a commitment to take any action. Individuals in the preparation stage intend to take action soon and often report some initial attempts to change their behavior. Those in the action stage have successfully altered their behavior but have maintained the behavior for less than six months. Those in the maintenance stage have maintained their altered behavior for at least six months but must still make an effort to avoid relapse.

Because the present experiments were designed to increase cardiovascular fitness and exercise behavior, we only targeted participants who were classified into one of three stages of change: precontemplation, contemplation, and preparation. We considered such participants an "at-risk" population that could have potentially benefited from the behavioral interventions tested in the present experiments.

Initial Level of Exercise

Although participants in the present experiments (1 and 2) were all considered "at-risk" because they were not engaging in regular exercise, there was still a wide range of exercise behavior reported at the beginning of Experiments 1 and 2. Initial level of exercise was therefore included as a possible moderator in order to better identify which participants responded to the experimental manipulation by exercising more.

Social Desirability

The Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) was developed to identify individuals who demonstrate a tendency to respond and behave in ways that could be considered socially desirable rather than honest. Since several of the primary dependent measures in the present experiment relied on self-report and involved a behavior that is deemed beneficial by most members of society, it was important to identify those participants who responded honestly and those who might have been subject to experimental demand.

Locus of Control

The Rotter Locus of Control Scale (Rotter, 1966) was developed to differentiate between individuals who attribute their successes and failures to internal causes (e.g., I failed the exam because I did not study) and those who attribute their successes and failures to external causes (e.g., I failed the exam because the instructor used trick questions). Research has identified a relationship between locus of control and healthy behavior, such that individuals with higher levels of internal locus of control were more likely to engage in healthy behaviors than individuals with higher levels of external locus of control (e.g., Steptoe & Wardle, 2001). The scale was included to determine whether locus of control might moderate the effects of the experimental manipulation on exercise behavior. Specifically, directed thinking about action strategies to increase the performance of a target exercise might have proved more successful for participants with a higher internal locus of control because they already deem themselves in control of their outcomes, and are more likely to believe that their self-generated strategies would be effective.

Actor's Block Scale

The Actor's Block Scale (Ten Eyck & Lord, 2006) was developed in an attempt to identify individuals who have difficulty starting tasks, but have no difficulty once they have begun. Specifically, the actor's block scale is based on the premise that although many people wait until the last minute to begin projects, such as studying for an exam or writing a paper, there are some who do not start sooner because they are unable, rather than unwilling, to begin. In other words, some people have a "block" that prevents them from acting (i.e., starting) in a timely manner. The scale is also designed to identify individuals who have no trouble starting projects, but are unable to finish them. The possibility exists that some people do not engage in regular exercise because they are unable to start sessions, or unable to finish sessions they have started. The measure was intended to identify individuals who might benefit from different types of directed thinking based on whether they can easily start and finish tasks, or have difficulty starting and finishing tasks. For example, generating action strategies for doing a target exercise might have proved more effective for participants who have difficulty getting started on tasks because it provided them with a specific plan.

Psychological Reactance

According to Brehm (1966, 1972) psychological reactance is a motivational state that occurs when people attempt to resist constraints on their behavior or thoughts (Donnell, Thomas, & Buboltz, 2001). A man, for example, might be told by his wife that he *must* quit smoking cigarettes, or else suffer dire consequences (i.e., heart disease, lung cancer, divorce, being ostracized by his family). This man might not be interested in quitting smoking, and could come to resent his wife's threats. In order to resist the attempted constraints on his behavior, the man could defy his wife and continue to smoke, choose to engage in a related behavior like smoking

cigars, act aggressively toward his wife, or develop an increased liking for smoking (Dowd, Milne, & Wise, 1991). Because participants might have varied in the degree to which they resisted attempts to alter their exercise behaviors, the present experiments included the Therapeutic Reactance Scale (TRS; Dowd et al., 1991). Although Experiments 1 and 2 relied on self-generated ideas to influence participants' exercise behavior, it is possible that taking part in an experiment intended to intentionally focus their attention on a beneficial behavior might have led some participants to resist the manipulation.

Big Five Inventory Subscales

Costa and McCrae (1992) identified five dimensions of personality that have been shown to produce individual differences in how people think and behave. The present experiments included three subscales from the Big Five Inventory: Extraversion, Neuroticism, and Conscientiousness (John, Donahue, & Kentle, 1991). They were included because research indicates that extraversion has been found to be positively related to exercise behavior and Neuroticism has been found to be negatively related to exercise behavior (e.g., Courneya, Bobick, & Schinke, 1999; Courneya & Hellsten, 1998). In addition, Conscientiousness has been found to be positively related to exercise behavior (e.g., Courneya et al., 1999; Courneya & Hellsten, 1998). It was therefore important to explore whether participants with varying degrees of each trait responded to the experimental manipulation differently.

Possible Mediators

The present experiments also included several factors that might have mediated the effects of directed thinking on intentions to exercise, actual exercise behavior, and cardiovascular fitness.

Decisional Balance

Decisional balance is determined by comparing individual perceptions regarding the advantages and disadvantages of exercise (e.g., Prochaska et al., 1994; Velicer et al., 1985). A measure of decisional balance was included in Experiments 1 and 2 because it provided one possible explanation for the predicted increase in exercise behavior. Specifically, ideas associated with exercise sessions might have increased exercise behavior by creating a more positive decisional balance. Thus, changes in the positivity of decisional balance might have mediated the impact of the experimental manipulation on exercise intentions and behaviors, but decisional balance might have proved a significant mediator only for participants who generated reasons, and not for those who generated action strategies. Participants who were directed to think about reasons for engaging in their target exercise might have shown an increase in the advantages versus disadvantages because the reasons one should do something are essentially the advantages of doing it.

Self-Efficacy

Self-efficacy regarding exercise involves individuals' beliefs about their ability to resist temptations to avoid regular exercise (e.g., DiClemente, Prochaska, & Gilbertini, 1985). Bandura (1997) has provided both a theoretical framework and massive empirical support for the idea that expectations of personal efficacy determine whether people will initiate adaptive behaviors, how much effort they will expend, and how long they will continue to engage in adaptive behaviors in the face of obstacles. His theory of self-efficacy has been applied to many health-relevant behaviors, including post-coronary coping, management of coronary artery disease, and childhood health promotion (Bandura, 1998, 2004). A measure of self-efficacy was included in Experiments 1 and 2 because it could have mediated the effects of the strategic actions on

exercise behavior by increasing perceived self-efficacy. Thus, changes in perceived self-efficacy might have mediated the impact of the experimental manipulation on cardiovascular fitness and exercise behaviors, but changes in perceived self-efficacy might have proved a significant mediator only for participants who generated action strategies, and not for those who generated motivational thoughts. Since the generation of action strategies can include the development of plans for overcoming situations that might prevent one from exercising, it was possible that doing so would also result in an increase in self-efficacy over the course of the experiment.

EXPERIMENT 1

Experiment 1 was conducted to test the effects of two types of directed thinking on intentions to exercise, and the performance of actual exercise behavior. In addition, participants' cardiovascular fitness was assessed prior to the introduction of the experimental manipulation, and at the conclusion of five weekly sessions.

Method

Participants

Fifty-eight undergraduates (14 males and 44 females) participated for course credit. During the course of the experiment, five participants dropped out (2 males and 3 females), and an additional female participant was excluded from the analyses for failure to follow instructions. The final sample included 52 participants (12 males and 40 females). Because of the small number of male participants, gender was not examined as a possible moderator.

Materials

Experimental Manipulation

Based on the results of prior research, we expected that participants' exercise behavior would be differentially affected by different types of directed thinking techniques (e.g., Labansat

et al., in press; Ten Eyck et al., 2006). Consequently, participants were randomly assigned to one of three experimental conditions.

Action strategies condition. Approximately one-third of participants were assigned to the *action strategies* condition. In each of five weekly sessions, participants were asked to generate actions they could take to increase the performance of a pre-selected target exercise. In order to help participants understand the types of ideas that would best represent action strategies, they were first asked to read an instructional passage using an unrelated example (Appendix A). The passage began: "Successful authors, who turn out one article or book after another, have written a lot about the action strategies they use." After finishing the passage, participants read four examples of action strategies for writing ostensibly provided by a successful author. The examples included: "I use various props, like index cards to organize my ideas, various color pens, and a note-book that I carry with me everywhere in case an idea strikes me," "Writing may seem like a solitary profession, but I don't think anyone ever wrote a great novel sitting in a cave, without other people to use for inspiration, advice, encouragement, and practical support," "I find that I can't write just anywhere. I'm very particular about my surroundings. I know other authors who could write in a busy bus terminal or even in the bowels of Hell, but if I had to do that, I think I'd go mad," and "In retrospect, I realize how important time is to my writing. I have to schedule my writing by making appointments with myself, and beginning at exactly the appointed time, complete each segment of the writing on time."

After reading the instructional passage and above examples, participants in the action strategies condition were asked to generate actions they could take to increase the performance of their target exercise. Next, participants read an additional set of instructions designed to help them place their ideas into categories. In these instructions, the four author-generated ideas from

the previous passage were each placed into a category as an example of how ideas might fit into the provided categories (Appendix B). The categories included: *acting on things*, *acting on people*, *acting on surroundings*, and *acting on time*. Participants in the action strategies condition were provided with these passages and examples during each of the first five weekly experimental sessions to help them remain focused and accurate while generating their ideas.

Reasons condition. Approximately one-third of participants were assigned to the *reasons* condition. In each of five weekly sessions, these participants were asked to generate motivational thoughts that would increase the performance of a pre-selected target exercise during five weekly sessions. In order to help participants understand the types of ideas that would best represent reasons, they were first asked to read an instructional passage using an unrelated example (Appendix C). The passage began: “Successful authors, who turn out one article or book after another, have written a lot about what they do to motivate themselves.” After finishing the passage, participants read four examples of reasons for writing ostensibly provided by a successful author. The examples included: "I frequently have to remind myself that starting the next book or finishing the one in progress will make me rich and famous," "I don't write entirely for the money. I really enjoy writing for its own sake. When I have trouble in writing, I stop to think that my books change many people's lives for the better," "How could I possibly stop writing? I wouldn't have any way to get out my thoughts, my fears, my conjectures, or my deepest yearnings by putting them on paper. If I didn't write, I think I'd go mad,” and "I suppose I could stop writing, but then what would I do? It's the only way I know to make a decent living. If I stop writing, my family will end up destitute."

After reading the instructional passage and above examples, participants in the reasons condition were asked to generate motivational thoughts (reasons) they could use to increase the

performance of their target exercise. Next, participants read an additional set of instructions designed to help them place their ideas into categories (Appendix D). In these instructions, the four author-generated ideas from the previous passage were each placed into a category as an example of how ideas might fit into the provided categories. The categories included: *good for me if I do it*, *good for others if I do it*, *bad for me if I don't do it*, and *bad for others if I don't do it*. Participants in the reasons condition were also provided with these passages and examples during each of the first five weekly experimental sessions to help them remain focused and accurate while generating their ideas.

Control condition. In each of five weekly sessions, participants in the control condition completed only the dependent measures. They were not asked to generate either action strategies or reasons.

Dependent Measures

Cardiovascular fitness. All participants completed the Astrand-Rhyming step test at the beginning and end of the experiment (Astrand, 1956; Astrand & Rhyming, 1954). It is a sub-maximal test designed to estimate maximal oxygen capacity (VO_2max). The test provides an indication of cardiovascular fitness level. During the test, participants engaged in bench stepping at a rate of 22.5 steps/minute for five minutes (using a Matrix MR-500 metronome), after which one trained experimenter measured their pulse rate for 15 seconds, during the time from five minutes and fifteen seconds to five minutes and thirty seconds after the bench stepping stopped. The bench height was 33 cm for females and 40 cm for males. Because estimated VO_2max provides a concrete measure of cardiovascular fitness, it was used to track changes in participants' fitness levels.

Body mass index. Body mass index is a measure of body fat based on height and weight. Prior to completing the initial step test (Week 1), all participants were weighed and their heights were measured. Prior to completing the final step test (Week 6), participants were weighed a second time. If the experimental manipulation led some participants to engage in cardiovascular exercise with greater frequency, then it was possible that there may have been changes in their body fat composition.

Time spent doing target exercise. Directed thinking about action strategies that one could take to increase the performance of a target exercise was hypothesized to increase the actual performance of that specific exercise more so than directed thinking about reasons one should engage in a target exercise, or a no-treatment control. Consequently, participants were asked to report the time spent doing their target exercise during each of five weekly sessions (Appendix E). Each week, participants reported the time spent doing their target exercise, the number of days they engaged in the exercise, how much effort they exerted during each session [using a scale from 6 (*almost none*) to 20 (*extremely hard)*] and how much they enjoyed each session [using a scale from 0 (*not at all enjoyable*) to 4 (*very enjoyable*)].

Time spent doing exercise overall. It was also possible that directed thinking about action strategies might increase the performance of exercise overall, when compared to the other two experimental conditions. Participants therefore reported all of the exercise they completed during each of five weekly sessions using the same format and scales described above (Appendix E).

Perceptions of exercise behavior. At the end of the experiment, participants completed items assessing their perceptions of how much more or less they were doing their target exercise and exercising overall now compared to before they started the study on a scale from -3 = *a lot less*, through 0 = *the* same, to +3 = *a lot more* (Appendix F).

Intentions to exercise. Prior research suggests that intentions increase the likelihood that a person will actually engage in a specific behavior (e.g., Anderson, 1983). Directed thinking about action strategies was predicted to increase behavioral intentions to exercise more readily than directed thinking about reasons or a no-treatment control. During the final weekly session, all participants completed items assessing their intentions to do their target exercise and exercise overall in the coming month using a scale from 0 = *none* to 6 = *a lot* (Appendix F).

Perceptions of health, well-being, and physical fitness. If participants' exercise increased as a result of the experimental manipulation, it is possible that they may have also reaped the additional benefits that are often associated with engagement in regular exercise (CDC, 2003; Plante, Coscarelli, & Ford, 2001; Plante, Cage, Clements, & Stover, 2006). During the final weekly session, participants completed three items assessing their perceptions of their health, well-being, and physical fitness now compared to before they started in the study using a scale from -3 = *a lot worse*, through 0 = *the same*, to +3 = *a lot better* (Appendix F).

Characteristics of the typical exerciser. Prior research indicates that different types of directed thinking might influence perceptions of the typical person who engages in the beneficial behavior (Ten Eyck et al., 2006). Consequently, the present experiment included a series of items on Likert scales from -8 to +8 (Appendix G). Each item contained a pair of bipolar adjectives pertaining to the characteristics of the "typical person who exercises a lot" (i.e., *very unlikeable – very likeable*; *very incompetent – very competent; very irresponsible – very responsible; very untrustworthy – very trustworthy; very inefficient – very efficient; very disrespected – very respected; very unpopular – very popular; very incapable – very capable*).

Satisfaction with Life scale. The Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; SWLS; Appendix H) is a five item scale designed to measure the degree to

which individuals are content with their current lives. For example, participants responded to the items: "In many ways my life is close to the ideal" and "If I could live my life over, I would change almost nothing," using a scale from 1 = *disagree strongly* to 7 = *agree strongly*. Participants completed the scale during Weeks 1 and 6, in order to determine whether increased cardiovascular fitness or exercise behavior might also improve participants' overall sense of happiness.

Possible Moderators

The present experiment included a series of individual difference measures that might moderate the effects of the experimental manipulation. These measures included: an exercise stage questionnaire (Prochaska et al., 1994), the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960), the Locus of Control Scale (Rotter, 1966), the Actor's Block Scale (Ten Eyck & Lord, 2006), the Therapeutic Reactance Scale (Dowd et al., 1991), and selected subscales from the Big Five Inventory (John et al., 1991).

Stages of change for exercise. One of the criteria for inclusion in the present experiment was a lack of engagement in regular exercise activity. During the beginning of the semester, potential participants were asked about their current level of physical activity using a staging algorithm based on prior research (Prochaska et al., 1994). All participants read a description of regular exercise and reported their current level of exercise by choosing one of five options: a) I do not intend to exercise regularly in the next 6 months, b) I intend to begin exercising regularly in the next 6 months, c) I intend to begin exercising regularly in the next 30 days, d) I have been exercising regularly for less than 6 months, or e) I have been exercising regularly for at least 6 months (Appendix I). Only participants who chose 'a,' 'b,' or 'c' were eligible for the present

experiment. Participants might have responded to the experimental manipulation differently because they were in different stages of readiness to change (Labansat et al., in press).

Marlowe-Crowne Social Desirability Scale. Participants completed the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960; Appendix X), which includes 33 true-false items such as: "I never hesitate to go out of my way to help someone in trouble," I have never intensely disliked anyone," and "I can remember 'playing sick' to get out of something

Locus of Control. Participants completed the Locus of Control Scale (Rotter, 1966; Appendix J) by choosing either 'a' or 'b' for 29 pairs of statements. For example: a) "In the case of the well-prepared student, there is rarely if ever such a thing as an unfair test" or b) "Many times, exam questions tend to be so unrelated to course work that studying is really useless." Choice 'a' in the previous example denotes a tendency toward an internal locus of control, while choice 'b' denotes a tendency toward an external locus of control.

Actor's Block Scale. Participants completed the Actor's Block Scale (Ten Eyck & Lord, 2006; Appendix K) with 17 items such as, "I put off starting projects until the last minute" (i.e., trouble starting) and "I often struggle to finish projects or assignments on time" (i.e., trouble finishing), using a scale from 0 = *not at all like me* to 9 = *very much like me*. The scale yields a separate start subscore and a finish subscore.

Because the Actor's Block scale (Ten Eyck & Lord, 2006) has not been fully developed, responses to the 17 items from an initial participant pool ($N = 432$) were subjected to a principle components analysis, which yielded two factors that accounted for 68.13% of the variance. In order to better identify the items proposed to measure the start and finish subfactors of the scale, the 17 items were then subjected to a principal components analysis with varimax rotation. Table

1 displays the rotated factor loadings for the 17 items. A mean start score was then calculated for each of the participants in the present experiment, using the ten highest loading items from the first factor, while a mean finish score was calculated using the seven highest loading items from the second factor.

Therapeutic Reactance Scale. Participants completed the 28-item Therapeutic Reactance Scale (Dowd et al., 1991; Appendix L). The scale yields verbal and behavioral reactance subscores, plus a composite therapeutic reactance score. Participants completed 28 items such as, "It really bothers me when police officers tell people what to do" (i.e., verbal reactance) and "I enjoy seeing someone else do something that neither of us is supposed to do" (i.e., behavioral reactance), using a scale from 1 = *strongly disagree* to 4 = *strongly agree*.

The Big Five Inventory. The present experiment also included selected subscales from the Big Five Inventory (John et al., 1991; BFI; Appendix M), intended to measure degree of Extraversion, Neuroticism , and Conscientiousness. Participants responded to 25 items such as, "I see myself as someone who is talkative" (i.e., Extraversion), "I see myself as someone who is relaxed, handles stress well" (i.e., Neuroticism), and "I see myself as someone who does a thorough job" (i.e., Conscientiousness), using a scale from 1 = *disagree strongly* to 7 = *agree strongly*.

Possible Mediators

The present experiment also included factors that might have mediated the effects of directed thinking on exercise behavior.

Decisional balance for target exercise. To assess decisional balance, participants first responded to five items describing some of the possible advantages of engaging in their target exercise, such as, "I would feel less stressed if I exercised regularly" (Velicer et al., 1985;

Table 1

Rotated factor loadings for Actor's Block Scale items (N =432; Experiment 1).

Item	Factor 1	Factor 2
1. I often procrastinate more than I should.	.861*	.120
2. I put off starting projects until the last minute.	.898*	.139
3. I often struggle to finish projects or assignments on time.	.474	.527**
4. I understand the importance of starting a task, but can't seem to get going.	.768*	.312
5. I can't seem to manage my time in a way that permits me to finish projects on time.	.433	.630**
6. I have no trouble finding excuses for not starting a task.	.664*	.009
7. Although I have no trouble starting projects, I can never seem to finish them.	.002	.827**
8. I will have every intention of doing something, but end up starting it late.	.862*	.145
9. I am usually behind when it comes to getting started on things.	.861*	.197
10. I can't seem to finish many of the things that I start.	.118	.856**
11. I will often look for any other task to do rather than starting on something that needs to be done.	.779*	.227
12. Poor planning prevents me from completing many of the projects that I start.	.322	.702**
13. I often wait until the last minute to begin projects.	.912*	.139
14. I am easily distracted, which often keeps me from finishing things properly.	.599*	.479
15. Even as a deadline approaches, I still wait until the last minute to begin.	.869*	.196
16. Completing projects has never been easy for me.	.175	.817**
17. I wish there was a way that I could complete more of projects that I start.	.004	.782**

Notes: * items loading on first factor included in 'start' subscale score. ** items loading on second factor included in 'finish' subscale score.

Appendix N). They then responded to five additional items describing some of the possible disadvantages of engaging in their target exercise, such as "Exercise prevents me from spending time with my friends." Each of the ten items was answered using a scale from 1 = *not at all important* to 5 = *extremely important*, during five weekly sessions.

Self-efficacy for target exercise. The six-item self-efficacy scale outlines a series of situations that might prevent a person from exercising (e.g., "I am under a lot of stress"; DiClemente et al., 1985; Velicer, Norman, Fava, & Prochaska, 1999; Appendix O). Participants reported their degree of confidence for overcoming each situation and choosing to exercise using a scale from 1 = *not at all confident* to 5 = *extremely confident*, during five weekly sessions.

Stage of change for exercise. Recall that participants were selected for inclusion in the present experiment based on their current level of exercise behavior. It was also possible that different types of directed thinking might have been more or less effective for producing changes in participants' stages of readiness to change their exercise behavior. To determine whether participants changed stages during the course of the experiment, they were asked to report their current level of exercise at the end of the experiment using the identical staging algorithm described in the prior stages of change for exercise section.

Number of ideas generated. The number of original ideas generated by each participant in the two experimental groups was tallied after the completion of the experiment to establish whether it might have influenced any of the primary outcome measures.

Impact of ideas. At the end of the experiment, participants in the two experimental groups were provided with a comprehensive list of the ideas they listed during the course of the experiment, and asked to rate how often they thought about each item, the effectiveness of each item for increasing their target exercise, and the effect that each item had on their enjoyment of

exercise on scales from 0 = *not at all* to 10 or more = *very much.* Participants also reported how often they used the idea to increase their target exercise on a scale from 0 to 10 or more (Appendix P).

Procedure

Participant Recruitment

During a study conducted at the beginning of the spring semester, undergraduate psychology students completed a series of questionnaires regarding their current health (Velicer et al., 2000; Appendix Q), exercise behavior (Prochaska et al., 1994; Appendix I), attitude toward exercising, and several individual difference measures including the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960; Appendix R), the Locus of Control Scale (Rotter, 1966; Appendix J), and the Actor's Block Scale (Ten Eyck & Lord, 2006; Appendix K). Students also indicated whether they would be willing to participate in other psychology experiments during the course of the coming semester. Those students who indicated interest in further participation, had no contraindications for engaging in physical activity, and identified themselves as non-regular exercisers were invited to participate.

Pre-Manipulation Cardiovascular Assessment

Eligible participants reported separately to a psychology laboratory wearing comfortable clothing and gym shoes. They read and signed an experimental consent form which included four additional medical screening questions (Heyward, 2002; Appendix S), after which the experimenter recorded each participant's height in inches and body weight in pounds.

Each participant then completed the Astrand-Rhyming step test (Astrand, 1956; Astrand & Rhyming, 1954) as described in the materials section. Participants were informed of their right to stop the test at any time. Further, participants who demonstrated physical or psychological

distress as a result of the bench-stepping exercise were advised by the experimenter to stop. Three participants were unable to complete the test because of physical distress.

Session 1

After reading and signing an experimental consent form (Appendix T), participants completed a series of individual difference measures including the Therapeutic Reactance Scale (Dowd et al., 1991; Appendix L), selected subscales from the Big Five Inventory (John et al., 1991; Appendix M), and the Satisfaction with Life Scale (Diener et al., 1985; Appendix H). Participants then reported their experience with six cardiovascular exercises, including brisk walking, jogging/running, swimming, bicycling, elliptical training, and group exercise (Appendix U), and reported their exercise behavior for the prior seven days (Appendix E). Next, participants were asked to rank the six exercises in order of preference, with number one being the exercise that they would be "most willing to try" were they to begin exercising regularly today (e.g., brisk walking, jogging/running, swimming, bicycling/stationary bicycling, elliptical training, group exercise; Appendix V). The exercise they were most willing to try served as their target exercise for the remainder of the experiment. Participants then completed decisional balance measures for the advantages and disadvantages of engaging in their target exercise (Velicer et al., 1985; Appendix N) and a measure of self-efficacy for resisting temptations to avoid doing their target exercise (Prochaska et al., 1994; Velicer et al., 1985; Appendix O). The control participants (n = 17) were then excused and reminded of their next appointment.

Action strategies condition. After collecting all materials, the experimenter provided participants with an additional packet. As described in the materials section, participants assigned to the *action strategies condition* (n = 18) read an instructional passage about successful authors designed to provide examples of the types of ideas they would be asked to

generate (Appendix A). Participants then generated their own action strategies for engaging in their target exercise, placed their ideas into categories (Appendix B), and then generated additional ideas for any category that did not contain at least three items. Finally, participants indicated whether each idea would help them start exercising, enjoy exercising, or finish exercising once they had started (Appendix B).

Reasons condition. As described in the materials section, participants assigned to the *reasons condition* (n = 17) also read an instructional passage about successful authors (Appendix C). Participants then generated their own thoughts (reasons) that might motivate them to engage in their target exercise, placed their ideas in categories (Appendix D), and generated additional ideas for any category that did not contain at least three items. Finally, participants indicated whether each idea would help them start exercising, enjoy exercising, or finish exercising once they had started (Appendix D).

Participants in both experimental groups were then reminded of their next appointment and excused.

Sessions 2 – 5

At one week intervals, all participants returned and completed the decisional balance and self-efficacy measures for their target exercises (DiClemente et al., 1985; Velicer et al., 1985), and then reported their exercise behavior for the prior seven days using the identical format they had in Session 1. Control participants were then excused and reminded of their next appointment.

Participants in the action strategies and reasons groups then read the same instructional passage from Session 1. The instructions for this task varied slightly, in that participants were informed that they may list ideas they recalled from Session 1, plus any new ideas that occurred to them. Participants then categorized their ideas using the same experimenter-provided

categories from Session 1, added additional ideas to their incomplete categories, and indicated whether each idea would help them start, enjoy, or finish doing their exercise.

Session 6

One week following Session 5, all participants returned and completed the decisional balance and self-efficacy measures for their target exercise (DiClemente et al., 1985; Velicer et al., 1985) and reported their exercise behavior for the prior seven days. Participants then completed selected subscales from the Big Five Inventory (John et al., 1991) and the Satisfaction with Life Scale (Diener et al., 1985). Next, they answered a series of items pertaining to the characteristics of the "typical person who exercises a lot" (Ten Eyck et al., 2006).

As described in the materials section, participants in the two experimental groups were then provided with a comprehensive list of the ideas they listed during the course of the experiment, and asked to rate each idea on a number of aspects (Appendices P & Q).

All participants reported their current level of exercise by using the staging algorithm described previously (Appendix I), and then completed items assessing their perceptions of exercise, intentions to exercise and perceptions of their health, well-being, and physical fitness (Appendix F). Participants were then reminded of their final individual appointment and excused.

Post-Manipulation Cardiovascular Assessment

Within one week of completing Session 6, each participant returned to a psychology lab and completed the Astrand-Rhyming step test again (Astrand, 1956; Astrand & Rhyming, 1954). Three participants were unable to complete the step test because of physical distress. The experimenters recorded participants' body weights in pounds, provided them with feedback

regarding their cardiovascular fitness and body mass index (Appendix W), debriefed them, and thanked them for their participation.

Results

Experiment 1 was designed to determine whether directing participants to think about action strategies they might use to increase the performance of their target exercise is more effective for increasing exercise behavior and cardiovascular fitness than directing participants to think about reasons for engaging in their target exercise, and how each type of directed thinking compared to a no-treatment control. Participants completed six weekly group sessions, plus an individual pre- and post-manipulation assessment of their cardiovascular fitness.

Types of Ideas Generated

Table 2 shows the 10 most frequently generated action strategies and the 10 most frequently generated reasons, along with how often each item was thought about, used, and how effective participants thought it was for increasing target exercise behavior and enjoyment. Each type of action strategy and reason represents a variety of wording that was judged to have similar meaning. “Make a schedule,” for example, includes ideas such as “write times to exercise in my planner” and “schedule time each day to exercise.” “Reduce stress” includes ideas such as “exercise is a good outlet for stress” and “exercise is relaxing.”

Cardiovascular Fitness

One of the most important goals of the present experiment was to improve participants’ cardiovascular fitness level, which was measured by estimating absolute VO_2max and relative VO_2max.

Table 2

Mean ratings of thought frequency, use frequency, and effectiveness for increasing and enjoying exercise for participants in Experiment 1.

	Frequency	Think	Use	Increase	Enjoy
Actions					
Music/Books/TV	68	7.64	5.92	5.36	6.28
Make a schedule	58	4.66	2.91	3.50	2.75
Exercise with others	54	5.36	4.00	4.45	5.45
Make exercise interesting	53	6.91	5.18	5.91	7.41
Use others for encouragement	33	3.86	1.86	2.58	2.42
Set goals	29	7.00	5.67	5.33	3.67
Make a commitment	27	6.50	3.33	4.83	3.50
Exercise in proper environment	19	5.50	3.75	3.00	3.50
Set self up for success	18	3.00	2.25	2.50	1.50
Have a contingency plan	10	2.50	1.00	2.00	2.50
Reasons					
Role model for others	33	3.30	3.12	3.24	2.87
Reduce stress	27	8.29	7.14	5.57	3.14
Enjoyment	24	7.00	5.50	5.00	6.60
Improved Mood	24	6.17	1.33	2.50	2.00
Physical cost to others	24	4.00	3.00	3.60	2.40
Psychological cost to others	20	4.00	3.17	2.83	1.17
Psychological cost to self	19	8.20	4.80	3.00	2.60
Weight loss	19	7.24	6.00	2.74	3.00
Physical cost to self	18	8.20	6.20	6.40	4.00
Improved fitness	17	6.60	4.40	2.40	3.20

Estimated Absolute VO_2max

Participants' estimated absolute VO_2max was calculated using an equation (Females: VO_2max ($L \cdot min^{-1}$) = 3.750[(Body weight in kg – 3)/(60 s heart rate– 65)]; Males: VO_2max ($L \cdot min^{-1}$) = 3.744[(Body weight in kg + 5)/(60 s heart rate – 62)]; Marley & Linnerud, 1976). Table 3 summarizes the results for analyses of aerobic fitness as measured by estimated absolute VO_2max. Following a presentation scheme that will be used for all dependent measures, the left side of the table shows significant and marginally significant results from 3 (Condition: Action Strategies, Reasons, Control) X 2 (Time: Pre-Manipulation, Post-Manipulation) mixed model analyses of variance (ANOVAs) of estimated absolute VO_2max, whereas the right side of the table shows significant and marginally significant results from analyses of covariance (ANCOVAs) of post-manipulation scores, using pre-manipulation scores as the covariate. The first row of the table shows results for the main analyses, with no moderator variables included. The subsequent rows of the table show analyses that added each potential moderator variable to the main analyses.

Table 4 shows the means from the Condition X Time ANOVA that was summarized on the first row of Table 3. As the table shows, there was a marginally significant main effect of time, $F(2, 44) = 2.84$, $p = .099$. Participants showed a slight increase in estimated VO_2max from Time 1 ($M = 2.85$, $SD = .80$) to Time 2 ($M = 3.03$, $SD = .79$). Type of directed thinking (action strategies, reasons, control) did not have any significant effect on participants estimated absolute VO_2max from Time 1 to Time 2. The ANCOVA results were similar to those for the ANOVA.

Moderators of absolute VO_2max. Next, consider the rows of Table 3 that show the results when one moderator variable at a time was added to the main analyses. Initial stage was determined from the exercise staging algorithm completed by participants during the initial screening session, as described in the materials section (Prochaska et al., 1994). Of all

Table 3

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for cardiovascular fitness (absolute VO_2max), with and without the addition of potential moderators (M) for Experiment 1.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis		*	---		---	---	---	---	---	
W/ Mod's										
Initial Stage		*								
Initial $Level_{target}$										
MCSD										
LOC		*								
ABSS		**								**
ABSF		*								
TRS		*								
$BFI_{extraversion}$		**				**			**	
$BFI_{neuroticism}$						**			**	
$BFI_{conscientiousness}$		*								

Note: * $p < .10$, ** $p \leq .05$

Table 4

Mean estimated absolute VO_2max pre- and post-manipulation by type of directed thinking for participants in Experiment 1.

	Actions (n = 17)	Reasons (n = 14)	Control (n = 16)
Time 1	3.05 (.86)	2.69 (.80)	2.77 (.72)
Time 2	3.26 (.87)	2.67 (.75)	3.08 (.68)
Change	+.21 (.76)	-.02 (.54)	+.31 (.63)

Note: Standard deviations in parentheses.

participants, seven reported being in the precontemplation stage, 21 reported being in the contemplation stage, and 28 reported being in the preparation stage. The control group contained only one participant who reported being in the precontemplation stage, and the remaining six were equally divided among the other two conditions. Because of the small number of precontemplators (n = 7), they were combined with the participants who reported being in the contemplation stage (n = 21). The combined groups were categorized as *early stage exercisers* (n = 28) and the remaining participants were categorized as *mid-stage exercisers* (n = 24). When this moderator factor, with two levels, was added to the main ANOVA or the ANCOVA, as shown in the "Initial Stage" row of Table 3, the main effect of time remained marginally significant, but no other significant effects were revealed.

Initial Level of target exercise was decided by examining reports of target exercise at Weeks 1 and 2. The range of reported target exercise at Week 1, before the experimental manipulation began, was large (0 – 150 minutes). Thirty-seven of fifty-two participants reported

doing zero minutes of their target exercise during Week 1. It should be noted, however, that Week 1 occurred during a university scheduled spring break and therefore did not likely reflect normal exercise behavior. The range of reported exercise during Week 2 was also large (0 – 120 minutes), however Week 2 exercise occurred during regularly scheduled classes. Consequently, Week 2 exercise reports were used as a baseline. Thirty-two of fifty-two participants reported doing zero minutes of their target exercise during Week 2. Participants were divided into two groups based on a median split of how often they reported engaging in their target exercise at Week 2. Participants who reported doing none of their target exercise during Week 2 were categorized as *low target exercisers* ($n = 32$), while participants who reported doing any amount of their target exercise during Week 2 were categorized as *high target exercisers* ($M = 53.40$, $SD = 29.07$, $n = 20$). When this moderator factor, with two levels, was added to the main ANOVA, or ANCOVA, as shown in the "Initial Level" row of Table 3, there were no significant effects.

Marlowe-Crowne Social Desirability scores were divided at the median for this sample (Crowne & Marlowe, 1960). Of all participants, 21 were categorized as *low in social desirability* (MCSD score < 14; $M = 9.91$, $SD = 1.89$), while 30 participants were categorized as *high in social desirability* (MCSD ≥14; $M = 17.27$, $SD = 3.23$). When this moderator factor, with two levels, was added to the main ANOVA or ANCOVA, as shown in the "MCSD" row of Table 3, there were no significant effects.

Locus of Control scores were divided at the median for this sample (Rotter, 1966). Of all participants, 28 were categorized as having an *internal locus of control* (LOC < 13; $M = 9.93$, $SD = 2.25$), while 24 were categorized as having an *external locus of control* (LOC ≥ 13; $M = 15.55$, $SD = 2.55$). When this two-level moderator factor was added to the main ANOVA or ANCOVA,

as shown in the "LOC" row of Table 3, the main effect of time remained marginally significant, but there were no other significant effects

Participants' Actor's Block Scale Start scores were also divided based on median split (Ten Eyck & Lord, 2006). Of all participants, 26 found it relatively easy to get started on projects and were categorized as *easy starters* (ABSS < 6.4; $M = 4.14$, $SD = 1.79$), while 28 found it relatively difficult to get started on projects and were categorized as *hard starters* (ABSS ≥ 6.5; $M = 7.25$, $SD = .55$). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "ABSS" row of Table 3, there was only a significant main effect of time, $F(1, 41) = 4.38$, $p = .05$. When the Actor's Block Scale start factor was added to the ANCOVA, however, it produced a significant type of directed thinking X Actor's Block Scale Start category interaction, $F(2, 40) = 4.66$, $p < .05$, which is shown in Table 5. When controlling for Time 1 scores, easy starters displayed better cardiovascular fitness in the control group but that trend was reversed in the two experimental groups.

Participants' Actor's Block Scale Finish scores were divided based on a median split (Ten Eyck & Lord, 2006). Of all participants, 28 found it relatively easy to finish projects and were categorized as *easy finishers* (ABSF < .2.86; $M = 1.68$, $SD = .83$). Twenty-four participants found it relatively difficult to finish projects and were categorized as *difficult finishers* (ABSF ≥ 2.86; $M = 4.5$, $SD = 1.11$). When the Actor's Block Scale Finish factor, with two levels, was added to the main ANOVA or ANCOVA, as shown in the "ABSF" row of Table 3, time remained marginally significant, but no other significant effects were found.

Therapeutic Reactance Scale composite scores were divided at their median for this sample (Dowd et al., 1991). Of all participants, 26 were categorized as *low in therapeutic reactance* (TRS < 68; $M = 62.31$, $SD = 3.64$) and 26 were categorized as *high in therapeutic*

reactance (TRS ≥ 68; $M = 73.66$, $SD = 5.34$). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "TRS" row of Table 3, it produced the same marginally significant main effect of time, but there were no other significant effects.

Table 5

Mean estimated absolute VO_2max at Time 2 by type of directed thinking and actor's block scale start category for participants in Experiment 1.

	Type of Directed Thinking		
	Actions	Reasons	Control
Actor's Block Start Category			
Easy Starter	2.99	2.40	3.55
	(.64)	(.28)	(.66)
	$n = 10$	$n = 8$	$n = 6$
Hard Starter	3.65	3.03	2.80
	(1.05)	(1.05)	(.54)
	$n = 7$	$n = 6$	$n = 10$

Note: Standard deviations in parentheses.

The Big Five Inventory Extraversion subscale scores were divided at their median for this sample (John et al., 1991). Of all participants, 24 were categorized as *low in extraversion* ($BFI_{extraverion} < 4.2$; $M = 3.32$, $SD = .60$), while 28 participants were categorized as *high in extraversion* ($BFI_{extraversion} \geq 4.2$; $M = 5.03$, $SD = .64$). When this two-level moderator factor was added to the original ANOVA, as shown in the "$BFI_{extraversion}$" row of Table 3, it produced a significant main effect of time, $F(1, 41) = 4.14$, $p < .05$. Additionally, it produced a significant

time X extraversion category interaction, $F(1, 41) = 5.76$, $p < .05$. Participants categorized as low in extraversion demonstrated a small increase in estimated absolute VO_2max from Time 1 to Time 2 ($M_{change} = .43$, $SD = .53$, $n = 21$), while participants categorized as high in extraversion demonstrated a negligible decrease in estimated absolute VO_2max from Time 1 to Time 2 ($M_{change} = -.04$, SD = .68, $n = 26$). No other significant effects were revealed. When this moderator factor was added to the ANCOVA, it produced the same significant main effect of extraversion category, $F(1, 40) = 5.02$, $p < .05$; however, there were no other significant effects.

Participants were divided into two categories based on a median split of their Big Five Inventory Neuroticism subscale scores (John et al., 1991). Of all participants, 28 were categorized as *low in neuroticism* ($M = 4.65$, $SD = .47$), while 24 were categorized as *high in neuroticism* ($M = 5.93$, $SD = .50$). When this moderator factor, with two levels, was added to the ANOVA, as shown in the $BFI_{neuroticism}$ row of Table 3, it produced a significant time X neuroticism category interaction, $F(1, 41) = 6.89$, $p < .05$. Participants initially categorized as low in neuroticism showed a small increase in estimated absolute VO_2max from Time1 to Time 2 ($M_{change} = .39$, $SD = .61$, $n = 25$); but participants initially categorized as high in neuroticism showed a slight decrease in estimated absolute VO_2max from Time 1 to Time 2 ($M_{change} = -.09$, $SD = .62$, $n = 22$). The ANOVA did not produce any other significant effects. When this factor, with two levels, was added to the ANCOVA, it produced a main effect of neuroticism category, $F(1, 40) = 6.77$, $p < .05$; however there were no other significant effects. Regardless of whether participants generated action strategies or reasons, it appears that initial level of neuroticism did affect their cardiovascular fitness level.

Big Five Inventory Conscientiousness subscale scores were divided at their median for this sample (John et al., 1991). Of all participants, 25 were categorized as *low in*

conscientiousness ($BFI_{conscientiousness} < 4.60$; $M = 3.95$, $SD = .39$), and 27 participants were categorized as *high in conscientiousness* ($BFI_{conscientiousness} \geq 4.60$; $M = 5.17$, $SD = .48$). When this moderator factor, with two levels, was added to the ANOVA or ANCOVA, as shown in the "$BFI_{conscientiousness}$" row of Table 3, it produced a marginally significant main effect of time, but no other significant effects were found.

Estimated Relative VO_2max

In addition to using estimated absolute VO_2max as an indicator of cardiovascular fitness level, we analyzed participants' estimated relative VO_2max, which adjusts for individual body weight in kilograms {relative VO_2max = [(absolute VO_2max)(1000)/ body weight in kg)]}. Table 6 summarizes the results for estimated relative VO_2max. Table 7 shows the means from mixed-model time X condition ANOVA that are summarized on the first row of Table 6. As the table shows, there was a marginally significant main effect of time, $F(1, 44) = 2.86$, $p = .098$. Participants ($n = 47$) showed a slight increase in their estimated relative VO_2max from Time 1 ($M = 45.17$, SD = 10.66) to Time 2 ($M = 47.73$, $SD = 9.23$). Type of directed thinking, however, did not have any significant effect on participants' estimated relative VO_2max from Time 1 to Time 2.

An additional one-way ANCOVA was conducted, controlling for estimated relative VO_2max at Time 1, using estimated relative VO_2max at Time 2 as the dependent variable and type of directed thinking as the independent variable. The effect of condition proved significant, $F(2, 43) = 3.26$, $p < .05$. As shown in the "Time 2" row of Table 7, participants in the control condition had a higher estimated relative VO_2max at Time 2 ($M = 51.32$, $SD = 8.47$) than did participants who generated reasons for five weeks ($M = 42.88$, $SD = 8.64$) or participants who

Table 6

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for cardiovascular fitness (estimated relative VO_2max), with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis		*	---		---	---	---	**	---	---
W/ Mod's										
Initial Stage		*						*		
Initial $Level_{target}$								**		
MCSD										
LOC		*						*		
ABSS		*						**		
ABSF								*		
TRS								*		
$BFI_{extraversion}$		*		**						
$BFI_{neuroticism}$				**						
$BFI_{conscientiousness}$		*						*		

Note: * $p < .10$, ** $p \leq .05$

generated action strategies for five weeks (M = 48.35, SD = 9.11). There were no other significant effects.

Table 7

Mean estimated relative VO_2max pre- and post-manipulation by type of directed thinking task for participants in Experiment 1.

	Actions (n = 17)	Reasons (n = 14)	Control (n = 16)
Time 1	45.53 (8.98)	43.27 (11.51)	46.44 (11.93)
Time 2	48.35 (9.11)	42.88 (8.64)	51.32 (8.47)
Change	+2.82 (10.80)	-.39 (8.93)	+4.87 (9.53)

Note: Standard deviations in parentheses.

Moderators of relative VO_2max. Next, consider the rows of Table 6 that show the results when one moderator variable at a time was added to the main analyses. Initial Stage (Prochaska et al., 1994), Initial Level, Marlowe-Crowne Social Desirability (Crowne & Marlowe, 1960), Locus of Control (Rotter, 1966), Actor's Block Scale Start (Ten Eyck & Lord, 2006), Actor's Block Scale Finish (Ten Eyck & Lord, 2006), and Therapeutic Reactance (Dowd et al., 1991) added nothing to the basic results.

When the Big Five Inventory Extraversion subscale category was added to the ANOVA as a two-level moderator factor, as shown in the "$BFI_{extraversion}$" row of Table 6, a marginally significant main effect of time was revealed, $F(1, 41) = 3.89$, $p = .055$ (John et al., 1991). In addition, there was a significant time X extraversion category interaction, $F(1, 41) = 4.29$, $p < .05$, where participants classified as low in extraversion increased their estimated relative

VO_2max from Time 1 to Time 2 (M_{change} = 6.15, SD = 7.65, n = 21), while those classified as high in extraversion did not (M_{change} = -.32, SD = 10.62, n = 26). There were no other significant effects.

Next, Big Five Inventory Neuroticism category was added to the ANOVA and ANCOVA, which is shown in the "$BFI_{neuroticism}$" row of Table 6 (John et al., 1991). As the table shows, this two-level moderator produced a significant time X neuroticism category interaction, $F(1, 41) = 5.93$, $p < .05$. Participants initially categorized as low in neuroticism increased their estimated relative VO_2max from Time 1 to Time 2 (M_{change} = +5.74, SD = 9.16, n = 25); but participants initially categorized as high in neuroticism did not (M_{change} = -.11, SD = 9.56, n = 22).

When the Big Five Inventory Conscientiousness subscale category was added to the ANOVA or ANCOVA, no interesting results emerged beyond those from the main analyses (John et al., 1991).

Summary of Results for Cardiovascular Fitness

Looking back at Tables 4 and 7, it is apparent that the directed thinking manipulation did not have the intended effect on cardiovascular fitness, whether measured by absolute or relative VO_2max. If anything, the control group fared best. The only achievement from generating action strategies lay in being better able to keep pace with the control group than did participants who generated reasons why they should exercise. In addition, the only hint of moderation was found in Table 5, where generating actions seemed to work somewhat better for participants who usually found it hard to get started on projects.

Body Mass Index

The present experiment was designed to increase the performance of exercise behavior and improve cardiovascular fitness levels, which might in turn influence participants' body weights and body composition. Body mass index provides an estimate of body fat based height and weight, with lower values indicating lower levels of body fat. Body mass index (BMI) was calculated using the following formula: BMI = 703[weight in pounds/(height in inches X height in inches)]. Table 8 summarizes the results for the analyses of BMI.

Table 9 shows the means from a time X condition mixed model ANOVA that were summarized on the first row of Table 8. As the table shows, there were no significant effects. An ANCOVA of post-manipulation (Week 1) BMI, using pre-manipulation (Week 6) BMI as a covariate, and type of directed thinking as the independent variable also yielded no significant effects.

Moderators of body mass index. As shown in Table 8, the only interesting result from analyses of moderator variables involved Locus of Control (Rotter, 1966).

When Locus of Control category, as a moderator factor with two levels, was added to the ANOVA, as shown in the "LOC" row of Table 8, the ANOVA yielded a significant time X locus of control category interaction, $F(1, 43) = 4.64$, $p < .05$ (Rotter, 1966). Participants categorized as having an internal locus of control showed a small increase in body mass index from Week 1 to Week 6 ($M_{change} = +.15$, $SD = .41$), while participants categorized as having an external locus of control showed a small decrease in body mass index from Week 1 to Week 6 ($M_{change} = -.14$, $SD = .51$). The ANOVA did not yield any other significant effects. When this moderator factor, with two levels, was added to the ANCOVA, it produced a significant main effect of locus of control category, $F(1, 42) = 5.91$, $p < .05$. At Week 6, participants with an internal locus of

Table 8

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for body mass index (BMI) with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis			---		---	---	---		---	---
W/ Mod's										
Initial Stage										
Initial $Level_{target}$										
MCSD			*							
LOC						**			**	
ABSS										
ABSF										
TRS										
$BFI_{extraversion}$										
$BFI_{neuroticism}$										
$BFI_{conscientiousness}$										

Note: * $p < .10$, ** $p \leq .05$

control had a slightly lower body mass index (M = 22.15, SD = 5.09) than did participants with an external locus of control (M = 23.20, SD = 3.45). The ANCOVA did not yield any other significant effects.

Table 9

Mean body mass index at Weeks 1 and 6 by type of directed thinking for participants in Experiment 1.

	Actions (n = 18)	Reasons (n = 16)	Control (n = 15)
Week 1	22.87 (3.62)	23.40 (5.94)	21.51 (2.58)
Week 6	22.96 (3.55)	23.43 (6.22)	21.44 (2.63)
Change	+.09 (.45)	+.02 (.57)	-.08 (.41)

Note: Standard deviations in parentheses.

Self-Report Exercise Behaviors

Selection of Target Exercise

During Session 1, all participants selected a target exercise from a list of six cardiovascular activities. Participants chose one of the following: brisk walking (1 male and 6 females), running (5 males and 5 females), bicycling (2 males and 5 females), swimming (2 males and 4 females), elliptical training (11 females), or group exercise (2 males and 9 females).

Experience with Target Exercise

To rule out any differences in the performance of target exercise between groups that might exist prior to the experimental manipulation, participants were asked to report their experience with their target exercise at the beginning of Week (session) 1. Participants' responses to the items: "To what extent have you engaged in _____as a form of exercise *in*

the past?", "To what extent have you been doing _____ as a form of exercise *recently*?", "*On average,* how many times per week do you _____?", and "How much experience do you have with _____ as a form of exercise?" were subjected to one-way ANOVAs. Type of directed thinking served as the independent variable and participants' responses to each item served as the dependent variables. The analyses were non-significant (Fs < 1.6).

Performance of Target Exercise

One of the most practical goals of the present experiment was to increase the performance of exercise. The total minutes participants spent engaging in their target exercise each week was determined by examining self-reports of exercise. Table 10 summarizes the results for the analyses of target exercise performance. A square root transformation was used to reduce the variance, and the analyses to be reported were performed on the square roots. Means will be reported, however, in actual minutes spent exercising. Figure 1 shows the mean reported minutes spent doing the target exercise in each of the six weeks for participants in the three conditions. The figure suggests that by the end of the experiment (Week 6), the manipulation had produced differences among the groups, with the actions group spending the most time on their target exercise and the control group the least time.

Were these differences across time significant? Table 11 shows the means from the time X condition mixed-model ANOVA that was summarized on the first row of Table 10. As the table shows, there were no significant effects. An ANCOVA of Week 6 reports of target exercise, using Week 2 reports of target exercise as a covariate, and condition as the independent variable was also non-significant, even though participants in the action strategies condition reported exercising most in Week 6.

Table10

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for performance of target exercise with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis			---		---	---	---		---	---
W/ Mod's										
Initial Stage										
Initial $Level_{target}$						***	*			*
MCSD										
LOC									**	
ABSS			*							
ABSF										
TRS										
$BFI_{extraversion}$										
$BFI_{neuroticism}$										
$BFI_{conscientiousness}$										

Note: * $p < .10$, ** $p \leq .05$, *** $p < .01$

Table 11

Mean self-report target exercise behavior at Weeks 2 and 6 by type of directed thinking for participants in Experiment 1.

	Actions (n = 18)	Reasons (n = 17)	Control (n = 17)
Week 2	21.94 (31.39)	25.88 (40.74)	13.71 (20.17)
Week 6	26.67 (42.81)	18.29 (32.41)	11.17 (20.63)
Change	+4.72 (24.58)	-7.58 (39.37)	-2.52 (21.89)

Note: Standard deviations in parentheses.

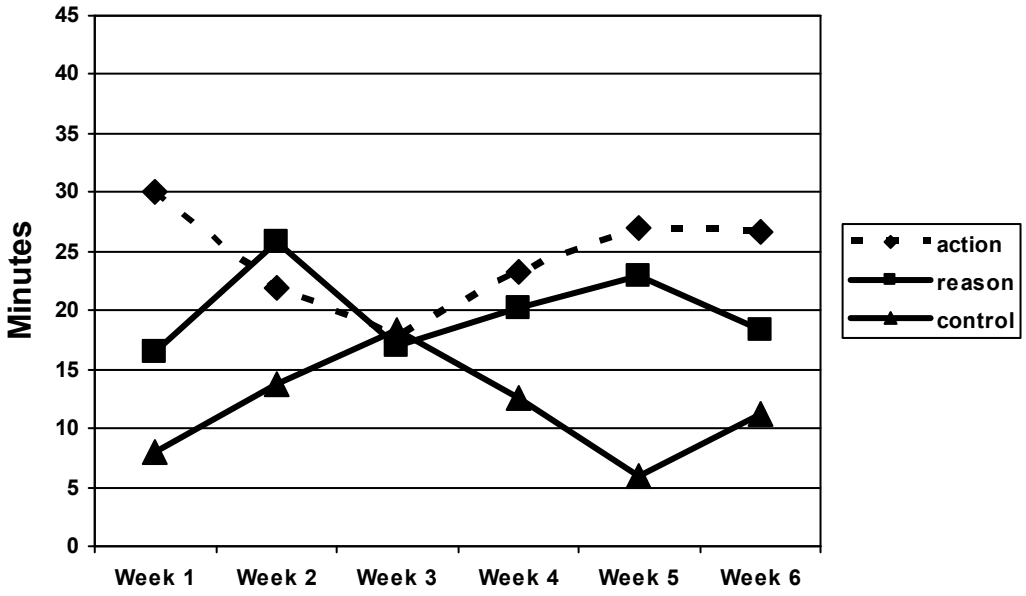


Figure 1. Mean time spent doing target exercise by type of directed thinking task for Weeks 1 through 6 for participants in Experiment 1.

Note: Week 1 exercise occurred during spring break.

Moderators of target exercise. Next, consider the rows of Table 10 that show the results when one moderator variable at a time was added to the main analyses. Only initial level of exercise yielded any interesting results.

When initial level of target exercise was added to the ANOVA as a potential moderator, as the "Initial Level" row of Table 10 shows, the analysis revealed a significant time X initial level interaction, $F(1, 46) = 14.71$, $p < .001$. Interestingly, participants who were categorized as high exercisers at the beginning of the experiment showed a decrease in the reported performance of their target exercise from Week 2 to Week 6 ($M_{change} = -15.00$, $SD = 39.00$), while participants categorized as low exercisers showed a small increase in the reported performance of their target exercise from Week 2 to Week 6 ($M_{change} = +6.65$, $SD = 17.41$). The analysis also produced a marginally significant time X initial level X condition interaction, $F(2, 46) = 2.50$, $p = .093$. For participants categorized as low exercisers, condition did not have differential effects on change in performance of target exercise from Week 2 to Week 6 (action strategies: $M_{change} = +2.72$, $SD = 9.04$; reasons: $M_{change} = +10.50$, $SD = 22.17$; control: $M_{change} = +7.10$, $SD = 19.59$). For participants categorized as high exercisers, however, generating action strategies proved marginally more effective for maintaining the performance of target exercise from Week 2 to Week 6 ($M_{change} = +7.85$, $SD = 39.46$) than did generating reasons ($M_{change} = -33.43$, $SD = 45.51$) or a no-treatment control ($M_{change} = -20.17$, $SD = 13.72$). These results suggest that directed thinking about action strategies was more effective for maintaining exercise behavior when participants were already engaging in their target exercise. When initial level of target exercise was added to the ANCOVA, which controlled for Week 2 exercise, it produced a marginally significant condition X initial level interaction, $F(2, 45) = 2.63$, $p = .083$. For participants classified as high exercisers, generating actions for doing their target exercise led to

a greater number of minutes spent reported doing their target exercise at Week 6 (*M* = 64.29, *SD* = 48.51) than participants who generated reasons for doing their target exercise (*M* = 29.43, *SD* = 42.62) or participants in the control condition (*M* = 18.67, *SD* = 22.15). For participants classified as low exercisers, however, the pattern of means was different. Generating action strategies for doing their target exercise was no more effective (*M* = 2.72, *SD* = 9.04) than either generating reasons (*M* = 10.50, *SD* = 22.17) or a no-treatment control (*M* = 7.09, *SD* = 19.59). In order to further clarify these differences, graphs of time spent exercising by low and high target exercisers are shown separately in Figures 2 and 3. There were no other significant effects.

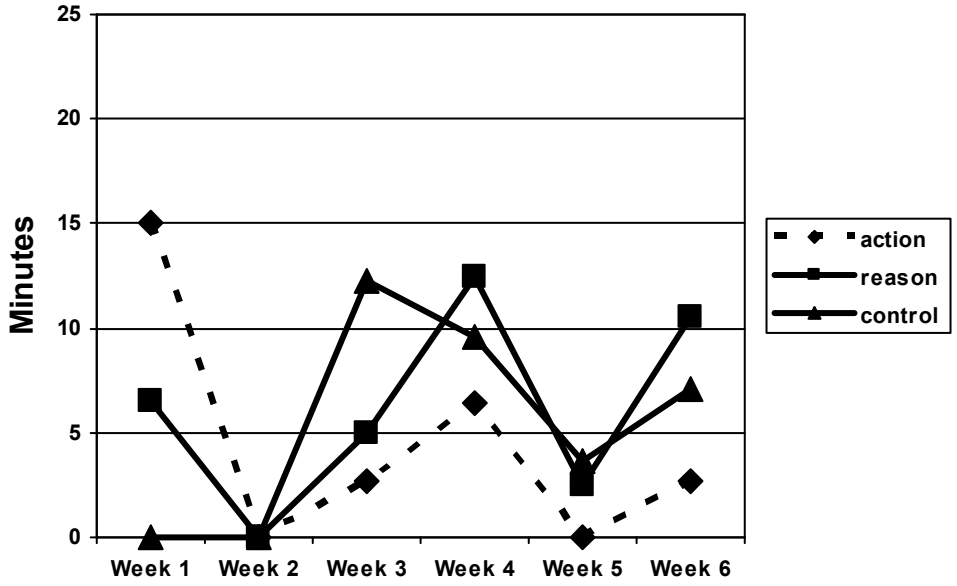


Figure 2. Mean time spent doing target exercise by type of directed thinking for Weeks 1 through 6 for participants classified as low exercisers in Experiment 1

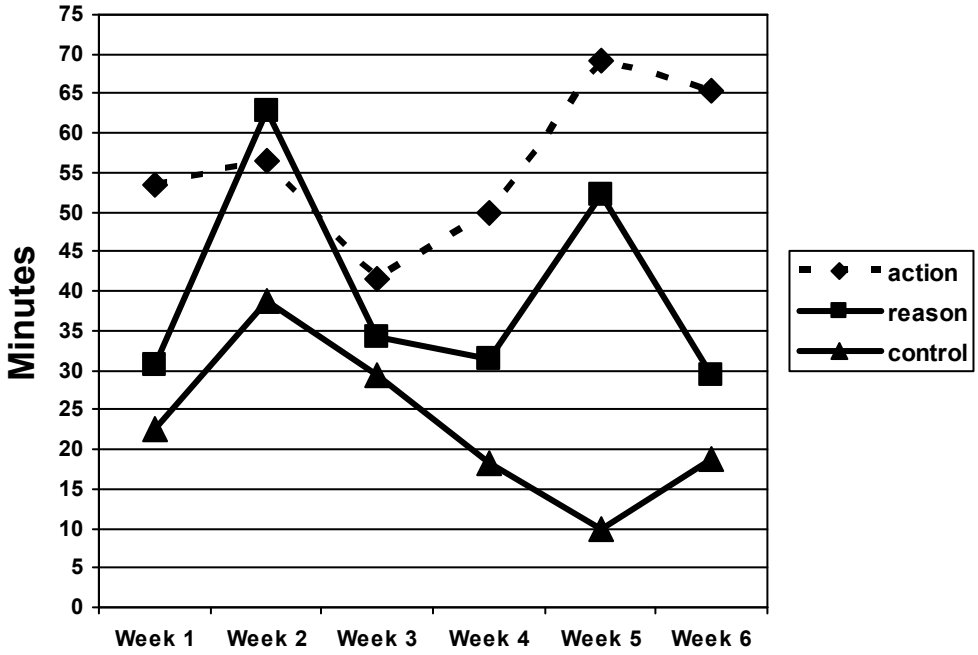


Figure 3. Mean time spent doing target exercise by type of directed thinking for Weeks 1 through 6 for participants classified as high exercisers in Experiment 1.

Overall Performance of Exercise

It was also important to assess whether the experimental manipulation affected overall exercise performance. The total minutes participants spent engaging in all exercise each week was also determined by examining self-reports of exercise. The range of reported overall exercise at Week 2, which provided the baseline for overall exercise analyses, was large (0 – 290 minutes). A square root transformation was used to reduce the variance, and the analyses to be reported were performed on the square roots. Means will be reported in actual minutes spent exercising. Figure 4 shows the mean reported minutes spent doing all types of exercise in each of the six weeks for participants in the three conditions.

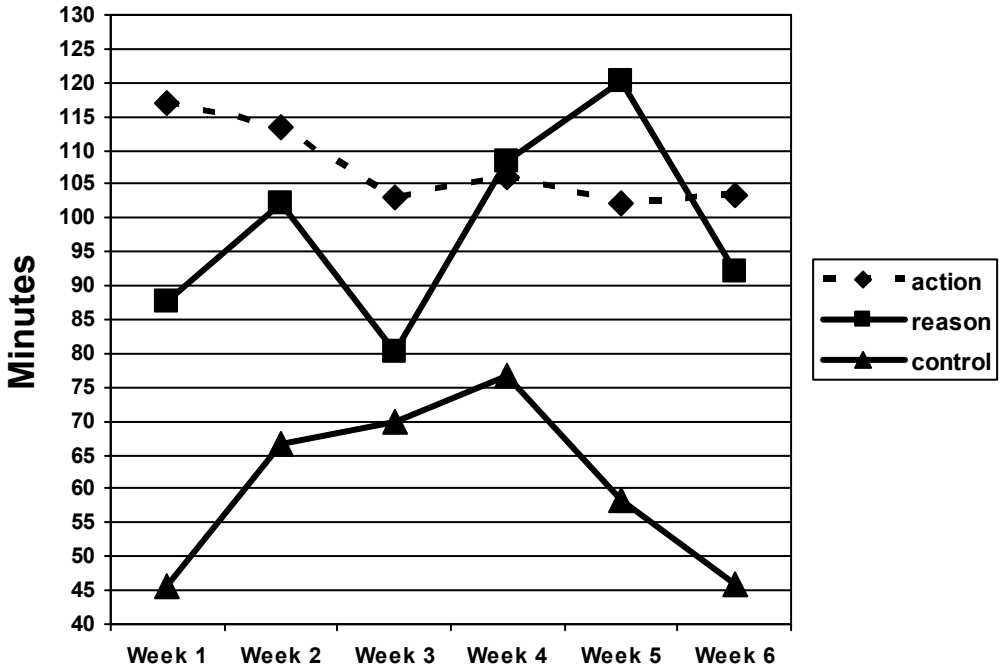


Figure 4. Mean time spent exercising overall for Weeks 1 through 6 by type of directed thinking task for participants in Experiment 1.

Table 12 summarizes the results for the analyses of overall exercise. Table 13 shows the means from a time X condition mixed-model ANOVA that was summarized in the first row of Table 12. The analysis yielded a significant main effect of time, $F(1, 49) = 5.586$, $p < .05$. Participants decreased their total time spent exercising from Week 2 ($M = 94.39$, $SD = 74.12$) to Week 6 ($M = 80.91$, $SD = 77.33$). The analysis did not yield any additional significant effects. An ANCOVA of Week 6 reports of total exercise, using Week 2 reports as a covariate and condition as the independent variable, was non-significant.

Moderators of overall exercise behavior. Next, consider the rows of Table 12 that show the results when one moderator variable at a time was added to the main analyses. Initial stage was added to the original ANOVA, as shown in the "Initial Stage" row of Table 12, as a

moderator factor with two levels (Prochaska et al., 1994). Initial stage yielded no addition findings beyond the basic analyses.

Initial level of overall exercise was determined by dividing participants into two groups based on a median split of how often they reported engaging in exercise overall at Week 2. Of all participants, 26 were categorized as *low overall exercisers* (Initial $Level_{overall} < 85$, $M = 34.53$, $SD = 26.62$), and 26 participants were categorized as *high overall exercisers* (Initial $Level_{overall} \geq 85$, $M = 154.24$, $SD = 55.23$). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "Initial $Level_{overall}$" row of Table 12, the main effect of time remained significant, $F(1, 46) = 5.98$, $p < .05$. The analysis also revealed a significant time X initial level interaction, $F(1, 46) = 6.35$, $p < .05$. Specifically, participants who were categorized as high overall exercisers reported a decrease in overall exercise behavior from Week 2 to Week 6 ($M_{change} = -31.50$, $SD = 62.13$), while participants who were categorized as low overall exercisers reported almost no change in overall exercise behavior from Week 2 to Week 6 ($M_{change} = +4.53$, $SD = 33.23$). The analysis did not reveal any additional significant effects. When this two-level factor was added to the ANCOVA, there were no significant effects. The results suggest that although initial level of overall exercise influenced the performance of exercise from Week 2 to Week 6, condition did not. Further, initial level and condition did not interact significantly to affect the performance of exercise overall.

Table 12

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for overall performance of exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis		**	---		---	---	---		---	---
W/ Mod's										
Initial Stage		**								
Initial $Level_{overall}$		**				**				
MCSD		***				*		*	*	
LOC		**				*			*	
ABSS		*								
ABSF		**								
TRS		**			*					
$BFI_{extraversion}$		**								
$BFI_{neuroticism}$		**								*
$BFI_{conscientiousness}$		**			*	**	*		**	*

Note: * $p < .10$, ** $p \leq .05$, *** $p < .01$

Table 13

Mean self-report overall exercise behavior at Weeks 2 and 6 by type of directed thinking for participants in Experiment 1.

	Actions (n = 18)	Reasons (n = 17)	Control (n = 17)
Week 2	113.33 (87.16)	102.06 (71.74)	66.64 (54.89)
Week 6	103.28 (81.54)	92.12 (84.42)	46.00 (53.67)
Change	-10.05 (62.54)	-9.94 (48.57)	-20.64 (47.07)

Note: Standard deviations in parentheses.

Marlowe-Crowne Social Desirability category was added to the ANOVA as a moderator factor with two levels, as shown in the "MCSD" row of Table 12 (Crowne & Marlowe, 1960). As the table shows, the main effect of time remained significant, $F(1, 45) = 8.80$, $p < .01$. There was also a marginally significant time X social desirability category interaction, $F(1, 45) = 3.65$, $p = .063$. Participants initially categorized as low in social desirability reported a greater decrease in overall exercise behavior from Week 2 to Week 6 ($M_{change} = -18.77$, $SD = 58.08$) than did participants initially categorized as high in social desirability ($M_{change} = -10.23$, $SD = 49.97$); however, the analyses did not reveal any other significant effects. When this factor was added to the ANCOVA, it produced a marginally significant main effect of condition, $F(2, 44) = 2.65$, $p = .082$. Generating either reasons or action strategies resulted in marginally higher reports of overall exercise behavior at Week 6 ($M = 92.12$, $SD = 84.42$ & $M = 103.28$, $SD = 81.54$, respectively) than did a no-treatment control ($M = 43.25$, $SD = 54.17$). Additionally, there was a

marginally significant main effect of social desirability category, $F(1, 44) = 3.22$, $p = .079$, in which participants initially categorized as low in social desirability reported doing more exercise overall at Week 6 ($M = 88.29$, $SD = 97.57$) than did participants initially categorized as high in social desirability ($M = 75.43$, $SD = 62.29$). Although it appears that condition and social desirability category may have individually affected the performance of exercise overall, they did not significantly interact.

Locus of Control category was also added to the ANOVA as a two-level moderator, as shown in the "LOC" row of Table 12 (Rotter, 1966). The main effect of time remained significant, $F(1, 46) = 4.90$, $p < .05$, and there was a marginally significant time X locus of control category interaction, $F(1, 46) = 3.57$, $p = .065$. Participants categorized as having an internal locus of control reported a marginally greater decrease in exercise overall from Week 2 to Week 6 ($M_{change} = -21.00$, $SD = 56.48$), than did participants categorized as having an external locus of control ($M_{change} = -4.70$, $SD = 47.30$). The analysis did not, however, produce any other significant effects. When this moderator factor was added to the ANCOVA, it revealed a marginally significant main effect of locus of control category, $F(1, 45) = 3.20$, $p = .08$. At Week 6, participants categorized as having an internal locus of control reported doing less exercise overall ($M = 73.75$, $SD = 80.40$) than did participants categorized as having an external locus of control ($M = 89.25$, $SD = 74.42$). There were no other significant effects. Together, the results indicate that locus of control had an effect on overall exercise behavior; however condition did not significantly interact with either category or time.

The Actor's Block Scale Start and Finish category yielded no significant results beyond the main effect of time (Ten Eyck & Lord, 2006).

When Therapeutic Reactance Scale composite score category (Dowd et al., 1991) was added to the ANOVA as a two-level moderator factor, as shown in the "TRS" row of Table 12, the main effect of time remained significant, $F(1, 46) = 5.42$, $p < .05$, and there was a marginally significant condition X therapeutic reactance category interaction, $F(2, 46) = 2.47$, $p = .096$. For participants in the no-treatment control group, there was little difference in their reports of overall exercise at Week 6 regardless of therapeutic reactance category (low therapeutic reactance: $M = 50.50$, $SD = 56.25$ vs. high therapeutic reactance: $M = 39.57$, $SD = 53.39$). For participants in the two experimental groups, however, generating action strategies and reasons may have had differential effects on overall exercise at Week 6. After generating reasons for multiple weeks, participants low in therapeutic reactance reported doing more exercise overall at Week 6 ($M = 126.87$, $SD = 100.75$) than did their high therapeutic reactance counterparts ($M = 61.22$, $SD = 55.60$). After generating action strategies for multiple weeks, conversely, participants low in therapeutic reactance reported doing less exercise overall at Week 6 ($M = 71.00$, $SD = 58.73$) than their high therapeutic reactance counterparts ($M = 129.10$, $SD = 90.60$). These results suggest that generating reasons why they should engage in their target exercise may have been more effective for sustaining overall exercise for participants low in therapeutic reactance; but, generating action strategies they could employ to increase the performance of their target exercise may have been more effective for participants high in therapeutic reactance. The ANOVA did not produce any other significant effects. When this moderator factor, with two levels, was added to the ANCOVA, no additional significant effects were found.

When the Big Five Inventory subscale categories were added to the ANOVA, only conscientiousness yielded interesting results (John et al., 1991). When the Big Five Inventory Conscientiousness subscale category was added to the ANOVA, as shown in the

"$BFI_{conscientiousness}$" row of Table 12, the analysis revealed a significant main effect of time, $F(1, 46) = 5.21$, $p < .05$, and a significant time X conscientiousness category interaction, $F(1, 46) = 4.49$, $p < .05$. Participants who were categorized as high in conscientiousness reported a greater decrease in overall exercise behavior from Week 2 to Week 6 ($M_{change} = -20.93$, $SD = 61.85$) than did participants who were categorized as low in conscientiousness ($M_{change} = -5.44$, $SD = 40.02$). There was also a marginally significant conscientiousness category X type of directed thinking interaction, $F(2, 46) = 2.63$, $p = .083$, which will be discussed in the ANCOVA results below. The time X conscientiousness category X type of directed thinking interaction was marginally significant, $F(2, 46) = 2.78$, $p = .072$. Low conscientiousness participants, regardless of condition, reported little change in their overall exercise behavior from Week 2 to Week 6 (action strategies: $M_{change} = -19.70$, $SD = 42.20$; reasons: $M_{change} = -3.43$, $SD = 35.36$; control: $M_{change} = +10.62$, $SD = 39.32$). For participants high in conscientiousness, however, control participants showed the largest decrease in overall exercise behavior from Week 2 to Week 6 ($M_{change} = -48.44$, $SD = 35.10$), while participants who generated action strategies reported a almost no change ($M_{change} = +2.00$, $SD = 83.12$). High conscientiousness participants who generated reasons also reported small decreases in overall exercise behavior ($M_{change} = -14.50$, $SD = 57.51$). Thus, it seems that for high conscientiousness participants, generating action strategies for doing their target exercise lessened the reduction of overall exercise behavior, while reasons and the no-treatment control proved less effective.

When this factor was added to the ANCOVA, it produced a significant main effect of conscientiousness category, $F(1, 45) = 4.37$, $p < .05$. Participants categorized as low in conscientiousness reported doing more exercise overall during Week 6 ($M = 93.36$, $SD = 82.01$) than did participants categorized as high in conscientiousness ($M = 69.37$, $SD = 72.35$). The main

effect of condition was not significant. The ANCOVA also produced a marginally significant conscientiousness category X type of directed thinking interaction, $F(2, 45) = 2.94$, $p = .063$. For participants low in conscientiousness, generating reasons proved more effective for influencing overall exercise behavior during Week 6 ($M = 143.00$, $SD = 97.97$) than did generating action strategies ($M = 84.80$, $SD = 76.83$) or a no-treatment control ($M = 60.62$, $SD = 58.76$). For participants high in conscientiousness, in contrast, generating action strategies proved more effective for influencing overall exercise behavior during Week 6 ($M = 126.37$, $SD = 86.38$) than did generating reasons ($M = 56.5$, $SD = 53.39$) or a no-treatment control ($M = 33.00$, $SD = 48.30$).

Summary of Results for Self-Report Exercise Behavior

Looking back at Tables 11 and 13, it is clear that the experimental manipulation alone did not influence the performance of target exercise or exercise overall. In both instances, however, participants who generated action strategies reported doing more exercise at Week 6 than did participants in the other two groups. The only hint of moderation came from Initial Level of target exercise. Participants who were doing some of their target exercise when they started the experiment were better able to sustain their exercise behavior from Week 2 to Week 6 when they generated action strategies, but participants who were doing little or no target exercise at the beginning of the experiment did not.

Post-Manipulation Dependent Measures

In addition to cardiovascular fitness and exercise behavior as outcome measures in the present experiment, participants' intentions to exercise in the future and their perceptions regarding aspects of their physical and mental health were assessed. Finally, participants' perceptions of the typical person who exercises a lot were also assessed.

Perceptions of Target Exercise Behavior

In order to determine the effects of the manipulation on how frequently participants in the two experimental groups (action strategies, reasons) perceived they were performing their target exercise, we subjected their responses to the question, "How much of your target exercise are you doing now compared to before you started in this study?" to a one-way ANOVA using type of directed thinking (type of directed thinking: action strategies, reasons) as the independent variable; but the analysis did not yield a significant effect. Table 14 summarizes the analyses of target exercise perceptions, and Table 15 displays the means for this item. Note that there is no control group mean displayed in Table 15 because the experimenter inadvertently omitted the item from the control group's packets during the final group session.

Moderators of target exercise perceptions. Participants' perceptions of target exercise performed might have been moderated by individual differences. The results of these analyses are summarized in Table 14. Their responses to the item: "How much of your target exercise are you doing now compared to before you started in this study?" were therefore subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis.

As shown in Table 14, Initial Stage (Prochaska et al., 1994), Initial Level, and Social Desirability (Crowne & Marlowe, 1960) yielded no interesting results, other than a marginally significant main effect of initial level, $F(1, 31) = 3.76$, $p = .062$. Participants categorized as low target exercisers perceived doing slightly less of their target exercise now compared to before they started in the experiment ($M = -.15$, $SD = 1.56$, $n = 21$), but their high target exercise counterparts perceived doing more of their target exercise now compared to before they started in the experiment ($M = +.79$, $SD = 1.18$, $n = 14$).

Table 14

Significant and marginally significant results from condition (C) ANOVA for perceptions of target exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage			
Initial $Level_{target}$		*	
MCSD			
LOC	*	**	***
ABSS			
ABSF			
TRS			
$BFI_{extraversion}$		*	**
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$			

Note: * $p < .10$, ** $p \leq .05$, *** $p < .01$

Table 15

Means perceptions of doing target exercise behavior by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much of your target exercise are you doing now compared to before you started in this study?	.56	-.12	---
	(1.04)	(1.80)	
	(*n* = 18)	(*n* = 17)	(*n* = 17)

Note: Standard deviations in parentheses. ---Data was not collected.

When Locus of Control category (Rotter, 1966) was added to the ANOVA, as shown in the "LOC" row of Table 14, it yielded a marginally significant main effect of condition, $F(1, 31) = 4.07$, $p = .052$. Participants who generated action strategies perceived that they were doing slightly more of their target exercise ($M = .56$, $SD = 1.04$), while participants who generated reasons perceived that they were doing slightly less of their target exercise ($M = -.12$, $SD = 1.80$). In addition, there was also a significant main effect of locus of control category, $F(1, 31) = 5.42$, $p < .05$. Participants with an internal locus of control perceived that they were doing slightly more of their target exercise at the end of the experiment as compared to the beginning of the experiment ($M = .64$, $SD = 1.06$, $n = 19$), while participants with an external locus of control perceived that they were doing slightly less of their target exercise at the end of the experiment as compared to the beginning of the experiment ($M = -.25$, $SD = 1.77$, $n = 16$). The analysis also revealed a significant locus of control category X type of directed thinking interaction, $F(1, 31) = 9.55$, $p < .01$, which is shown in Table 16. As the table shows, type of directed thinking did not

have any effect on participants' perceptions of doing their target exercise more now than before they started the experiment when they were identified as having an internal locus of control. For participants identified as having an external locus of control, generating action strategies for five weeks increased participants' perceptions of having exercised more now than before they started the experiment, while generating reasons decreased those same perceptions.

Table 16

Mean perceptions of doing target exercise now compared to before beginning the study by type of directed thinking and locus of control category for participants in Experiment 1.

	Type of Directed Thinking	
Locus of Control Category	Actions	Reasons
Internal	.17	.89
	(.76)	(1.26)
	$n = 6$	$n = 9$
External	.75	-1.25
	(1.14)	(1.66)
	$n = 12$	$n = 8$

Note: Standard deviations in parentheses.

As Table 14 shows, the only other moderator of interest was $BFI_{extraversion}$. When Big Five Inventory Extraversion subscale category (John et al., 1991) was added to the ANOVA, as the "$BFI_{extraversion}$" row of Table 14 shows, the analysis revealed a marginally significant main effect of extraversion category, $F(1, 31) = 4.05$, $p = .053$. Participants low in extraversion perceived

doing less of their target exercise now compared to before they started the experiment (M = -.21, SD = 1.54, n = 19), and participants high in extraversion perceived doing more of their target exercise now compared to before they started in the experiment (M = +.75, SD = 1.24, n = 16). Table 17 displays the means from a significant type of directed thinking X extraversion category interaction, $F(1, 31) = 5.21$, $p < .05$.

Table 17

Mean perceptions of doing target exercise now compared to before beginning the study by type of directed thinking and Big Five Inventory extraversion subscale category for participants in Experiment 1.

	Type of Directed Thinking	
BFI Extraversion Category	Reasons	Actions
Low	.50	1.17
	(1.08)	(1.48)
	n = 10	n = 6
High	.62	-.81
	(1.07)	(1.60)
	n = 8	n = 11

Note: Standard deviations in parentheses.

As shown in the table, for participants low in extraversion, generating reasons had a more positive effect than generating action strategies on perceptions of doing the target exercise. For participants high in extraversion, in contrast, generating action strategies had a more positive effect than generating reasons.

Perceptions of Overall Exercise Behavior

In order to determine whether participants' responses to the item, ""How much exercise overall (counting all forms of exercise) are you getting now compared to before you started in this study?" were subjected to a one-way ANOVA, which did not yield a significant effect. Table 18 summarizes the analyses for this item, and the means are displayed in Table 19.

Moderators of overall exercise perceptions. Participants' perceptions of overall exercise performed might have been moderated by individual differences. Their responses to the original item were therefore subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis.

When Initial Stage (Prochaska et al., 1994), as a two-level moderator factor, was added to the ANOVA, as shown in the "Initial Stage" row of Table 18, it produced a significant initial stage X type of directed thinking interaction, $F(2, 46) = 5.73$, $p < .01$. As shown in the top row of Table 20, type of directed thinking had no effect on perceptions of doing more or less exercise overall now compared to before they started in the experiment when participants were categorized as early stage exercisers. Now consider the bottom row of the table. Participants categorized as mid-stage exercisers who generated action strategies perceived that they were doing significantly more exercise overall now compared to the perceptions of the other two groups.

Table 18

Significant and marginally significant results from condition (C) ANOVA for perceptions of overall exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage			***
Initial $Level_{target}$			
MCSD			
LOC			
ABSS			
ABSF			
TRS			*
$BFI_{extraversion}$			*
$BFI_{neuroticism}$	*		
$BFI_{conscientiousness}$			*

Note: * $p < .10$, *** $p < .01$

The only other interesting effects involved Therapeutic Reactance (Dowd et al., 1991), and Big Five Inventory Extraversion and Conscientiousness (John et al., 1991). When Therapeutic Reactance Scale composite score category (Dowd et al., 1991) was then added to the ANOVA, as the "TRS" row of Table 18 shows, the analysis produced a marginally significant type of directed thinking X Therapeutic Reactance category interaction, $F(2, 46) = 2.819$, $p =$

.07. Participants classified as low in therapeutic reactance who generated reasons perceived that they performed more exercise overall now than before they started in the study (M = 1.33, SD = 1.03), than did participants who generated action strategies (M = .37, SD = 1.31) or participants in the control condition (M = .87, SD = .83). For participants classified as high in Therapeutic Reactance, however, participants who generated action strategies perceived that they performed more exercise overall now than before they started in the study (M = 1.40, SD = 1.26), than did participants who generated reasons (M = .28, SD = 1.79) or participants in the control condition (M = .44, SD = 1.14).

Table 19

Mean perceptions of overall exercise behavior by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much exercise overall are you getting now compared to before you started in this study?	.94	.64	.64
	(1.35)	(1.61)	(.99)
	(n = 18)	(n = 17)	(n = 17)

Note: Standard deviations in parentheses.

When the Big Five Inventory Extraversion subscale category (John et al., 1991) was added to the ANCOVA, as the "$BFI_{extraversion}$" row of Table 18 shows, the analysis revealed a marginally significant type of directed thinking X extraversion category interaction, $F(2, 46) = 2.70$, $p = .078$.

Table 20

Mean perceptions of doing overall exercise now compared to before beginning the study by type of directed thinking and Initial Stage category for participants in Experiment 1.

Initial Stage	Actions	Reasons	Control
Early	.10	.50	1.12
	(1.10)	(1.35)	(.83)
	$n = 10$	$n = 10$	$n = 8$
Mid	2.00	.85	.22
	(.75)	(2.03)	(.97)
	$n = 8$	$n = 7$	$n = 9$

Note: Standard deviations in parentheses.

Participants classified as low in extraversion who generated reasons perceived that they were doing more exercise overall now than before they started in the study ($M = 1.50$, $SD = 1.22$), when compared to participants who generated actions strategies ($M = .60$, $SD = 1.34$) and a no-treatment control condition ($M = 1.33$, $SD = .83$). Participants classified as high in extraversion, in contrast, perceived that they were doing more exercise overall now than before they started in the experiment when they generated action strategies ($M = 1.37$, $SD = 1.30$), than they generated reasons ($M = .19$, $SD = 1.66$) or were in the no-treatment control group ($M = .44$, $SD = 1.14$).

Finally, when the Big Five Inventory Conscientiousness subscale category (John et al., 1991) was added to the ANOVA, as the "$BFI_{conscientiousness}$" row of Table 18 shows, there was a marginally significant conscientiousness category X type of directed thinking interaction, $F(2, 46) = 2.70$, $p = .078$. For participants categorized as low in conscientiousness, generating action

strategies resulted in lower reported perceptions of having exercised more now than before starting the experiment (M = .60, SD = .97), than did generating reasons (M = 1.29, SD = 1.70) or a no-treatment control condition (M = 1.12, SD = .83). For participants high in conscientiousness, however, generating action strategies resulted in higher reported perceptions of having exercised more now than before starting the experiment (M = 1.37, SD = 1.68), than did generating reasons (M = .20, SD = 1.47) or a no-treatment control condition (M = .22, SD = .97).

Target Exercise Intentions

It was also important to determine whether type of directed thinking had an effect on participants' intentions to do their target exercise in the month following the experiment. Participants' responses to the question, "How much of your target exercise do you plan on doing over the next month, after this study ends?" were subjected to one-way ANOVA using type of directed thinking as the independent variable, but the analysis was not significant. The analyses of target exercise intentions are summarized in Table 21, and the means are displayed in Table 22. Note that there is no control group mean displayed in Table 22 because the experimenter inadvertently omitted the item from the control group's packets during the final group session.

Moderators of target exercise intentions. To determine whether participants' responses to the item "How much of your target exercise do you plan on doing over the next month, after this study ends?" were moderated by individual differences, they were subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis. The results of these analyses are summarized in Table 21. The only findings of interest involved Initial Stage (Prochaska et al., 1994), Initial Level, Actor's Block Scale Finish (Ten Eyck & Lord, 2006), and Therapeutic Reactance (Dowd et al., 1991).

Table 21

Significant and marginally significant results from condition (C) ANOVA for intentions to perform target exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage			**
Initial $Level_{target}$			**
MCSD		**	
LOC			
ABSS			
ABSF		*	
TRS			*
$BFI_{extraversion}$			
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$		*	

Note: * $p < .10$, ** $p \leq .05$

Table 22

Mean intentions to do target exercise by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much of your target exercise do you plan on doing over the next month, after this study ends?	3.22	3.82	---
	(1.99)	(1.38)	
	(*n* = 18)	(*n* = 17)	(*n* = 17)

Note: Standard deviations in parentheses.

Initial Stage (Prochaska et al., 1994) was first added to the ANOVA, as a moderator factor with two levels, which is shown in the "Initial Stage" row of Table 21. There was no significant main effect of initial stage category or type of directed thinking. Table 23 displays the means from a significant initial stage X type of directed thinking interaction, $F(2, 31) = 4.21$, $p < .05$. As the table shows, for participants in the early stages of change for exercise, generating reasons led to greater intentions to engage in their target exercise than did generating action strategies; for participants in the mid stage of change for exercise, generating action strategies led to greater intentions than did generating reasons. This result conceptually replicates that of Labansat et al. (in press).

Initial level of target exercise was then added to the ANOVA, as a moderator factor with two levels, as shown in the "Initial $Level_{target}$" row of Table 21. Neither initial level of target exercise, nor type of directed thinking had a significant main effect on target exercise intentions.

Table 23

Mean intentions to do target exercise by type of directed thinking and Initial Stage for participants in Experiment 1.

	Type of Directed Thinking	
Initial Stage	Actions	Reasons
Early	2.40	4.00
	(1.84)	(1.57)
	$n = 10$	$n = 10$
Mid	4.25	3.57
	(1.75)	(1.14)
	$n = 8$	$n = 7$

Note: Standard deviations in parentheses.

Table 24 displays the means from a significant initial level X type of directed thinking interaction, $F(1, 31) = 7.20$, $p < .05$. As the table shows, again conceptually replicating the results of Labansat et al. (in press), reasons proved more effective for increasing the behavioral intentions of participants who were initially doing none of their target exercise, whereas actions proved more effective for participants who were initially doing at least some of their target exercise.

When the Actor's Block Scale Finish subscale category (Ten Eyck & Lord, 2006) was added to the ANOVA, as shown in the "ABSF" row of Table 21, it revealed a significant main effect of finish category, $F(1, 31) = 4.90$, $p < .05$. Participants who reported having little difficulty finishing tasks reported significantly greater intentions to engage in their target

exercise in the month following the experiment (M = 4.00, SD = 1.52) than did participants who reported have great difficulty finishing tasks (M = 2.69, SD = 1.79).

Table 24

Mean intentions to do target exercise by type of directed thinking and initial target exercise level for participants in Experiment 1.

	Type of Directed Thinking	
Initial Stage	Actions	Reasons
Low	2.37	4.10
	(2.02)	(1.59)
	n = 11	n = 10
High	4.57	3.43
	(.97)	(.97)
	n = 7	n = 7

Note: Standard deviations in parentheses.

Therapeutic Reactance Scale composite category (Dowd et al., 1991) was also added to the ANOVA as a moderator factor with two levels, as shown in the "TRS" row of Table 21. Although there were no significant main effects, the analysis revealed a marginally significant therapeutic reactance category X type of directed thinking interaction, $F(1, 31) = 3.43$, $p = .073$. Generating reasons proved more effective for positively affecting behavioral intentions when participants were low in therapeutic reactance (M = 4.12, SD = .83) than when participants were high in therapeutic reactance (M = 3.56, SD = 1.74). Conversely, participants high in therapeutic reactance who generated action strategies reported greater intentions to engage in their target

exercise (M = 3.90, SD = 1.72) than their low therapeutic reactance counterparts (M = 2.37, SD = 2.07). These results suggest that participants who resist therapeutic intervention might benefit more from generating action strategies, while participants more open to therapeutic intervention might benefit more from generating reasons.

Overall Exercise Intentions

Participants' intentions to do all forms of exercise in the month following experiment might have been affected by type of directed thinking. Their responses to the item, "How much exercise overall (counting all forms of exercise) do you plan to get over the next month, after this study ends?" were subjected to a one-way ANOVA using type of directed thinking as the independent variable. The analysis proved significant, $F(2, 49) = 4.99$, $p < .05$. Table 25 summarizes the analyses for overall exercise intentions, and the means for this item are shown in Table 26. As Table 26 shows, participants who generated action strategies reported significantly greater intentions to exercise over the next month than participants in the control condition. This result replicates that of Ratcliff et al. (1999). There were no other differences between groups.

Moderators of overall exercise intentions. To determine whether participants' responses to the item "How much exercise overall do you plan on doing over the next month, after this study ends?" were moderated by individual differences, they were subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis. The results of these analyses are summarized in Table 25. The only findings of interest involved Initial Stage (Prochaska et al., 1994) and Social Desirability (Crowne & Marlowe, 1960).

Table 25

Significant and marginally significant results from condition (C) ANOVA for intentions to perform overall exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA		
	C	M	CM
Analysis	**	---	---
W/ Mod's			
Initial Stage			*
$Initial\ Level_{overall}$	**		
MCSD	***	***	
LOC	**		
ABSS	**		
ABSF	**		
TRS	**		
$BFI_{extraversion}$	**		
$BFI_{neuroticism}$	**		
$BFI_{conscientiousness}$	**		

Note: * p < .10, ** p < .05, *** p < .01

Initial Stage of exercise was first added to the ANOVA, as a two-level moderator factor, which is shown in the "Initial Stage" row of Table 25 (Prochaska et al., 1994). As the table shows, the main effect of type of directed thinking remained significant; but initial stage category did not have a significant effect. The analysis also produced a marginally significant initial stage X type of directed thinking interaction, $F(2, 46) = 3.15$, $p = .052$. As shown in Table

27, for participants who began the experiment as early stage exercisers, generating action strategies or reasons seemed equally effective for influencing intentions to exercise overall in the month following the experiment when compared to a no-treatment control condition. Participants who began the experiment in the mid-stage of exercise, in contrast, expressed greater intentions to exercise in the month following the experiment when they generated action strategies when compared to reasons or a no-treatment control condition.

Table 26

Mean intentions to do exercise overall by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much exercise overall do you plan on doing over the next month after this study ends?	4.56*	4.11	3.17*
	(1.09)	(1.50)	(1.33)
	(*n* = 18)	(*n* = 17)	(*n* = 17)

Note: Standard deviations in parentheses. *means are significantly different at $p < .05$.

The Marlowe-Crowne Social Desirability Scale category (Crowne & Marlowe, 1960), as a moderator factor with two levels, was added to the ANOVA, as the "MCSD" row of Table 25 shows. The main effect of condition remained significant, $F(2, 46) = 6.70$, $p < .01$. The analysis also revealed a significant main effect of social desirability category, $F(1, 46) = 9.55$, $p < .01$. Participants categorized as high in social desirability reported greater intentions to exercise overall in the month following the experiment ($M = 4.37$, $SD = 1.21$) than did participants categorized as low in social desirability ($M = 3.47$, $SD = 1.51$).

Table 27

Mean intentions to exercise overall by type of directed thinking and Initial Stage category for participants in Experiment 1.

	Type of Directed Thinking		
Initial Stage	Actions	Reasons	Control
Early	4.00	4.50	3.38
	(1.41)	(1.61)	(1.42)
	$n = 7$	$n = 8$	$n = 11$
Mid	4.90	3.78	3.00
	(.70)	(1.39)	(1.26)
	$n = 11$	$n = 7$	$n = 6$

Note: Standard deviations in parentheses.

Perceptions of Health, Well-Being, and Physical Fitness

One possible positive outcome associated with the experimental manipulation was an increase in perceptions of overall health, psychological well-being, and physical fitness. Participants' responses to the questions, "How do you think your overall health is now compared to before you started in this study?," "How do you think your general feeling of psychological well-being is compared to before you started in this study?," and "How do you think your general physical fitness is now compared to before you started in this study?" was subjected to principle components analysis. The analysis yielded one factor that accounted for 65.80% of the variance. A mean positive benefits of exercise score was then calculated using all three items, and subjected to one-way ANOVA using type of directed thinking as the independent variable.

The effect, which is summarized on the top row of Table 28, was not significant ($F < 1$). The means for the item are displayed in Table 29.

Table 28

Significant and marginally significant results from condition (C) ANOVA for perceptions the positive benefits of exercise, with and without the addition of potential moderators (M) in Experiment 1.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage			*
Initial $Level_{target}$		*	
MCSD			
LOC			
ABSS			
ABSF			
TRS		*	***
$BFI_{extraversion}$			
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$			

Note: * p < .10, *** p < .01

Table 29

Mean perceptions of the positive benefits of exercise by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
	Actions	Reasons	Control
Positive benefits of exercise score	.53	.36	.47
	(.76)	(.67)	(.61)
	(*n* = 18)	(*n* = 17)	(*n* = 17)

Note: Standard deviations in parentheses.

Moderators of the positive benefits of exercise perceptions. To determine whether participants' perceptions of the positive benefits of exercise were moderated by individual differences, they were subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis. The results of these analyses are summarized in Table 28. The results of interest involved Initial Stage (Prochaska et al., 1994), Initial Level of target exercise and Therapeutic Reactance (Dowd et al., 1991).

When Initial Stage (Prochaska et al., 1994) of exercise was added to the ANOVA, as a moderator factor with two levels, as the "Initial Stage" row of Table 28 shows, it yielded a marginally significant type of directed thinking X initial stage interaction, $F(2, 46) = 2.83$, $p = .069$. As shown in Table 30, for participants in the early stage of exercise, the control group perceived more positive benefits of exercise than did the action strategies or reasons groups. For participants in the mid stage of exercise, in contrast, the action strategies group perceived more positive benefits of exercise than did participants in the other two groups.

Table 30

Mean perceptions of the positive benefits of exercise by type of directed thinking and Initial Stage category for participants in Experiment.

	Type of Directed Thinking		
Initial Stage	Actions	Reasons	Control
Early	.30	.10	.65
	(.88)	(.59)	(.62)
	n =10	*n* = 10	*n* = 8
Mid	.83	.71	.29
	(.47)	(.65)	(.58)
	n = 8	*n* = 7	*n* = 9

Note: Standard deviations in parentheses.

Initial level of target exercise was added to the ANOVA, as a two-level moderator, as shown in the "Initial $Level_{target}$" row of Table 28. As the table shows, there was a marginally significant main effect of initial level, $F(1, 46) = 3.93$, $p = .053$. Participants categorized as high target exercisers perceived the overall benefits of exercise at the end of the experiment more positively ($M = .68$, $SD = .72$) than did their low exercising counterparts ($M = .30$, $SD = .61$). Therapeutic Reactance Scale composite score category (Dowd et al., 1991) was added to the ANOVA, as shown in the "TRS" row of Table 28. The analysis revealed a marginally significant main effect of therapeutic reactance category, $F(1, 46) = 2.92$, $p = .094$. Specifically, participants identified as more likely to resist therapeutic interventions reported more positive perceptions ($M = .61$, $SD = .67$) than did participants identified as less likely to resist therapeutic interventions

(M = .30, SD = .67). Table 31 displays the means from a significant therapeutic reactance category X type of directed thinking interaction, $F(2, 46) = 7.51$, $p < .01$. As the table shows, participants low in therapeutic reactance reported more positive perceptions after generating reasons or a no-treatment control than did participants who generated action strategies. For participants high in therapeutic reactance, generating action strategies proved more effective for producing more positive perceptions than did generating reasons or a no-treatment control condition.

Table 31

Mean perceptions of the positive benefits of exercise by type of directed thinking and therapeutic reactance category for participants in Experiment 1.

	Type of Directed Thinking		
Therapeutic Reactance Category	Actions	Reasons	Control
Low	-.15	.45	.52
	(.53)	(.71)	(.62)
	n = 8	n = 8	n =10
High	1.07	.25	.38
	(.41)	(.66)	(.65)
	n = 10	n = 9	n = 7

Note: Standard deviations in parentheses.

Characteristics of Typical Exerciser

Recall that participants also reported their perceptions of the "typical person who exercises a lot" by responding to eight bipolar adjective pairs on a 17-point scale. Participants'

responses to these items were subjected to a principle components analysis, which yielded two factors that accounted for 65.44% of the variance. In order to identify those items that might most effectively portray perceptions of the typical exerciser, the items were subjected to a principle components analysis with varimax rotation. Table 32 displays the items and their rotated factor loadings. A mean typical exerciser trait score was then calculated using the five highest loading items from the first factor.

Table 32

Rotated factor loadings for typical person who exercises a lot items for participants in Experiment 1.

Item	Factor 1	Factor 2
The typical person who exercises a lot is:		
Very Unlikeable- Very Likeable	.535*	.254
Very Incompetent-Very Competent	.005	.866
Very Irresponsible-Very Responsible	.234	.766
Very Untrustworthy-Very Trustworthy	.339	.637
Very Inefficient-Very Efficient	.737*	.457
Very Disrespected-Very Respected	.873*	.172
Very Unpopular-Very Popular	.795*	-.208
Very Incapable-Very Capable	.789*	.355

Note: * denotes items used in typical exerciser composite score.

The mean typical exerciser trait score was then subjected to a one-way ANOVA using type of directed thinking as the independent variable. Type of directed thinking, however, did not

have a significant effect on participants' perceptions of the typical exerciser, $F(2, 49) = .622$, $p = .541$. To determine whether individual differences might moderate this effect, a series of ANOVAs with one moderator added at a time to the original analysis were conducted. No significant effects were found.

Potential Mediators

Several measures were included as possible mediators in case experimental condition had a significant effect on the dependent measures. In order to test a measure for mediation, however, it would be necessary to first find a main effect of condition on the dependent measure, and also a main effect of condition on the potential mediator (Barron & Kenny, 1986). In Experiment 1, the only main effects of condition occurred for estimated relative VO_2max (Table 7) and intentions to exercise overall (Table 26). In neither case was there a significant difference between the two experimental groups, action strategies and reasons. Measures that were taken only for the actions and reasons conditions, such as number of ideas generated, could not have therefore been significant mediators. These potential mediators, however, could be of interest as dependent measures in their own right.

Recall that one measure of individuals' readiness to begin doing a beneficial activity such as exercise weighs the perceived advantages versus disadvantages of doing the activity (Prochaska et al., 1994). In order to determine whether specific types of directed thinking might have influenced participants' perceptions regarding the advantages and disadvantages of engaging in their target exercise, they answered a series of items during each of the six weekly experimental sessions.

Advantages of Target Exercise

One goal of the present experiment was to improve participants' perceptions regarding the advantages of engaging in their target exercise (Prochaska et al., 1994; Velicer et al., 1985). Participants' responses to the five items measuring the advantages of engaging in their target exercise were subjected to a principal components analysis, which yielded one factor that accounts for 48.48% of the variance. A mean advantages of engaging in target exercise score was then calculated for Weeks 1 through 6 using all five items from the first factor. The top portion of Table 33 displays the items and their factor loadings, and Figure 5 shows the pattern of means for Weeks 1 through 6 by type of directed thinking task.

A time (Week 2, Week 6) X type of directed thinking ANOVA yielded a marginally significant main effect of type of directed thinking, $F(2, 49) = 2.76$, $p = .07$. Participants who generated reasons perceived the advantages of engaging in their target exercise marginally more positively ($M = 3.82$, $SD = .64$) than did participants who generated action strategies ($M = 3.71$, $SD = .79$) or a no-treatment control ($M = 3.34$, $SD = .36$). Since advantages are essentially positive reasons why one should exercise, it makes sense that participants who were directed to focus on reasons would be influenced more in their perceptions than participants in the other conditions. There were no other significant effects found.

An additional ANCOVA controlling for mean advantages of target exercise at Week 1 and using Week 6 as the dependent variable and type of directed thinking as the independent variable was not significant.

Table 33

Factor loadings for advantages and disadvantages of target exercise at Week 1 for participants in Experiment 1.

Item	Factor 1	Factor 2
Advantages of Exercise		
I would have more energy for my family/friends if I exercised regularly.	.594	
I would feel less stressed if I exercised regularly.	.847	
Exercising would put me in a better mood for the rest of the day.	.805	
I would feel more comfortable with my body.	.428	
Regular exercise would help me have a more positive outlook on life.	.723	
Disadvantages of Exercise		
I would feel embarrassed if people saw me exercising.	.751*	-.371
Exercise prevents me from spending time with my friends.	.187	.748
I feel uncomfortable or embarrassed in exercise clothes.	.783*	-.359
There is too much I would have to learn to exercise.	.623*	.382
Exercise puts an extra burden on my significant other.	.292	.623

Note: * denotes items included in mean disadvantages of exercise score.

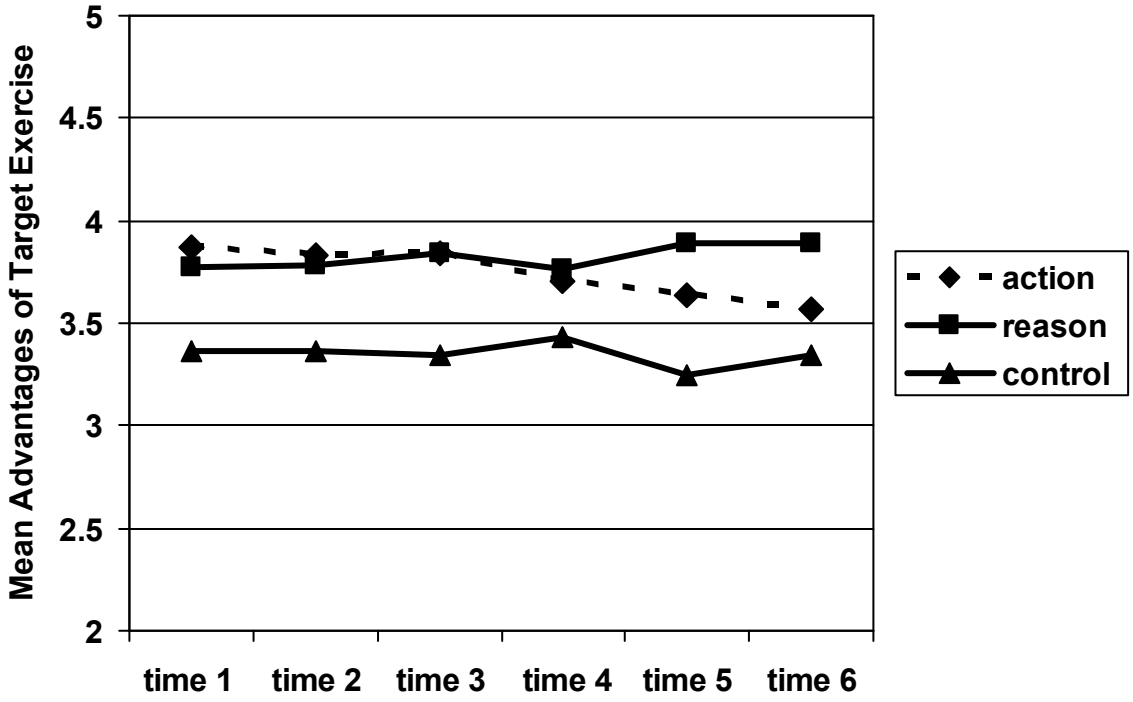


Figure 5. Mean advantages of engaging in target exercise during Weeks 1 through 6 by type of directed thinking for participants in Experiment 1.

Participants' intentions to exercise in the month following the experiment were also subjected to a one-way ANCOVA using type of directed thinking as the independent variable and the mean advantages of exercise score at Week 6 as a covariate. The effect of directed thinking condition remained significant, $F(2, 48) = 4.43$, $p < .05$.

Disadvantages of Target Exercise

Another goal of the present experiment was to decrease participants' perceptions of the disadvantages of engaging in their target exercise (Prochaska et al., 1994; Velicer et al., 1985). Participants' responses to the five items measuring the disadvantages of engaging in their target exercise were subjected to a principal components analysis, which yielded a first factor that accounted for 33.70% of the variance and a second factor that accounted for 27.21% of the

variance. A mean disadvantages of target exercise score was then calculated for Weeks 1 through 6 using the three highest loading items from the first factor. The bottom portion of Table 33 displays the items and their factor loadings, and Figure 6 displays the pattern of means for Weeks 1 through 6 by type of directed thinking task.

A time X type of directed thinking ANOVA did not, however, yield any significant effects. The results were similar for the ANCOVA.

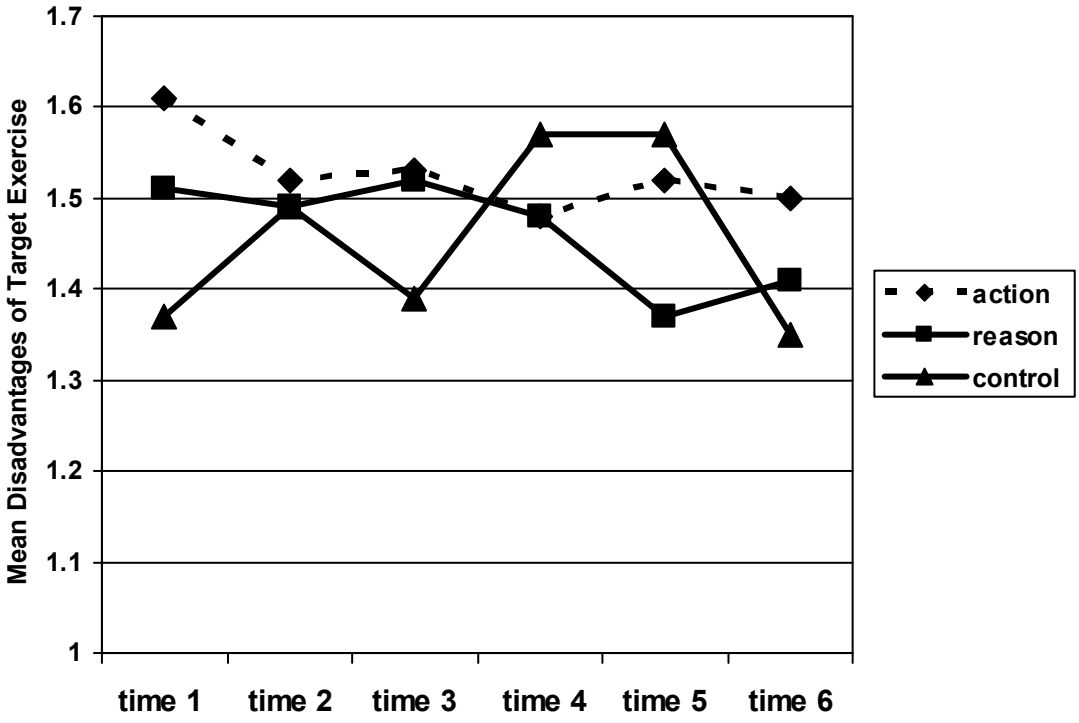


Figure 6. Mean disadvantages of engaging in target exercise during Weeks 1 through 6 by type of directed thinking for participants in Experiment 1.

Decisional Balance for Target Exercise

Yet another way to determine the effects of type of directed thinking on the advantages and disadvantages of engaging in a target exercise is by calculating a decisional balance score (Prochaska et al., 1994). Decisional balance is determined by subtracting the mean disadvantages

of exercise score from the mean advantages of exercise score for each participant during Weeks 1 through 6. Positive scores show that the advantages of exercise outweigh the disadvantages of exercise, while negative scores show that the disadvantages of exercise outweigh the advantages of exercise. Figure 7 displays the mean decisional balance scores for Weeks 1 through 6 by type of directed thinking task. The figure suggests that by Week 6, participants who generated reasons for doing their target exercise reported a more positive decisional balance toward doing that exercise than participants who generated action strategies and participants in the control condition; but a time X type of directed thinking ANOVA of did not yield any significant effects. The ANCOVA also yielded no significant effects.

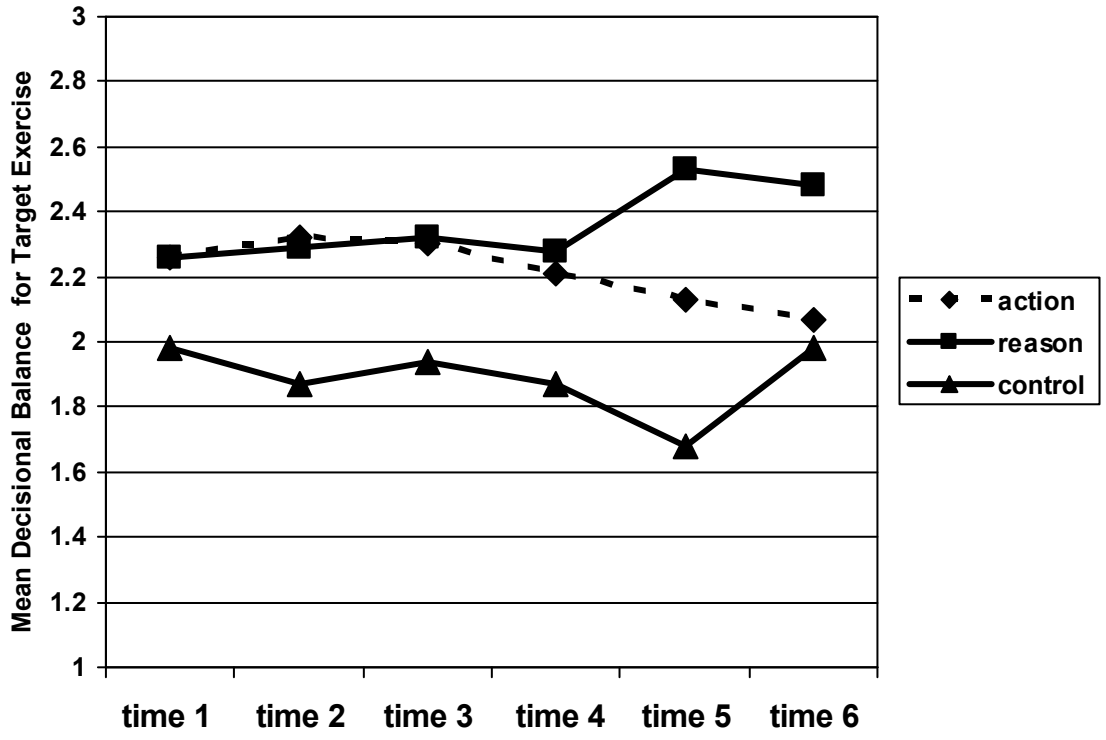


Figure 7. Mean decisional balance for engaging in target exercise for Weeks 1 through 6 by type of directed thinking for participants in Experiment 1.

Self-Efficacy

Recall that we also measured participants' perceived self-efficacy for engaging in their target exercise (DiClemente et al., 1985; Velicer et al., 1999). Participants' responses to the six self-efficacy items were subjected to a principal components analysis, which yielded a first factor that accounts for 41.03% of the variance and a second factor that accounts for 25.37% of the variance. A mean self-efficacy for target exercise score was then calculated using all six items. Table 34 displays the items and their factor loadings, and Figure 8 displays the mean self-efficacy for target exercise scores for Weeks 1 through 6 by type of directed thinking task. A time (Week 1, Week 6) X type of directed thinking ANOVA did not yield any significant effects. The results were similar for the ANCOVA.

Table 34

Factor loadings for target exercise self-efficacy items for participants in Experiment 1.

Item	Factor 1	Factor 2
I am under a lot of stress.	.591*	.699
I feel I don't have the time.	.438*	.820
I have to exercise alone.	.638*	-.413
I don't have access to exercise equipment.	.683*	-.204
I am spending time with friends or family who do not exercise.	.727*	-.352
It's raining or snowing.	.721*	-.159

Notes: All items on a scale from 1 = "not at all confident" to 5 = "extremely confident. * denotes items included in self-efficacy for target exercise scores.

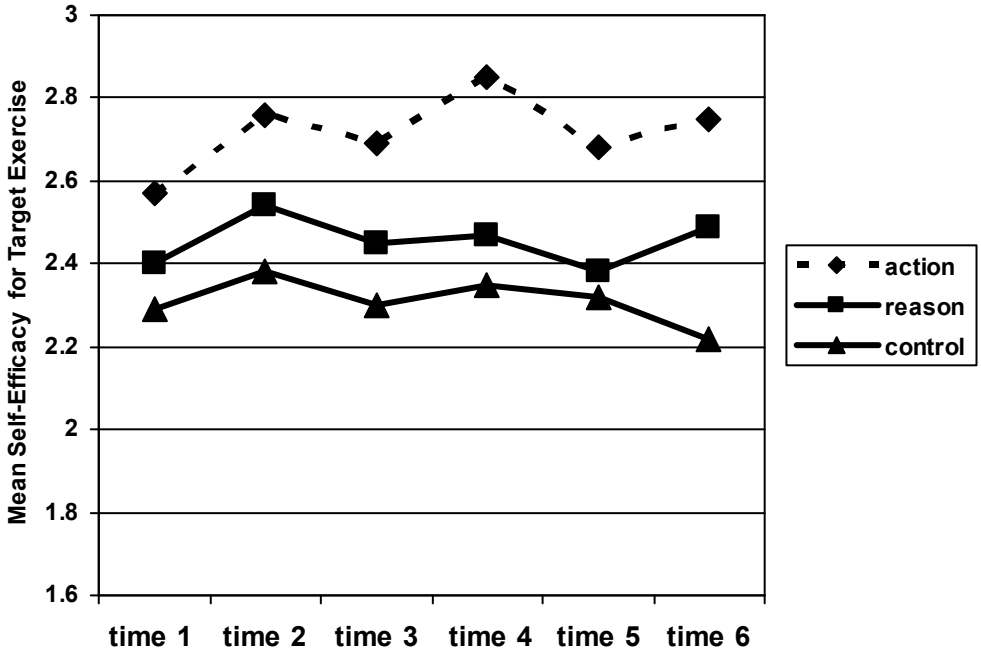


Figure 8. Mean self-efficacy for engaging in target exercise for Weeks 1 through 6 by type of directed thinking for participants in Experiment 1.

Number of Ideas

It is possible that the number of ideas participants generated during the course of the experiment was affected by type of directed thinking. Total number of ideas generated by each participant was determined by counting the number of original ideas that occurred during each of the five weekly experimental sessions. If an item was listed during each of the five weeks, it was only counted once for the present analysis. A one-way ANOVA using type of directed thinking (action strategies vs. reasons) as the independent variable and total number of ideas generated as the dependent variable was significant, $F(1, 33) = 5.21$, $p < .05$. Participants generated more reasons ($M = 25.58$, $SD = 7.43$) than action strategies ($M = 20.67$, $SD = 5.17$), which replicates the results reported by Ten Eyck et al. (2006).

Frequency of Thought about Ideas

Although participants differed in the total number of original ideas they generated during the course of the experiment, most listed at least five of their ideas in each of the weekly sessions. Participants' mean ratings of the number of times they thought about each of the five most frequently generated items were subjected to a one-way ANOVA using type of directed thinking as the independent variable; however, the analysis was not significant.

Frequency of Idea Use

It is also possible that there were differences in the number of times participants used their ideas to increase target exercise. Participants' mean ratings of the number of times they actually used each of the five most frequently generated items to increase exercise were therefore subjected to a one-way ANOVA using type of directed thinking as the independent variable. The analysis was not significant.

Effectiveness of Ideas for Increasing Target Exercise

Participants may have also differed in their perceptions about the effectiveness of their ideas for increasing the performance of target exercise. Their mean ratings of the effectiveness of the five most frequently generated items were subjected to a one-way ANOVA using type of directed thinking as the independent variable, however the analysis proved non-significant.

Effectiveness of Ideas for Increasing Enjoyment of Target Exercise

Finally, participants may have differed in their perceptions about the effectiveness of their ideas for increasing their enjoyment of target exercise. Participants' mean rating of the effectiveness of their five most frequently generated items were subjected to a one-way ANOVA using type of directed thinking as the independent variable. The analysis proved marginally significant, $F(2, 33) = 3.73$, $p = .06$. Action strategies were perceived as more effective for

increasing the enjoyment of target exercise (M = 4.70, SD = 2.92) than reasons (M = 3.04, SD = 2.05).

Discussion

Summary of Results

Cardiovascular Fitness

Participants in Experiment 1 demonstrated a marginally significant increase in their cardiovascular fitness during the course of the experiment, as measured by estimated relative VO_2max. Control participants increased their cardiovascular fitness the most, which was unexpected (see Table 7).

Further, participants' estimated absolute VO_2max was higher at Week 6 after generating reasons or a no-treatment control condition when they reported having no difficulty starting tasks; but, had a higher estimated absolute VO_2max at Week 6 after generating action strategies when they reported having difficulty starting tasks (see Table 5). Perhaps generating and thinking about action strategies proved more useful for participants who reported having difficulty starting tasks because their ideas provided them with concrete techniques they could employ to overcome their actor's block.

Target Exercise

Performance of target exercise was moderated by type of directed thinking and initial level of target exercise. For participants who began the experiment doing little or none of their target exercise (i.e., low exercisers), type of directed thinking had no significant effect on changes in their target exercise behavior from Week 2 to Week 6. For participants who began the experiment doing some of their target exercise (i.e., high exercisers), however, generating action strategies proved marginally more effective for increasing target exercise behavior from Week 2

to Week 6 than did generating reasons or a no-treatment control condition. Further analyses revealed a similar pattern. For participants categorized as high exercisers, generating action strategies led to a greater number of minutes spent doing their target exercise at Week 6, than did generating reasons or a non-treatment control condition. For participants categorized as low exercisers, action strategies were no more effective for the increasing the performance of target exercise at Week 6 than were generating reasons or a no-treatment control condition. These findings conceptually replicate those found by Labansat et al. (in press), who found that actions proved more effective than reasons for increasing study intentions only when participants were already engaged in some regular studying behavior.

Overall Exercise

Overall performance of exercise was affected by type of directed thinking and Big Five Inventory Conscientiousness category (John et al., 1991). For participants low in conscientiousness, overall exercise performance from Week 2 to Week 6 was not differentially affected by type of directed thinking. For participants high in conscientiousness, in contrast, the control group reported the largest decrease in overall exercise behavior from Week 2 to Week 6, while there was little change for participants in the other two groups. Further analyses also revealed that generating reasons proved marginally more effective for increasing the performance of overall exercise at Week 6 when participants were categorized as low in conscientiousness while generating action strategies proved marginally more effective for participants high in conscientiousness.

Perceptions of Target Exercise

Individual differences also interacted with type of directed thinking to significantly impact participants' perceptions of how much of their target exercise they were doing now

compared to before they started in the experiment. The first of these individual differences was Locus of Control category (Rotter, 1966). For participants with an internal locus of control, generating reasons led to more positive perceptions of having done their target exercise than did generating action strategies. For participants with an external locus of control, in contrast, generating action strategies led to more positive perceptions of having done their target exercise than did generating reasons (see Table 16).

Big Five Inventory Extraversion category also interacted with type of directed thinking to affect participants' perceptions of target exercise (John et al., 1991). Introverted participants perceived that they were doing more of the target exercise now compared to before they started the experiment when they generated reasons than actions. Extraverted participants, in contrast, perceived that they were doing more of their target exercise when they generated actions than reasons (see Table 17).

Perceptions of Overall Exercise

Participants' perceptions of how much exercise overall they were doing at the end, compared to the beginning, of the experiment were affected by type of directed thinking and initial stage of exercise (Prochaska et al., 1994). When participants were categorized as early stage exercisers, type of directed thinking had no effect on perceptions of doing more or less exercise now compared to before they started in the experiment; but participants categorized as mid stage exercisers who generated action strategies perceived that they were doing significantly more exercise overall now compared to the perceptions of the other two groups (see Table 20).

Type of directed thinking also interacted with therapeutic reactance category to affect perceptions of overall exercise behavior (Dowd et al., 1991). For participants low in therapeutic reactance, generating reasons had a marginally more positive effect on perceptions of overall

exercise than did generating actions or a no-treatment control condition. For participants high in therapeutic reactance, generating action strategies had a more positive effect on perceptions than did the other two conditions.

Big Five Inventory Extraversion category (John et al., 1991) interacted with type of directed thinking to affect perceptions of overall exercise. Introverted participants had more positive perceptions of having exercised more now compared to before starting the experiment after generating reasons when compared to participants who generated action strategies and a no-treatment control condition. Extraverted participants, in contrast, had more positive perceptions after generating actions than in the other two groups.

Big Five Inventory Conscientiousness category (John et al., 1991) also interacted with type of directed thinking to affect perceptions of overall exercise. For participants categorized as low in conscientiousness, generating reasons led to more positive perceptions of having exercise more now than before starting the experiment than did generating action strategies or a no-treatment control condition. For highly conscientious participants, generating action strategies resulted in higher reported perceptions than did generating reasons or a no-treatment control condition.

Target Exercise Intentions

Participants' intentions to do their target exercise in the month following the experiment were affected by a type of directed thinking X initial stage of exercise interaction (Prochaska et al., 1994). For participants in the early stages of change, generating reasons led to greater target exercise intentions than did generating action strategies. For participants in the mid stage of change, in contrast, generating action strategies led to greater target exercise intentions than did generating reasons (see Table 23). These results conceptually replicate prior findings regarding

the efficacy of using experiential processes to enact behavior change when in early stages of readiness to change and more action-oriented processes to enact behavior change when in later stages of readiness to change (Velicer & Prochaska, 1999).

Similarly, initial level of target exercise interacted with type of directed thinking to differentially affect target exercise intentions. Again, reasons proved more effective for increasing the behavioral intentions of participants who were initially doing none of their target exercise, while actions proved more effective for participants who were initially doing at least some of their target exercise (see Table 24).

Therapeutic Reactance category (Dowd et al., 1991) also interacted with type of directed thinking to produce differences in target exercise intentions. When participants were low in therapeutic reactance, generating reasons proved marginally more effective for increasing intentions to do target exercise than did generating action strategies. Conversely, action strategies proved marginally more effective for increasing intentions to engage in their target exercise for participants high in therapeutic reactance.

Overall Exercise Intentions

Participants' intentions to exercise more in the month following the experiment were greatest after generating action strategies, which replicates prior research (see Table 26; e.g., Ratcliff et al., 1999). In addition, participants' intentions to exercise overall were affected by an interaction between type of directed thinking and initial stage of exercise (Prochaska et al., 1994). For participants in the early stages of exercise, generating actions and reasons proved equally effective when compared to a no-treatment control condition. For participants in the mid stage of exercise, action strategies proved marginally more effective than did reasons or a no-treatment control condition (see Table 27).

Positive Benefits of Exercise Perceptions

Participants' perceptions of the positive benefits of exercise were affected by interactions between type of directed thinking and two individual differences. Participants in the early stages of exercise reported marginally more positive perceptions regarding the benefits of exercise after generating reasons or a no-treatment control condition than did participants who generated action strategies (see Table 30). Similarly, participants identified as less likely to resist therapeutic interventions reported more positive perceptions regarding the benefits of exercise after generating reasons or a no-treatment control condition, while action strategies proved more effective for participants identified as more likely to resist therapeutic interventions (see Table 31).

Advantages of Target Exercise

Type of directed thinking affected participants' perceptions of the benefits of engaging in their target exercise. When participants generated reasons, they perceived the advantages of their target exercise marginally more positive than did participants in the other two groups (see Figure 5).

Perceptions of Actions or Reasons

Finally, participants generated more reasons than actions during the course of the experiment. Actions, however, were perceived as more effective for increasing the enjoyment of target exercise.

The above summary of results from Experiment 1 indicates some expected and unexpected trends. There were, however, some issues that needed to be addressed.

Limitations

Experiment 1 was intended to assess whether directed thinking about action strategies or reasons would be more effective for increasing cardiovascular fitness and the performance of exercise. After examining the procedures used for assessing estimated VO_2max, idea generation, self-reports of exercise, and exposure to the experimental manipulation, it was apparent that they needed to be refined. First, in many cases, only one trained experimenter measured participants' pulse rates following the completion of the step exercise. This procedure increased the likelihood of obtaining inaccurate pulse rates, which could in turn lead to inaccurate estimates of VO_2max.

An examination of the content of participants' idea generation sheets revealed that in some cases, participants failed to follow the instructions. For example, participants in the reasons condition would sometimes generate actions, and vice versa. Participants' self-reports of exercise were sometimes vague, which made it difficult to count the actual number and types of exercise they completed each week.

The instructions used to select target exercise instructed participants to choose the exercise they would most *prefer to do*. Several participants chose "swimming" as their target exercise, but never actually swam during the course of the experiment.

Finally, the participants were exposed to the experimental manipulation for only five weeks. According to the American College of Sports Medicine (2005), individuals should engage in moderately vigorous physical activity three to five times per week for 20 to 60 minutes each time. Based on their self-reports of exercise, it does not appear that participants in Experiment 1 adhered to this guideline, and it would therefore be unlikely that they would show any significant benefits in only five weeks. Each of these issues was therefore addressed in Experiment 2.

EXPERIMENT 2

Experiment 2 was conducted to test the effects of two types of directed thinking on intentions to exercise and the performance of actual exercise behavior. In addition, participants' cardiovascular fitness was assessed prior to the introduction of the experimental manipulation, and at the conclusion of nine weekly sessions.

In order to correct the limitations of Experiment 1, some of the procedures and materials used in Experiment 2 were modified. The first limitation arose during the measurement of cardiovascular fitness. Recall that one experimenter measured each participant's radial pulse upon completion of the step test. In Experiment 2, pulse rate was measured by two experimenters, and relied on carotid pulse, which is typically easier to detect.

The second limitation arose when participants selected their target exercise. At the beginning of Experiment 1, participants selected a cardiovascular exercise that they would be "most willing to try," were they to start exercising regularly today. Post-experimental analysis of this procedure revealed that several participants selected "swimming" as their target exercise, but did not report swimming as exercise during the experiment. Consequently, when participants in Experiment 2 selected their target exercise, they were asked to choose the exercise that they would be "most likely to do," were they to begin exercising regularly today.

The third limitation involved the ideas generated by participants in the action strategies and reasons groups. Post-experimental examinations of the ideas that participants in each of these conditions generated during the weekly sessions revealed that not all participants followed the instructions. In Experiment 2, participants' ideas were reviewed by the experimenter between the first two to three weekly sessions in order to insure that they were following the instructions.

Any participant who was not following instructions received written feedback from the experimenter on which types of ideas would be most appropriate.

Finally, the number of weeks that participants were exposed to the experimental manipulation during Experiment 1 was not likely sufficient to influence cardiovascular fitness. As a result, the number of weeks that participants generated action strategies or reasons was extended to eight weeks in Experiment 2.

Method

Participants

Sixty-one undergraduates (6 males and 55 females) participated in nine weekly sessions for course credit. Due to attrition (1 male and 2 females), participation in organized athletic activities (1 male and 2 females), and injury (2 females), the final sample consisted of 53 participants (4 males and 49 females). Because there were very few males in the present experiment, gender will not be discussed further. Satisfaction with Life Scale (Diener et al., 1985) scores did not have any significant effects and will also not be discussed further.

Procedure

Participant Recruitment

Participants were recruited at the beginning of the fall semester based on their responses to a series of questions regarding their current health (Velicer et al., 2000; Appendix Q) and their current level of exercise (Prochaska et al., 1994; Appendix I). Undergraduate psychology students with no contraindications for engaging in physical activity and self-identified as non-regular exercisers were invited to participate in a nine-week experiment.

Pre-Manipulation Cardiovascular Assessment

Eligible participants reported separately to a psychology laboratory wearing comfortable clothing and gym shoes. They read and signed an experimental consent form which included four additional medical screening questions (Heyward, 2002; Appendix X), and then ranked five cardiovascular exercises in order of likelihood that they would do each one (Appendix Y). The exercise participants ranked as number one served as their target exercise during the remainder of the experiment. In other words, the cardiovascular exercise they would be most likely to do served as their target exercise. The experimenter then recorded each participant's height in inches and body weight in pounds.

Each participant then completed the Astrand-Rhyming step test (Astrand, 1956; Astrand & Rhyming, 1954), following the same protocol described in Experiment 1. The only exception included the addition of a second trained experimenter, who also measured each participant's pulse rate following the bench-stepping exercise. Four participants were unable to complete the test because of physical distress.

Session 1

After reading and signing an experimental consent form, participants completed a series of individual difference measures including the Marlowe-Crowne Social Desirability scale (Crowne & Marlowe, 1960; Appendix R), the Locus of Control Scale (Rotter, 1966; Appendix J), the Therapeutic Reactance Scale (Dowd et al., 1991; Appendix L), selected subscales from the Big Five Inventory (John et al., 1991; Appendix M), and the Satisfaction With Life Scale (Diener et al., 1985; Appendix H). Participants then reported their experience with the five cardiovascular exercises they had ranked previously[1] (Appendix U), completed a series of items pertaining to the characteristics of the typical person who exercises a lot (Appendix G) and

[1] The experience with exercise questionnaire used in Experiment 2 was identical to the one used in Experiment 1, except that "swimming" was omitted.

reported their exercise behavior for the past seven days (Appendix E). Finally, participants completed a decisional balance measure of the advantages and disadvantages of engaging in their target exercise (Prochaska et al., 1994; Appendix N) and a measure of self-efficacy for resisting temptations to avoid their target exercise (DiClemente et al., 1985; Appendix O). At this point, participants assigned to the control condition (n = 16) were excused and reminded of their next appointment.

Action strategies condition. After collecting all materials, the experimenter provided participants with an additional packet. Participants assigned to the *action strategies condition* (n = 18) read an instructional passage about successful authors identical to the one used in Experiment 1. After reading the passage, participants were asked to generate their own action strategies for engaging in their target exercise (Appendix A) and then to categorize those ideas using four experimenter-provided categories (Appendix B). Participants were then instructed to generate additional ideas for any category that did not contain at least three ideas, after which they indicated whether each idea would help them start exercising, enjoy exercising, or finish exercising once they had started (Appendix B).

Reasons condition. Participants assigned to the *reasons condition* (n = 15) also read an instructional passage about successful authors identical to the one described in Experiment 1 (Appendix C), generated their own reasons why they should engage in their target exercise, categorized those ideas using four experimenter-provided categories (Appendix D), generated additional ideas for any category that did not contain at least three ideas, and indicated whether each idea would help them start, enjoy, or finish their target exercise (Appendix D). Participants in both experimental groups were then reminded of their next appointment and excused.

Sessions 2 through 8

At one week intervals, all participants returned and completed the decisional balance and self-efficacy measures for engaging in their target exercises (DiClemente et al., 1985; Prochaska et al., 1994; Velicer et al., 1985), followed by a report of their exercise behavior for the past seven days. At this point, participants in the control condition were excused and reminded of their next appointment.

Participants in the action strategies and reasons groups then read the same instructional passage from Session 1. As described in Experiment 1, the instructions for this task varied slightly, in that participants were informed that they may list ideas they recalled from Session 1, plus any new ideas that occurred to them. Participants then categorized their ideas using the same experimenter-provided categories from Session 1, added additional ideas to their lists, and indicated whether each idea helped them start, enjoy, or finish doing their target exercise.

Session 9

One week following Session 8, all participants returned and completed the decisional balance and self-efficacy measures for engaging in their target exercises (DiClemente et al., 1985; Prochaska et al., 1994; Velicer et al., 1985), and reported their exercise behavior for the past seven days. Participants then completed selected subscales from the Big Five Inventory (John et al., 1991) and the Satisfaction with Life Scale (Diener et al., 1985). Next, participants again answered a series of items pertaining to the characteristics of the typical person who exercises a lot. Participants in the two experimental groups (action strategies, reasons) were then provided with a comprehensive list of all ideas listed during sessions one through seven and asked to provide ratings of how often they thought about each item, how many times they implemented each item, the effectiveness of each item for increasing the performance of their

target exercise, and the effect that each item had on their enjoyment of exercise (Appendix P). All participants then reported their current level of exercise (Prochaska et al., 1994; Appendix I) and completed a series of items assessing their intentions to exercise and their perceptions of health, well-being, and physical fitness (Appendix F). Participants were then reminded of their final individual appointment and excused.

Post-Manipulation Cardiovascular Assessment

Within one week of completing Session 9, each participant returned to a psychology lab and completed the Astrand-Rhyming step test again (Astrand, 1956; Astrand & Rhyming, 1954). Four participants were unable to complete the step test because of physical distress. The experimenters recorded participants' body weights in pounds, provided them with feedback regarding their cardiovascular fitness and body mass index (Appendix W), debriefed them, and thanked them for their participation.

Results

Experiment 2 was intended to hone the specific directed thinking techniques that participants might use to increase their cardiovascular fitness and exercise behavior. In addition, the experimenters employed a more stringent method of determining estimated VO_2max than in Experiment 1, by adding a second experimenter and measuring carotid pulse rates.

Types of Ideas Generated

Table 35 shows the 10 most frequently generated action strategies and the 10 most frequently generated reasons, along with how often each item was thought about, used, and how effective they were for increasing target exercise behavior and enjoyment. As in Experiment 1, each type of action strategy and reason represents a variety of wording that was judged to have similar meaning. For example, "Wear proper attire" includes ideas such as "wear comfortable

clothing" and "buy new running shoes." "Physical cost to self" includes ideas such as "I will gain weight if I don't walk" and "I will get more stressed if I don't run."

Table 35

Mean ratings of thought frequency, use frequency, and effectiveness for increasing and enjoying exercise for participants in Experiment 2.

	Frequency	Think	Use	Increase	Enjoy
Actions					
Make exercise interesting	163	4.84	4.46	5.38	5.65
Music/Book/TV	124	6.85	4.55	5.15	6.05
Make a schedule	124	5.77	4.27	4.67	4.05
Exercise with others	119	6.61	3.44	4.33	5.05
Set goals	99	5.87	4.12	4.56	5.84
Exercise in proper environment	96	5.81	5.34	5.39	5.33
Use others for encouragement	77	4.86	3.26	4.33	3.93
Wear proper attire	62	5.33	1.45	1.55	1.33
Make a commitment	60	2.67	.89	1.33	1.56
Set self up for success	53	5.24	3.62	3.62	4.25
Reasons					
Physical cost to self	115	5.59	4.91	4.62	3.08
Psychological cost to self	91	4.65	3.71	3.58	2.52
Psychological cost to others	68	4.43	4.14	3.86	2.79
Improved Fitness	66	6.75	5.81	5.75	4.56
Improved mood	62	4.90	5.10	4.40	4.50
More energy	49	5.67	4.00	4.22	3.22
Role model	41	4.67	4.33	4.33	2.33
Look better	33	7.80	6.60	6.20	3.80
Improved confidence	30	6.12	5.37	5.37	4.00
Physical cost to others	29	5.33	4.67	5.00	3.67

Cardiovascular Fitness

One of the most important goals of the present experiment was to improve participants' cardiovascular fitness level, which was measured by estimating absolute VO_2max and relative VO_2max.

Estimated Absolute VO_2max

Participants' estimated absolute VO_2max was calculated using a regression equation (Females: VO_2max ($L \cdot min^{-1}$) = 3.750[(Body weight in kg – 3)/(60 s heart rate– 65)]; Males: VO_2max ($L \cdot min^{-1}$) = 3.744[(Body weight in kg + 5)/(60 s heart rate – 62)]; Marley & Linnerud, 1976) Table 36 summarizes the results for analyses of aerobic fitness as measured by estimated absolute VO_2max. Following the identical presentation scheme from Experiment 1 that will be used for all dependent measures, the left side of the table shows significant and marginally significant results from 3 (Type of Directed Thinking: Action Strategies, Reasons, Control) X 2 (Time: Pre-Manipulation, Post-Manipulation) mixed model analyses of variance (ANOVAs) of estimated absolute VO_2max, whereas the right side of the table shows significant and marginally significant results from analyses of covariance (ANCOVAs) of post-manipulation scores, using pre-manipulation scores as the covariate. The first row of the table shows results for the main analyses, with no moderator variables included. The subsequent rows of the table show analyses that added each potential moderator variable to the main analyses.

Table 37 shows the means from the type of directed thinking X time ANOVA that was summarized on the first row of Table 36. As the table shows, the two-way interaction proved significant, $F(2, 46) = 3.34$, $p < .05$. As shown in Figure 9, participants who generated action strategies for nine weeks showed an increase in estimated absolute VO_2max from Time 1 to Time 2 (M_{change} = +.20, SD = .41), while participants who generated reasons (M_{change} = -.06, SD = .29),

and participants in the control group (M_{change} = -.13, *SD* = .33), showed a decrease in estimated absolute VO_2max from Time 1 to Time 2. The ANCOVA results were similar to those for the ANOVA.

Table 37

Mean estimated absolute VO_2max pre- and post-manipulation by type of directed thinking for participants in Experiment 2.

	Actions (*n* = 18)	Reasons (*n* = 15)	Control (*n* = 16)
Time 1	2.42 (.65)	2.40 (.77)	2.31 (.59)
Time 2	2.62 (.70)	2.34 (.71)	2.18 (.48)
Change	+.20 (.41)	-.06 (.29)	-.13 (.33)

Note: Standard deviations in parentheses.

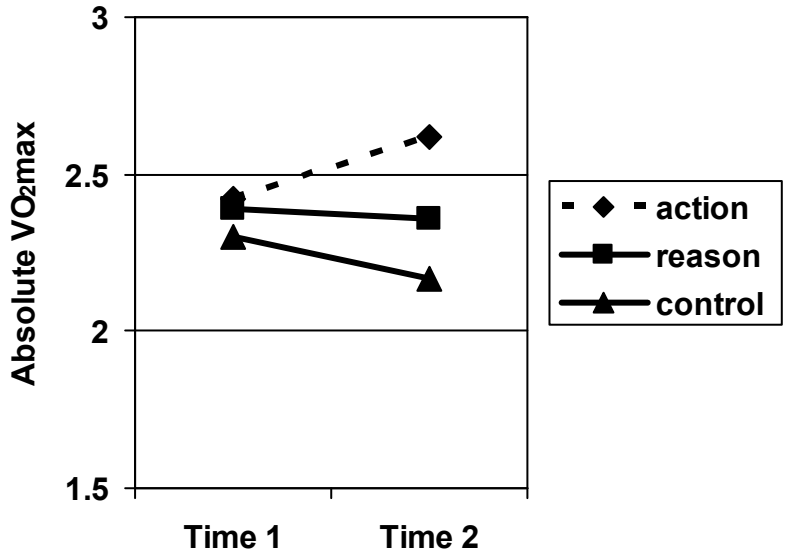


Figure 9. Mean change in estimated absolute VO_2max from Time 1 to Time 2 by type of directed thinking task for participants in Experiment 2.

Table 36

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for cardiovascular fitness (absolute VO_2max), with and without the addition of potential moderators (M) for Experiment 2.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis			---	**	---	---	---	**	---	---
W/ Mod's										
Initial Stage				*				**		
Initial $Level_{target}$				*						
MCSD				*		*		**	*	
LOC				*				*		
ABSS				*				*		
ABSF			**	*				*		
TRS				**		**		***	*	
$BFI_{extraversion}$				*	*			**		
$BFI_{neuroticism}$				**			*	**		
$BFI_{conscientiousness}$				*				**		

Note: * $p < .10$, ** $p < .05$, ***$p < .01$

Analyses of pulse rates. Did participants in the action strategies condition demonstrate an increase in their estimated absolute VO_2max from Time 1 to Time 2 because their post-exercise pulse rates were lower following the step test? A mixed-model ANOVA using type of directed thinking as the between-subjects variable and time as the within-subjects variable yielded a marginally significant interaction, $F(2, 45) = 2.56$, $p = .089$. As Figure 10 shows, participants who generated action strategies demonstrated a decrease in their 60 second pulse rates from Time 1 to Time 2, while participants who generated reasons and control participants demonstrated an increase. The results were similar for the ANCOVA, $F(2, 44) = 3.42$, $p < .05$.

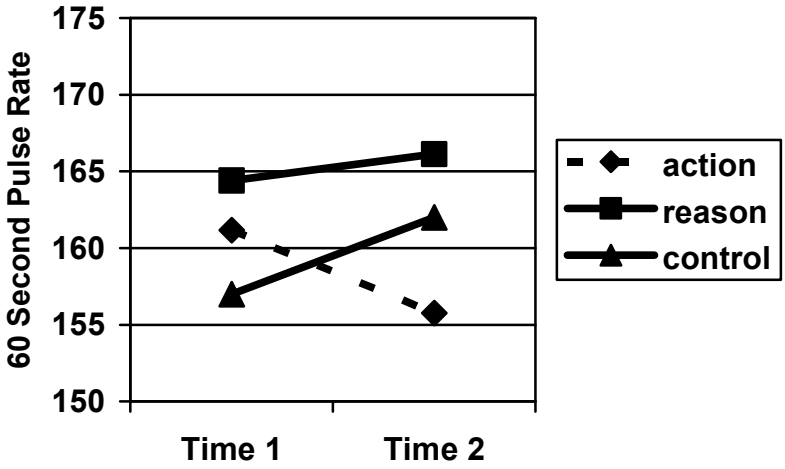


Figure 10. Mean change in post-exercise 60 second pulse rate by type of directed thinking for participants in Experiment 2.

Moderators of absolute VO_2max. Next, consider the rows of Table 36 that show the results when one moderator variable at a time was added to the main analyses. Initial Stage was determined from the exercise staging algorithm completed by participants during the initial screening session, as described in the materials section (Prochaska et al., 1994). Of all participants, 10 reported being in the precontemplation stage, 10 reported being in the contemplation stage, and 33 reported being in the preparation stage. Because of the small number

of precontemplators and contemplators, these combined groups were categorized as *early stage exercisers* (n = 20) and the remaining participants were categorized as *mid stage exercisers* (n =33). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "Initial Stage" row of Table 36, it revealed a marginally significant time X type of directed thinking interaction, $F(2, 43) = 2.83$, $p = .07$. When initial stage was added to the ANCOVA, there was a significant main effect of condition, which reflected a similar pattern.

Initial Level of target exercise was decided by examining reports of target exercise at Weeks 1. The range of reported target exercise at Week 1, before the experimental manipulation began, was large (0 – 165 minutes). Twenty-three of fifty-two participants reported doing zero minutes of their target exercise during Week 1. Consequently, Week 1 exercise reports were used as a baseline. Participants were divided into two blocks based on a median split of how often they reported engaging in their target exercise at Week 1. Participants who reported doing 20 minutes or less of their target exercise during Week 1 were categorized as *low target exercisers* (M = 2.96, SD = 7.24, n = 27), while participants who reported doing more than 20 minutes of their target exercise during Week 1 were categorized as *high target exercisers* (M = 78.85, SD = 39.56, n = 26). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "Initial Level" row of Table 36, there was a marginally significant time X type of directed thinking interaction. When this factor was added to the ANCOVA, the same pattern emerged.

Marlowe-Crowne Social Desirability scores were divided at their median for this sample (Crowne & Marlowe, 1960). Of all participants, 25 were categorized as *low in social desirability* (MCSD score < 15; M = 10.76, SD = 3.20), while 26 participants were categorized as *high in social desirability* (MCSD score ≥15; M = 18.31, SD = 3.27). When this moderator factor was

added to the main ANOVA, as shown in the "MCSD" row of Table 36, it revealed a marginally significant time X type of directed thinking interaction. Additionally, the analysis revealed a marginally significant time X social desirability category interaction, $F(1, 42) = 3.19$, $p = .081$. Participants identified as less likely to respond in a socially desirable manner showed an increase in estimated absolute VO_2max from Time 1 to Time 2 ($M_{change} = +.14$, $SD = .35$), while participants identified as more likely to respond in a socially desirable manner showed a slight decrease in estimated absolute VO_2max from Time 1 to Time 2 ($M_{change} = -.07$, $SD = .42$). When this factor was added to the ANCOVA, the effect of condition was significant. Participants who generated action strategies demonstrated a higher estimated absolute VO_2max at Time 2 ($M = 2.62$, $SD = .70$) than participants who generated reasons ($M = 2.34$, $SD = .70$) or a no-treatment control ($M = 2.14$, $SD = .48$). The analysis also yielded a marginally significant main effect of social desirability category, $F(1, 41) = 3.13$, $p = .084$. Participants low in social desirability had a higher estimated absolute VO_2max at Time 2 ($M = 2.47$, $SD = .83$) than did participants high in social desirability ($M = 2.30$, $SD = .46$), but there were no other significant effects.

Locus of Control scores were divided at their median for this sample (Rotter, 1966). Of all participants, 26 were categorized as having an *internal locus of control* (LOC < 11; $M = 8.03$, $SD = 1.95$), while 25 were categorized as having an *external locus of control* (LOC ≥ 11; $M = 12.72$, $SD = 1.54$). When this two-level moderator factor was added to the main ANOVA, as shown in the "LOC" row of Table 36, the time X type of directed thinking interaction remained marginally significant. When Locus of Control, with two levels, was added to the ANCOVA, there was a marginally significant main effect of condition, but no other significant effects were revealed.

Participants' Actor's Block Scale Start scores were also divided based on median split (Ten Eyck & Lord, 2006). Of all participants, 25 found it relatively easy to get started on projects and were categorized as *easy starters* (ABSS < 4.9; $M = 2.76$, $SD = 1.28$), while 26 found it relatively difficult to get started on projects and were categorized as *hard starters* (ABSS ≥ 4.9; $M = 6.64$, $SD = 1.23$). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "ABSS" row of Table 36, the time X type of directed thinking interaction remained marginally significant. When the Actor's Block Scale Start factor was added to the ANCOVA, it revealed the marginally significant main effect of condition, but there were no other significant effects.

Participants' Actor's Block Scale Finish scores (Ten Eyck & Lord, 2006) were divided based on a median split. Of all participants, 25 found it relatively easy to finish projects and were categorized as *easy finishers* (ABSF < .2.14; $M = 1.11$, $SD = .68$). Twenty-six participants found it relatively difficult to finish projects and were categorized as *difficult finishers* (ABSF ≥ 2.14; $M = 3.79$, $SD = 1.45$). When the Actor's Block Scale Finish factor, with two levels, was added to the main ANOVA, as shown in the "ABSF" row of Table 36, there was a marginally significant time X type of directed thinking interaction. Further, the ANOVA revealed a significant main effect of finish category, $F(1, 42) = 6.21$, $p < .05$. Participants who reported having little difficulty finishing tasks demonstrated a higher estimated absolute VO_2max at Time 2 ($M = 2.53$, $SD = .72$), than did participants who reported having more difficulty finishing tasks ($M = 2.22$, $SD = .58$). When the Actor's Block Scale Finish factor was added to the ANCOVA, the main effect of condition remained marginally significant; but no other significant effects were found.

Therapeutic Reactance Scale composite scores were divided at their median for this sample (Dowd et al., 1991). Of all participants, 27 were categorized as *low in therapeutic*

reactance (TRS < 67; M = 62.15, SD = 3.93) and 25 were categorized as *high in therapeutic reactance* (TRS ≥ 67; M = 73.44, SD = 5.39). When this moderator factor was added to the main ANOVA, as shown in the "TRS" row of Table 36, it produced the original significant time X type of directed thinking interaction. In addition, the analysis revealed a significant time X therapeutic reactance category interaction, $F(1, 43) = 4.94$, $p < .05$. Specifically, participants identified as high in therapeutic reactance increased their estimated absolute VO_2max from Time 1 to Time 2 (M_{change} = .13, SD = .30, n = 22), while participants identified as low in therapeutic reactance decreased their estimated absolute VO_2max during the same period (M_{change} = -.09, SD = .47, n = 27). When this factor, with two levels, was added to the ANCOVA, it produced the original significant main effect of condition. The analysis also revealed a marginally significant main effect of therapeutic reactance category, $F(1, 42) = 3.88$, $p < .05$, which reflected the same pattern described above.

The Big Five Inventory Extraversion subscale scores were divided at their median for this sample (John et al., 1991). Of all participants, 29 were categorized as *low in extraversion* ($BFI_{extraverion} < 5.0$; M = 4.03, SD = .69), while 23 participants were categorized as *high in extraversion* ($BFI_{extraverion} \geq 5.0$; M = 5.56, SD = .35). When this two-level moderator factor was added to the original ANOVA, as shown in the "$BFI_{extraversion}$" row of Table 36, it produced a marginally significant time X type of directed thinking interaction. The ANOVA also revealed a marginally significant type of directed thinking X extraversion category interaction, $F(2, 43) = 3.03$, p = .059. Action strategies proved more effective for producing higher mean estimated VO_2max for participants identified as high (M = 2.93, SD = .79) versus low (M = 2.36, SD = .52) in extraversion. For participants who generated reasons the pattern of means was reversed. Reasons were more effective for producing higher mean estimated VO_2max for participants

identified as low (M = 2.62, SD = .78) versus high (M = 2.07, SD = .55) in extraversion. For control participants, the pattern of means did not vary to the same degree (low: M = 2.18, SD = .23 vs. high: M = 2.28, SD = .67). When this moderator factor was added to the ANCOVA, it produced the same significant main effect of type of directed thinking, but no other significant effects were found.

Participants were divided into two categories based on a median split of their Big Five Inventory Neuroticism subscale scores (John et al., 1991). Of all participants, 27 were categorized as *low in neuroticism* ($BFI_{neuroticism} < 4.00$; M = 3.13, SD = .59), while 25 were categorized as *high in neuroticism* ($BFI_{neuroticism} \geq 4.00$; M = 5.01, SD = 1.58). When this moderator factor was added to the ANOVA, as shown in the $BFI_{neuroticism}$ row of Table 36, it produced a significant time X type of directed thinking interaction. The ANOVA also revealed a marginally significant time X type of directed thinking X neuroticism category interaction, F(2, 43) = 2.96, p =.062. For participants high in neuroticism, generating action strategies led to an increase in estimated absolute VO_2max from Time 1 to Time 2 (M_{change} = +.42, SD = .48), while generating reasons and a no-treatment control led to a decrease in estimated absolute VO_2max from Time 1 to Time 2 (reasons: M_{change} = -.14, SD = .29; control: M_{change} = -.22, SD = .47). For participants low in neuroticism, however, type of directed thinking appeared to have very little effect on changes in estimated absolute VO_2max from Time 1 to Time 2 (action strategies: M_{change} = +.03, SD = .47; reasons: M_{change} = +.04, SD = .28; control: M_{change} = -.05, SD = .25). When this factor, with two levels, was added to the ANCOVA, it produced the original significant main effect of type of directed thinking, but no other significant effects were found.

Big Five Inventory Conscientiousness subscale scores were divided at their median for this sample (John et al., 1991). Of all participants, 25 were categorized as *low in*

conscientiousness ($BFI_{conscientiousness} < 5.33$; $M = 4.60$, $SD = .53$), and 27 participants were categorized as *high in conscientiousness* ($BFI_{conscientiousness} \geq 5.33$; $M = 5.87$, $SD = .44$). When this moderator factor was added to the ANOVA, as shown in the "$BFI_{conscientiousness}$" row of Table 36, it produced a marginally significant main effect of time X type of directed thinking interaction. When this moderator factor was added to the ANCOVA, it yielded the significant main effect of condition, but no other significant effects were found. Whether participants were high or low in conscientiousness did not, therefore, significantly interact with generating action strategies or reasons to produce differences in estimated absolute VO_2max.

Estimated Relative VO_2max

In addition to using estimated absolute VO_2max as an indicator of cardiovascular fitness level, we analyzed participants' estimated relative VO_2max, which adjusts for individual body weight in kilograms {relative VO_2max = [(absolute VO_2max)(1000)/ body weight in kg)]}. Table 39 shows the means from a mixed-model time X type of directed thinking ANOVA that was summarized on the first row of Table 38. As the table shows, there was a marginally significant time X type of directed thinking interaction, $F(2, 46) = 2.93$, $p = .063$. As Figure 11 shows, participants who generated action strategies for nine weeks showed an increase in estimated relative VO_2max from Time 1 to Time 2 while participants who generated reasons and participants in the control group showed a decrease in estimated relative VO_2max from Time 1 to Time 2.

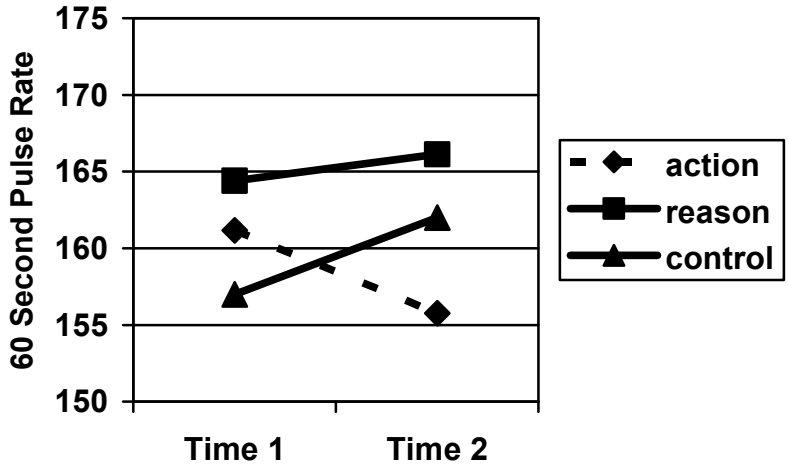


Figure 11. Mean change in estimated relative VO_2max from Time 1 to Time 2 by type of directed thinking task for participants in Experiment 2.

A one-way ANCOVA was conducted, controlling for estimated relative VO_2max at Time 1, using estimated relative VO_2max at Time 2 as the dependent variable. The analysis proved significant, $F(2, 45) = 3.70$, $p < .05$. As shown in the "Time 2" row of Table 39, participants who generated strategic actions had a significantly higher estimated relative VO_2max than participants who generated reasons or participants in the control condition.

Moderators of relative VO_2max. Next, consider the rows of Table 38 that show the results when one moderator variable at a time was added to the main analyses. Initial Level of target exercise, Locus of Control (Rotter, 1966), and Big Five Inventory Neuroticism and Conscientiousness (John et al., 1991) added nothing to the basic results.

Table 38

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for cardiovascular fitness (relative VO_2max), with and without the addition of potential moderators (M) for Experiment 2.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis			---	*	---	---	---	**	---	---
W/ Mod's										
Initial Stage				*				**		
Initial $Level_{target}$				*				**		
MCSD				*		*		**	*	
LOC				*				*		
ABSS			**					*		
ABSF			**					**		
TRS				**		**		**		
$BFI_{extraversion}$					***			**	*	
$BFI_{neuroticism}$				**	**			**		
$BFI_{conscientiousness}$				*				*		

Note: * p < .10, ** p < .05, ***p < .01

Table 39

Mean estimated relative VO_2max pre- and post-manipulation by type of directed thinking for participants in Experiment 2.

	Actions (n = 18)	Reasons (n = 15)	Control (n = 16)
Time 1	38.30 (7.69)	36.93 (5.95)	40.51 (10.21)
Time 2	40.71 (8.14)	35.95 (4.18)	37.47 (6.26)
Change	+2.43 (7.91)	-.97 (4.32)	-3.04 (6.91)

Note: Standard deviations in parentheses.

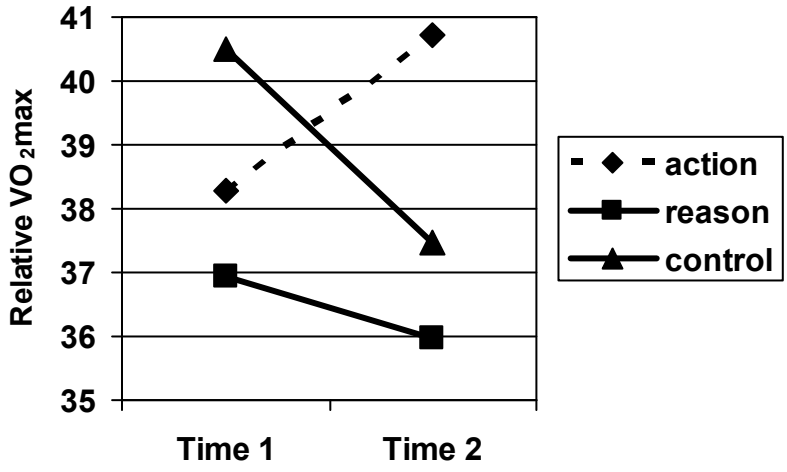


Figure 12. Mean change in estimated relative VO_2max from Time 1 to Time 2 by type of directed thinking task for participants in Experiment 2.

When Initial Stage (Prochaska et al., 1994) was added to the original ANOVA as a moderator factor with two levels, as shown in the "Initial Stage" row of Table 38, it produced a marginally significant time X type of directed thinking interaction; however, no other significant effects were revealed. When this moderator factor was added to the ANCOVA, it produced the original significant main effect of condition. In addition, the analysis produced a marginally significant main effect of initial stage, $F(1, 42) = 3.27$, $p = .078$. Participants who began the experiment while engaging in at least some regular exercise behavior demonstrated a higher estimated relative VO_2max at Time 2 ($M = 39.50$, $SD = 7.61$) than did participants initially doing very little or no regular exercise ($M = 35.98$, $SD = 4.06$); but no other significant effects were found.

Marlowe-Crowne Social Desirability category was also added to the ANOVA and, as shown in the "MCSD" row of Table 38 (Crowne & Marlowe, 1960). There was a marginally significant time X social desirability category interaction, $F(1, 42) = 3.76$, $p = .059$. Participants identified as high in social desirability decreased their estimated relative VO_2max from Time 1 to Time 2, ($M_{change} = -1.72$, $SD = 6.83$, $n = 25$), but participants identified as low in social desirability increased their estimated relative VO_2max from Time 1 to Time 2($M_{change} = +1.86$, $SD = 5.49$, $n = 23$). The ANOVA did not reveal any other significant effects. When this moderator factor was added to the ANCOVA, the main effect of condition remained significant, but no other significant effects were revealed.

The Actor's Block Scale Start category was next added to the ANOVA, as shown in the "ABSS" row of Table 38 (Ten Eyck & Lord, 2006). The analysis revealed a significant main effect of start category, $F(1, 42) = 5.82$, $p < .05$. At the end of the experiment, participants who reported having little or no difficulty starting tasks had a higher estimated relative VO_2max ($M =$

39.34, *SD* = 7.96) than did participants who reported having more difficulty starting tasks (*M* = 36.70, *SD* = 4.74). There were no additional significant effects. When this factor, with two levels, was added to the ANCOVA, it produced a marginally significant main effect of condition; but no other significant effects were found.

When the Actor's Block Scale Finish category (Ten Eyck & Lord, 2006) was added to the ANOVA as a two-level moderating factor, which is shown in the "ABSF" row of Table 38, it revealed a significant main effect of finish category, $F(1, 42) = 5.25$, $p < .05$. Participant who reported having little or no difficulty finishing tasks had a higher estimated relative VO_2max at Time 2 (*M* = 39.18, *SD* = 8.09) than did participants who reported having more difficulty finishing tasks (*M* = 36.75, *SD* = 4.36); but no other significant effects were revealed. When this factor was added to the ANCOVA, the main effect of condition remained significant; but, no other significant effects were revealed.

Therapeutic Reactance Scale composite score category was added to the ANOVA, as shown in the "TRS" row of Table 38 (Dowd et al., 1991). The time X type of directed thinking interaction remained significant. Additionally, the analysis revealed a significant time X therapeutic reactance category interaction, $F(1, 43) = 6.28$, $p < .05$. Participants categorized as low in therapeutic reactance decreased their estimated relative VO_2max from Time 1 to Time 2 (M_{change} = -2.22, *SD* = 8.10, *n* = 27), but participants categorized as high in therapeutic reactance increased their estimated relative VO_2max (M_{change} = +1.84, *SD* = 4.37, *n* = 22) from Time 1 to Time 2. The ANOVA did not reveal any other significant effects. When this moderator factor, with two levels, was added to the ANCOVA, the main effect of condition remained significant; but no other significant effects were found.

The Big Five Inventory Extraversion subscale category was added to the ANOVA as a two-level moderator factor, as shown in the "$BFI_{extraversion}$" row of Table 38 (Dowd et al., 1991). There was a significant type of directed thinking X extraversion category interaction, $F(2, 43) = 5.95$, $p < .01$. The results indicate that type of directed thinking did not appear to differentially affect estimated relative VO_2max when participants were identified as low in extraversion (action strategies: $M = 36.68$, $SD = 4.16$; reasons: $M = 38.77$, $SD = 4.21$; control: $M = 37.80$, $SD = 5.04$). When participants were identified as high in extraversion, however, the results indicate that action strategies proved more effective for estimated relative VO_2max ($M = 47.82$, $SD = 7.39$) than did generating reasons ($M = 33.79$, $SD = 3.83$) or a no-treatment control ($M = 39.91$, $SD = 9.53$). The ANOVA did not yield any other significant effects. When this moderator factor, with two levels, was added to the ANCOVA, the main effect of condition remained significant. There was also a marginally significant main effect of extraversion category, $F(1, 42) = 3.07$, $p = .087$. Extroverted participants had a higher estimated relative VO_2max at Time 2 ($M = 39.50$, $SD = 4.37$) than did their introverted counterparts ($M = 37.23$, $SD = 8.87$).

Summary of Results for Cardiovascular Fitness

Looking back at Tables 37 and 39, it is apparent that the directed thinking manipulation had the intended effect on cardiovascular fitness, whether measured by absolute or relative VO_2max. It both cases, only the participants who generated action strategies increased their cardiovascular fitness from the beginning of the experiment to the end of the experiment. In addition, there was no real evidence of moderation.

Body Mass Index

The present experiment was designed to increase the performance of exercise behavior and improve cardiovascular fitness levels, which might in turn influence participants' body

weights and body compositions. Body mass index provides an estimate of body fat based on height and weight, with lower values indicating lower levels of body fat. Body mass index (BMI) was calculated using identical formula described in Experiment 1. Table 40 summarizes the results for the analyses of BMI.

Table 41 shows the means from a time X type of directed thinking mixed model ANOVA. As the table shows, the analysis yielded a significant main effect of time, $F(1, 49) = 8.42$, $p < .01$. There was a significant increase in body mass index from Week 1 to Week 9 ($M_{change} = +.27$, $SD = .64$). The ANOVA did not yield any other significant effects. An ANCOVA of post-manipulation (Week 1) BMI, using pre-manipulation (Week 9) BMI as a covariate, and type of directed thinking as the independent variable did not yield any significant effects.

Moderators of body mass index. As shown in Table 40, the only result of even marginally significant interest from analyses of moderator variables involved Initial Level of target exercise. When initial level of target exercise was added to the ANOVA, as shown in the "Initial $Level_{target}$" row of Table 40, it yielded a marginally significant main effect of initial level, $F(1, 46) = 3.32$, $p = .075$. Participants who began the experiment doing little or none of their target exercise had a higher body mass index ($M = 24.35$, $SD = 5.09$) than did participant who began the experiment doing some of their target exercise ($M = 21.91$, $SD = 3.38$); but no other significant effects were found. The results were similar when this factor was added to the ANCOVA.

Table 40

Significant and marginally significant results from condition (C) X time (T) repeated measures and condition (C) ANOVA for body mass index, with and without the addition of potential moderators (M) in Experiment 2.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis		***	---		---	---	---		---	---
W/ Mod's										
Initial Stage		***								
Initial $Level_{target}$		***	*						*	
MCSD		**								
LOC		**								
ABSS		**								
ABSF		**								
TRS		***								
$BFI_{extraversion}$		***								
$BFI_{neuroticism}$		***								
$BFI_{conscientiousness}$		***								

Note: * p < .10, ** p < .05, ***p < .01

Table 41

Mean body mass index at Weeks 1 and 9 by type of directed thinking for participants in Experiment 2.

	Actions (n = 17)	Reasons (n = 16)	Control (n = 19)
Week 1	22.81 (3.42)	23.11 (4.81)	22.82 (5.37)
Week 9	23.19 (3.48)	23.23 (4.69)	23.11 (5.27)
Change	+.37 (.65)	+.11 (.55)	+.29 (.72)

Note: Standard deviations in parentheses.

Self-Report Exercise Behaviors

Selection of Target Exercise

Prior to beginning the experiment, all participants selected a target exercise from a list of five cardiovascular activities. Participants chose one of the following: brisk walking (n = 13 f), running (n = 9 f), bicycling (n = 7; f 6, m 1), elliptical training (n = 12; f 11, m 1), or group exercise (n = 12; f 10, m 2).

Experience with Target Exercise

To rule out any differences in the performance of target exercise between groups that might exist prior to the experimental manipulation, participants were asked to report their experience with their target exercise at the beginning of Week 1. Participants' responses to the items: "To what extent have you engaged in _____as a form of exercise *in the past*?", "To what extent have you been doing _____ as a form of exercise *recently*?", "*On average,* how many times per week do you _____?", and "How much experience do you have with _____ as a form of exercise?" were subjected to one-way ANOVAs. Type of directed

thinking served as the independent variable and participants' responses to each item served as the dependent variables. The analyses were non-significant (Fs < 1.1).

Performance of Target Exercise

One of the most practical goals of the present experiment was to increase the performance of exercise. The total minutes participants spent engaging in their target exercise each week was determined by examining self-reports of exercise. Table 42 summarizes the results from the analyses of target exercise behavior. A square root transformation was used to reduce the variance, and the analyses to be reported were performed on the square roots. Means will be reported, however, in actual minutes spent exercising. Figure 12 shows the mean reported minutes spent doing the target exercise in each of the nine weeks for participants in the three conditions. The figure suggests that by the end of the experiment (Week 9), the manipulation had produced differences among the groups, with the actions group spending the most time on their target exercise and the control group the least time.

Were these differences significant? Table 43 shows the means from a time X type of directed thinking mixed-model ANOVA. As the table shows, there was a significant main effect of time, $F(2, 47) = 8.98$, $p < .01$. Participants decreased the performance of target exercise from Week 1 to Week 9 ($M_{change} = -14.09$, $SD = 43.73$); but, the analysis did not yield any other significant effects. An ANCOVA of Week 9 reports of target exercise, using Week 1 reports of target exercise as a covariate, and condition as the independent variable was also non-significant.

Moderators of target exercise. Next, consider the rows of Table 42 that show the results when one moderator variable at a time was added to the main analyses. Only Initial Stage (Prochaska et al., 1994), Initial Level of target exercise, Locus of Control (Rotter, 1966) and Big Five Inventory Neuroticism (John et al., 1991) yielded any interesting results.

Table 42

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for target exercise, with and without the addition of potential moderators (M) for Experiment 2.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis		***	---		---	---	---		---	---
W/ Mod's										
Initial Stage		***	****							
Initial $Level_{target}$		***	****			****		**	***	
MCSD		***								
LOC		***			**					
ABSS		***								
ABSF		***								
TRS		***								
$BFI_{extraversion}$		***								
$BFI_{neuroticism}$		***						*	*	
$BFI_{conscientiousness}$		***								

Note: * p < .10, ** p < .05, *** p < .01, **** p < .001

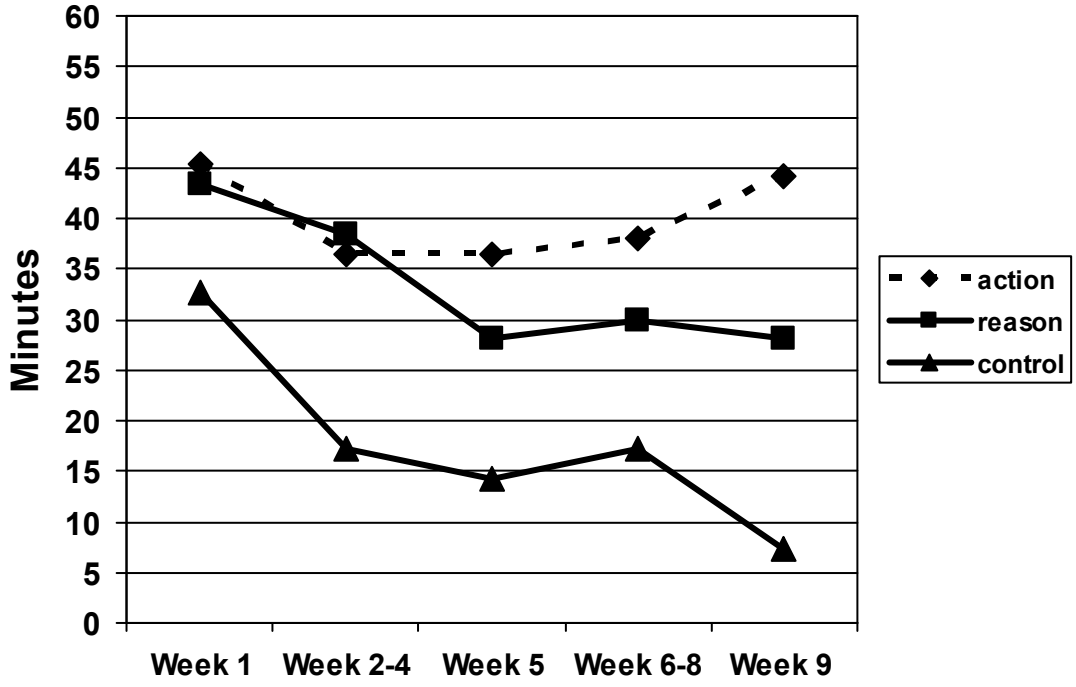


Figure 12. Mean time spent doing target exercise for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2

Table 43

Mean self-report target exercise at Weeks 1 and 9 by type of directed thinking for participants in Experiment 2.

	Actions (n = 17)	Reasons (n = 16)	Control (n = 19)
Week 1	45.28 (54.35)	43.43 (50.79)	32.64 (38.09)
Week 9	44.06 (63.41)	28.12 (48.89)	7.36 (18.81)
Change	-1.22 (55.83)	-15.31 (33.08)	-25.26 (36.98)

Note: Standard deviations in parentheses.

When Initial Stage of exercise (Prochaska et al., 1994) was added to the ANOVA as a potential moderator, the "Initial Stage" row of Table 42 shows, the main effect of time remained significant. The analysis also revealed a significant main effect of initial stage, $F(1, 47) = 14.40$, $p < .001$. Participants in the early stages of exercise reported doing significantly less of their target exercise at Week 9 ($M = 7.50$, $SD = 27.32$) than did participants in the mid stage of exercise ($M = 37.36$, $SD = 55.29$). There were no other significant effects.

When initial level of target exercise was then added to the ANOVA as a potential moderator, as the "Initial Level" row of Table 42 shows, the main effect of time remained significant; and there was a significant main effect of initial level, $F(1, 47) = 78.12$, $p < .001$. Participants who began the experiment as high target exercisers reported doing more of their target exercise ($M = 60.83$, $SD = 44.25$) than did participants who began the experiment as low target exercisers ($M = 6.48$, $SD = 16.39$). Further, the analysis revealed a significant time X initial level interaction, $F(1, 46) = 18.29$, $p < .001$. Participants categorized as low target exercisers increased their target exercise from Week 1 to Week 9 ($M_{change} = +7.03$, $SD = 33.26$), while participants categorized as high target exercisers decreased their target exercise from Week 1 to Week 9 ($M_{change} = -36.03$, $SD = 42.93$). When this factor was added to the ANCOVA as a potential moderator, it revealed a significant main effect of type of directed thinking, $F(2, 47) = 11.89$, $p < .01$. Controlling for Week 1 levels, participants who generated strategic actions reported doing more of their target exercise during Week 9 ($M = 44.06$, $SD = 63.41$) than did participants in the control condition ($M = 8.23$, $SD = 19.76$), or the reasons condition ($M = 28.12$, $SD = 48.89$).

When Locus of Control category was added to the ANOVA, as the "LOC" row of Table 42 shows, the main effect of time remained significant (Rotter, 1966). The analyses also

produced a significant type of directed thinking X locus of control category interaction, $F(2, 45) = 4.95$, $p < .05$. For participants with an internal locus of control, generating reasons proved slightly more effective for the performance of target exercise ($M = 56.25$, $SD = 49.33$) than did generating action strategies ($M = 36.25$, $SD = 48.55$) or a no-treatment control condition ($M = 27.50$, $SD = 29.95$). For participants with an external locus of control, however, generating action strategies proved more effective for the performance of target exercise ($M = 55.18$, $SD = 57.60$) than did generating reasons ($M = 1.67$, $SD = 4.09$) or a no-treatment control condition ($M = 19.54$, $SD = 21.11$). There were no other significant effects.

Finally, when the Big Five Inventory Neuroticism subscale category was added to ANOVA, as the "$BFI_{neuroticism}$" row of Table 42 shows, the main effect of time remained significant, but there were no other significant effects (John et al., 1991). When this factor was added to the ANCOVA, it produced a marginally significant main effect of condition, $F(2, 45) = 2.63$, $p = .083$. Additionally, the ANCOVA revealed a marginally significant main effect of neuroticism category, $F(1, 45) = 3.09$, $p = .085$. Participants low in neuroticism reported doing more of their target exercise during Week 9 ($M = 35.11$, $SD = 54.17$) than did participants high in neuroticism ($M = 17.40$, $SD = 41.87$).

Overall Performance of Exercise

It was also important to assess whether the experimental manipulation affected overall exercise performance. The total minutes participants spent engaging in all exercise each week was also determined by examining self-reports of exercise The range of reported overall exercise before the experimental manipulation (Week 1), which provided the baseline for overall exercise analyses, was large (0 – 360 minutes). A square root transformation was used to reduce the variance, and the analyses to be reported were performed on the square roots. Means will be

reported in actual minutes spent exercising. Figure 13 shows the mean reported minutes spent doing exercise in each of the nine weeks for participants in the three conditions. The figure suggests that by the end of the experiment (Week 9), the manipulation had produced differences among the groups, with the reasons group spending the most time on overall exercise and the control group the least time.

Were these differences significant across time? Table 44 summarizes the results for the analyses of overall exercise. Table 45 shows the means from a time X type of directed thinking mixed-model ANOVA. The analysis yielded a significant main effect of time, $F(1, 49) = 10.16$, $p < .01$. Participants decreased their total time spent exercising from Week 1 ($M = 94.28$, $SD = 86.74$) to Week 9 ($M = 67.83$, $SD = 76.87$). The analysis also revealed a significant main effect of condition, $F(2, 50) = 3.41$, $p < .05$. Participants who generated reasons reported doing more exercise overall ($M = 117.03$, $SD = 81.58$) than did participants who generated action strategies ($M = 76.53$, $SD = 66.35$) or a no-treatment control condition ($M = 55.06$, $SD = 74.78$). The analyses did not yield any additional significant effects. An ANCOVA of Week 9 reports of total exercise, using Week 1 reports as a covariate and condition as the independent variable yielded no significant effects.

Moderators of overall exercise behavior. Next, consider the rows of Table 44 that show the results when one moderator variable at a time was added to the main analyses. As the table shows, only Initial Stage (Prochaska et al., 1994), Initial Level of overall exercise, Actor's Block Scale Finish (Ten Eyck & Lord, 2006), Therapeutic Reactance (Dowd et al., 1991), and Big Five Inventory Conscientiousness (John et al., 1991) were moderators of interest.

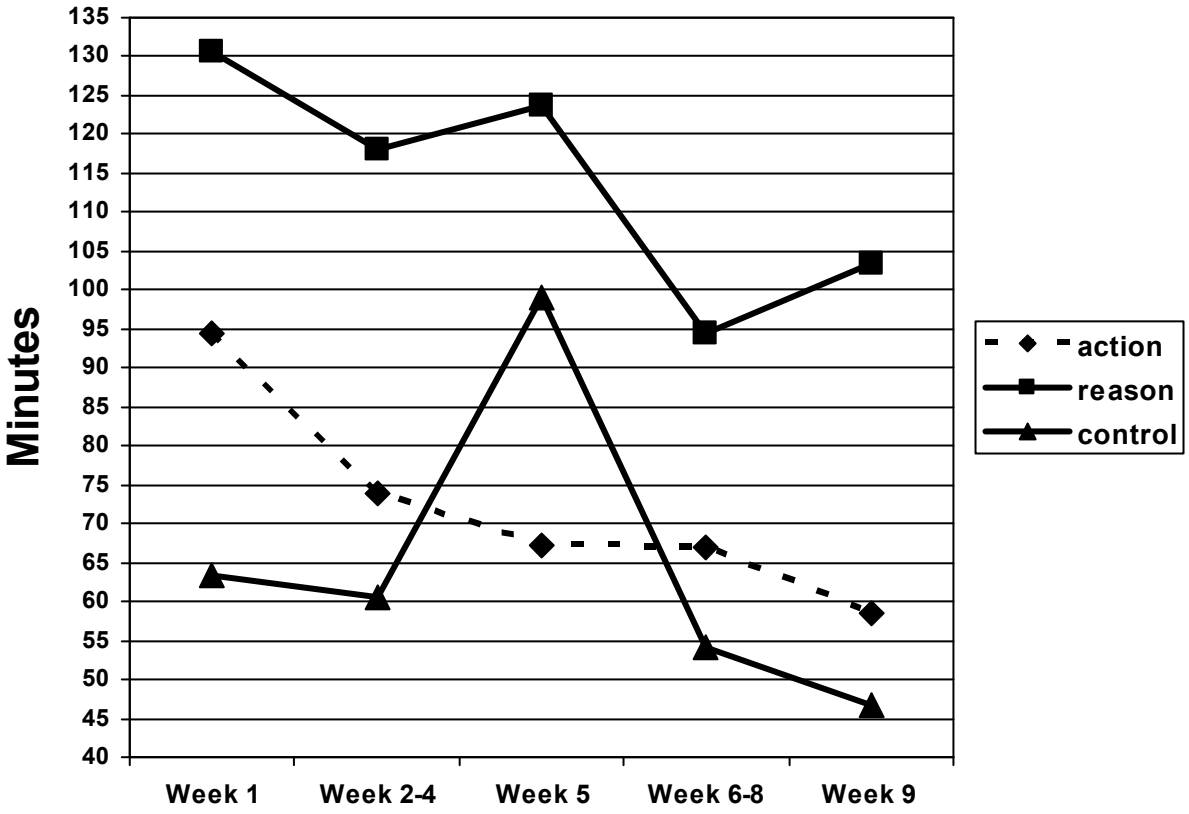


Figure 13. Mean time spent exercising overall for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2.

Table 44

Significant and marginally significant results from condition (C) X time (T) repeated measures ANOVA and from condition (C) ANCOVA, for overall exercise, with and without the addition of potential moderators (M) for Experiment 2.

	ANOVA							ANCOVA		
	C	T	M	CT	CM	TM	CTM	C	M	CM
Analysis	**	***	---		---	---	---		---	---
W/ Mod's										
Initial Stage	*	***	****						**	
Initial $Level_{overall}$	*	***	****			**				
MCSD	*	***								
LOC	*	***								
ABSS	*	***								
ABSF	*	***					**			*
TRS	*	***	*							
$BFI_{extraversion}$	*	***								
$BFI_{neuroticism}$	*	***								
$BFI_{conscientiousness}$	*	***					**			**

Note: * p < .10, ** p < .05, *** p < .01, **** p < .001

Table 45

Mean self-report overall exercise at Weeks 1 and 9 by type of directed thinking for participants in Experiment 2.

	Actions (n = 17)	Reasons (n = 16)	Control (n = 19)
Week 1	94.56 (77.92)	130.62 (91.85)	63.42 (82.42)
Week 9	58.50 (65.46)	103.43 (80.31)	46.68 (77.23)
Change	-36.06 (55.74)	-27.18 (56.06)	-16.74 (56.09)

Note: Standard deviations in parentheses.

When Initial Stage was added to the ANOVA, as shown in the "Initial Stage" row of Table 44, the main effect of time remained significant and the main effect of condition was marginally significant (Prochaska et al., 1994). There was a significant main effect of initial stage, $F(1, 47) = 27.17$, $p < .001$. Participants who began the experiment in the early stages of exercise reported doing less exercise overall ($M = 31.62$, $SD = 50.95$) than did participants who began the experiment in the mid stage of exercise ($M = 111.01$, $SD = 75.30$). When this factor was added to the ANCOVA, it yielded a significant main effect of initial stage, $F(1, 46) = 5.93$, $p < .05$. Mid stage exercisers reported doing more exercise overall during Week 9 ($M = 97.12$, $SD = 78.57$) than did early stage exercisers ($M = 19.50$, $SD = 42.73$). There were no other significant effects.

Initial level of overall exercise was determined by dividing participants into two groups based on a median split of how often they reported engaging in exercise overall at Week 1. Of all

participants, 26 were categorized as *low overall exercisers* (Initial $Level_{overall} < 85$, $M = 24.69$, $SD = 31.38$), and 27 participants were categorized as *high overall exercisers* (Initial $Level_{overall} \geq 85$, $M = 161.29$, $SD = 67.80$). When this moderator factor, with two levels, was added to the main ANOVA, as shown in the "Initial $Level_{overall}$" row of Table 44, the main effect of time remained significant and the main effect of condition was marginally significant. There was a significant main effect of initial level of overall exercise, $F(1, 47) = 66.59$, $p < .001$. Participants who began the experiment doing little exercise overall reported doing less exercise overall ($M = 49.89$, $SD = 64.95$) than did participants who began the experiment doing more exercise overall $M = 113.42$, $SD = 76.44$). The analysis also revealed a significant time X initial level interaction, $F(1, 46) = 4.23$, $p < .05$. Specifically, participants who were categorized as high overall exercisers reported a decrease in overall exercise behavior from Week 1 to Week 9 ($M_{change} = -50.00$, $SD = 56.59$), while participants who were categorized as low overall exercisers reported almost no change in overall exercise behavior from Week 1 to Week 9 ($M_{change} = -2.00$, $SD = 43.02$). The analysis did not reveal any additional significant effects. When this two-level factor was added to the ANCOVA, there were no significant effects.

When the Actor's Block Scale Finish category was added to the ANOVA, as the "ABSF" row of Table 44 shows, the main effect of time remained significant and the main effect of condition remained marginally significant (Ten Eyck & Lord, 2006). Table 46 displays the means from a significant time X type of directed thinking X finish category interaction, $F(2, 45) = 3.19$, $p = .05$. As the table shows, overall exercise decreased most in the reasons groups for easy finishers and decreased most in the action strategies group for the hard finishers. There were no other significant effects. When this factor was added to the ANCOVA, it revealed a marginally significant type of directed thinking X finish category interaction, $F(2, 44) = 2.51$, p

= .093. As shown in Table 47, participants who reported having no trouble finishing tasks, generating action strategies or reasons were both more effective for affecting overall exercise at Week 9 when compared to a no-treatment control condition. For participants who reported having more difficulty finishing tasks, generating reasons proved more effective for affecting overall exercise at Week 9 than did generating action strategies or a no-treatment control condition.

When Therapeutic Reactance Category was added to the ANOVA, as the "TRS" row of Table 44 shows, the main effect of time remained significant and the main effect of condition remained marginally significant (Dowd et al., 1991). The analyses also revealed a marginally

Table 46

Mean change in overall exercise behavior from Week 1 to Week 9 by type of directed thinking and Actor's Block Scale finish category for participants in Experiment 2.

	Type of Directed Thinking		
Actor's Block Scale Finish Category	Actions	Reasons	Control
Easy Finish	-15.62	-60.83	-26.63
	(48.28)	(53.15)	(39.27)
	n = 8	*n* = 6	*n* = 11
Hard Finish	-52.4	-7.00	+9.17
	(58.21)	(49.63)	(79.77)
	n = 10	*n* = 10	*n* = 6

Notes: Standard deviations in parentheses. Negative values indicate a decrease.

Table 47

Mean self-report overall exercise behavior at Week 9 by type of directed thinking and Actor's Block Scale finish category for participants in Experiment 2.

	Type of Directed Thinking		
Actor's Block Scale Finish Category	Actions	Reasons	Control
Easy Finish	71.25	82.50	55.63
	(67.02)	(90.42)	(93.16)
	$n = 8$	$n = 6$	$n = 11$
Hard Finish	48.00	116.00	42.50
	(65.89)	(75.74)	(57.77)
	$n = 10$	$n = 10$	$n = 6$

Note: Standard deviations in parentheses.

significant main effect of therapeutic reactance category, $F(1, 46) = 2.89$, $p = .096$. Participants low in therapeutic reactance reported doing more of exercise overall ($M = 99.78$, $SD = 88.14$) than did participants high in therapeutic reactance ($M = 64.08$, $SD = 59.17$). There were no other significant effects. When this factor was added to the ANCOVA, no additional significant effects were found.

Finally, when Big Five Inventory Conscientiousness category was added to the ANOVA, as the "$BFI_{conscientiousness}$" row of Table 44 shows, the main effect of time was significant and the main effect of condition was marginally significant (John et al., 1991). There was also a significant time X type of directed thinking X conscientiousness category interaction, $F(2, 46) = 3.35$, $p < .05$. As Table 49 shows, participants low in conscientiousness showed small decreases

in overall exercise from Week 1 to Week 9 when they generated reasons or were in a no-treatment control condition, but showed a larger decrease in overall exercise when they

Table 48

Mean change in overall exercise behavior by type of directed thinking and Big Five Inventory conscientiousness category for participants in Experiment 2.

	Type of Directed Thinking		
	Actions	Reasons	Control
Conscientiousness Category			
Low	-58.54	-5.00	-6.87
	(58.87)	(29.33)	(70.95)
	n = 11	*n* = 6	*n* = 8
High	-.71	-40.50	-26.30
	(25.40)	(65.09)	(46.44)
	n = 7	*n* = 10	*n* = 10

Notes: Standard deviations in parentheses. Negative values indicate a decrease.

generated action strategies. Participants high in conscientiousness showed almost no change in overall exercise from Week 1 to Week 9 when they generated action strategies, but showed decreases when they generated reasons or were in a no-treatment control condition. When this factor was added to the ANCOVA, there was a marginally significant type of directed thinking X conscientiousness category interaction, $F(2, 45) = 3.03$, $p = .058$. As Table 49 shows, participants low in conscientiousness reported doing more exercise overall at Week 9 when they

generated reasons than when they generated action strategies or were in a no-treatment control condition. Participants high in conscientiousness reported doing slightly more exercise overall when they generated action strategies than when they generated reasons, and both of these groups reported doing more exercise overall than did participants in the no-treatment control condition.

Table 49

Mean overall exercise behavior at Week 9 by type of directed thinking and Big Five Inventory Conscientiousness category for participants in Experiment 2.

	Type of Directed Thinking		
	Actions	Reasons	Control
Conscientiousness Category			
Low	41.19	113.33	44.37
	(63.35)	(67.43)	(65.22)
	$n = 11$	$n = 6$	$n = 8$
High	85.71	97.50	53.20
	(63.53)	(90.10)	(91.24)
	$n = 7$	$n = 10$	$n = 10$

Note: Standard deviations in parentheses.

Summary of Exercise Behavior Results

As Table 43 shows, participants who generated action strategies reported doing more of their target exercise at Week 9 than did participants in the other two groups; however, the differences were not significant. When considering Table 45, however, we find that participants

who generated reasons reported doing significantly more exercise overall at Week 9 than participants in the other two groups. The manipulation did not have the intended effect on exercise behavior, but is interesting nonetheless. Labansat et al. (in press) found that participants in the earlier stages of change for studying expressed greater intentions to study after generating reasons rather than actions. One explanation for the present findings is that only earlier stage exercisers were recruited. Prior research indicates that individuals in the early stages of change for beneficial behaviors respond more readily to interventions that raise their awareness of the benefits of doing the behavior (i.e., reasons), rather than focusing on actions associated with doing the behavior (e.g., Velicer & Prochaska, 1999).

Post-Manipulation Dependent Measures

Perceptions of Exercise Behavior

In order to determine the effects of the experimental manipulation on how frequently participants perceived they were performing their target exercise and exercise overall, we analyzed participants' responses to the questions, "How much of your target exercise are you doing now compared to before you started in this study?" and "How much exercise overall (counting all forms of exercise) are you getting now compared to before you started in this study?" These two items were significantly correlated ($r = .625$, $p < .001$); consequently they were averaged to create a mean perception of exercise score. Participants mean perception of exercise scores were subjected to a one-way ANOVA using type of directed thinking as the independent variable. Table 51 displays the means for the perception of exercise item; however the effect, which is summarized in the top row of Table 50, was not significant ($F < 1$).

Moderators of mean exercise perceptions. Participants' perceptions of exercise performed might have been moderated by individual differences. Their mean perception of

exercise scores were therefore subjected to a series of ANOVAs, with one moderator factor at a time added to the original analyses. The only findings of interest involve Initial Stage (Prochaska et al., 1994), Actor's Block Scale Finish (Ten Eyck & Lord, 2006), and Big Five Inventory Extraversion (John et al., 1991).

Table 50

Significant and marginally significant results from condition (C) ANOVA for mean perceptions of exercise, with and without the addition of potential moderators (M) in Experiment 2.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage		**	
Initial $Level_{target}$			
MCSD			
LOC			
ABSS			
ABSF			*
TRS			
$BFI_{extraversion}$		**	
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$			

Note: * $p < .10$, ** $p < .05$

When Initial Stage of exercise (Prochaska et al., 1994) was added to the ANOVA, as the "Initial Stage" row of Table 50 shows, it yielded a significant main effect of initial stage, $F(1, 47) = 4.12$, $p < .05$. Participants categorized as early stage exercisers perceived doing less of their exercise now compared to before they started in the experiment ($M = .10$, $SD = 1.24$) than did participants categorized as mid stage exercisers ($M = .93$, $SD = 1.43$). There were no other significant effects.

Table 51

Mean perceptions of exercise behavior by type of directed thinking for participants in Experiment 2.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
Average perception of exercise behavior	.39	.78	.71
	(1.64)	(1.25)	(1.32)
	($n = 18$)	($n = 16$)	($n = 19$)

Note: Standard deviations in parentheses.

When the Actor's Block Scale Finish category (Ten Eyck & Lord, 2006) was added to the ANOVA, as shown in the "ABSF" row of Table 50, it yielded a marginally significant type of directed thinking X finish category interaction, $F(2, 45) = 2.88$, $p = .066$. As the top row of Table 52 shows, participants who reported having little difficulty finishing tasks and generated action strategies perceived doing less exercise now compared to before they started in the experiment, while generating reasons and a no-treatment control condition increased those perceptions. As the bottom row of the table shows, participants who reported having difficulty finishing tasks and generated action strategies perceived doing more exercise now compared to

before they started in the experiment than did participants who generated reasons or a no-treatment control condition. When the Big Five Inventory Extraversion (John et al., 1991) category was added to the main analysis, as the "$BFI_{extraversion}$" row of Table 50 shows, it yielded a significant main effect of extraversion category, $F(1, 46) = 4.04$, $p = .05$. Introverted participants perceived that they were doing more exercise now than before they started in the experiment ($M = .92$, $SD = 1.60$) than did extraverted participants ($M = .29$, $SD = 1.08$). The analysis did not yield any other significant effects.

Table 52

Mean perceptions of exercise behavior at Week 9 by type of directed thinking and Actor's Block Scale Finish category for participants in Experiment 2.

	Type of Directed Thinking		
ABS Finish Category	Actions	Reasons	Control
Easy	-.62	.92	.72
	(1.73)	(1.53)	(1.67)
	$n = 8$	$n = 6$	$n = 11$
Hard	1.20	.70	.67
	(1.08)	(1.14)	(.60)
	$n = 10$	$n = 10$	$n = 6$

Note: Standard deviations in parentheses.

Target Exercise Intentions

It was also important to determine whether type of directed thinking had any effect on participants' intentions to do their target exercise in the month following the experiment. Participants' responses to the question, "How much of your target exercise do you plan on doing over the next month, after this study ends?" were subjected a one-way ANOVA using type of directed thinking as the independent variable. The analysis, which is summarized on the top row of Table 53, yielded no significant effects ($F < 1$). The means for this item are displayed in Table 54.

Moderators of target exercise intentions. Participants' intentions to do their target exercise might have been moderated by individual differences. Their intentions to do target exercise were subjected to a series of ANOVAs with one moderator factor at a time added to the original analysis. The results of these analyses are summarized in Table 53. The only results of interest involved Initial Stage (Prochaska et al., 1994), Initial Level, and Locus of Control (Rotter, 1966).

When Initial Stage (Prochaska et al., 1994) was added to the ANOVA, as shown in the "Initial Stage" row of Table 53, it yielded a significant main effect of initial stage, $F(1, 47) = 9.61$, $p < .01$. Participants who began the experiment in the mid stage of exercise reported greater intentions to do their target exercise in the month following the experiment ($M = 3.95$, $SD = 1.54$) than did participants who began the experiment in the early stages of exercise ($M = 2.60$, $SD = 1.76$); but there were no other significant effects.

Table 53

Significant and marginally significant results from condition (C) ANOVA for intentions to do target exercise, with and without the addition of potential moderators (M) in Experiment 2.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage		***	
Initial $Level_{target}$		***	
MCSD			
LOC			***
ABSS			
ABSF			
TRS			
$BFI_{extraversion}$			
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$			

Note: * $p < .10$, ** $p < .05$, *** $p < .01$

Table 54

Mean intentions to do target exercise by type of directed thinking for participants in Experiment 1.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much of your target exercise do you plan on doing over the next month, after this study ends?	3.47	3.19	3.63
	(1.85)	(1.87)	(1.57)
	(*n* = 18)	(*n* = 16)	(*n* = 19)

Note: Standard deviations in parentheses.

A similar pattern emerged when initial level of target exercise was added to the ANOVA, as the "Initial $Level_{target}$" row of Table 53 shows. The analysis revealed a significant main effect of initial level, $F(1, 47) = 7.73$, $p < .01$. Participants who began the experiment doing some of their target exercise reported greater intentions to exercise in the month following the experiment ($M = 4.06$, $SD = 1.47$) than did participants who began the experiment doing little or none of their target exercise ($M = 2.86$, $SD = 1.80$); but no other significant effects were found.

When Locus of Control (Rotter, 1966) was added to the ANOVA, as the "LOC" row of Table 53 shows, it yielded a significant type of directed thinking X locus of control category interaction, $F(2, 45) = 7.09$, $p < .01$. As Table 55 shows, generating reasons proved more effective for affecting intentions to do target exercise when participants had an internal locus of control than did generating actions or a no-treatment control condition; but when participants had an external locus of control, generating action strategies and a no-treatment control condition proved more effective than did generating reasons.

Table 55

Mean intentions to do target exercise over the next month by type of directed thinking and Locus of Control category for participants in Experiment 2.

	Type of Directed Thinking		
Locus of Control Category	Actions	Reasons	Control
Internal	3.40	4.30	3.17
	(1.84)	(1.06)	(2.04)
	$n = 10$	$n = 10$	$n = 6$
External	3.56	1.33	3.82
	(1.99)	(1.37)	(1.16)
	$n = 8$	$n = 6$	$n = 11$

Note: Standard deviations in parentheses.

Overall Exercise Intentions

It was also important to determine whether type of directed thinking affected participants' intentions to exercise overall in the month following the experiment. Participants' responses to the question, "How much exercise overall (counting all forms of exercise) do you plan to get over the next month, after this study ends?" were subjected to a one-way ANOVA using type of directed thinking as the independent variable. The analysis, which is summarized on the top row of Table 56, yielded no significant effect ($F < 1$). The means for overall exercise intentions are shown in Table 57.

Table 56

Significant and marginally significant results from condition (C) ANOVA for intentions to exercise overall, with and without the addition of potential moderators (M) in Experiment 2.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage		***	
Initial $Level_{target}$		**	
MCSD		*	
LOC			***
ABSS			
ABSF		*	
TRS			
$BFI_{extraversion}$		**	**
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$		*	

Note: * $p < .10$, ** $p < .05$, *** $p < .01$

Moderators of overall exercise intentions. To determine whether participants' intentions to exercise overall in the month following the experiment were moderated by individual differences, they were subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis. The only findings of interest involved Initial Stage (Prochaska et al., 1994), Initial level of overall exercise, Social Desirability (Crowne & Marlowe, 1960), Locus

of Control (Rotter, 1966), Actor's Block Scale Finish (Ten Eyck & Lord, 2006) and Big Five Inventory Extraversion (John et al., 1991).

Table 57

Mean intentions to do overall exercise by type of directed thinking for participants in Experiment 2.

	Type of Directed Thinking		
Item	Actions	Reasons	Control
How much exercise overall do you plan on doing over the next month, after this study ends?	3.67	3.63	4.05
	(1.94)	(1.96)	(1.61)
	(*n* = 18)	(*n* = 16)	(*n* = 19)

Note: Standard deviations in parentheses.

When Initial Stage (Prochaska et al., 1994) was added to the ANOVA, as the "Initial Stage" row of Table 56 shows, it yielded a significant main effect of initial stage, $F(1, 47) = 11.10$, $p < .01$. Mid stage exercisers reported greater intentions to exercise overall in the month following the experiment ($M = 4.37$, $SD = 1.49$) than did early stage exercisers ($M = 2.85$, $SD = 1.93$). There were no other significant effects found.

A similar pattern emerged when initial level of overall exercise was added to the ANOVA, as the "Initial $Level_{overall}$" row of Table 56 shows. The analysis revealed a significant main effect of initial level, $F(1, 47) = 4.49$, $p < .05$. Participants who began the experiment doing some amount of exercise reported greater intentions to exercise overall in the month following the experiment ($M = 4.25$, $SD = 1.37$) than did participants who began the experiment doing little or no exercise ($M = 3.31$, $SD = 2.09$); but no other significant effects were found.

When the Marlowe-Crowne Social Desirability category (Crowne & Marlowe, 1960) was added to the ANOVA, as shown in the "MCSD" row of Table 56, it yielded a marginally significant main effect of social desirability category, $F(1, 45) = 2.93$, $p = .094$. Participants identified as less likely to respond in socially desirable ways reported greater intentions to exercise in the month following the experiment ($M = 4.24$, $SD = 1.80$) than did participants identified as more likely to respond in socially desirable ways ($M = 3.34$, $SD = 1.71$). There were no other significant effects found.

Table 58

Mean intentions to exercise overall by type of directed thinking and Locus of Control category for participants in Experiment 2.

	Type of Directed Thinking		
Locus of Control Category	Actions	Reasons	Control
Internal	3.80	4.50	2.83
	(2.04)	(1.35)	(1.83)
	$n = 10$	$n = 10$	$n = 6$
External	3.50	2.17	4.72
	(1.92)	(2.04)	(.90)
	$n = 8$	$n = 6$	$n = 11$

Note: Standard deviations in parentheses.

When Locus of Control category (Rotter, 1966) was added to the ANOVA, as the "LOC" row of Table 56 shows, it yielded a significant type of directed thinking X locus of control category interaction $F(2, 45) = 6.10$, $p < .01$. As Table 58 shows, generating reasons and action

strategies proved more effective for affecting intentions to exercise overall when participants had an internal locus of control than did a no-treatment control condition; but when participants had an external locus of control, generating action strategies and a no-treatment control proved more effective than did generating reasons.

The Actor's Block Scale Finish category (Ten Eyck & Lord, 2006) was then added to the ANOVA, as shown in the "ABSF" row of Table 56. As the table shows, the analysis revealed a marginally significant main effect of finish category, $F(1, 45) = 3.47$, $p = .069$. Participants who reported having some difficulty finishing tasks reported greater intentions to exercise overall ($M = 4.29$, $SD = 1.69$) than did participants who reported having no difficulty finishing tasks ($M = 3.36$, $SD = 1.85$). There were no other significant effects found.

Finally, when the Big Five Inventory Extraversion category (John et al., 1991) was added to the ANOVA, as the "$BFI_{extraversion}$" row of Table 56 shows, it yielded a significant main effect of extraversion category, $F(1, 46) = 4.44$, $p < .05$. Participants low in extraversion reported greater intentions to exercise in the month following the experiment ($M = 4.21$, $SD = 1.82$) than did participants who were high in extraversion ($M = 3.34$, $SD = 1.74$). The analysis also revealed a significant type of directed thinking X extraversion category interaction, $F(2, 46) = 3.52$, $p < .05$. As Table 59 shows, generating reasons proved more effective for affecting intentions to exercise overall when participants were low in extraversion than did generating action strategies or a no-treatment control condition; but when participants were high in extraversion, the no-treatment control condition proved more effective than did generating action strategies or reasons.

Table 59

Mean intentions to exercise overall by type of directed thinking and Big Five Inventory Extraversion category for participants in Experiment 2.

	Type of Directed Thinking		
Extraversion Category	Actions	Reasons	Control
Low	3.84	5.00	4.00
	(1.90)	(1.41)	(1.92)
	$n = 13$	$n = 8$	$n = 8$
High	3.20	2.25	4.30
	(2.16)	(1.38)	(1.34)
	$n = 5$	$n = 8$	$n = 10$

Note: Standard deviations in parentheses.

Perceptions of Health, Well-Being, and Physical Fitness

Perceptions of the Positive Benefits of Exercise

One possible positive outcome associated with the experimental manipulation was an increase in perceptions of overall health, psychological well-being, and general physical fitness. Participants' responses to the questions, "How do you think your overall health is now compared to before you started in this study?," "How do you think your general feeling of psychological well-being is compared to before you started in this study?" and "How do you think your general physical fitness is now compared to before you started in this study?" were subjected a principal components analysis. The analysis yielded a first factor that accounted for 76.42% of the variance; thus, a mean perception of the positive benefits of exercise score was calculated using

all three items. The mean perception of the positive benefits of exercise score was then subjected to a one-way ANOVA using condition as the independent variable. The effect was not significant ($F < 1$). The analyses of perceptions of the positive benefits of exercise are summarized in Table 60, and the means for the item are displayed in Table 61.

Table 60

Significant and marginally significant results from condition (C) ANOVA for mean perceptions of the positive benefits of exercise, with and without the addition of potential moderators (M) in Experiment 2.

	ANOVA		
	C	M	CM
Analysis		---	---
W/ Mod's			
Initial Stage		*	
Initial $Level_{target}$			
MCSD			
LOC			
ABSS			
ABSF			
TRS			
$BFI_{extraversion}$			
$BFI_{neuroticism}$			
$BFI_{conscientiousness}$		*	

Note: * $p < .10$

Table 61

Mean perceptions of the positive benefits of exercise by type of directed thinking for participants in Experiment 2.

	Type of Directed Thinking		
	Actions	Reasons	Control
Item	(*n* = 18)	(*n* = 16)	(*n* = 19)
Mean perception of positive benefits of exercise	.39	.42	.17
	(1.04)	(1.29)	(.77)

Note: Standard deviations in parentheses.

Moderators of perceptions of the positive benefits of exercise. To determine whether participants' mean perceptions of the positive benefits of exercise were moderated by individual differences, they were subjected to a series of ANOVAs, with one moderator factor at a time added to the original analysis. The findings of these analyses are summarized in Table 60. The only results of interest involved Initial Stage (Prochaska et al., 1994) and Big Five Inventory Conscientiousness (John et al., 1991).

When Initial Stage of exercise (Prochaska et al., 1994) was added to the ANOVA, as the "Initial Stage" row of Table 60 shows, it yielded a marginally significant main effect of initial stage, $F(1, 47) = 3.19$, $p = .08$. Participants who began the experiment in the mid stage of exercise perceived the positive benefits of exercise more optimistically now compared to before they started the experiment ($M = .51$, $SD = 1.11$) than did participants who began the experiment in the early stages of exercise ($M = .00$, $SD = .80$); but no other significant effects were found.

When Big Five Inventory Conscientiousness (John et al., 1991) category was added to the ANOVA, as the "$BFI_{conscientiousness}$" row of Table 60 shows, it yielded a significant main effect of conscientiousness category, $F(1, 46) = 5.13$, $p < .05$. Participants high in conscientiousness reported greater perceptions of the positive benefits of exercise now compared to before they started in the experiment ($M = .63$, $SD = 1.13$) than did participants low in conscientiousness ($M = .01$, $SD = .83$).

Characteristics of Typical Exerciser

Recall that participants also reported their perceptions of the "typical person who exercises a lot" pre- (Week 1) and post-manipulation (Week 9) by responding to eight bipolar adjective pairs on a 17-point scale. Participants' Week 1 responses to these items were subjected to a principal components analysis, which yielded one factors that accounted for 61.22% of the variance. Table 62 displays the items and their factor loadings. A mean typical exerciser trait score was then calculated using all eight items.

The Week 1 mean typical exerciser trait score was then subjected to a one-way ANOVA using type of directed thinking as the independent variable. Type of directed thinking, however, did not have a significant effect on participants' perceptions of the typical exerciser, $F(2, 50) = 1.79$, $p = .177$. It is also possible that participants' perceptions of the typical exerciser changed from Week 1 to Week 9 as a result of the manipulation. A Week 9 mean typical exerciser score was therefore calculated using all eight items. A mean typical exerciser difference score was then calculated by subtracting mean perceptions of the typical exerciser at Week 1 from Week 9. The difference score was then subjected to a one-way ANOVA using type of directed thinking as the independent variable. Type of directed thinking did not, however, have a significant effect on changes in perceptions of the typical exerciser, $F(2, 50) = .407$, $p = .668$.

Table 62

Factor loadings for typical person who exercises a lot items for participants in Experiment 2.

Item	Factor Loading
The typical person who exercises a lot is:	
Very Unlikeable- Very Likeable	.709
Very Incompetent-Very Competent	.707
Very Irresponsible-Very Responsible	.741
Very Untrustworthy-Very Trustworthy	.790
Very Inefficient-Very Efficient	.844
Very Disrespected-Very Respected	.864
Very Unpopular-Very Popular	.762
Very Incapable-Very Capable	.861

Potential Mediators

As in Experiment 1, several measures were included as possible mediators in case experimental condition had a significant effect on the dependent measures. In order to test a measure for mediation, however, it would be necessary to first find a main effect of condition on the dependent measure, and also a main effect of condition on the potential mediator (Barron & Kenny, 1986). In Experiment 2, the only main effects of condition occurred for estimated absolute VO_2max (Table 37) and estimated relative VO_2max (Table 39). In neither case was there a significant difference between the two experimental groups, action strategies and reasons. Measures that were taken only for the actions and reasons conditions, such as number of ideas

generated, could not have therefore been significant mediators. These potential mediators, however, could be of interest as dependent measures in their own right.

Recall that one measure of individuals' readiness to begin doing a beneficial activity such as exercise weighs the perceived advantages versus disadvantages of doing the activity (Velicer et al., 1985). In order to determine whether specific types of directed thinking might have influenced participants' perceptions regarding the advantages and disadvantages of engaging in their target exercise, they answered a series of items during each of the nine weekly experimental sessions.

Advantages of Target Exercise

Did type of directed thinking differentially affect participants' perceptions regarding the advantages of engaging in their target exercise during the course of the experiment (Velicer et al., 1985)? Participants' responses to the five items measuring the advantages of engaging in their target exercise were subjected to a principal components analysis, which yielded a first factor that accounted for 49.67% of the variance and a second factor that accounted for 20.68% of the variance. A mean advantages of engaging in target exercise score was then calculated for Weeks 1 through 9 using the four highest loading items from the first factor. The top portion of Table 63 displays the items and their factor loadings, and Figure 14 shows the pattern of means for Weeks 1 through 9 by type of directed thinking task. As the figure shows, there was almost no difference in the perceived advantages of engaging in target exercise either between groups or across the nine weekly sessions.

Were there any significant differences? A time (Week 1, Week 9) X type of directed thinking mixed-model ANOVA was conducted, but no significant effects were found.

Table 63

Factor loadings for advantages and disadvantages of target exercise at Week 1 in Experiment 2.

Item	Factor 1	Factor 2
Advantages of Exercise		
I would have more energy for my family/friends if I exercised regularly.	.812*	-.300
I would feel less stressed if I exercised regularly.	.864*	-.286
Exercising would put me in a better mood for the rest of the day.	.740*	-.117
I would feel more comfortable with my body.	.729*	.301
Regular exercise would help me have a more positive outlook on life.	.378	.870
Disadvantages of Exercise		
I would feel embarrassed if people saw me exercising.	.540	
Exercise prevents me from spending time with my friends.	.429	
I feel uncomfortable or embarrassed in exercise clothes.	.720	
There is too much I would have to learn to exercise.	.714	
Exercise puts an extra burden on my significant other.	.730	

Note: * denotes items included in mean advantages of exercise score.

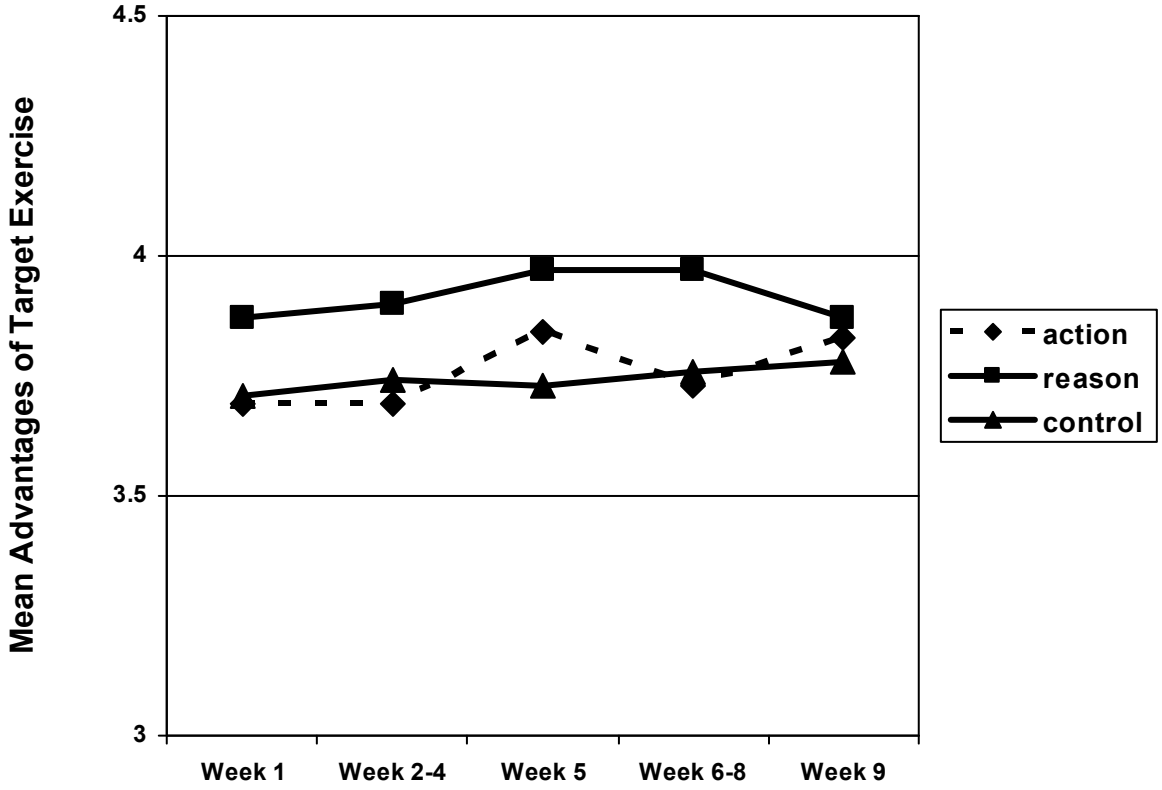


Figure 14. Mean advantages of engaging in target exercise for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2.

Note: All items were on a scale from 1 = *not at all important* to 5 = *extremely important*.

An additional ANCOVA of Week 9 mean advantages of exercise using type of directed thinking as the independent variable and Week 1 mean advantages of exercise as a covariate did not yield a significant effect.

Disadvantages of Target Exercise

Did type of directed thinking differentially affect participants' perceptions regarding the disadvantages of engaging in their target exercise during the course of the experiment (Velicer et al., 1985)? Participants' responses to the five items measuring the disadvantages of engaging in their target exercise were subjected to a principal components analysis, which yielded one factor

that accounted for 40.75% of the variance. A mean disadvantages of target exercise score was then calculated for Weeks 1 through 9 using all five items. The bottom portion of Table 63 displays the items and their factor loadings, and Figure 15 displays the pattern of means for Weeks 1 through 9 by type of directed thinking task. Again, the figure shows that there was very little difference in the perceived disadvantages of engaging in target exercise between groups, but an overall increase in all groups across the nine weekly sessions.

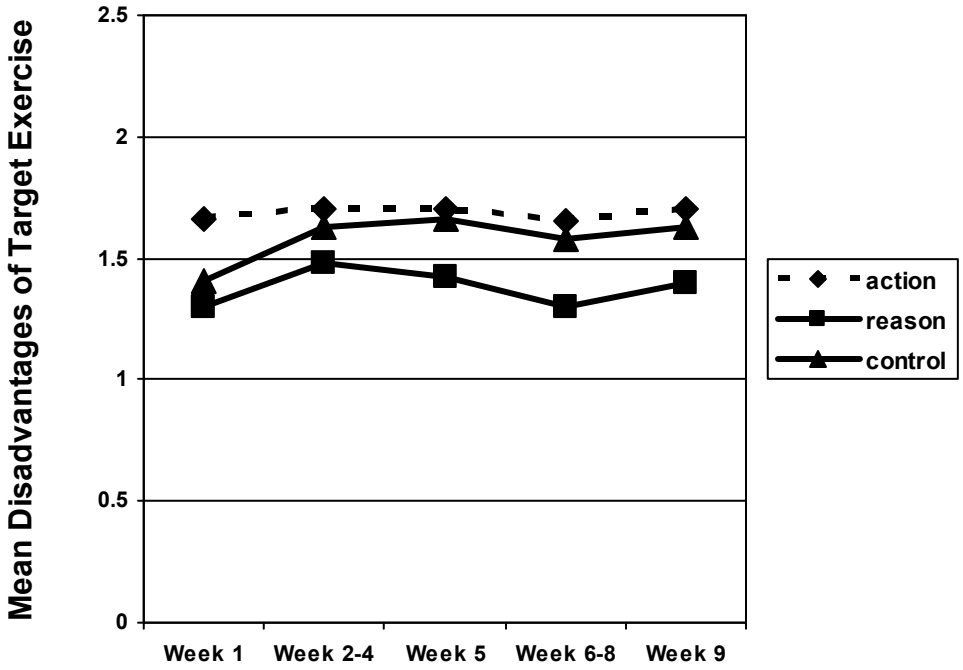


Figure 15. Mean disadvantages of engaging in target exercise for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2.

Note: All items on a scale from 1 = *not at all important* to 5 = *extremely important*

Were there any changes in the disadvantages of engaging in target exercise? A time X type of directed thinking ANOVA, yielded a significant main effect of time, $F(1, 52) = 5.53$, $p < .05$. Participants increased the disadvantages of engaging in their target exercise from Week 1 (*M*

= 1.46, *SD* = .47) to Week 9 (*M* = 1.58, *SD* = .54), but the time X type of directed thinking interaction was not significant, $F(2, 50) = 1.07$, $p = .352$.

Decisional Balance for Target Exercise

Another way to determine the effects of type of directed thinking on the advantages and disadvantages of engaging in target exercise is by calculating a decisional balance score (Velicer et al., 1985). Decisional balance is determined by subtracting the mean disadvantages of exercise score from the mean advantages of exercise score for each participant during Weeks 1 through 9. Positive scores show that the advantages of exercise outweigh the disadvantages of exercise, while negative scores show that the disadvantages of exercise outweigh the advantages of exercise. Figure 16 displays the mean decisional balance scores for Weeks 1 through 9 by type of directed thinking task. As the figure shows, participants who generated reasons appear to have a higher mean decisional balance score at Week 9 than participants in the other two conditions.

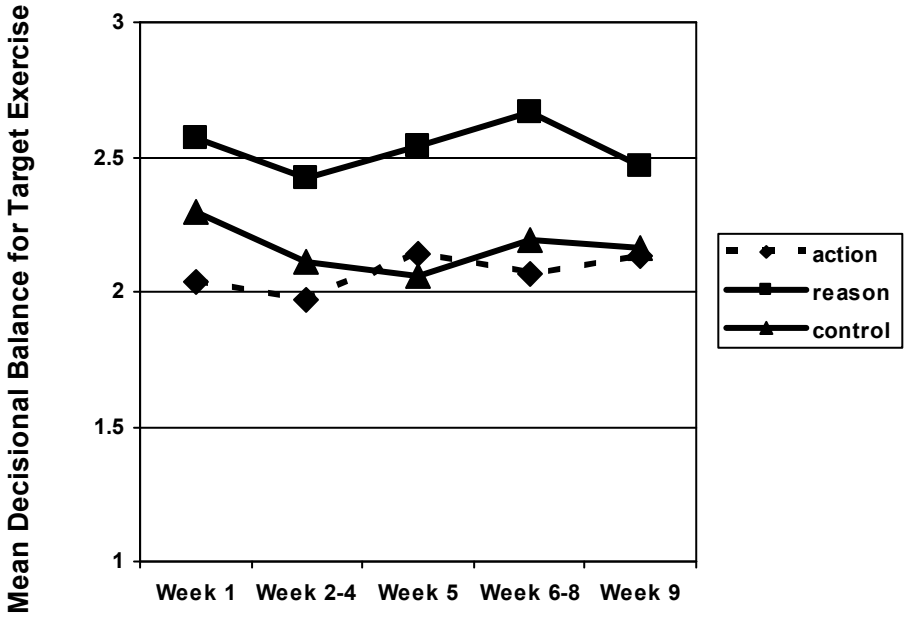


Figure 16. Mean decisional balance for engaging in target exercise for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2.

Were these differences significant? A time X type of directed thinking ANOVA did not yield any significant effects (*Fs* < 1). The results were similar for the ANCOVA.

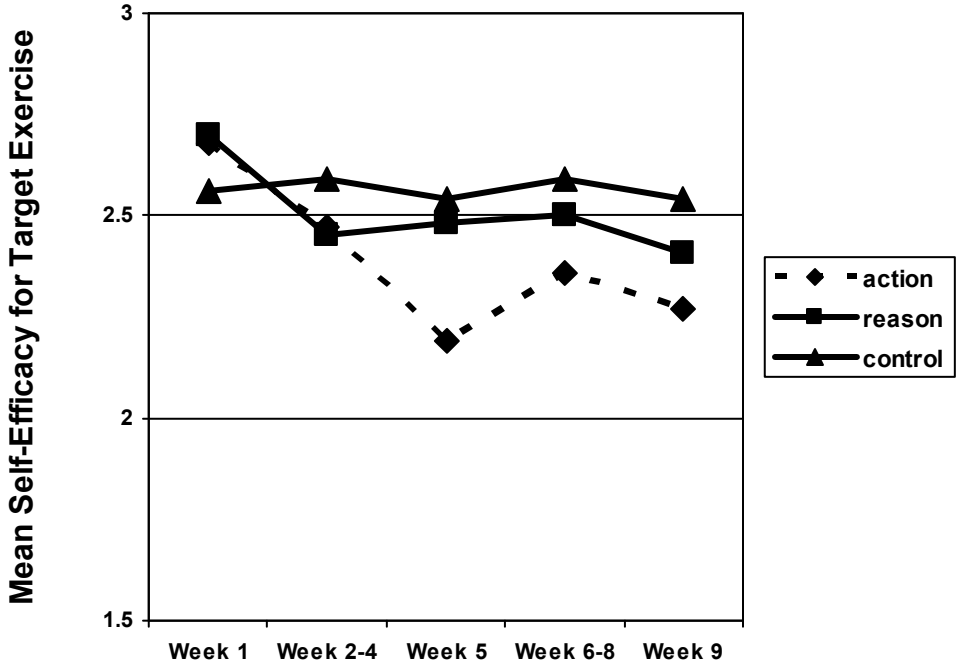


Figure 17. Mean self-efficacy for engaging in target exercise for Weeks 1 through 9 by type of directed thinking task for participants in Experiment 2.

Note: All items on a scale from 1 = *not at all confident* to 5 = *extremely confident*

Self-Efficacy

Recall that we also measured participants' perceived self-efficacy for engaging in their target exercise (DiClemente et al., 1985; Velicer et al., 1985). Participants' responses to the six self-efficacy items were subjected to a principal components analysis, which yielded a first factor that accounted for 33.27% of the variance and a second factor that accounts for 18.91% of the variance. A mean self-efficacy for target exercise score was then calculated using the five highest loading items from the first factor. Table 64 displays the items and their factor loadings, and Figure 17 displays the mean self-efficacy for target exercise scores for Weeks 1 through 9 by

type of directed thinking task. As the figure shows, mean self-efficacy scores decreased from Week 1 to Week 9 across all conditions.

Were these decreases significant? A time X type of directed thinking ANOVA yielded a main effect of time, $F(1, 50) = 5.46$, $p < .05$. All participants showed a decrease in perceived self-efficacy for engaging in their target exercise from Week 1 ($M = 2.65$, $SD = .79$) to Week 9 ($M = 2.41$, $SD = .76$); but there were no other significant effects found and the ANCOVA was also not significant.

Table 64

Factor loadings for target exercise self-efficacy items for Weeks 1 through 9 by type of directed thinking in Experiment2.

Item	Factor 1	Factor 2
I am under a lot of stress.	.560*	.497
I feel I don't have the time.	.534*	.463
I have to exercise alone.	.609*	-.465
I don't have access to exercise equipment.	.734*	-.156
I am spending time with friends or family who do not exercise.	.658*	-.383
It's raining or snowing.	.232	.535

Notes: All items on a scale from 1 = "not at all confident" to 5 = "extremely confident. * denotes items included in self-efficacy for target exercise score.

Number of Ideas

Total number of ideas generated by each participant was determined using the identical procedure as Experiment 1. Recall that if an item was listed during each of the weekly sessions,

it was only counted once for the present analysis. A one-way ANOVA using type of directed thinking as the independent variable and total number of ideas as the dependent variable was marginally significant, $F(2, 32) = 4.02$, $p = .054$. Participants generated more reasons ($M = 30.93$, $SD = 8.51$) than action strategies ($M = 25.67$, $SD = 6.81$), which replicates the results from Experiment 1 and from Ten Eyck et al. (2006).

Frequency of Thought about Ideas

As in Experiment 1, participants differed in the total number of original ideas they generated during the course of the experiment. Recall that for Experiment 1, the five most frequently generated items were used to examine thought frequency. Since the present experiment had more weekly sessions, and therefore more opportunities to list ideas, the seven most frequently generated items were used. Participants mean ratings of the number of times they thought about each of their seven most frequently generated items were subjected to a one-way ANOVA using type of directed thinking as the independent variable; but, the analysis was not significant.

Frequency of Idea Use

It was also possible that there were difference in the number of times participants used their ideas to increase the performance of their target exercise. Participants' mean ratings of the number of times they actually used each of their seven most frequently generated items to increase exercise were also subjected to a one-way ANOVA using type of directed thinking as the independent variable. The effect of condition was not significant.

Effectiveness of Ideas for Increasing Target Exercise

Participants may have also differed in their perceptions of the effectiveness of their ideas for increasing the performance of their target exercise. Their mean ratings of the effective of

their seven most frequently generated times were subjected to a one-way ANOVA using type of directed thinking as the independent variable. Again, the effect of condition was not significant.

Effectiveness of Ideas for Increasing Enjoyment of Target Exercise

Participants may have differed in their perceptions about the effectiveness of their ideas for increasing the enjoyment of their target exercise. Their mean ratings of the seven most frequently generated items were subjected to a one-way ANOVA using type of directed thinking as the independent variable. The analysis did not produce a significant effect.

Discussion

Summary of Results

Cardiovascular Fitness

The most significant finding in Experiment 2 involves the generation of action strategies in the improvement of participants' cardiovascular fitness as measured by estimated absolute (see Table 37) and relative VO_2max (see Table 39). Additionally, participants high in neuroticism showed increases in their estimated absolute VO_2max from Week 1 to Week 9 when they generated actions, but showed decreases after generating reasons or a no-treatment control condition. For participants low in neuroticism, however, type of directed thinking did not have any differential effects.

Target Exercise Behavior

Although generating action strategies did not produce the expected increases in target exercise behavior, it did allow participants to sustain the performance of their target exercise behavior (see Table 43).

Overall Exercise Behavior

Participants' overall exercise behavior was affected by an interaction between type of directed thinking and Actor's Block Scale Finish category (Ten Eyck & Lord, 2006). Specifically, overall exercise decreased most in the reasons group for easy finishers and decreased most in the action strategies groups for hard finishers (see Table 46). Since action strategies typically entail ways to begin exercising, or to enjoy exercise once begun, they may not provide the information necessary for hard finishers to complete their exercise sessions once they begin. Consequently, they may have exercised for a shorter duration before giving up or stopping.

Participants' overall exercise behavior was also affected by an interaction between type of directed thinking and Big Five Inventory Conscientiousness category (John et al., 1991). Exercise decreased most in the action strategies group for participants low in conscientiousness and decreased most in the reasons group for participants high in conscientiousness (see Table 48). Further analyses showed that participants low in conscientiousness reported doing more exercise overall at Week 9 when they generated reasons than when they generated actions or were in a no-treatment control condition. For participants high in conscientiousness, actions proved only slightly more effective for increasing overall exercise at Week 9 than did generating reasons, and both of these groups reported doing more exercise overall than did participants in the no-treatment control condition (see Table 49). For participants who do not report particularly high levels of conscientiousness, generating and thinking about the reasons why they should exercise may have raised their awareness and therefore positively affected their behavior more than generating actions or doing nothing.

Perceptions of Exercise Behavior

For participants' perceptions of their exercise behavior, the only finding of interest involved type of directed thinking and the Actor's Block Scale Finish category. Participants who reported no difficulty finishing tasks and who generated action strategies perceived doing less exercise now compared to before they started in the experiment, while generating reasons and a no-treatment control condition increased those perceptions. For participants who reported having difficulty finishing tasks, generating action strategies proved more effective for increasing perceptions of exercise than did generating reasons or a no-treatment control condition (see Table 52).

Target Exercise Intentions

Although type of directed thinking did not significantly affect intentions to engage in target exercise in the month following the experiment, it did interact with Locus of Control category (Rotter, 1966) to produce differences. Generating reasons proved more effective for affecting intentions to do target exercise for participants who had an internal locus of control; but for participants who had an external locus of control, generating reasons had the least positive effect on intentions (see Table 55).

Overall Exercise Intentions

Intentions to exercise overall were also differentially affected by type of directed thinking and Locus of Control category (Rotter, 1966). Generating reasons and action strategies proved more effective for affecting intentions to exercise overall when participants had an internal locus of control than did a no-treatment control condition; but when participants had an external locus of control, generating action strategies and a no-treatment control proved more effective than did generating reasons (see Table 58).

Additionally, generating reasons proved more effective for affecting intentions to exercise overall when participants were low in extraversion than did generating action strategies or a no-treatment control condition; but when participants were high in extraversion, the no-treatment control condition proved more effective than did generating action strategies or reasons (see Table 59).

Perceptions of Actions or Reasons

As in Experiment 1, participants generated more reasons than actions during the course of the experiment. In both instances, it seems likely that self-identified sedentary college students had no difficulty identifying and listing the reasons why they should exercise because most everyone is familiar with those reasons. Actions, on the other hand, were less frequent because non-exercising individuals are not likely to be familiar with effective strategies for doing so.

Conclusions

Experiments 1 and 2 were based on the assumption that self-generated ideas, especially actions, are more effective for increasing behavioral intentions, exercise behavior, and cardiovascular fitness. The results from Experiment 2 provided some evidence that self-generated actions were in fact more effective. In order to better understand the efficacy of self-generated action strategies demonstrated in Experiment 2, it is therefore important to compare them to actions and reasons generated by others.

EXPERIMENT 3

Experiments 1 and 2 provided some evidence that self-generated action strategies are effective for positively affecting behavioral intentions to exercise, sustaining the performance of a target exercise, and improving cardiovascular fitness. To support the contention that "persuasion from within" in the form of directed thinking about self-generated action strategies

is effective for doing a self-beneficial behavior such as exercise, it is important to compare self-generated ideas with other-generated ideas.

Self-Generated or Other-Generated?

Research has identified two ways to induce attitude and behavior change: persuasion from without and persuasion from within (McGuire & McGuire, 1991, 1996). Persuasion from without involves providing individuals with new information; for instance, "some types of music are especially conducive to exercise." Persuasion from within, in contrast, involves directing individuals toward "discovering" the same associations or ideas for themselves (Labansat et al., in press; McGuire & McGuire, 1991, 1996; Ratcliff et al., 1999; Ten Eyck et al., 2006).

Previous research suggests that self-generated ideas are better remembered (e.g., Slameka & Graf, 1978) and create less resistance (e.g., Brehm, 1972; Mussweiler & Neumann, 2000) than ideas that are imposed by others in obvious attempts at persuasion. Thus well-intentioned others might keep reminding the individual to make time every day to exercise, but such persuasion-from-without might be misguided on two counts. First, it imposes unwelcome external pressure. Second, it assumes that an external agent somehow knows best which action strategies or reasons will work for the individual. We believed that the most effective way to increase level of and involvement in self-beneficial behaviors is to prompt individuals to "invent" for themselves ways that they can restructure their environments to be more facilitative. Experiment 3 was therefore designed to examine the impact of self- or other-generated action strategies and reasons on behavioral intentions to exercise and attitudes toward regular exercise.

Method

Preliminary Rating Study

In order to provide other-generated actions and reasons to participants in Experiment 3, it was first necessary to determine how effective college students believed commonly generated ideas would be for increasing a person's exercise behavior.

Participants

For the preliminary rating task, 76 upper-level psychology majors participated for partial course credit.

Procedure and Materials

Using actions and reasons generated during the course of prior directed thinking about exercise experiments (e.g., Ten Eyck, Gresky, & Lord, 2006), the experimenter compiled a list of the actions and reasons that participants spontaneously generated when asked to think about the types of ideas that would be most effective for increasing the performance of exercise. The actions and reasons were then examined, and duplicate ideas were collapsed into more inclusive categories. For example, the actions "Exercise with a friend" and "Work out with a friend" were both included under the action "Get an exercise partner or buddy." The reasons "Weight loss benefits" and "Lose body weight" were both included under the reason "Lose weight."

After reading and signing an informed consent, participants rated the effectiveness of 51 actions and 52 reasons for increasing a person's regular exercise using a scale from 0 = *not at all effective* to 10 = *extremely effective* (Appendix Z). In order to control for order effects, one-half of the participants rated the actions, followed by the reasons. The remaining participants rated the reasons, followed by the actions.

Table 65

Mean effectiveness ratings for actions to increase exercise for Experiment 3.

Item	Rating	Item	Rating
Hire a trainer and make appts.	8.46 (1.94)	Buy a gym membership	6.65 (1.80)
Make exercise fun	8.11 (1.56)	Watch TV while exercising	6.56 (2.43)
Enroll in class that meets @ set time	8.05 (2.04)	Vary exercise program	6.42 (2.13)
Maintain or adopt a healthy lifestyle	8.04 (1.67)	Buy a scale, check wt. regularly	6.42 (2.06)
Have an exercise partner or buddy	7.96 (1.58)	Wear outfit that makes you feel good	6.11 (2.57)
Keep a record of weight loss or gain	7.88 (1.65)	Use varied equipment	6.07 (2.25)
Establish realistic goals	7.87 (1.38)	Choose area not too hot or cold	6.04 (2.14)
Set a goal to work toward	7.82 (1.55)	Become more educated about benefits	6.04 (2.08)
Encourage friends to exercise w/me	7.82 (1.75)	Measure body fat weekly	5.97 (2.33)
Make plans to exercise w/others	7.76 (1.84)	Stretch before exercising	5.95 (2.93)
Listen to music	7.70 (2.09)	Exercise in pretty environment	5.88 (2.51)
Make a commitment	7.58 (1.88)	Go to gym when not crowded	5.82 (2.36)
Choose a stimulating area to exercise	7.50 (1.71)	Ask a pro to tell you benefits	5.82 (2.51)
Make friends w/ppl who exe reg	7.46 (1.73)	Buy new clothes or shoes	5.78 (1.98)
Have another encourage you to exercise	7.46 (2.15)	Try one new exercise per month	5.74 (2.25)
Exercise at same time every day	7.46 (2.16)	Post reminders to exercise	5.66 (2.63)
Enter a race, marathon, etc.	7.41 (1.91)	Go to gym when convenient	5.50 (2.65)
Challenge self during exercise	7.39 (1.87)	Exercise around others	5.47 (2.35)
Have clothes/equip available	7.37 (1.87)	Buy exercise tapes	5.16 (2.16)
Schedule time using planner	7.29 (2.12)	Get up early so have time to ex	5.04 (2.32)
Weigh self to see results	7.08 (2.12)	Wear a pedometer to motivate	5.00 (2.50)
Make desired act contingent	6.89 (1.90)	Bring book or magazine to read	4.67 (2.77)
Reward self for exercising	6.84 (2.23)	Unplug TV or computer	4.51 (3.00)
Have another remind you to exercise	6.84 (2.40)	Get a job at the gym	4.32 (2.60)
Wear proper attire	6.79 (2.10)	Exercise w/different ppl each time	3.72 (2.01)
Dress in workout attire	6.77 (1.88)		
Keep track of exercise	6.67 (2.09)		

Note: Standard deviations in parentheses.

Table 66

Mean effectiveness ratings for reasons to increase exercise for Experiment 3.

Item	Rating	Item	Rating
Better appearance	8.91 (1.11)	Cope w/age related disease	7.25 (2.09)
Lose weight	8.72 (1.34)	Decrease depression	7.15 (2.04)
Better body image	8.71 (1.27)	Promotes health immune system	7.03 (2.08)
Better physical health	8.42 (1.61)	Helps combat depression	6.96 (2.14)
Being physically fit	8.40 (1.25)	Encourages healthy eating	6.93 (2.11)
A more toned body	8.39 (1.32)	Better at sports	6.91 (2.20)
More energy	8.23 (1.66)	Study/think better	6.78 (2.20)
Decreased stress	8.09 (1.72)	Reduce grumpiness	6.71 (2.19)
Better quality of life	8.03 (1.67)	Helps control emotions	6.59 (2.16)
Be proud of oneself	8.01 (1.45)	Decreases chance of illness	6.48 (1.97)
More positive mood/outlook	8.00 (1.72)	Exercise can be fun	6.43 (1.95)
Burn fat/calories	7.96 (1.78)	Motivates to do other tasks	6.40 (2.09)
Feel better afterwards	7.93 (1.57)	Can buy better/new clothes	6.26 (2.84)
Live longer	7.88 (1.91)	Nice break from sitting	6.24 (2.40)
Feel satisfied after doing	7.86 (1.69)	Become more flexible	6.17 (2.35)
Feel accomplished	7.82 (1.64)	Improve coordination	6.08 (2.25)
Be more confident/better self esteem	7.81 (1.62)	Be liked by others more	5.71 (2.53)
Decrease health risks	7.75 (1.62)	Bond w/others through exercise	5.64 (2.36)
Be stronger	7.64 (1.73)	More time for self	5.56 (2.21)
Sleep better	7.58 (2.05)	Positive role model	5.36 (2.41)
Will be happier	7.57 (1.74)	Gives time to think	5.33 (2.45)
Better health when older	7.56 (1.88)	Reduce chance of injury	5.33 (2.33)
Better mental health	7.53 (2.07)	Impress friends	5.07 (2.69)
Faster metabolism	7.39 (2.04)	Could meet more people	4.75 (1.95)
Helps body func @ potential	7.38 (1.98)	Get to try new things	4.36 (2.17)
Become more muscular	7.29 (1.59)	Less time for harmful activities	3.70 (2.69)

Note: Standard deviations in parentheses.

Results

The mean effectiveness ratings of the 51 actions are listed in Table 65, and the mean effectiveness ratings of the 52 reasons are listed in Table 66.

Main Experiment

Participants

Seventy-five undergraduates (25 males and 50 females) participated in two weekly sessions for course credit. Because of attrition, prior participation in related experiments, and suspicion of the experimental hypothesis, the final sample consisted of 65 participants (23 males and 42 females). Because of the small number of males, sex will not be discussed further.

Procedure and Materials

Session 1. After reading and signing an experimental consent form (Appendix AA), participants reported their attitudes toward several groups (e.g., politicians), issues (e.g., capital punishment) and behaviors (e.g., exercising, studying, blood donation) on a 15-point scale from -7 to +7 (Appendix BB). Participants then reported their intentions to exercise regularly, study regularly, and donate blood in the near future, using a scale from 0 = *not at all* to 10 = *definitely* (Appendix CC).

One-half of the participants were then asked to provide a list of five actions they might recommend another person take to increase exercise, studying and blood donation (Actions condition; Appendix DD). The remaining participants were asked to provide a list of five reasons they might recommend another person consider in order to increase exercise, studying and blood donation (Appendix EE).

Finally, all participants completed a series of individual difference measures including the Locus of Control Scale (Rotter, 1966), the Satisfaction with Life Scale (Diener et al., 1985),

the Therapeutic Reactance Scale (Dowd et al., 1991), and the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960). Participants were excused and reminded of their next appointment.

Session 2. Two weeks later, participants returned to the laboratory to complete an ostensibly unrelated experiment assessing the effectiveness of persuasive messages about exercise. A different experimenter provided a consent form (Appendix FF), after which participants were given an additional packet that had been individually prepared by the primary experimenter prior to the session.

One-half of the participants who generated actions and one-half of the participants who generated reasons during Session 1 read a persuasive message about regular exercise that contained three of their own original ideas (self-generated actions group, self-generated reasons group; see Appendix GG for samples). A participant who wrote "Establish realistic goals," "Keep a record of weight loss or gain," and "Make plans to exercise with others," for instance, would get a persuasive message that listed those same three actions as bulleted items.

The remaining participants in the actions and reasons groups read a persuasive message that contained three ideas that were not contained in their original lists, but were rated as equally effective (see Tables 64 and 65) by independent judges during the preliminary rating session (other-generated actions group, other-generated reasons group). For example, a participant who listed the reason "Lose weight" during Session 1 ($M_{\text{effectiveness}} = 7.42$) would instead read a persuasive message that contained "Better body image" ($M_{\text{effectiveness}} = 7.41$). A participant who listed the action "Establish realistic goals" ($M_{\text{effectivenss}} = 7.87$) would instead read a message that contained "Keep a record of weight loss and gain" ($M_{\text{effectivenss}} = 7.88$).

After reading the persuasive message, all participants were asked to evaluate it by completing four items (Appendix HH). The first item, "This message would be very effective in persuading a person to exercise regularly," was answered using a 15-point scale from -7 = *strongly disagree* to +7 = *strongly agree*. The second item, "How likely would you be to recommend that another person use the techniques/consider the above benefits to increase regular exercise?" was answered using a scale from 0 = *not at all likely* to 10 = *extremely likely*. The third item: "How would you rate the clarity of this message" was answered using a scale from 0 = *not at all clear* to 10 = *extremely clear.* A fourth item assessed participants' perceptions of the creativity and quality of the three ideas from the persuasive message using a scale from 0 = *poor* to 10 = *excellent*.

After evaluating the persuasive message, all participants again reported their attitudes toward regular exercise and their intentions to exercise in the near future using the identical scales from Session 1 (Appendix II). Participants were then provided with a sheet on which they were instructed to write their ideas about the nature and hypotheses of the experiment (Appendix JJ). After materials were collected, participants were thanked and excused.

Results

Experiment 3 was intended to compare the effectiveness of self- versus other-generated actions and reasons for increasing behavioral intentions and attitudes toward regular exercise. Because of the unexpectedly low number of participants, analyses of moderators would have involved very small cell sizes; therefore the potential moderators will not be discussed further.

Attitudes toward Exercise

One of the goals of the present experiment was to increase participants' attitudes toward regular exercise. Participants who reported an attitude of "+7" during Session 1 were excluded

from the analyses because their attitudes could not be increased. Of the 65 participants, 20 reported an attitude of "+7" during Session 1. The following analyses were performed using the remaining 45 participants (16 males and 29 females).

Table 67 shows the means from a time (Time 1, Time 2) X source (self, other) X directed thinking (actions, reasons) mixed-model ANOVA. The analysis yielded a significant main effect of time, $F(1, 41) = 12.35$, $p < .01$. Participants adopted more positive attitudes from Time 1 to Time 2 ($M_{change} = +.67$, $SD = 1.25$), but no other significant effects were found.

Table 67

Mean attitudes toward regular exercise at Time 1 and Time 2 by source and type of directed thinking for participants in Experiment 3.

	Self		Other	
	Actions	Reasons	Actions	Reasons
	(n = 12)	(n = 11)	(n = 12)	(n = 10)
Time 1	3.75	4.37	3.58	3.40
	(2.41)	(1.85)	(1.88)	(1.55)
Time 2	4.25	5.10	4.75	3.60
	(1.76)	(2.02)	(1.49)	(1.57)
Change	+.50	+.72	+1.16	+.20
	(1.32)	(1.00)	(1.40)	(1.14)

Notes: Standard deviation in parentheses. Attitude reported on 15-point scale from – 7 to + 7.

An ANCOVA of participants' attitudes toward exercise at Time 2, using source and directed thinking as the independent variables and attitudes toward exercise at Time 1 as a covariate, produced a significant source X directed thinking interaction, $F(1, 40) = 4.90$, $p < .05$.

As shown in the "Time 2" row of Table 67, participants who read a persuasive message that contained self-generated reasons had a more positive attitude toward exercise at Time 2 than did participants who read a persuasive message that contained self-generated actions. Now consider the other two groups in the "Time 2" row of the table, where the pattern of means was reversed. Participants who read a persuasive message that contained other-generated actions had a more positive attitude at Time 2 than did participants who read a persuasive message that contained other-generated reasons. Controlling for Time 1 attitudes, participants' final attitudes were most positive when they read and considered their own reasons, or another's actions. Did these same differences occur with behavioral intentions to exercise?

Behavioral Intentions to Exercise

Another goal of the present experiment was to increase participants' intentions to engage in regular exercise in the near future. Participants who reported an intention of "10" during the first experimental session were excluded from the analyses because their intentions could not be increased. Of the 65 participants, 26 reported intentions of "10" during Session 1. The following analyses were performed using the remaining 39 participants (11 males and 28 females).

Table 68 shows the means from a time (Time 1, Time 2) X source (self, other) X directed thinking (actions, reasons) mixed-model ANOVA of behavioral intentions. The analysis yielded a significant main effect of time, $F(1, 35) = 5.17$, $p < .05$. Participants increased their intentions to engage in regular exercise from Time 1 to Time 2 ($M = + .92$, $SD = 2.42$), but no other significant effects were found.

An ANCOVA of participants' intentions to exercise regularly in the near future at Time 2, using source and directed thinking as the independent variables and attitudes toward exercise at Time 1 as a covariate, did not yield any significant effects (Fs < 1).

Table 68

Mean intentions to engage in regular exercise at Time 1 and Time 2 by source and type of directed thinking for participants in Experiment 3.

	Self		Other	
	Actions	Reasons	Actions	Reasons
	(*n* = 9)	(*n* = 9)	(*n* = 10)	(*n* = 11)
Time 1	6.56	7.33	6.50	6.45
	(3.24)	(2.00)	(1.85)	(1.51)
Time 2	7.56	8.22	7.10	7.63
	(1.82)	(2.33)	(2.42)	(2.02)
Change	+1.00	+.89	+.60	+1.19
	(2.06)	(2.03)	(3.56)	(2.00)

Notes: Standard deviation in parentheses. Intentions reported on a scale from 0 = *not at all* to 10 = *definitely*.

Post-Manipulation Dependent Measures

Message Effectiveness

The source and type of directed thinking implemented might have differentially affected participants' perceptions of the effectiveness of the persuasive message. Participants' responses to the item "This message would be very effective in persuading a person to exercise regularly" were subjected to a source X directed thinking ANOVA, which yielded a marginally significant main effect of directed thinking, $F(1, 60) = 3.17$, $p = .08$. Persuasive messages that contained reasons were perceived as marginally more effective ($M = 2.62$, $SD = 2.68$) than were persuasive

messages that contained actions (M = 1.30, SD = 3.03); but no other significant effects were found. The means for perceptions of message effectiveness are displayed in Table 69.

Table 69

Means by source and type of directed thinking for items assessing the persuasive message for participants in Experiment 3.

	Self		Other	
Item	Actions	Reasons	Actions	Reasons
	(n = 16)	(n = 16)	(n = 14)	(n = 18)
Message Effectiveness[a]	1.25	2.06	1.35	3.11
	(3.02)	(2.37)	(3.15)	(2.91)
Message Recommendation[b]	4.62	5.62	3.79	5.28
	(2.31)	(2.45)	(2.52)	(3.18)
Message Clarity[c]	7.60	7.81	7.50	7.78
	(1.99)	(1.51)	(1.91)	(2.04)
Creativity of Ideas[d]	5.15	4.42	5.80	5.71
	(2.10)	(2.19)	(2.15)	(1.89)
Quality of Ideas[d]	7.39	7.37	7.79	7.78
	(1.97)	(1.97)	(2.13)	(2.15)

Notes: Standard deviations in parentheses. [a] completed using a scale from -7 = *strongly disagree* to +7 = *strongly agree.* [b] completed using a scale from 0 = *not at all likely* to 10 = *extremely likely.* [c] completed using a scale from 0 = *not at all clear* to 10 = *extremely clear.* [d] completed using a scale from 0 = *poor* to 10 = *excellent*.

Message Recommendation

The source and type of directed thinking might have differentially affected the likelihood that participants would recommend the persuasive message to another person for increasing exercise. Participants' responses to the item "How likely would you be to recommend another person use the techniques/consider the above benefits to increase regular exercise?" were therefore subjected to a source X directed thinking ANOVA, which yielded a marginally significant main effect of directed thinking, $F(1, 60) = 3.49$, $p = .067$. Participants were marginally more likely to recommend persuasive messages that contained reasons ($M = 5.44$, $SD = 2.81$) than persuasive messages that contained actions ($M = 4.23$, $SD = 2.40$). No other significant effects were found. The means for message recommendation are displayed in Table 69.

Message Clarity

The source and type of directed thinking might have also differentially affected participants' perceptions of the persuasive message's clarity. Participants' responses to the item "How would you rate the clarity of the message" were subjected to a source X directed thinking ANOVA, which did not yield any significant effects (Fs < 1). These results indicate that there were no significant differences in the clarity of the messages, which also indicates that any differences between groups were not the result of unintended differences in the message. The means for message clarity are displayed in Table 69.

Creativity and Quality of Persuasive Messages

Did the source and type of directed thinking differentially affect participants' perceptions of the creativity and quality of the ideas contained in the persuasive messages? A composite creativity rating was calculated using the creativity ratings from all three message ideas.

Participants' composite creativity ratings were then subjected to a source X directed thinking ANOVA, which yielded a marginally significant main effect of source, $F(1, 60) = 3.49$, $p = .066$. Participants rated the persuasive messages as more creative when they were other- rather than self-generated (Other: $M = 5.75$, $SD = 1.97$ vs. Self: $M = 4.78$, $SD = 2.14$). No other significant effects were found. The means for the composite creativity of idea ratings are displayed in Table 69.

A composite quality rating was calculated using the quality ratings from all three message ideas. Participants' composite quality ratings were then subjected to a source X directed thinking ANOVA, but the analysis did not yield any significant effects (Fs < 1). The means for the composite quality ratings are displayed in Table 69.

Discussion

Experiment 3 was intended to compare the efficacy of self- versus other-generated reasons and actions for changing attitudes toward, and intentions to engage in, regular exercise. The main finding involved attitudes toward regular exercise at Time 2. Recall that reading persuasive messages containing self-generated reasons led to more positive attitudes at Time 2 than did reading persuasive messages containing self-generated actions. Perhaps participants found their own reasons the most compelling because they were personally relevant. Support for this explanation comes from the elaboration likelihood model of persuasion (ELM; Petty & Cacioppo, 1986). According the ELM, a persuasive communication receives greater processing when the contents of the message are deemed personally relevant by the individual. Since the reasons contained within the persuasive messages were self-generated, it is likely that participants viewed them as valid arguments for doing regular exercise that would be thoroughly

processed. As a result of the deeper processing of the message, the ELM would predict that attitudes would be bolstered, and possibly become more positive.

Also recall that reading persuasive messages containing other-generated actions led to more positive attitudes at Time 2 than did reading persuasive messages containing other-generated reasons. These results are more in line with Ratcliff et al.'s (1999) findings that generating actions another person might take to increase regular studying led to greater study intentions than did generating reasons another person should consider to increase regular studying. Further, although they were generated by another person, actions might be easier to imagine oneself doing and therefore more effective for changing attitudes (e.g., Anderson, 1983; Ten Eyck et al., 2006).

The only other finding of interest involved the perceived effectiveness of the persuasive message for increasing exercise. Recall that participants perceived persuasive messages containing reasons as more effective for increasing regular exercise than persuasive messages containing actions. Many external sources of information regarding the benefits of regular exercise are filled with the positive consequences that will occur if one does exercise (e.g., lose weight, better health, increased energy). Participants' preferences for the reasons messages may simply be a result of a biased belief that they are more effective simply because there are so many of these messages available. Research indicates, nonetheless, that such messages are easily remembered but have little impact on the performance of exercise (Marcus, Owen, Forsyth, Cavill, & Friginder, 1998).

GENERAL DISCUSSION

Major Findings in Experiments 1 and 2

Prior research has found that generating and thinking about action strategies that could increase the performance of a beneficial behavior is more effective than generating and thinking about reasons why one should do the behavior (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006). Recently, Labansat and her colleagues (in press) extended this research to include participants who were in various stages of readiness to study regularly. In each of these studies, however, the behavior of interest was studying and the dependent measure was intentions rather than actual behavior. Experiments 1 and 2 extended prior research on directed thinking to a new beneficial behavior: exercise. In addition, these experiments focused on self-identified sedentary college students, who could be considered an at-risk population.

In Experiment 1, the major findings involved behavioral intentions to exercise and cardiovascular fitness. Participants who generated action strategies reported greater intentions to exercise in the month following the experiment, which replicates prior research (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006). Actions are easier to imagine, which makes them more likely to affect future behaviors (e.g., Anderson, 1983). Although it was predicted that generating action strategies would also prove most effective for increasing cardiovascular fitness, the control participants, who did not generate any ideas, seemed to benefit the most. If anything, generating action strategies allowed participants to keep pace with the control participants more than did generating reasons.

Evidence in the analysis of target exercise behavior indicated that participants who generated action strategies were doing more exercise at the end of the experiment than participants in the other two groups; however the analysis was not significant, nor did it appear

that there was a marked improvement in the performance of exercise. Prior research on the transtheoretical model of behavior change has identified processes that are effective for people in different stages of readiness to engage in a beneficial behavior (Prochaska & DiClemente, 1983; Velicer & Prochaska, 1999). Experiential processes such as realizing the benefits to oneself (i.e., reasons) are more likely to be invoked by people in the earlier stages of change, whereas behavioral processes (i.e., actions) are more likely to be employed by people in the later stages of change. Experiments 1 and 2 targeted participants who were in one of the first three stages of readiness to change: precontemplation (no intent to exercise), contemplation (intending to begin in the next 6 months) and preparation (intending to begin in the next 30 days; Prochaska et al., 1994). It is possible that there were no significant differences in the performance of target exercise behavior because participants in the early stages did not respond to the actions manipulation. This pattern of results is consistent with those reported by Labansat et al. (in press), who found that participants in the early stages of change showed no differences in intentions to study whether they generated actions or reasons (Experiment 1). However it was also possible that the specific procedures of Experiment 1 were not sophisticated enough to create and detect differences among the directed thinking manipulations.

In Experiment 2, we attempted to hone the directed thinking instructions, the definitions and self-reports of exercise, and the manner in which cardiovascular fitness was assessed. The main findings involved the improvement of cardiovascular fitness as measured by estimated absolute and relative VO_2max. Action strategies proved more effective than did reasons or a no-treatment control. The actions group alone increased their cardiovascular fitness while the other two groups decreased their cardiovascular fitness.

As in Experiment 1, Experiment 2 provided some evidence that participants who generated action strategies were doing more of their target exercise at the end of the experiment, but again, it is possible that these early stage exercisers did not respond to the manipulation as would individuals who were in later stages of readiness to exercise regularly (Velicer & Prochaska, 1999). Since there were increases in estimated VO_2max, it is possible that participants in the action strategies group improved the quality of exercise that they did during the course of the experiment, rather than the quantity. Recall that the reasons group reported doing more exercise overall at Week 9, but also showed a decrease in cardiovascular fitness.

When looking back at Experiments 1 and 2, there are several shared and unique results that serve as points of comparison. In Experiment 1, control participants showed the greatest increase in estimated relative VO_2max, which was unexpected. In Experiment 2, we honed the procedures used to measure participants' pulse rates following the step exercise and improved the directed thinking instructions, which produced the predicted increase in cardiovascular fitness after generating action strategies.

In Experiment 1, participants who reported difficulty starting tasks demonstrated the highest estimated absolute VO_2max when generating action strategies, while participants who reported having no difficulty starting tasks benefited the most when generated reasons or were in a no-treatment control condition. This effect was not replicated in Experiment 2, however the moderator analyses of estimated absolute VO_2max revealed a different interaction. Highly neurotic participants increased their cardiovascular fitness from Week 1 to Week 9 when they generated action strategies, but showed decreases when they generated reasons or were in a no-treatment control condition. Changes in cardiovascular fitness from Week 1 to Week 9 were not, however, differentially affected for participants with low levels of neuroticism.

In Experiment 1, the performance of target exercise was moderated by type of directed thinking and initial level of target exercise behavior. Low exercisers' target exercise behaviors from Week 2 to Week 6 were not differentially affected by type of directed thinking; but for high exercisers, generating action strategies proved marginally more effective for increasing target exercise behavior from Week 2 to Week 6 when compared to generating reasons or a no-treatment control condition. High exercisers also reported doing more of their target exercise at Week 6 after generating action strategies, but neither action strategies nor reasons proved more effective for affecting the target exercise behavior of low exercisers. In Experiment 2, none of these findings were replicated, which suggests that the directed thinking techniques and procedures used to track exercise behavior provided results more accurate than those in Experiment 1.

In Experiment 1, overall exercise behavior was differentially affected by an interaction between type of directed thinking and Big Five Inventory Conscientiousness category (John et al., 1991). Participants low in conscientiousness did not show any significant change in their overall exercise behavior from Week 2 to Week 6, regardless of condition. Participants high in conscientiousness, in contrast, showed the greatest decrease in overall exercise behavior from Week 2 to Week 6 when they were in a no-treatment control condition and almost no change when they generated action strategies or reasons. In Experiment 2, the same interaction produced a slightly different pattern of results. Participants low in conscientiousness showed the largest decrease in overall exercise from Week 1 to Week 9 after generating action strategies, while participants high in conscientiousness showed the greatest decrease in overall exercise after generating reasons. In both experiments, nonetheless, participants' overall exercise behavior at the end of the experiment (Weeks 6 & 9) was affected by type of directed thinking and

conscientiousness category in the same manner. Participants low in conscientiousness reported doing marginally more exercise overall at the end of the experiment after generating reasons, while for participants high in conscientiousness, generating actions proved marginally more effective for overall exercise behavior at the end of the experiment.

In Experiment 1, participants' overall exercise behavior was also affected by a type of directed thinking X Actor's Block Scale Finish category interaction. Overall exercise decreased from Week 2 to Week 6 most in the reasons group for easy finishers and decreased most in the action strategies group for hard finishers. This effect was not replicated in Experiment 2.

In Experiment 1, participants' intentions to do their target exercise were affected by an interaction between type of directed thinking and initial stage of exercise (Prochaska et al., 1994). For participants in the early stages of change, generating reasons led to greater target exercise intentions than did generating action strategies. For participants in the mid stage of exercise, generating action strategies led to greater target exercise intentions than did generating reasons. A similar pattern emerged for the type of directed thinking X initial level of target exercise interaction. Specifically, reasons proved more effective for increasing the behavioral intentions of participants who were initially doing none of their target exercise, and action strategies proved more effective for participants who were initially doing at least some of their target exercise. Finally, the degree to which participants would resist therapeutic interventions interacted significantly with type of directed thinking to produce changes in their target exercise intentions (Dowd et al., 1991). Participants less likely to resist therapeutic interventions expressed marginally greater intentions do their target exercise after generating reasons then after generating actions. Participants more likely to resist therapeutic interventions expressed

marginally greater intentions to do their target exercise after generating actions then after generating reasons. None of these findings, however, were replicated in Experiment 2.

The only finding of interest involving target exercise intentions in Experiment 2 resulted from a type of directed thinking X Locus of Control category interaction (Rotter, 1966). Generating reasons proved more effective for positively affecting intentions to do target exercise when participants had an internal locus of control; but for participants with an external locus of control, generating action strategies and a no-treatment control condition were only slightly more effective than did generating reasons.

Behavioral intentions to exercise overall in the month following the experiment were significantly affected by type of directed thinking in Experiment 1. Participants' intentions to exercise were greatest after generating action strategies; but this effect was not replicated in Experiment 2. In Experiment 1, participants intentions to exercise overall were also affected by an interaction between type of directed thinking and initial stage of exercise (Prochaska et al., 1994). For participants in the early stages of exercise, generating actions and reasons proved equally effective when compared to a no-treatment control condition. For participants in the mid stage of exercise, action strategies proved marginally more effective than did reasons or a no-treatment control condition. Again, this result was not replicated in Experiment 2.

In Experiment 2, nonetheless, participants' intentions to exercise were differentially affected by an interaction between type of directed thinking and Locus of Control category (Rotter, 1966). Generating action strategies and reasons proved more effective for positively affecting intentions to exercise overall when participants had an internal locus of control than did a no-treatment control condition; but when participants had an external locus of control, generating action strategies and a no-treatment control proved more effective than did generating

reasons. Finally, participants' intentions to exercise were differentially affected by an interaction between type of directed thinking and Big Five Inventory Extraversion category (John et al., 1991). Generating reasons proved more effective for positively affecting intentions to exercise overall when participants were low in extraversion than did generating action strategies or a no-treatment control condition. For participants high in extraversion, however, the no-treatment control condition proved more effective than did generating action strategies or reasons.

Finally, participants generated more reasons than actions in both Experiments 1 and 2, which replicates prior research on directed thinking (e.g., Ratcliff et al., 1999; Ten Eyck et al., 2006).

Conclusions for experiments 1 and 2. The most important finding from Experiments 1 and 2 was the increase in estimated absolute VO_2max demonstrated by the action strategies group in Experiment 2. This finding may have resulted from an improvement in the procedures used to measure pulse rates following the step exercise, the extended length of the experiment (from six week to nine weeks), the refined directed thinking instructions, or some combination of these three factors.

Generating actions also significantly affected overall exercise intentions for participants in Experiment 1, which conceptually replicated the findings of prior directed thinking studies (e.g., Ratcliff et al., 1999; Ten Eyck et al., 2006). However, the procedures used in the present experiments were quite different. Prior research measured intentions immediately following one exposure to the experimental manipulation (e.g., Ratcliff et al., 1999) or immediately following one exposure and one week later (e.g., Ten Eyck et al., 2006). Participants in Experiments 1 and 2 instead reported their intentions to exercise after repeated exposure to the experimental

manipulation. Clearly, further investigation is warranted to better understand the affects of long-term directed thinking on intentions, actual behavior, and cardiovascular fitness.

Theoretical Implications

Attitude representation theory contends that when people encounter an attitude object, they spontaneously bring to mind assumptions about the attitude object's exemplars, characteristics, emotions, actions, and contexts (ART; Lord & Lepper, 1999). Together, these associations form an "attitude object representation," which affects how people behave toward the attitude object. Until recently, research testing the components of ART has focused on attitudes toward social groups and issues (e.g., Lord et al., 1994; Lord et al., 2004; Ramsey et al., 1994; Sia et al., 1997; Sia et al., 1998), but not behaviors.

Recently, research testing the components of ART has been expanded to included attitude-relevant behaviors such as studying (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006) and in the present experiments, exercise. ART is based on the idea that when asked to think about an attitude-relevant behavior such as exercise, people spontaneously activate typical exemplars. For example, a person asked to think of the behavior 'studying' might commonly imagine a student in a library sitting in front of a pile of books. Prior research examining exemplars showed that people are more likely to behave in line with their positive attitudes toward a member of a social category when that member was described in a way that matched their exemplar (Ramsey et al., 1994, Study 1). In order to test whether the experimental manipulation would yield similar results in Experiments 1 and 2, recall that we had participants select a target exercise behavior in an attempt to provide an attitude-relevant behavior that their exemplar matched. Participants' target and overall exercise behaviors were not significantly affected by type of directed thinking in either Experiment 1 or Experiment 2; but the results of

Experiment 2 strongly suggest that matching participants' exemplars for cardiovascular exercise by allowing them to select a target exercise did positively affect their estimated absolute and relative VO_2max when they generated action strategies to do the target exercise. The present results extend ART by demonstrating that having participants bring to mind specific actions that fit their exemplars for a cardiovascular exercise, such as brisk walking or running, has a positive effect on the performance of that exercise. This positive effect was not found in the amount of target exercise reported, but in the improvements of cardiovascular fitness during the course of the experiment.

McGuire and McGuire (1991) identified the types of thoughts that people spontaneously generate when asked to free associate to an event, such as 'joining the psychology club next semester.' According to the results of several studies, people primarily list the antecedents (e.g., 'I will pick up an application to join the club') and consequences (e.g., 'I will meet new and interesting people in the club') of the event. Antecedents can be thought of as actions one could take to increase the likelihood of the event, while consequences can be considered the reasons why one would benefit from engaging in the event.

Experiments 1 and 2 tested the efficacy of using action strategies or reasons to increase intentions to exercise, exercise behavior, and cardiovascular fitness; however, the results were not as clear cut as we predicted. The experimental manipulation employed in Experiments 1 and 2 was designed to make salient information about exercise that the participants' already knew. We predicted that making salient action strategies one could use to increase the performance of a target exercise would lead participants to express greater intentions to exercise in the future, and do that exercise more often. In fact, behavioral intentions to exercise were significantly higher when participants in Experiment 1 generated action strategies, but type of directed thinking did

not have a significant impact on any other intentions in either experiment. Target exercise was also not significantly affected by type of directed thinking. How might the lack of results be explained?

McGuire and McGuire (1996) used directed thinking to affect changes in participants' self-esteem, by having them focus on either desirable or undesirable characteristics that they possessed (Expts. 2 & 3). The researchers first established baseline levels of self-esteem. Then, they directed some of the participants to think about and generate a list of self-favorable information that included positive characteristics they did possess (e.g., 'I am a caring person') or negative characteristics they did not possess (e.g., 'I am not vindictive'). The remaining participants were directed to think about and generate a list of self-unfavorable information that included negative characteristics they did possess (e.g., 'I am vindictive') and positive characteristics they did not possess (e.g., 'I am not a caring person'). Participants' levels of self-esteem were again measured at the end of the session.

When participants were directed to think about the positive characteristics they did possess and the negative characteristics they did not possess, their self-esteem increased from baseline (McGuire & McGuire, 1996, Expts. 2 & 3). Conversely, when participants were directed to think about the negative characteristics they did possess and the positive characteristics they did not possess, their self-esteem decreased from baseline. McGuire and McGuire clearly demonstrated the power of directed thinking to influence changes self-esteem. It is important to note, however, that their manipulation was successful because they provided very specific instructions for the directed thinking task. Participants were asked to focus specifically on their positive and negative characteristics, rather than simply being asked to list characteristics they associated with themselves.

In Experiments 1 and 2, participants were instructed to think about and generate action strategies and reasons for their target exercise. Participants in the actions group were not, however, directed to specifically focus on ideas that they considered to be positive or negative. Participants in the actions groups in both experiments were asked to generate actions that would increase the performance of their target exercise behavior, but they were not asked to generate actions that would keep exercise from decreasing. Participants in the reasons groups were asked to generate ideas to increase the performance of their target exercise behavior. They were also directed to consider the positive consequences of doing their target exercise and the negative consequences of not doing their target exercise; these directions may have unintentionally shifted focus to mostly positive or mostly negative associations regarding the self and exercise. Further, these reasons may not have been personally relevant. When considering the effectiveness ratings for the most commonly generated actions and reasons from both experiments (see Tables 1 and 35), it is clear in many instances, the most frequently generated items were not necessarily the ones that participants rated as most effective for increasing target exercise. Perhaps the efficacy of action strategies could be increased by directing participants to think specifically about actions that they have used successfully in the past, or that they believe would actually be effective for increasing exercise behavior, rather than restricting their idea generation to predetermined categories.

Experiments 1 and 2 extended the directed thinking literature by examining a new behavior: exercise. Participants in Experiment 1 expressed greater intentions to study after generating action strategies, which replicates prior findings (e.g., Ratcliff et al., 1999; Ten Eyck et al., 2006); but these prior studies measured intentions after one exposure to the experimental manipulation. In the present experiments, intentions were measured after several exposures to the

experimental manipulation and were not significantly affected in Experiment 2. Perhaps in the short-term, intentions reflect an optimistic attitude toward doing the behavior, while long-term exposure to the reality that one is not actually doing the behavior leads those intentions to wane. Participants in both experiments did not significantly increase the performance of their exercise behavior, which may therefore account for the lack of intentions.

Most recently, Labansat et al. (2006) extended research on directed thinking by including stages of readiness to change regular studying behavior (Prochaska et al., 1994). When participants in one experiment were in the early stages of change (i.e., little or no intentions to study regularly in the next six months), generating actions or reasons had no effect on their intentions to study regularly in the near future (Expt. 1). For participants in the later stages of change (i.e., already studying regularly or preparing to do so in the near future), generating action proved more effective for increasing intentions to study than did generating actions.

Although Experiment 1 included only participants who were in the three earliest stages of change for exercise, it provided a conceptual replication of these results. Participants in the mid stages of change expressed greater intentions to do their target exercise after generating action strategies than reasons; and extended Labansat et al.'s (in press) findings by demonstrating that reasons proved more effective for increasing intentions to do target exercise when participants were in the early stages of change.

Major Findings in Experiment 3

Experiment 3 compared the efficacy of self- versus other-generated action strategies and reasons for increasing attitudes toward and intentions to engage in regular exercise. The major finding involved attitudes toward exercise at Time 2. Participants who read persuasive messages containing self-generated reasons expressed more positive attitudes at Time 2 than did

participants who read messages containing self-generated actions. Further, participants who read persuasive messages containing other-generated actions expressed more positive attitudes at Time 2 than did participants who read persuasive messages that contained other-generated reasons. A final finding of interest involved the perceived effectiveness of the persuasive messages for increasing the performance of regular exercise. Participants rated persuasive messages that contained reasons as more effective for increasing exercise than persuasive messages that contained actions.

Theoretical Implications

Experiment 3 was intended to provide evidence that the 'persuasion from within' directed thinking techniques employed in the present experiments and in prior experiments (e.g., Labansat et al., in press; Ratcliff et al., 1999; Ten Eyck et al., 2006) were superior to 'persuasion from without' messages provided by external sources (McGuire & McGuire, 1991, 1996). That participants reported higher attitudes toward exercise after reading persuasive messages containing self-generated reasons rather than self-generated actions was unexpected, but interesting nonetheless. When considering the tenets of the ELM, the current findings make sense (Petty & Cacioppo, 1986). According to the ELM, persuasive communications receive greater processing when the contents of the message are personally relevant to the individual. Self-generated reasons for doing regular exercise could certainly be considered personally relevant, which helps explain the significant positive attitudes that resulted. The self-generated actions may have simply represented the spontaneously associated exemplars that were contained within participants' attitude object representations, as described by ART (Lord & Lepper, 1999). For example, a participant may have spontaneously associated the attitude-object 'regular exercise' with running around the track at a gym. If this exemplar has been associated

with the successful completion of exercise in the past, then it would be perceived as effective by the individual. If, however, running around the track at a gym typically ends because the track is too crowded, or the individual spends too much time visiting with friends, then it will not be perceived as effective.

It makes sense then, that persuasive messages containing other-generated actions led to more positive attitude reports at Time 2 than did persuasive messages containing other-generated reasons. Other-generated reasons may or may not be personally relevant (Petty & Cacioppo, 1986). Additionally, other-generated actions may have provided participants with new exemplars that they would not normally associate with regular exercise (Lord & Lepper, 1999). If their own exemplars and actions for regular exercise were associated with negative thoughts and emotions in the past, then novel exemplars and actions may have proved effective for increasing their attitudes toward regular exercise. From the perspective of increased accessibility (Wyer & Srull, 1989), another person's ideas about effective actions might gain more probability of activation than one's own ideas, which are already high in accessibility.

Future Directions

The findings from Experiments 1 and 2 offered some evidence that action strategies are more effective than reasons for increasing intentions to exercise and cardiovascular fitness. In addition, action strategies may have helped participants in Experiment 2 sustain their target exercise behavior. One possible explanation for the failure of the present experiments to fully support our hypotheses lies in the types of ideas that participants spontaneously generated. Perhaps the action strategies that self-identified sedentary individuals spontaneously generate arise more from accessibility than from prior effectiveness (Wyer & Srull, 1989).

It may prove useful to examine the frequency with which sedentary and non-sedentary individuals spontaneously generate action strategies for exercise and compare the effectiveness of high (i.e., frequently generated) and low (i.e. infrequently generated) accessibility ideas (Wyer & Srull, 1989). Individuals who are already regularly engaged in a self-beneficial behavior such as exercise may generate action strategies that are different than those generated by individuals who have had little success initiating or maintaining regular exercise. Although the ideas may be very similar, those ideas may elicit very different spontaneous associations. By making low accessibility actions more available to sedentary individuals, it may be possible to increase their intentions, attitudes, and actual behavior.

It may also prove useful to further explore different types of instructions for directed thinking about reasons and actions, to determine their impact on people's attitudes and intentions. McGuire and McGuire (1986) demonstrated that having participants focus on their own positive attributes increased their self-esteem, and having other participants focus on their own negative attributes decreased their self-esteem (Expts. 2 & 3). Sedentary individuals, who have tried unsuccessfully in the past to exercise regularly, may automatically bring to mind those past actions that did not work. Although participants in Experiments 1 and 2 rated the effectiveness of their ideas for increasing exercise, they did so at the end of the experiments. If the actions that they generated every week were perceived as ineffectual, then in some cases, participants spent six to eight weeks thinking about actions that would not likely increase their intentions or behaviors. Future studies should therefore more thoroughly examine the perceived effectiveness of ideas as they are generated by the individual.

Prior research on directed thinking showed that vividly imagining oneself doing generated actions led to greater study intentions (Ten Eyck et al., 2006). Future studies could attempt to extend these findings into other beneficial behaviors, such as exercise.

Directed thinking, as a persuasion from within technique for increasing intentions, attitudes and behavior, still holds promise. Self-beneficial behaviors such as exercise are highly complex, and should therefore be explored more thoroughly. Future research may provide our hoped-for definitive answer: self-generated action strategies to increase and maintain regular exercise might yet prove to be important tools we need to insure success.

References

American College of Sports Medicine (ACSM; 2005). General exercise guidelines from the ACSM. Retrieved February 11, 2005 from http://www.acsm.org.

Anderson, C. A. (1983). Imagination and expectation: The effect of imagining behavioral scripts on personal intentions. *Journal of Personality and Social Psychology, 42,* 293-305.

Armitage, C. J. (2004). Evidence that implementation intentions reduce dietary fat intake: A randomized trial. *Health Psychology, 23,* 319-323.

Astrand, P. O. (1956). Human physical fitness with special reference to sex and age. *Physiological Reviews, 36,* 307-335.

Astrand, P. O., & Rhyming, I. (1954). A nomogram for calculation of aerobic capacity (physical fitness) from pulse rate during sub-maximal workout. *Journal of Applied Physiology, 7,* 218-221.

Bandura, A. (1986). *Social foundations of thought and actions: A social cognitive theory.* Upper Saddle River, NJ: Prentice Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W. H. Freeman/Times Books/ Henry Holt & Co.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health, 13,* 623-649.

Bandura, A. (2004). Health promotion by a social cognitive means. *Health Education and Behavior, 31,* 143-164.

Barron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

Brehm, J. W. (1966). *A theory of psychological reactance.* San Diego, CA: Academic Press.

Brehm, J. W. (1972). *Responses to loss of freedom: A theory of psychological reactance.* Morristown, NJ: General Learning Press.

Centers for Disease Control and Prevention (2003, August 15). Prevalence of physical activity, including lifestyle activities among adults – United States, 2000-2001. Retrieved December 4, 2004, from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5232a2.htm.

Centers for Disease Control and Prevention. Retrieved February 4, 2005, from http://www.cdc.gov.

Costa, P. T., Jr., & McCrae, R. R. (1992). *The NEO personality inventory R: Professional manual.* Odessa, Fl: Psychological Assessment Resources.

Courneya, K. S., Bobick, T. M., Schinke, R. J. (1999). Does the theory of planned behavior mediate the relation between personality and behavior? *Basic and Applied Social Psychology, 21,* 317-324.

Courneya, K. S., & Hellsten, L. M. (1998). Personality correlates of behavior, motives, barriers, and preferences: An application of the five-factor model. *Personality and Individual Differences, 24,* 625-633.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24,* 349-354.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11,* 227-268.

DiClemente, C. C., Prochaska, J. O., & Gilbertini, M. (1985). Self-efficacy and the stages of change of smoking. *Cognitive Therapy and Research, 9,*181-200.

Diener, E., R.A. Emmons, R.J. Larsen and S. Griffin (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 71–75.

Donnell, A. J., Thomas, A., & Buboltz Jr., W. C. (2001). Psychological reactance: Factor structure and internal consistency of the questionnaire for the measurement of psychological reactance.

Dowd, E. T., Milne, C. R., & Wise, S. L. (1991). The therapeutic reactance scale: A measure of psychological reactance. *Journal of Counseling and Development, 69,* 541-545.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes.* New York: Harcourt Brace Jovanovich.

Gibbons, F. X., & Eggleston, T. J. (1996). Smoker networks and the "typical smoker": A prospective analysis of smoking cessation. *Health Psychology, 15,* 469-477.

Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. In W. Stroebe & M. Hewstone (Eds), *The European review of social psychology* (Vol. 4, pp. 141-185). New York: John Wiley & Sons Ltd.

Gollwitzer, P. M., & Brandstatter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73,* 186-199.

Gollwitzer, P. M., & Schaal, B. (1998). Metacognition in action: The importance of implementation intentions. *Personality and Social Psychology Review, 2,* 124-136.

Gregory, W. L., Cialdini, R. B., & Carpenter, K. M. (1982). Self-relevant scenarios as mediators of likelihood estimates. Does imagining it make it so? *Journal of Personality and Social Psychology, 43,* 89-99.

Heyward, V. H. (2002). *Advanced fitness assessment and exercise prescription* (4th ed.). Champaign, IL: Human Kinetics.

Janis, I. L., & Mann, L. (1977). *Decision-making: A psychological analysis of conflict, choice, and commitment.* New York: Free Press.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The big five inventory--Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

Labansat, H. A., Ten Eyck, L. L., Gresky, D. M., Dansereau, D. F., & Lord, C. G. (in press). Directed thinking and readiness to change self-beneficial behaviors: Are you ready for some studying? *Accepted for publication in the Journal of Applied Social Psychology.*

Leventhal, H., Singer, R., & Jones, S. (1965). Effects of fear and specificity of recommendation upon attitudes and behavior. *Journal of Personality and Social Psychology, 2,* 20-29.

Lippke, S., Ziegelmann, J. P., & Schwarzer, R. (2004). Behavioral intentions and action plans promote physical exercise: A longitudinal study with orthopedic rehabilitation patients. *Journal of Sport and Exercise Psychology, 26,* 470-483.

Lord, C. G., Deforges, D. M., Fein, S., Pugh, M. A., & Lepper, M. R. (1994). Typicality effects in attitudes toward social policies: A concept-mapping approach. *Journal of Personality and Social Psychology, 66,* 658-673.

Lord, C. G., & Lepper, M. R. (1999). Attitude representation theory. In xxx (ed), *Advances in experimental social psychology* (Vol. 31, pp. 265 -343. New York: Academic Press.

Lord, C. G., Lepper, M. R., & Mackie, D. (1984). Attitude prototypes as determinants of attitude-behavior consistency. *Journal of Personality and Social Psychology, 46,* 1254-1266.

Lord, C. G., Paulson, R. M., Sia, T. L., Thomas, J. C. & Lepper, M. R. (2004). Houses built on sand: Effects of exemplar stability on attitude change. *Journal of Personality and Social Psychology, 87,* 733-749.

Marcus, B. H., Owen, N., Forsyth, L. H., Cavill, N. A., & Fridinger, F. (1998). Physical activity interventions using mass media, print, and information technology. *American Journal of Preventative Medicine, 15,* 362-378.

Marley, W. P., & Linnerud, A. C. (1976). Astrand-Rhyming step test for college students. *British Journal of Sports Medicine, 10,* 76-79>

McGuire, W. J., & McGuire, C. V. (1991). The content, structure, and operation of thought systems. In R. S. Wyer, Jr. & T. Srull (Eds.), *Advances in Social Cognition* (Vol. 4, pp. 1-78). Hillsdale, NJ: Erlbaum.

McGuire, W. J., & McGuire, C. V. (1996). Enhancing self-esteem by directed-thinking tasks: Cognitive and affective asymmetries. *Journal of Personality and Social Psychology, 70,* 1117-1125.

Millar, M. (2004). Effects of thinking about reasons and actions on intentions to perform health behaviors. *Journal of Applied Social Psychology, 34,* 1457-1469.

Mussweiler, T., & Neumann, R. (2000). Sources of mental contamination: Comparing effect of self-generated versus externally provided primes. *Journal of Experimental Social Psychology, 36,* 194-206.

Paulson, R. M. (2004). The effects of attitude action activity on the attitude-behavior relationship. (Doctoral Dissertation, Texas Christian University, 2004). *Dissertation Abstracts International: Section B: The Sciences and Engineering, 66, 1-B,* p. 620.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 124-205). New York: Academic Press.

Pham, L. B., & Taylor, S. E. (1999). From thought to action: Effects of process- versus outcome-based mental simulations on performance. *Personality and Social Psychology Review, 25,* 250-260.

Plante, T. G., Cage, C., Clements, S., Stover, A. (2006). Psychological benefits of exercise paired with virtual reality: Outdoor exercise energizes whereas indoor virtual exercise relaxes. *International Journal of Stress Management, 13,* 108-117.

Plante, T. G., Coscarelli, L., & Ford, M. (2001). Does exercising with another enhance the stress-reducing benefits of exercise? *International Journal of Stress Management, 8,* 201-213.

Prestwich, A., Lawton, R., & Conner, M. (2003). The use of implementation intentions and the decisional balance sheet in promoting exercise behavior. *Psychology and Health, 18,* 707-721.

Prochaska, J. O. (1979). *Systems of psychotherapy: A transtheoretical analysis.* Homewood, IL: Dorsey.

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51,* 390-395.

Prochaska, J. O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Marcus, B. H., Rakowsi, W., Fiore, C., Harlow, L. L., Redding, C. A., Rosenbloom, D., & Rossi, S. R. (1994). Stages of change and decisional balance for twelve behavioral problems. *Health Psychology, 13,* 39-46.

Ramsey, S. L., Lord, C. G., Wallace, D. S., & Pugh, M. A. (1994). The role of subtypes in superordinate social categories. *British Journal of Social Psychology, 33,* 387-403.

Ratcliff, C. D., Czuchry, M., Scarberry, N. C., Thomas, J. C., Dansereau, D. F., & Lord, C. G. (1999). Effects of directed thinking on intentions to engage in beneficial activities: Actions Versus Reasons. *Journal of Applied Social Psychology, 29,* 994-1009.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied, 80,* 1-28.

Ruiter, R. A. C., Abraham, C, & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology and Health, 16,* 613-630.

Sheeran, P., & Silverman, M. (2003). Evaluation of three interventions to promote workplace health and safety: Evidence for the utility of implementation intentions. *Social Science and Medicine, 56,* 2153-2163.

Sia, T. L., Lord, C. G., Blessum, K. A., Ratcliff, C. D., & Lepper, M. R. (1997). Is a rose always a rose? The role of social category exemplar change in attitude stability and attitude-behavior consistency. *Journal of Personality and Social Psychology, 72,* 501-514.

Sia, T. L., Thomas, J. C., Lord, C. G., & Lepper, M. R. (1998). A longitudinal investigation of social category exemplar activation: Consistency imparts resistance to attitude change. Unpublished manuscript.

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning and Memory, 4,* 592-604.

Steptoe, A., & Wardle, J. (2001). Locus of control and health behaviour revisited: A multivariate analysis of young adults from 18 countries. *British Journal of Psychology, 92,* 659-672.

Svenson, G. R., Östergren, P-O., Merlo, J., & Rastam, L. (2002). Action control and situational risks in the prevention of HIV and STIs: Individual, dyadic, and social influences on consistent condom use in a university population. *AIDS Education and Prevention, 14,* 515-531.

Ten Eyck, L. L., Gresky, D. M., & Lord, C. G. (2006). Exercise and the stages of change. *Unpublished data.*

Ten Eyck, L. L., Junemann, A. M., Caldwell, A. E., & Daniel, A. (2005). The effects of directed thinking on exercise intentions. *Unpublished manuscript.*

Ten Eyck, L. L., Labansat, H. A., Gresky, D. M., Dansereau, D. F., & Lord, C. G. (2006). Effects of directed thinking on intentions to engage in beneficial activities: Idea generation or mental simulation? *Journal of Applied Social Psychology, 36,* 1234-1262.

Ten Eyck, L. L., & Lord, C. G. (2006). [The actor's block scale]. Unpublished scale.

Velicer, W. F., DiClemente, C. C., Prochaska, J. O., & Brandenburg, N. (1985). A decisional balance measure for assessing and predicting smoking status. *Journal of Personality and Social Psychology, 48,* 1279-1289.

Velicer, W. F., Norman, G. J. Fava, J. L., & Prochaska, J. O. (1999). Testing 40 predictions from the Transtheoretical Model. *Addictive Behaviors, 24,* 455-469.

Velicer, W. F., & Prochaska, J. O. (1999). An expert system intervention for smoking cessation. *Patient Education and Counseling, 36,* 119-129.

Wilson, P. M., & Rogers, W. M. (2004). The relationship between perceived autonomy support, exercise regulations and behavioral intentions in women. *Psychology of Sport and Exercise, 5,* 229-242.

Wyer, R. S., Jr., & Srull, T. K. (1989). *Memory and cognition in its social context.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Appendix A

Action Strategies Condition

Successful authors, who turn out one article or book after another, have written a lot about the action strategies they use. Like everyone else, they sometimes have times when they can't seem to start a new article or book, aren't enjoying themselves while they are writing it, or can't make themselves finish the article or book that they are working on. When these things happen, successful authors use action strategies that involve changing the world around them. Here are some examples of action strategies used by actual successful authors.

"I use various props, like index cards to organize my ideas, various color pens, and a note-book that I carry with me everywhere in case an idea strikes me."

"Writing may seem like a solitary profession, but I don't think anyone ever wrote a great novel sitting in a cave, without other people to use for inspiration, advice, encouragement, and practical support."

"I find that I can't write just anywhere. I'm very particular about my surroundings. I know other authors who could write in a busy bus terminal or even in the bowels of Hell, but if I had to do that, I think I'd go mad."

"In retrospect, I realize how important time is to my writing. I have to schedule my writing by making appointments with myself, and beginning at exactly the appointed time, complete each segment of the writing on time."

By using these types of action strategies, successful writers facilitate their getting started on their writing projects, enjoying the writing while they are doing it, and finishing the writing projects that they have begun.

NEXT PAGE

Action Strategies Condition

We gave you these examples of action strategies because we are interested in strategic actions regarding **exercise**. Specifically, you told us that you preferred _____ as your exercise of choice. What strategic actions would you use to alter the world around you as it pertains to_____? On the lines below, please list action strategies that you could use to change your world in ways that would facilitate starting exercise sessions, enjoying exercise sessions while you are doing them, and finishing exercise sessions once you have started. Please list as many as possible different action strategies for _____ that you think would work for you.

Appendix B

Action Strategies Condition

Now that you have made your list of action strategies that would work for you, we'd like you to divide them into categories. The examples of action strategies that successful writers use seem to us to fall into four categories: acting on things; acting on people; acting on the surroundings; and acting on time. For example:

Acting on things

"I use various props, like index cards to organize my ideas, various color pens, and a note-book that I carry with me everywhere in case an idea strikes me."

Acting on people

"Writing may seem like a solitary profession, but I don't think anyone ever wrote a great novel sitting in a cave, without other people to use for inspiration, advice, encouragement, and practical support."

Acting on surroundings

"I find that I can't write just anywhere. I'm very particular about my surroundings. I know other authors who could write in a busy bus terminal or even in the bowels of Hell, but if I had to do that, I think I'd go mad."

Acting on time

"In retrospect, I realize how important time is to my writing. I have to schedule my writing by making appointments with myself, beginning at exactly the appointed time, timing my progress while writing, and ending at exactly the appointed time."

ON THE NEXT PAGE, YOU WILL FIND A TABLE. Copy each item into its corresponding category. If you think an item falls into more than one of these categories, write it in more than one slot. If you think an item falls into none of these categories, then copy it into the category marked "none."

Action Strategies for My Exercise

Acting on things: _____ _____ _____	 _____ _____ _____
Acting on people: _____ _____ _____	 _____ _____ _____
Acting on surroundings: _____ _____ _____	 _____ _____ _____
Acting on time: _____ _____ _____	 _____ _____ _____
Other: _____ _____	 _____ _____

Next we have another way that we would like you categorize your own action strategies. For each action strategy, we'd like to know whether you think it would work for getting you to **start** an exercise session, **enjoy** an exercise session while you are doing it, or **finish** an exercise session once you have started it. Please go back and write "**S**," "**E**" or "**F**" next to each of the items that you wrote in the table on the previous page. If you think an item falls into more than one of these categories, write more than one letter next to it. If you think an item falls into none of these categories, then write "none."

Appendix C

Motivational Thoughts Condition

Successful authors, who turn out one article or book after another, have written a lot about what they do to motivate themselves. Like everyone else, they sometimes have times when they can't seem to start a new article or book, aren't enjoying themselves while they are writing it, or can't make themselves finish the article or book that they are working on. When these things happen, what do successful authors think about to motivate themselves? Here are some examples of motivational thoughts expressed by actual successful authors.

"I frequently have to remind myself that starting the next book or finishing the one in progress will make me rich and famous."

"I don't write entirely for the money. I really enjoy writing for its own sake. When I have trouble in writing, I stop to think that my books change many people's lives for the better."

"How could I possibly stop writing? I wouldn't have any way to get out my thoughts, my fears, my conjectures, or my deepest yearnings by putting them on paper. If I didn't write, I think I'd go mad.

"I suppose I could stop writing, but then what would I do? It's the only way I know to make a decent living. If I stop writing, my family will end up destitute."

By using these types of thoughts, successful writers motivate themselves to get started on their writing projects, motivate themselves to enjoy the writing while they are doing it, and motivate themselves to finish the projects that they have begun.

NEXT PAGE

Motivational Thoughts Condition

We gave you these examples because we are interested in motivational thoughts regarding **exercise**. Specifically, you told us that you preferred _____ as your exercise of choice. What thoughts would you use to motivate yourself regarding _____? On the lines below, please list thoughts that you could use to motivate yourself for starting exercise sessions, enjoying exercise sessions while you are doing them, and finishing exercise sessions once you have started. Please list as many as possible different motives for _____ that you think would motivate you.

Appendix D

Motivational Thoughts Condition

Now that you have made your list of motivational thoughts that would motivate you, we'd like you to divide them into categories. The examples of motivational thoughts that successful writers use seem to us to fall into four categories: good things that will happen to me if I do it; good things that will happen to others if I do it; bad things that will happen to me if I don't do it; and bad things that will happen to others if I don't do it. For example:

good things that will happen to me if I do it:
"I frequently have to remind myself that starting the next book or finishing the one in progress will make me rich and famous."

good things that will happen to others if I do it
"I don't write entirely for the money. I really enjoy writing for its own sake. When I have trouble in writing, I stop to think that my books change many people's lives for the better."

bad things that will happen to me if I don't do it
"How could I possibly stop writing? I wouldn't have any way to get out my thoughts, my fears, my conjectures, or my deepest yearnings by putting them on paper. If I didn't write, I think I'd go mad."

bad things that will happen to others if I don't do it
"I suppose I could stop writing, but then what would I do? It's the only way I know to make a decent living. If I stop writing, my family will end up destitute."

ON THE NEXT PAGE, YOU WILL FIND A TABLE. Copy each item into its corresponding category. If you think an item falls into more than one of these categories, write it in more than one slot. If you think an item falls into none of these categories, then copy it into the category marked "none."

Motivational Thoughts About My Exercise

Good for me: _____ _____ _____	 _____ _____ _____
Good for others: _____ _____ _____	 _____ _____ _____
Bad for me: _____ _____ _____	 _____ _____ _____
Bad for others: _____ _____ _____	 _____ _____ _____
OTHER: _____ _____	 _____ _____ _____

Next we have another way that we would like you to categorize your own motivational thoughts. For each motivational thought, we'd like to know whether you think it would motivate you to **start** an exercise session, **enjoy** an exercise session while you are doing it, or **finish** an exercise session once you have started it. Please go back and write "**S**," "**E**" or "**F**" next to each of the items that you wrote in the table on the previous page. If you think an item falls into more than one of these categories, write more than one letter next to it. If you think an item falls into none of these categories, then write "none."

Appendix E

We would like to know about your exercise over the past 7 days, regardless of how much you did or did not do. We gain valuable data even if you did not do any exercise, so please be as accurate as possible. **On the following page you will find a table. For each of the 6 exercises listed, you will fill in 3 pieces of information:**

1. In the slot marked "T" tell us how many MINUTES of exercise you did during each session.
2. In the slot marked "EX" tell us how much effort you exerted during the exercise session, USING THE FOLLOWING SCALE

PERCEIVED EXERTION SCALE

6
7 Very, very light
8
9 Very light
10
11 Fairly light
12
13 Somewhat hard
14
15 Hard
16
17 Very hard
18
19 Very, very hard
20

3. In the slot marked "EN" tell us how much you enjoyed the exercise session, USING THE FOLLOWING SCALE.

ENJOYMENT SCALE
0 = not at all enjoyable
1 = Slightly enjoyable
2 = Moderately enjoyable
3 = Enjoyable
4 = Very Enjoyable

PLEASE NOTE THAT YOU HAVE SPACE TO FILL IN ANY OTHER EXERCISE/PHYSICAL ACTIVITY YOU DID IN THE PAST 7 DAYS

EXERCISE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Brisk walking	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
Jog/Run	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
Swimming	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
Bicycling	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
Elliptical Training	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
Group Exercise	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______
	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______	T: ________ EX: _______ EN: _______

Appendix F

Your target exercise was _____.

How much of that specific type of exercise are you doing now compared to before you started in this study?

-3 -2 -1 00 +1 +2 +3

a lot less the same a lot more

How much of that specific type of exercise do you plan on doing over the next month, after this study ends?

0 1 2 3 4 5 6
none at all a lot

How much exercise overall (counting all forms of exercise) are you getting now compared to before you started in this study?

-3 -2 -1 00 +1 +2 +3

a lot less the same a lot more

How much exercise overall (counting all forms of exercise) do you plan to get over the next month, after this study ends?

0 1 2 3 4 5 6
none at all a lot

How do you think your general physical fitness is now compared to before you started in this study?

-3 -2 -1 00 +1 +2 +3

a lot worse the same a lot better

How do you think your overall health is now compared to before you started in this study?

-3 -2 -1 00 +1 +2 +3

a lot worse the same a lot better

How do you think your general feeling of psychological well-being is compared to before you started in this study?

-3 -2 -1 00 +1 +2 +3

a lot worse the same a lot better

Appendix G
Exercise Trait Questionnaire

For each of the following traits, circle the score that best represents your opinion of the typical person who exercises a lot:

The typical person who exercises a lot is:

-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very unlikable																very likable
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very incompetent																very competent
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very irresponsible																very responsible
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very untrustworthy																very trustworthy
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very inefficient																very efficient
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very disrespected																very respected
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very unpopular																very popular
-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	**8**
very incapable																very capable

Appendix H

Satisfaction with Life Scale

Below are five statements that you may agree or disagree with. Using the 1 – 7 scale below, please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement*.

Disagree strongly	Disagree	Disagree slightly	Neither agree nor disagree	Agree slightly	Agree	Agree strongly
1	2	3	4	5	6	7

____ 1. In most ways my life is close to the ideal.

____ 2. The conditions of my life are excellent.

____ 3. I am satisfied with my life.

____ 4. So far I have gotten the things I want in life.

____ 5. If I could live my life over, I would change almost nothing.

Appendix I

Staging Algorithm for Regular Exercise

Regular Exercise is any planned activity (for example, brisk walking, jogging, bicycling, swimming, basketball, aerobics classes, etc.) performed to increase physical fitness. Such activity should be performed *4 or more times* per week for *30 or more minutes* per session at a level that increases your breathing rate and causes you to break a sweat.

Which of the following best describes your level of regular exercise? Please circle one and only one of these five answers.

a) I do not intend to exercise regularly in the next 6 months
b) I intend to begin exercising regularly in the next 6 months
c) I intend to begin exercising regularly in the next 30 days
d) I have been exercising regularly for less than 6 months
e) I have been exercising regularly for at least 6 months

Appendix J

Rotter's (1966) Locus of Control Scale

Instructions:

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you are concerned. Indicate your choice by circling the appropriate letter (a or b). Be sure to select the one you actually believe to be more true rather than the one you would like to be true. This is a measure of personal beliefs; obviously, there are no right or wrong answers. In some instances, you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you are concerned.

1. a. Children get into trouble because their parents punish them too much.

   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.

   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.

   b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run, people get the respect they deserve in this world.

   b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he or she tries.

5. a. The idea that teachers are unfair to students is nonsense.

   b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. a. Without the right breaks, one cannot be an effective leader.

   b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try, some people just don't like you.

   b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.

   b. It is one's experiences in life which determine what one is like.

9. a. I have often found that what is going to happen will happen.

   b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well-prepared student, there is rarely if ever such a thing as an unfair test.

    b. Many times, exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work and luck has little or nothing to do with it.

    b. Getting a good job depends mainly of being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.

    b. This world is run by the few people in power and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.

    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.

    b. There is some good in everybody.

15. a. In my case, getting what I want has little or nothing to do with luck.

    b. Many times, we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.

    b. Getting people to do the right thin depends upon ability and luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control.

    b. By taking an active part in political and social affairs, the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.

    b. There really is no such thing as "luck".

19. a. One should always be willing to admit mistakes.

    b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.

    b. How many friends you have depends on how nice a person you are.

21. a. In the long run, the bad things that happen to us are balanced by the good ones.

    b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort, we can wipe out political corruption.

    b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.

    b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.

    b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times, I feel that I have little influence over the things that happen to me.

    b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.

. b. There is not much use in trying too hard to please people; if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.

    b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.

    b. Sometimes I feel that I don't have enough control over the direction my life is taking.

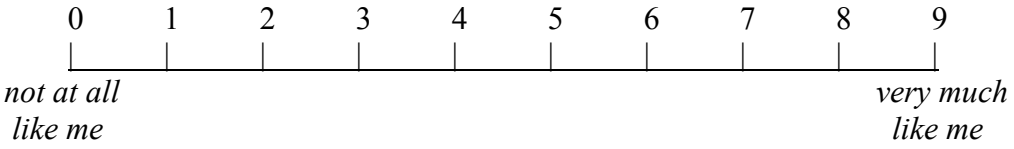
29. a. Most of the time, I can't understand why politicians behave the way they do.

    b. In the long run, the people are responsible for bad government on a national as well as on a local level.

Appendix K

The Actor's Block Scale

Please read each of the following statements carefully, and then choose the number that best applies to you. Please write the number you choose in the space provided to the left of each question.



1. I often procrastinate more than I should.

2. I put off starting projects until the last minute.

3. I often struggle to finish projects or assignments on time.

4. I understand the importance of starting a task, but can't seem to get going.

5. I can't seem to manage my time in a way that permits me to finish projects on time.

6. I have no trouble finding excuses for not starting a task.

7. Although I have no trouble starting projects, I can never seem to finish them.

8. I will have every intention of doing something, but end up starting it late.

9. I am usually behind when it comes to getting started on things.

10. I can't seem to finish many of the things that I start.

11. I will often look for any other task to do rather than starting on something that needs to be done.

12. Poor planning prevents me from completing many of the projects that I start.

13. I often wait until the last minute to begin projects.

14. I am easily distracted, which often keeps me from finishing things properly.

15. Even as a deadline approaches, I still wait until the last minute to begin.

16. Completing projects has never been easy for me.

17. I wish there was a way that I could complete more of the projects that I start.

Appendix L
Therapeutic Reactance Scale

Personal Attitude Inventory

1. If I receive a lukewarm dish at a restaurant, I make an attempt to let that be known.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

2. I resent authority figures who try to tell me what to do.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

3. I find that I often have to question authority.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

4. I enjoy seeing someone else do something that neither of us is supposed to do.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

5. I have a strong desire to maintain my personal freedom.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

6. I enjoy playing “devil’s advocate” whenever I can.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

7. In discussions, I am easily persuaded by others.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

8. Nothing turns me on as much as a good argument.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

9. It would be better to have more freedom to do what I want on a job.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

10. If I am told what to do, I often do the opposite.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

11. I am sometimes afraid to disagree with others.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

12. It really bothers me when police officers tell people what to do.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

13. It does not upset me to change my plans because someone in the group wants to do something else.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

14. I don’t mind other people telling me what to do.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

15. I enjoy debates with other people.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

16. If someone asks a favor of me, I will think twice about what this person is really after.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

17. I am not very tolerant of others' attempts to persuade me.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

18. I often follow the suggestions of others.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

19. I am relatively opinionated.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

20. It is important to me to be in a powerful position relative to others.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

21. I am very open to solutions to my problems from others.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

22. I enjoy "showing up" people who think they are right.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

23. I consider myself more competitive than cooperative.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

24. I don't mind doing something for someone even when I don't know why I'm doing it.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

25. I usually go along with others' advice.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

26. I feel it is better to stand up for what I believe than to be silent.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

27. I am very stubborn and set in my ways.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

28. It is very important for me to get along well with the people I work with.

1	2	3	4
strongly disagree	**disagree**	**agree**	**strongly agree**

Appendix M

Here are a number of statements that may or may not apply to you. Please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement*. You should rate the extent to which the statement applies to you.

Disagree strongly	**Disagree moderately**	**Disagree a little**	**Neither agree nor disagree**	**Agree a little**	**Agree moderately**	**Agree strongly**
1	**2**	**3**	**4**	**5**	**6**	**7**

I See Myself as Someone Who….

____ Is talkative

____ Does a thorough job

____ Is depressed, blue

____ Is reserved

____ Can be somewhat careless

____ Is relaxed, handles stress well

____ Is full of energy

____ Is a reliable worker

____ Can be tense

____ Generates a lot of enthusiasm

____ Tends to be disorganized

____ Worries a lot

____ Tends to be quiet

____ Tends to be lazy

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

____ Is emotionally stable, not easily upset

____ Has an assertive personality

____ Perseveres until the task is finished

____ Can be moody

____ Is sometimes shy, inhibited

____ Does things efficiently

____ Remains calm in tense situation

____ Is outgoing, sociable

____ Makes plans and follows through with them

____ Gets nervous easily

____ Is easily distracted

Appendix N

This section looks at the advantages and disadvantages of exercise. Please indicate how important each statement is to your decision to do _____ *(fill in your exercise choice here)* as a form of exercise in your free time. Please answer according to the following 5 point scale:

1 = Not At All Important
2 = Somewhat Important
3 = Moderately Important
4 = Very Important
5 = Extremely Important

ADVANTAGES (PROS)
___1. I would have more energy for my family and friends if I exercised regularly.
___2. I would feel less stressed if I exercised regularly.
___3. Exercising put me in a better mood for the rest of the day.
___4. I would feel more comfortable with my body.
___5. Regular exercise would help me have a more positive outlook on life.

DISADVANTAGES (CONS)
___1. I would feel embarrassed if people saw me exercising.
___2. Exercise prevents me from spending time with my friends.
___3. I feel uncomfortable or embarrassed in exercise clothes.
___4. There is too much I would have to learn to exercise.
___5. Exercise puts an extra burden on my significant other.

Appendix O

Next are some situations in which some people might choose not to exercise when something gets in the way. Please rate how confident you are that you would participate in _____ *(fill in your exercise choice here)* in your free time for each of these situations, using the following 5 point scale:

1 = Not At All Confident
2 = Somewhat Confident
3 = Moderately Confident
4 = Very Confident
5 = Extremely Confident

___1. I am under a lot of stress.
___2. I feel I don't have the time.
___3. I have to exercise alone.
___4. I don't have access to exercise equipment.
___5. I am spending time with friends or family who do not exercise.
___6. It's raining or snowing.

Appendix P

Action strategies example questionnaire

Below are the strategic actions that you listed over the past 6 weeks. Recall that we asked you to list strategic actions that you could use to alter the world around you as it pertains to exercise. Your preferred exercise was _____. Now that you have had some time think about and use your strategies, we would like you to answer some questions about them. For each item, please answer all questions.

Keep a gym bag with exercise clothes in my car

How many times did you *think* about this action strategy since you made your 1st list during the beginning of this experiment (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very Much"

How many times did you do this action (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more

On average, how effective was this action for increasing your exercise behavior (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very Much"

On average, how effective was this action for increasing your enjoyment of exercise (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very

Reasons example questionnaire

Below are the motivational thoughts that you listed over the past 6 weeks. Recall that we asked you to list strategic actions that you could use to motivate yourself to exercise. Your preferred exercise was _____. Now that you have had some time think about and use your motivational thoughts, we would like you to answer some questions about them. For each item, please answer all questions.

I will lose weight

How many times did you *think* about this motivational thought since you made your 1st list during the beginning of this experiment (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very Much"

How many times did you actually use this thought for motivation (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more

On average, how effective was this thought in increasing your exercise behavior (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very Much"

On average, how effective was this thought in increasing your enjoyment of exercise (circle one)?

0	1	2	3	4	5	6	7	8	9	10 or more
"Not at all"										"Very Much"

Appendix Q

MEDICAL SCREENER

The next set of questions is about your general health. Note: If you choose not to provide this information, we may not be able to determine your eligibility for further studies.

1. Do you have insulin dependent diabetes?
    1. No
    2. Yes

2. Has a doctor told you that you currently have an eating disorder such as anorexia nervosa or bulimia?
    1. No
    2. Yes

    Note: The following are also diagnoses and terms that would apply: Anorexic; Anorexia Nervosa; Anorexia Nervosa Restricting Type; Anorexia Nervosa Binge-Eating/Purging Type; Bulimic; Bulimia Nervosa; Bulimia Nervosa Purging Type; Bulimia Nervosa Non-Purging Type; Binge Eating Disorder.

3. Are you currently pregnant?
    1. No
    2. Yes

4. Has your doctor ever said you have heart trouble?
    1. No
    2. Yes

5. Do you frequently have pains in your heart and chest?
    1. No
    2. Yes

6. Do you often feel faint or have spells of severe dizziness?
    1. No
    2. Yes

7. Has a doctor ever said your blood pressure was too high?
    1. No
    2. Yes

8. Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise or might be made worse with exercise?
    1. No
    2. Yes

9. Is there a good physical reason not mentioned here why you should not follow an activity program even if you wanted to?
    1. No
    2. Yes

10. Are you over age 65 and not accustomed to vigorous exercise?
    1. No
    2. Yes

Appendix R

Social Desirability Scale

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

T	F	1.	Before I vote, I thoroughly investigate the qualifications of all of the candidates.
T	F	2.	I never hesitate to go out of my way to help someone in trouble.
T	F	3.	It is sometimes hard for me to go on with my work if I am not encouraged.
T	F	4.	I have never intensely disliked anyone.
T	F	5.	On occasion, I have had doubts about my ability to succeed in life.
T	F	6.	I sometimes feel resentful when I don't get my way.
T	F	7.	I am always careful about my manner of dress.
T	F	8.	My table manners at home are as good as when I eat out in a restaurant.
T	F	9.	If I could get into a movie without paying and be sure I was not seen, I would probably do it.
T	F	10.	On a few occasions, I have given up doing something because I thought too little of my ability.
T	F	11.	I like to gossip at times.
T	F	12.	There have been times when I felt like rebelling against people in authority even though I knew they were right.
T	F	13.	No matter who I'm talking to, I'm always a good listener.
T	F	14.	I can remember "playing sick" to get out of something.
T	F	15.	There have been occasions when I took advantage of someone.
T	F	16.	I'm always willing to admit it when I make a mistake.
T	F	17.	I always try to practice what I preach.

T F 18. I don't find it particularly difficult to get along with loudmouthed, obnoxious people.

T F 19. I sometimes try to get even rather than forgive and forget.

T F 20. When I don't know something, I don't mind admitting it.

T F 21. I am always courteous, even to people who are disagreeable.

T F 22. At times I have really insisted on having things done my own way.

T F 23. There have been occasions when I felt like smashing things.

T F 24. I would never think of letting someone else be punished for my wrongdoings.

T F 25. I never resent being asked to return a favor.

T F 26. I have never been irked when people express ideas very different from my own.

T F 27. I never make a long trip without checking the safety of my car.

T F 28. There have been times when I was quite jealous of the good fortune of others.

T F 29. I have almost never felt the urge to tell someone off.

T F 30. I am sometimes irritated by people who ask favors of me.

T F 31. I have never felt that I was punished without cause.

T F 32. I sometimes think when people have a misfortune, they only got what they deserved.

T F 33. I have never deliberately said something that hurt someone's feelings.

Appendix S

STATEMENT OF CONSENT

I, the undersigned, do hereby give my informed consent to my participation in the Study. I have been informed about each of the following:

- The purposes of the study- The research is intended to provide a baseline physical assessment
- The risks- There are minimal risks involved in the current study
- I understand that I should consult a physician before beginning any program of exercise

- **Have you been told that you have any chronic or serious illnesses? YES NO**
- **Have you experienced any faintness, light-headedness or blackouts? YES NO**
- **Do you experience shortness or loss of breath while walking with**
- **others of your own age? YES NO**
- **Has you doctor told you not to engage in regular exercise? YES NO**

I understand that I may withdraw at any time before or during the experiment at my option. Recognizing the importance of avoiding bias in the results of this experiment, I agree not to discuss any of the details of the procedure with other participants. I understand that all of the research and evaluation materials will be confidentially maintained. The means used to maintain confidentiality are:

- My data will be given a code number for research identification, and my name will be kept anonymous.
- Data, along with consent forms, will be kept in a locked file cabinet.
- Only the investigators will have access to my identification data.

I understand that if I have questions concerning the research, I can call the following persons:

Laura L. Ten Eyck, & Charles G. Lord, Principal Investigators
Department of Psychology
257-7414

Jan Fox, TCU Coordinator
Research and Sponsored Projects
257-7515

Dr. Don Dansereau
Chair, Department of Psychology
Human Subjects Committee
257-7410

Dr. Timothy Hubbard
TCU Committee on Safeguards of
Human Subjects - Psychology
257-7410

_____ _____

Participant's Name (PLEASE PRINT) Signature

_____

Date

Appendix T
STATEMENT OF CONSENT

I, the undersigned, do hereby give my informed consent to my participation in the Study. I have been informed about each of the following:

- The purposes of the study- The research is intended to examine some of the factors that influence exercise
- The procedures – The study will take place in a series of sessions spanning 6 weeks
- The benefits – Participants will experience the research process, receive a physical assessment, and receive credit for their participation.
- The risks- There are minimal risks involved with the current study.
- I may only receive credit for participating in the present study once.

I understand that I may withdraw at any time before or during the experiment at my option. Recognizing the importance of avoiding bias in the results of this experiment, I agree not to discuss any of the details of the procedure with other participants. I understand that all of the research and evaluation materials will be confidentially maintained. The means used to maintain confidentiality are:

- My data will be given a code number for research identification, and my name will be kept anonymous.
- Data, along with consent forms, will be kept in a locked file cabinet.
- Only the investigators will have access to my identification data.

I understand that if I have questions concerning the research, I can call the following persons:

Laura L. Ten Eyck, Charles G. Lord - Principal Investigators
Department of Psychology
257-7414

Jan Fox, TCU Coordinator
Research and Sponsored Projects
257-7515

Dr. Don Dansereau
Chair, Department of Psychology
Human Subjects Committee
257-7410

Dr. Timothy Hubbard
TCU Committee on Safeguards of
Human Subjects - Psychology
257-7410

_____ _____

Participant's Name (PLEASE PRINT) Signature

Appendix U

Experience with Exercise

Each of us has varying degrees of experience with different types of exercise. We are interested in learning to what extent you have ever done each of the following exercises *at any time in the past.* Please answer the items for each type of exercise honestly and completely.

1. Brisk Walking – brisk walking is defined as walking on a level surface (track, ground, treadmill) at a pace of approximately 4 miles per hour (15 minute mile) performed 4 times per week for 20 minutes or more each time.

1a. To what extent have you engaged in brisk walking as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

1b. To what extent have you been doing brisk walking as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

1c. *On average,* how many times per week do you walk briskly? _____

1d. How much experience do you have with brisk walking <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

1e. When you think: "me walking briskly to exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

1f. When you think of brisk walking, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

2. Jogging/Running – jogging/running is defined as running on a level surface (track, ground, treadmill) at a pace of *at least* 5 miles per hour (12 minute mile) performed 4 times per week for 20 minutes or more each time.

2a. To what extent have you engaged in jogging/running as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

2b. To what extent have you been doing jogging/running as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

2c. *On average,* how many times per week do you jog/run? _____

2d. How much experience do you have with jogging/running <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

2e. When you think: "me jogging/running to exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

_____

2f. When you think of jogging/running, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

3. Swimming – Swimming is defined as swimming as freestyle laps in a pool at pace of approximately 50 yards per minute (45.72 meters per minute), which is a light to moderate pace performed 4 times per week for 20 minutes or more each time.

3a. To what extent have you engaged in swimming as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

3b. To what extent have you been doing swimming as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

3c. *On average,* how many times per week do you swim? _____

3d. How much experience do you have with swimming <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

3e. When you think: "me swimming to exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

_____

3f. When you think of swimming, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

4. Bicycling – Bicycling is defined as riding a stationary or regular bicycle at 80 watts or above performed 4 times per week for 20 minutes or more each time.

4a. To what extent have you engaged in bicycling/stationary bicycling as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

4b. To what extent have you been doing bicycling/stationary bicycling as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

4c. *On average,* how many times per week do you bike? _____

4d. How much experience do you have with bicycling/stationary bicycling <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

4e. When you think: "me bicycling/stationary bicycling to exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

_____

4f. When you think of bicycling/stationary bicycling, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

5. Elliptical Training – Elliptical training is defined as exercise performed on an elliptical machine at 70% of your maximum heart rate performed 4 times per week for 20 minutes or more each time.

5a. To what extent have you engaged in elliptical training as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

5b. To what extent have you been doing elliptical training as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

5c. *On average,* how many times per week do you use an elliptical trainer? _____

5d. How much experience do you have with elliptical training <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

5e. When you think: "me doing the elliptical trainer to exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

_____

5f. When you think of elliptical training, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

6. Group Exercise – Group exercise is defined as any exercise that you complete in a group setting, such as kick-boxing, aerobics, or step aerobics. It may also include exercise tapes that you might do at home. These types of exercise should be performed 3 times per week for 1 hour or more each time.

6a. To what extent have you engaged in group exercise as a form of exercise *in the past*?

0	1	2	3	4	5	6
not at all						a lot

6b. To what extent have you been doing group exercise as a form of exercise *recently*?

0	1	2	3	4	5	6
not at all						a lot

6c. *On average,* how many times per week do you do group exercise? _____

6d. How much experience do you have with group exercise <u>as a form of exercise</u>?

0	1	2	3	4	5	6
no experience			moderate experience			a lot of experience

6e. When you think: "me doing group exercise," what types of thoughts come to mind? Use the lines below to list your *positive and negative* thoughts.

_____

_____

_____

_____

6f. When you think of group exercise, the majority of your thoughts are _____? (circle one)

-5	-4	-3	-2	-1	0	1	2	3	4	5
very negative					neither negative nor positive					very positive

Appendix V

Preference for exercise

On the previous pages, you answered questions about 6 different types of exercise. We would now like to know which of the types of exercise you would be willing to try, *if you were to going to begin exercising regularly now*. Below we have listed the 7 exercises. Please rank them in order of preference so that the exercise you would be most willing to try is #1 and the exercise you would be least willing to try is #6.

_____Brisk Walking (walking on a level surface (track, ground, treadmill) at a pace of approximately 4 miles per hour (15 minute mile) performed 4 times per week for 20 minutes or more each time.

_____Jogging/Running [running on a level surface (track, ground, treadmill) at a pace of *at least* 5 miles per hour (12 minute mile) performed 4 times per week for 20 minutes or more each time].

_____Swimming [swimming as freestyle laps in a pool at pace of approximately 50 yards per minute (45.72 meters per minute), which is a light to moderate pace performed 4 times per week for 20 minutes or more each time].

_____Bicycling/Stationary Bicycling (riding a stationary or regular bicycle at 80 watts or above performed 4 times per week for 20 minutes or more each time).

_____ Elliptical Training (exercise performed on an elliptical machine at 70% of your maximum heart rate performed 4 times per week for 20 minutes or more each time).

_____Group Exercise (Group exercise is defined as any exercise that you complete in a group setting, such as kick-boxing, aerobics, or step aerobics. It may also include exercise tapes that you might do at home. These types of exercise should be performed 3 times per week for 1 hour or more each time).

THE EXERCISE THAT I AM <u>MOST</u> WILLING TO TRY IS:

_____ (please write your choice here)

When we refer to exercise any time during the remainder of the experiment, we want you to think of your choice.

Appendix W

Physical Fitness Feedback Form

Height: _____inches Age _____

Beginning weight _____lbs Final weight _____lbs

Body Mass Index (BMI) start _____ Body Mass Index (BMI) finish _____

< 20: Underweight
20 – 25: Healthy Weight
25 – 30: Overweight
> 30: Obese

Cardiovascular Fitness start:

Poor
Fair
Average
Good
Excellent

Cardiovascular Fitness finish:

Poor
Fair
Average
Good
Excellent

Appendix X

STATEMENT OF CONSENT

I, the undersigned, do hereby give my informed consent to my participation in the Study. I have been informed about each of the following:

- The purposes of the study- The research is intended to provide a baseline physical assessment
- The risks- There are minimal risks involved in the current study
- I understand that I should consult a physician before beginning any program of exercise

- **Have you been told that you have any chronic or serious illnesses? YES NO**
- **Have you experienced any faintness, light-headedness or blackouts? YES NO**
- **Do you experience shortness or loss of breath while walking with**
- **others of your own age? YES NO**
- **Has you doctor told you not to engage in regular exercise? YES NO**

I understand that I may withdraw at any time before or during the experiment at my option. Recognizing the importance of avoiding bias in the results of this experiment, I agree not to discuss any of the details of the procedure with other participants. I understand that all of the research and evaluation materials will be confidentially maintained. The means used to maintain confidentiality are:

- My data will be given a code number for research identification, and my name will be kept anonymous.
- Data, along with consent forms, will be kept in a locked file cabinet.
- Only the investigators will have access to my identification data.

I understand that if I have questions concerning the research, I can call the following persons:

Laura L. Ten Eyck, & Charles G. Lord, Principal Investigators
Department of Psychology
257-7414

Jan Fox, TCU Coordinator
Research and Sponsored Projects
257-7515

Dr. Don Dansereau
Chair, Department of Psychology
Human Subjects Committee
257-7410

Dr. Timothy Hubbard
TCU Committee on Safeguards of
Human Subjects - Psychology
257-7410

_____ _____

Participant's Name (PLEASE PRINT) Signature

_____

Date

Appendix Y

Likelihood of Engaging in Exercise

We would like to know which of the following types of exercise you would be **most likely to do**, *if you were to going to begin exercising regularly now*. Below we have listed 5 exercises. Please rank them in order of preference so that the exercise you would be **most likely to do** is #1 and the exercise you would be **least likely to do** is #5.

_____Brisk Walking (walking on a level surface (track, ground, treadmill) at a pace of approximately 4 miles per hour (15 minute mile) performed 4 times per week for 20 minutes or more each time.

_____Jogging/Running [running on a level surface (track, ground, treadmill) at a pace of *at least* 5 miles per hour (12 minute mile) performed 4 times per week for 20 minutes or more each time].

_____Bicycling/Stationary Bicycling (riding a stationary or regular bicycle at 80 watts or above performed 4 times per week for 20 minutes or more each time).

_____ Elliptical Training (exercise performed on an elliptical machine at 70% of your maximum heart rate performed 4 times per week for 20 minutes or more each time).

_____Group Exercise (Group exercise is defined as any exercise that you complete in a group setting, such as kick-boxing, aerobics, or step aerobics. It may also include exercise tapes that you might do at home. These types of exercise should be performed 3 times per week for 1 hour or more each time).

THE EXERCISE THAT I WOULD BE MOST LIKELY TO DO IS:

_____ (please write your choice here)

When we refer to exercise any time during the remainder of the experiment, we want you to think of your choice.

Appendix Z

The following section contains a list of various reasons a person might consider to increase engagement in regular exercise. Please read each item carefully and use the scale provided below to rate the effectiveness of each reason.

On average, how effective would considering this reason be in increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____a more toned body

_____allows more time for self ("me" time)

_____be happier

_____be liked more by others

_____be more confident and have better self-esteem

_____be motivated to do other things (school, work, socialize)

_____be proud of self

_____be stronger

_____become a positive role model

_____become more flexible

_____become more muscular

_____being physically fit

_____better appearance

_____better at sports

_____better body image

_____better coordination

_____better mental health

_____better physical health (e.g., heart, lungs, circulation)

_____better quality of life

_____better sleep

_____bond w/others (e.g., friends, family) through exercise

_____burn fat/calories

_____buy new/better clothes

On average, how effective would considering this reason be in increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____could meet more people

_____decrease chance of getting sick

_____decrease depression

_____decrease health risks

_____decreased stress

_____encourages healthy eating habits

_____exercise can be fun

_____faster metabolism

_____feel better afterwards

_____feeling of accomplishment

_____feeling of satisfaction after completion

_____financial burden on family if you get sick

_____get to try new things

_____gives time to think about things

_____have better health when you get old

_____helps body function @ highest potential

_____helps combat depression

_____helps control emotions

_____helps cope with age-related diseases (e.g., diabetes, high blood pressure)

_____impress friends

_____less chance of injury

_____less time to engage in harmful activities

_____live longer

_____lose weight

_____more energy

_____more positive mood/outlook

_____nice break from sitting in front of desk/computer/TV

On average, how effective would considering this reason be in increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____promote healthy immune system

_____reduce grumpiness/crankiness

_____study/think better

TURN TO NEXT PAGE PLEASE

The following section contains a list of various actions a person could take to increase engagement in regular exercise. Please read each item carefully and use the scale provided below to rate the effectiveness of each action.

On average, how effective would taking this action be for increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____ask a health/fitness professional to tell you about the benefits of exercise

_____become more educated about the benefits of exercise by reading books or magazines, watching TV, and using the internet.

_____bring a book or magazine to read

_____buy a gym membership

_____buy a scale and check weight regularly

_____buy exercise tapes

_____buy new exercise/shoes clothes

_____challenge yourself during exercise

_____choose a stimulating area to exercise in

_____choose a workout area that is not too hot or cold

_____dress in workout attire (e.g., shoes, clothes)

_____encourage friends to exercise with me

_____enroll in a class that meets at a set time

_____enter a race, marathon, or other sporting event

_____establish reasonable/realistic goals

_____exercise at same time every day

_____exercise in a pretty environment

_____exercise while others are around

_____exercise with different people each time

_____get a job at the gym

_____get up early so that you have time to exercise

_____go to gym when it is convenient

_____go to gym when it is not crowded

_____have an exercise partner or buddy

On average, how effective would taking this action be for increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____have someone encourage you to exercise

_____have someone remind you to exercise

_____have workout clothes/equipment readily available (e.g., keep in car)

_____hire a personal trainer and make appointments

_____keep a record of your weight loss or gain

_____keep track of the types/times of exercise you do

_____listen to music (e.g., iPod)

_____maintain or adopt a healthy lifestyle (e.g., enough sleep, healthy diet, drink water, refrain from smoking, alcohol in moderation)

_____make a commitment to lose weight, get fit, etc.

_____make desired activity contingent upon exercise

_____make exercise fun

_____make friends with people who exercise regularly

_____make plans to exercise with others

_____measure body fat weekly

_____post reminders to exercise

_____reward yourself for exercising

_____schedule time each day to exercise, using a planner or calendar

_____set a personal goal to work for

_____stretch before you exercise

_____try one new exercise per month

_____unplug TV or computer

_____use varied equipment

_____vary your program

_____watch TV while exercising

_____wear a pedometer to motivate yourself

_____wear an outfit that makes you feel good

On average, how effective would taking this action be for increasing a person's regular exercise behavior?

0	1	2	3	4	5	6	7	8	9	10
"Not at all effective"										**"Extremely effective"**

_____wear proper attire that does not hinder your movement

_____weigh yourself to see results

Appendix AA

STATEMENT OF CONSENT

I, the undersigned, do hereby give my informed consent to my participation in the Study. I have been informed about each of the following:

- The purposes of the study- The research is intended to examine ideas and attitudes about different groups, behaviors, and issues.
- The procedures – The entire study will take place in two sessions and take 1.5 hours total.
- I understand that today's part of the study will take about 1 hour to complete.
- I understand that I must complete both sessions to earn full credit for the study.
- The benefits – Participants will experience the research process and receive credit for their participation.
- The risks- There are minimal risks involved with the current study.
- I may only receive credit for participating in the present study once.
- I also understand that I may withdraw at any time before or during the experiment at my option.

Recognizing the importance of avoiding bias in the results of this experiment, I agree not to discuss any of the details of the procedure with other participants. I understand that all of the research and evaluation materials will be confidentially maintained. The means used to maintain confidentiality are:

- My data will be given a code number for research identification, and my name will be kept anonymous.
- Data, along with consent forms, will be kept in a locked file cabinet.
- Only the investigators will have access to my identification data.

I understand that if I have questions concerning the research, I can call the following persons:

Laura L. Ten Eyck, Charles G. Lord – Principal Investigators
Department of Psychology
25-7414

Jan Fox, TCU Coordinator
Research and Sponsored Projects
257-7515

Dr. Don Dansereau
Chair, Department of Psychology
Human Subjects Committee
257-7410

Dr. Timothy Hubbard
TCU Committee on Safeguards of
Human Subjects – Psychology
257-7410

_____ _____

Participant's Name (PLEASE PRINT) Signature/date

Appendix BB

Please circle the number that best corresponds to your attitude toward each of the following groups, issues, and behaviors.

What is your attitude toward studying? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward blood donation? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward regular exercise? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward politicians? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward professors? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward voting? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward capital punishment? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward professional athletes? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward newscasters? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

What is your attitude toward journalists? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

Appendix CC

Below we would like you to tell us about your intentions to perform specific behaviors in the near future. Please read each description carefully, and choose the number that best corresponds to your intentions.

1. I intend to exercise regularly in the near future.

0 1 2 3 4 5 6 7 8 9 10
"not at all" "Definitely"

2. I intend to study regularly in the near future.

0 1 2 3 4 5 6 7 8 9 10
"not at all" "Definitely"

3. I intend to donate blood in the near future.

0 1 2 3 4 5 6 7 8 9 10
"not at all" "Definitely"

Appendix DD

Most people would agree that regular exercise is beneficial. One way of increasing regular exercise is by identifying specific actions a person might take to increase the performance of regular exercise. Although there is a lot of information available regarding such actions, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 actions <u>you would recommend another person take to increase their regular exercise behavior.</u>

Action #1: _____

_____

Action #2: _____

_____

Action #3: _____

_____

Action #4: _____

_____

Action #5: _____

_____

Most people would agree that regular studying is beneficial. One way of increasing regular studying is by identifying specific actions a person might take to increase the performance of regular studying. Although there is a lot of information available regarding such actions, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 actions <u>you would recommend another person take to increase their regular studying behavior.</u>

Action #1: _____

_____

Action #2: _____

_____

Action #3: _____

_____

Action #4: _____

_____

Action #5: _____

_____

Most people would agree that regular blood donation is beneficial. One way of increasing regular blood donation is by identifying specific actions a person might take to increase the performance of regular blood donation. Although there is a lot of information available regarding such actions, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 actions <u>you would recommend another person take to increase their regular blood donation behavior.</u>

Action #1: _____

_____

Action #2: _____

_____

Action #3: _____

_____

Action #4: _____

_____

Action #5: _____

_____

Appendix EE

Most people would agree that regular exercise is beneficial. One way of increasing regular exercise is by considering specific reasons why a person might choose to exercise regularly. Although there is a lot of information available regarding such reasons, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 reasons <u>you would recommend another person consider to increase their regular exercise behavior.</u>

Reason #1: _____

_____

Reason #2: _____

_____

Reason #3: _____

_____

Reason #4: _____

_____

Reason #5: _____

_____

Most people would agree that regular studying is beneficial. One way of increasing regular studying is by considering specific reasons why a person might choose study regularly. Although there is a lot of information available regarding such reasons, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 reasons <u>you would recommend another person consider to increase their regular studying behavior.</u>

Reason #1: _____

_____

Reason #2: _____

_____

Reason #3: _____

_____

Reason #4: _____

_____

Reason #5: _____

_____

Most people would agree that regular blood donation is beneficial. One way of increasing regular blood donation is by considering specific reasons why a person might choose donate blood regularly. Although there is a lot of information available regarding such reasons, we are interested in your perceptions of effectiveness. On the lines provided below, please list 5 reasons <u>you would recommend another person consider to increase their regular blood donation behavior.</u>

Reason #1: _____

_____

Reason #2: _____

_____

Reason #3: _____

_____

Reason #4: _____

_____

Reason #5: _____

_____

Appendix FF

STATEMENT OF CONSENT

I, the undersigned, do hereby give my informed consent to my participation in the Study. I have been informed about each of the following:

- The purposes of the study- The research is intended to assess the effectiveness of some persuasive messages.
- The procedures – The entire study will take place in two sessions and take 1.5 hours total.
- I understand that today's part of the study will take about 1/2 hour to complete.
- The benefits – Participants will experience the research process and receive credit for their participation.
- The risks- There are minimal risks involved with the current study.
- I may only receive credit for participating in the present study once.
- I also understand that I may withdraw at any time before or during the experiment at my option.

Recognizing the importance of avoiding bias in the results of this experiment, I agree not to discuss any of the details of the procedure with other participants. I understand that all of the research and evaluation materials will be confidentially maintained. The means used to maintain confidentiality are:

- My data will be given a code number for research identification, and my name will be kept anonymous.
- Data, along with consent forms, will be kept in a locked file cabinet.
- Only the investigators will have access to my identification data.

I understand that if I have questions concerning the research, I can call the following persons:

Dana P. Gresky, Charles G. Lord – Principal Investigators
Department of Psychology
25-7414

Jan Fox, TCU Coordinator
Research and Sponsored Projects
257-7515

Dr. Don Dansereau
Chair, Department of Psychology
Human Subjects Committee
257-7410

Dr. Timothy Hubbard
TCU Committee on Safeguards of
Human Subjects – Psychology
257-7410

_____ _____

Participant's Name (PLEASE PRINT) Signature/date

Appendix GG

As part of an ongoing research project that we are conducting in conjunction with a local health organization, we are developing a series of persuasive messages that might be used as part of a larger campaign to increase certain beneficial behaviors. Today we would like you to evaluate the effectiveness of a persuasive message. It is important that you read the message carefully, so that you can provide us with an accurate evaluation of its clarity, content, and impact. Please turn the page, read the message and answer the questions that follow.

Actions Condition Persuasive Message Example

We all understand the importance of regular exercise; however recent surveys show that the majority of Americans still choose to remain sedentary. Experts from the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and the American College of Sports Medicine have been working to develop techniques that people can use to increase their regular exercise activity. In a recently published report (NIH, 2006), researchers identified the following techniques as most effective for increasing regular exercise activity:

- Establish realistic and reasonable goals.
- Keep a record of weight loss and gain.
- Make plans to exercise with others.

By implementing the above techniques, people can increase their regular exercise activity. We recommend that people use these techniques so that everyone can be more active.

Reasons Condition Persuasive Message Example

We all understand the importance of regular exercise; however recent surveys show that the majority of Americans still choose to remain sedentary. Experts from the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and the American College of Sports Medicine have been working to identify benefits that people can consider to increase their regular exercise activity. In a recently published report (NIH, 2006), researchers identified the consideration of the following benefits as most effective for increasing regular exercise activity:

- Regular exercise increases energy levels
- Regular exercise aids in weight loss
- Regular exercise improves mood
- Regular exercise leads to better physical health

By considering the above benefits, people can increase their regular exercise activity. We recommend that people consider them, so that everyone can be more active.

NEXT PAGE

Appendix HH

Now we would like you to answer three questions regarding the passage you just read.

1. This message would be very effective in persuading a person to exercise regularly.

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7
strongly disagree — strongly agree

2. How likely would you be to recommend another person use the techniques to increase regular exercise? ("consider the above benefits" for the reasons group)

0 1 2 3 4 5 6 7 8 9 10
"not at all likely" — "Extremely likely"

3. How would you rate the clarity of the message?

0 1 2 3 4 5 6 7 8 9 10
"not at all clear" — "Extremely clear"

4. Next, we would like you to provide ratings of the quality and creativity of each main idea that was listed in the persuasive message using the scale provided. Please write your rating in the corresponding boxes.

0 1 2 3 4 5 6 7 8 9 10
"poor" — "excellent"

Main Ideas:	Creativity Rating:	Quality Rating:
Main idea 1		
Main idea 2		
Main idea 3		

Appendix II

Please answer the following questions by circling the number that best represents you.

1. What is your attitude toward regular exercise? (circle one)

-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7

2. I intend to exercise regularly in the near future.

0 1 2 3 4 5 6 7 8 9 10
"not at all" "Definitely"

Appendix JJ

In the space below, we would like you to take a moment to tell us what you think this experiment was about.

VITA

Laura Lea Ten Eyck

Education

Doctor of Philosophy, December 2006
Texas Christian University, Fort Worth, TX
Master of Science in Psychology, August 2004
Texas Christian University, Fort Worth, TX
Master of Arts in Psychology, May 2001
Stephen F. Austin State University, Nacogdoches, TX
Bachelor of Arts in Psychology, Summa Cum Laude, December 1999
Texas Wesleyan University, Fort Worth, TX

Awards/ Academic Honors

Graduate Student Senate Travel Award Recipient – 2005
Psychology Department Teaching Assistant Award, TCU, 2004
Ida Green Fellowship recipient, Department of Psychology, TCU, 2001
Outstanding Psychology Graduate Student, Department of Psychology, SFASU, 2000 & 2001
Graduated *Summa Cum Laude,* TWU, 1999
Outstanding Psychology Student, Department of Psychology, TWU, 1999
Alpha Chi, National Honor Scholarship Society, TWU, 1999
Hatton W. Sumners Scholarship recipient, TWU, 1998
PSI CHI, National Honor Society in Psychology, TWU 1997

Professional Affiliations

Graduate Student Affiliate of the APA
Member of the Society for Personality and Social Psychology (SPSP; APA Division 8).
Graduate Student member of the Southwestern Psychological Association (SWPA)

ABSTRACT

EFFECTS OF DIRECTED THINKING ON EXERCISE BEHAVIOR AND CARDIOVASCULAR FITNESS

by Laura Lea Ten Eyck, Ph.D. 2006
Department of Psychology
Texas Christian University

Dissertation Advisor: Charles G. Lord, Professor of Psychology

Although it is well established that exercise aids in the prevention of bone loss, heart disease, obesity, and type II diabetes, recent surveys suggest that only one quarter of Americans engage in regular physical activity. The present experiments examined one possible technique for increasing regular exercise, a technique derived from attitude representation theory (Lord & Lepper, 1999) and from McGuire and McGuire's (1991) theory of directed thinking. According to attitude representation theory, when people think about any attitude object, whether it is a social group or an activity such as exercise, they activate relevant exemplars, characteristics and actions. According to the theory of directed thinking, when people think about any event, including personally relevant events such as "me doing regular exercise" they activate pre-event actions and post-event consequences. Pre-event actions involve actions an individual could take that would increase the probability that the event would occur. Several previous studies have shown that directing students to think about action strategies that would increase studying results in greater intentions to study. The present experiments (1 and 2) tested whether directing students to think about action strategies to exercise might increase intentions to exercise, and also increase actual exercise behavior and cardiovascular fitness. Although Experiment 1 found few effects of directed thinking, Experiment 2, which altered and improved the experimental procedures and dependent measures, found that directed thinking about self-generated action strategies can significantly increase cardiovascular fitness. Experiment 3 suggested that action

strategies might be equally effective for changing attitudes toward exercise regardless of whether the strategies are self-generated or other-generated, but reasons for exercising might be effective only when they are self-generated. The results of the three experiments are discussed in terms of theoretical perspectives on attitude processes.