IMPLEMENTATION INTENTIONS, PERSONALITY, AND EXERCISE BEHAVIOR

DISSertation

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

By

Terry Ransom-Flint, M.A.

* * * *

The Ohio State University
2006

Dissertation Committee:
Dr. Herbert L. Mirels, Advisor
Dr. Steven J. Beck
Dr. Thomas E. Nygren

Approved by
Advisor
Graduate Program in Psychology
The trend toward physical inactivity in adults in the United States has been a growing concern of researchers and health care professionals for decades. The present study investigated effects of an integrated intervention based on implementation intentions and relapse prevention methods to promote exercise behavior in college students. In addition, the study sought to examine whether dispositional variables, particularly personal disorganization, would moderate the effects of the implementation intention interventions. Participants in all active intervention conditions were predicted to report greater exercise frequency and duration as compared to control condition participants. Participants in the both the combined implementation intention-relapse prevention and implementation intention alone conditions were predicted to report greater increases in exercise frequency and duration compared to participants in the other two conditions. However, combined intervention condition participants were expected to report greater increases in exercise frequency and duration than would the implementation intention only group. Relapse prevention condition participants were predicted to report greater increases in frequency and duration than would the control group. Further, it was predicted that implementation intention interventions would be most effective in
promoting exercise behavior for individuals with relatively high levels of personal disorganization as implementation intentions were purported to benefit behavioral performance for difficult tasks and for people who have difficulty regulating behavior. Ninety-two students recruited from introductory psychology courses were randomly assigned to one of four conditions (implementation intention, relapse prevention, combined implementation intention-relapse prevention, control). Participants completed self-report measures of intention to exercise, attitude, perceived behavioral control, subjective norm, self-efficacy, past exercise behavior, and various personality measures. All participants were asked to exercise two more times a week than they had prior to the study and to record exercise frequency and duration in weekly diaries for a period of four weeks. In general, data from this investigation did not support the predictions regarding the effects of the interventions on exercise behavior. Personal disorganization was associated with attrition from the study and exercise frequency. Exercise self-efficacy, perceived behavioral control, and attitude toward exercise were significantly correlated with exercise behaviors. Possible explanations for the lack of intervention effects are discussed.
Dedicated to my sister,
Marianne Ransom,
who has taught me much about
acceptance, compassion, and faith.
ACKNOWLEDGMENTS

I would like to acknowledge the generous financial support I received for this project. This dissertation was funded by an Alumni Grant for Graduate Research and Scholarship from The Ohio State University Graduate School.

I must further acknowledge that it was with the encouragement and support of many people that this dissertation was completed. First, I thank my advisor, Dr. Herbert L. Mirels for his guidance, counsel, and support on this project. I am the last of Dr. Mirels’ Ph.D. students in his remarkable academic career that has spanned nearly four decades at OSU. I feel privileged to have had the opportunity to collaborate with him on several projects and to manage his research lab. Working with Dr. Mirels has taught me much about psychology, personality, and the research process. Nevertheless, I will always remember him urging me not to take myself too seriously and to remember that there is more to life than work.

I give many thanks to my committee members, Dr. Steven J. Beck and Dr. Thomas E. Nygren. I am very appreciative of Dr. Beck’s invaluable comments regarding the implementation of the study, his patience, and his words of encouragement as I neared completion of this project. I am extremely grateful to Dr. Nygren for his suggestions regarding the data analyses and editorial
comments as I worked on drafts of this dissertation. More importantly, I must express my appreciation to Dr. Nygren for the important role he has played as my mentor for the past decade. I am very thankful that he urged me to take risks and attempt the challenges that led to my pursuing a graduate degree in the first place. While I cannot adequately express my gratitude for the support and encouragement he has provided me over the years, I will always remember with much appreciation the extent to which he has influenced my personal and professional development.

I also wish to thank Dr. Andrew Prestwich from the University of Essex for graciously providing me with copies of the materials he used in his study.

In addition, I wish to thank several of my colleagues for their willingness to lend helping hands, provide expertise when needed, and to offer moral support. I am grateful to Meghan Fondow and Marie Osborn for their assistance during the early stages of this project. I also thank Shaalon Joules for her reassurance and the technical support that she provided during the final stages of this project.

I gratefully acknowledge the many hard working undergraduate research assistants Amy Agosta, Kristen Gidel, Ryan Halterman, Jodi Kindred, Kristen Mackiewicz, Sarah Moore, Joanne Petursson, Brittany Shoots, Brian Snow, Mike Weber, Samar Zeiden, Laurel Zilka, and Megan Zhao who helped with preparation of experiment materials, data collection, and data entry. Without their efforts, this project would not have been possible. I am truly appreciative of their dedication and industriousness and I wish each of them the best of luck in their future endeavors.
I thank my good friend, Bob Forte, for his efforts to motivate me when I felt discouraged, his calming influence, and his extraordinary kindness.

Finally, I thank my family and friends for their limitless supply of patience, love, and support throughout the completion of this project and throughout my entire tenure as a graduate student at OSU. I am ever mindful of the teamwork, devotion, and sacrifices, particularly by my husband, John, that made it possible for me to pursue my dreams in the first place. For giving me that opportunity, I will always be truly grateful.

Terry Ransom-Flint, M.A.

August 3, 2006

Columbus, Ohio
June 22, 1957 . . . . . . . . . . . . . . . . . . .  Born – Kettering, Ohio

1997 . . . . . . . . . . . . . . . . . . . . . . . . . .  B.A., summa cum laude
         with Distinction in Psychology
         The Ohio State University

2003 . . . . . . . . . . . . . . . . . . . . . . . . . .  M.A., Psychology
         The Ohio State University

2003 – 2004 . . . . . . . . . . . . . . . . . . . .  Student Therapist
         Counseling Services
         Ohio Wesleyan University

2003 – 2005 . . . . . . . . . . . . . . . . . . . .  Graduate Administrative Assistant
         Office for Disability Services
         The Ohio State University

2005 –2006 . . . . . . . . . . . . . . . . . . . .  Psychology Intern
         West Virginia University
         School of Medicine, Charleston Division
         Department of Behavioral Medicine & Psychiatry

FIELDS OF STUDY

Major Field: Psychology
# TABLE OF CONTENTS

Abstract ................................................................. ii
Dedication ............................................................... iv
Acknowledgments ....................................................... v
Vita ........................................................................... viii
List of Tables ............................................................. xiii
List of Figures .............................................................. xv

Chapters:

1. Introduction ......................................................... 1
   1.1 Social cognitive theory ........................................ 4
   1.2 Theory of reasoned action/theory of planned behavior ... 5
   1.3 Relapse prevention model .................................... 10
   1.4 Model of action phases ....................................... 13
      1.4.1 Implementation intentions ............................... 14
   1.5 An integrated theoretical approach to behavior change . 23
   1.6 Personality, self-regulation of behavior, and implementation intentions ........................................... 26
   1.7 The present study .............................................. 29
   1.8 Hypotheses ......................................................... 32
2. Method ................................................................. 35
  2.1 Institutional Review Board approval ......................... 35
  2.2 Participants and recruitment ............................... 35
  2.3 Measures ......................................................... 37
  2.4 Additional materials ......................................... 50
  2.5 Design and procedure ....................................... 51
    2.5.1 Screening phase ...................................... 51
    2.5.2 Intervention phase ................................. 52
  2.6 Interventions ................................................ 53
    2.6.1 Implementation intention condition ............... 54
    2.6.2 Relapse prevention condition ..................... 55
    2.6.3 Combined implementation intention-relapse prevention condition. 55
    2.6.4 Control condition .................................. 56
  2.7 Power analysis ............................................... 57
  2.8 Statistical procedure ...................................... 58
3. Results ............................................................. 62
  3.1 Randomization checks ....................................... 62
  3.2 Attrition analysis ........................................... 66
  3.3 Correlations among individual difference variables ...... 74
  3.4 Correlations between individual difference and exercise variables ........................................... 78
    3.4.1 Correlations between individual difference variables and exercise frequency .............. 78
3.4.2. Correlations between individual difference variables and exercise session duration. ................................. 81
3.4.3. Correlations between individual difference variables and total exercise time per week. ................................. 83
3.5 Effects of implementation intentions and relapse prevention Interventions. ......................................................... 85
3.5.1 Frequency of exercise sessions. ................................. 85
3.5.2 Duration of exercise sessions. ................................ 89
3.5.3 Total exercise time per week. ................................. 93
3.6 Exercise self-efficacy. ................................................. 97
3.7 Post-experiment questionnaire data. ................................. 98
4. Discussion ................................................................. 101
4.1 Implementation intentions: commitment and cognitive rehearsal ................................................................. 104
4.2 Theory of planned behavior variables and exercise behavior. . 109
4.3 Relationships among theory of planned behavior constructs. . 112
4.4 Exercise self-efficacy. ................................................. 114
4.5 Personal disorganization. ............................................ 115
4.6 Limitations. ............................................................. 117
4.7 Future directions. ...................................................... 120
4.8 Summary and conclusions. .......................................... 122

Bibliography .................................................................. 124

APPENDICES

Appendix A. IRB Research Protocol Approval form. ....................... 136
Appendix B. Questionnaires administered to participants .................. 138
Appendix C. Online experiment description ................................. 167
Appendix D. Recruitment form .............................................. 170
Appendix E. Email invitation ................................................ 172
Appendix F Experimenter scripts ........................................... 174
Appendix G Informed consent forms ....................................... 185
Appendix H. Debriefing statements ......................................... 187
Appendix I. Exercise guidelines booklet ................................... 190
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Zero-order correlations between the Sense of Personal Disorganization Scale (SPDS; Mirels, Dean, &amp; Ponton, 1998) and other measures</td>
<td>28</td>
</tr>
<tr>
<td>2.1</td>
<td>38</td>
</tr>
<tr>
<td>Gender of sample by condition</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>39</td>
</tr>
<tr>
<td>Ethnic composition of sample by condition</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>40</td>
</tr>
<tr>
<td>Employment status of sample by condition</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>41</td>
</tr>
<tr>
<td>Education level of sample by condition</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>42</td>
</tr>
<tr>
<td>Marital status of sample by condition</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td>43</td>
</tr>
<tr>
<td>Family income level of sample by condition</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>63</td>
</tr>
<tr>
<td>Means and standard deviations of demographic, pre-intervention measures of TPB/motivational constructs, past exercise, and physical activity by condition</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>65</td>
</tr>
<tr>
<td>Means and standard deviations of pre-intervention measures of psychosocial measures by condition</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>67</td>
</tr>
<tr>
<td>Number of participants remaining versus withdrawing from study by intervention condition</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>68</td>
</tr>
<tr>
<td>Number of participants remaining versus withdrawing from study by sex</td>
<td></td>
</tr>
</tbody>
</table>
3.5 Number of participants remaining versus withdrawing from study by ethnicity……………………………………………………………………….70

3.6 Means and standard deviations of pre-intervention measures of TPB/motivational constructs, exercise, and physical activity by participation status…………………………………………………………..71

3.7 Means and standard deviations of pre-intervention measures of psychosocial measures by participation status………………………………………………………………………73

3.8 Correlations among baseline TPB and psychosocial variables.............75

3.9 Correlations among individual difference measures and frequency of exercise sessions………………………………………………………………………79

3.10 Correlations among individual difference measures and exercise session duration………………………………………………………………………82

3.11 Correlations among individual difference measures and total minutes per week………………………………………………………………………84

3.12 Means and standard deviations of pre- and post-intervention frequency of exercise sessions by intervention condition……………………….87

3.13 Means and standard deviations of post-intervention frequency of exercise session by personal disorganization group.........................88

3.14 Means and standard deviations of pre- and post-intervention exercise session duration (in minutes) by group.............................................90

3.15 Means and standard deviations of pre- and post-intervention exercise time per week (in minutes) by group.............................................94
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The theory of reasoned action / theory of planned behavior</td>
</tr>
<tr>
<td>3.1</td>
<td>Session duration by condition (actual means)</td>
</tr>
<tr>
<td>3.2</td>
<td>Session duration by condition (estimated marginal means after adjustment for covariate)</td>
</tr>
<tr>
<td>3.3</td>
<td>Total exercise time per week by condition (actual means)</td>
</tr>
<tr>
<td>3.4</td>
<td>Total exercise time per week by condition (estimated marginal means after adjustment for covariate)</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

Regular physical activity is an important factor in reducing the risk for a number of diseases including diabetes, hypertension, colon cancer, and heart disease. In addition, physical activity has been shown to lower blood pressure in individuals diagnosed with hypertension; to maintain healthy bones, muscles, and joints; and to be an effective weight management tool (U.S. Department of Health and Human Services [USDHHS], 2002; Centers for Disease Control and Prevention [CDC], 1999). Regular exercise has been shown to promote psychological well-being and to reduce feelings of depression and anxiety (Stathopoulou, Powers, Berry, Smits, & Otto, 2006; Broman-Fulks, Berman, Rabian, & Webster, 2004), to reduce perceived stress (Aldana, Sutton, Jacobson, & Quirk, 1996), to improve cognitive functioning (Etnier, Salazar, Landers, Petruzzello, Han, & Nowell, 1997), and to improve quality of life in a variety of populations (Courneya, & Friedenreich, 1999; Wielenga, Erdman, Husiveld, Dunselman, Baselier, & Mosterd, 1998). Furthermore, numerous studies have demonstrated that physical activity is effective in reversing or

The U.S. Centers for Disease Control and Prevention (CDC, 1999) and the American College of Sports Medicine (ACSM; Pate, et al., 1995) have recommended that every American adult engage in at least 30 minutes of moderate intensity physical activity most (and ideally all) days of the week. Moderate physical activity could include brisk walking (e.g., at a pace of 3 to 4.5 mph on a level surface), hiking, doubles tennis, heavy yard work or gardening.

Despite the well-documented and widely publicized benefits of physical activity, more than 60 percent of adults in the United States do not engage in the recommended amount of physical activity and more than 25 percent of adults do not engage in exercise at all. The Centers for Disease Control and Prevention (1996) reported that nearly half of young people aged 12-21 are not vigorously active on a regular basis. Enrollment in physical education classes declined among high school students from 42 percent in 1991 to 25 percent in 1995. Furthermore, female adolescents in the U.S. are much less physically active than are male adolescents, and in adulthood, women in the U.S. continue to engage in less physical activity than do men (Crespo, Ainsworth, & Keteyian, 1999). Inactivity also tends to increase with age and is more common among individuals with less education and lower socioeconomic status.

The trend toward physical inactivity in U.S. adults has been a serious public health concern for decades. Physical inactivity and its associated health problems have substantial economic consequences for the U.S. health care
system. Seventy-five percent of the U.S. health care budget ($1.4 trillion) is directly linked to the treatment of chronic diseases, many of which are related to physical inactivity and poor nutrition (President’s Council on Physical Fitness and Sports, 2000). Given the enormity of this public health problem it is not surprising that health educators, health promotion experts, and healthcare professionals have made extensive efforts to identify factors that predict and promote physical activity.

Research on understanding and promoting physical activity is at an early stage; however, interventions to promote physical activity in physical education classes in schools, through programs at worksites, and in health care settings have been evaluated and found to be successful (DHHS; 1996). Previously, the dearth of theory-driven interventions has limited exercise promotion efforts in health behavior research (Marcus, Bock, Pinto, Napolitano, & Clark, 2002). Recent studies derived from psychological models have been useful in predicting and explaining a range of health behaviors (Bandura, 2004; Rutter & Quine, 2002; Marcus et al., 2002; Schwarzer, 2001; Conner & Norman, 1996). Several of the health behavior models that serve as the bases for exercise promotion interventions contain common theoretical elements including social cognitive, decision-making, or cognitive-behavioral principles. Health behavior intervention studies focus on identifying the factors that can be modified in order for individuals to adopt certain health-promoting behaviors. Many health behavior interventions have focused on modifying specific motivational or volitional processes involved in behavioral enactment. Initial motivational stage processes
include goal intention formation and self-efficacy beliefs. Subsequent volitional stage processes include planning, initiation of intended behavior, maintenance of behavior, and relapse prevention.

1.1. Social Cognitive Theory

Social cognitive theory integrates principles of operant conditioning, social learning theory, and cognitive psychology. One principle of social cognitive theory is that personal, behavioral, and environmental factors operate as interacting reciprocal determinants of each other (Bandura, 1977). Environment is assumed to affect people’s behavior, but people also are assumed to affect their environment. In addition, cognition, affective states, and physiology influence behavior. Two important cognitive processes associated with social cognitive theory are outcome expectations and self-efficacy. The term *outcome expectations* refers to one’s beliefs about the effects of a given behavior. For example, one may have outcome expectations about physical activity that could include improved health status, reduced body weight, or improved psychological well-being. *Self-efficacy* refers to one’s judgment about one’s ability to successfully perform a specific behavior (Bandura, 1977). In addition, self-efficacy is behavior specific which means that one’s self-efficacy for a particular health behavior (e.g., exercising) may be very different from one’s self-efficacy for another behavior (e.g., abstaining from smoking tobacco). In general, the likelihood of an individual performing a behavior is assumed to increase with the degree to which s/he believes s/he can successfully perform the behavior. In
addition, the personal value of the goal or importance one attaches to various outcomes influences behavioral enactment. That is, even if a person’s self-efficacy for a particular behavior were relatively high (e.g., ability to exercise three times per week), but the person did not attach much importance to the outcome (e.g., health benefits), then it is less likely that the person would enact the target behavior.

Exercise self-efficacy judgments have been found to predict exercise level (Bagozzi & Edwards, 2000; Bock, Albrecht, Traficante, Clark, Pinto, Tilkemeier, & Marcus, 1997). In addition, there is some evidence that self-efficacy-based interventions can promote physical activity. Allison and Keller (2004) found that an exercise self-efficacy coaching intervention was significantly more effective in increasing physical activity performance than an attentional control intervention or a no intervention control group. In addition, exercise self-efficacy was significantly correlated with both self-reported measures of physical activity and objective measures of physical activity performance. Although intervention studies designed to increase physical activity have provided evidence for the usefulness of assessing and promoting exercise self-efficacy, other psychological models also have been shown to be effective in studies of exercise initiation and maintenance.

1.2. Theory of Reasoned Action / Theory of Planned Behavior

According to the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1980), people generally perform those behaviors that they intend to perform.
Intention is regarded as an indication of an individual's motivation to behave in a particular manner and of the amount of effort the individual is willing to exert to perform that behavior (Rutter & Quine, 2002). According to the Theory of Reasoned Action, intention is determined by two factors: attitude toward the behavior and subjective norm (see Figure 1.1). Attitude toward the behavior results from relevant beliefs about the consequences of performing the behavior (e.g., “Exercising more often will improve my cardiovascular health”) and the degree to which one evaluates the consequences as being positive or negative (e.g., “Improving my cardiovascular health is good”). Subjective norm refers to normative beliefs about perceived social pressure from significant others to engage or not to engage in a behavior (e.g., “My family thinks I should exercise more often”). Normative beliefs refer to one's perceived behavioral expectations of important referent individuals or groups (e.g., one’s spouse, family, friends, coworkers, physician). Normative beliefs are weighted by one’s motivation to comply with the wishes of those significant others (e.g., “Generally, I want to do what my family thinks I should do;” Ajzen; 2006).

Fishbein and Ajzen intended the Theory of Reasoned Action to predict behavior that is entirely under volitional control; however, Ajzen (cited in Rutter & Quine, 2002) later argued most human behavior is not under such control. Ajzen’s Theory of Planned Behavior (TPB; Ajzen, 1988; 1991), represents an expectancy-outcome model expanded from the TRA and attempts to address those behaviors that are not under complete volitional control. According to the TPB, intentions still are presumed to be the immediate determinants of behavior.
Figure 1.1. The theory of reasoned action / theory of planned behavior (Fishbein & Ajzen, 1960; Ajzen, 1988, 1991).
However, intentions to perform behaviors purportedly are determined not only by attitude toward the behavior and subjective norm regarding the behavior, but also by perceived behavioral control. Perceived behavioral control refers to one’s beliefs about one’s ability to perform the target behavior (e.g., “It would be easy for me to exercise more often”). Perceived behavioral control is influenced by one’s control beliefs about perceptions of obstacles, barriers, skills, resources, or opportunities (internal or external) that may facilitate or inhibit enactment of the behavior (Rutter & Quine, 2002). For example, a perceived internal resource might be one’s ability to perform a type of exercise; a perceived external barrier might be availability of the gym. Furthermore, attributing control over facilitating or inhibiting factors to oneself is an example of an internal control belief, and attributing control to external factors (i.e., not under volitional control) such as luck or chance is an external control belief.

Armitage and Conner (1999) have extended the Theory of Planned Behavior further by suggesting that perceived control consists of two components: self-efficacy and perceived control over behavior. The distinction between self-efficacy and perceived control over behavior is based on internal versus external influences on level of perceived control. Self-efficacy is defined as confidence in one’s own ability and is associated with personal competence, ability and skills related to engaging in the target behavior. Perceived control over behavior refers to an assessment of the situational constraints that might hinder the target behavior. Other authors have suggested that perceived control
over behavior and self-efficacy are distinct constructs and both should be measured in health behavior research (Abraham, Wight, & Scott as cited in Rutter & Quine, 2002).

A basic concept of TPB is that more favorable attitudes and subjective norms regarding the behavior plus greater perceived behavioral control predict the target behavior and that factors outside the TPB model are not necessary to increase the theory’s predictive value. Nonetheless, several researchers have challenged that notion and have tried to improve on the predictive validity of the model by investigating the addition of variables such as self-identity (Sparks and Shepherd, 1992), self-schemas (Sheeran and Orbell, 2000a), attention control (Orbell and Sheeran, 1998), planning (Jones, Abraham, Harris, Schulz, & Chrispin, 2001), and implementation intentions (Gollwitzer and Brandstätter, 1997). Although not initially included in his TPB, Ajzen later included past behavior as an additional significant predictor of future behavior.

The Theory of Planned Behavior has served as the conceptual framework for a number of efforts to identify beliefs that influence health behaviors. For example, the TPB constructs of behavior attitude, normative beliefs and perceived behavioral control have been used to predict breast cancer screening intentions (Rutter, 2000) and healthy eating intentions and behavior (Conner, Norman, and Bell, 2002; Povey, Conner, Sparks, James, & Shepherd, 2000). In a study of exercise intention and behavior in older women, Conn, Tripp-Reimer, and Maas (2003) employed TPB constructs to examine underlying beliefs about exercise. Exercise behavior intentions were predicted by beliefs about exercise,
perceived behavioral control, and normative beliefs. Attitude or beliefs about exercise and perceived behavioral control were significant predictors of exercise behavior as assessed by a self-report measure of physical activity.

In a recent meta-analysis, Armitage and Conner (2001) evaluated the efficacy of the Theory of Planned Behavior for predicting intention and behavior. In their review of 185 studies, they found that TPB variables (i.e., attitude, subjective norm, and perceived behavioral control) accounted for 39% of the variance in behavioral intention and 27% of the variance in behavior. Moreover, the TPB construct of perceived behavioral control was the best predictor of intention and behavior independent of the other constructs of attitude or subjective norm. Armitage and Conner concluded that the subjective norm construct was generally found to be a weak predictor of behavior due in part to poor measurement in studies included in their meta-analysis. Nonetheless, intervention studies based on TPB principles continue to provide further evidence of the usefulness of the Theory of Planned Behavior in predicting and modifying health behaviors.

1.3. Relapse Prevention Model

Relapse, or the full return to the former behavior or habit, is a frequent occurrence when people attempt to stop unhealthy behaviors or develop new or optimal health behaviors (Marlatt & George, 1998). Relapse rates in exercise programs are high with more than half of exercise program participants dropping out after the first six months (Dishman, 1991). The goal of relapse prevention is to help people anticipate and cope with problems that might interfere with their
ability to engage in their planned exercise programs. Marlatt and Gordon’s (1980; 1985) relapse prevention model is based on principles of social-learning theory and incorporates a conceptual model of relapse with a set of cognitive and behavioral strategies to prevent or limit relapse episodes. Initially developed as a behavioral maintenance program for use in the treatment of addictive behaviors and later applied to a range of health-related behaviors, the relapse prevention model (RPM) posits that maintenance of a new behavior is influenced by a person’s ability to cognitively and behaviorally cope with relapses to the undesirable behavior. The RPM has been applied to a number of different health behavior interventions. Concepts from the relapse prevention model more recently have been applied to interventions that focus on exercise adherence.

Marlatt and Gordon’s (1980; 1985) relapse prevention model is derived from findings that several factors contribute to relapse when people attempt to change health behaviors. Those factors include negative emotional or physiological states, limited coping skills, social pressure, interpersonal conflict, limited social support, low motivation, high-risk situations, and stress (Marlatt & Gordon, 1985; Brownell, Marlatt, Lichtenstein, & Wilson, 1986). The basic principles of the RPM include identifying high-risk situations for relapse and developing appropriate problem-solving solutions for those high-risk situations. High-risk situations for relapse from exercise participation might include changes in season or weather conditions, changes in school or work schedules, or the termination of organized team sports. Problem-solving solutions that target such high-risk situations might include walking on a treadmill or indoors at a mall when
weather is inclement, rescheduling workouts to fit new schedules, or planning on joining a new team sport when the current season ends.

In addition to identifying and coping with high-risk situations, relapse prevention also aims to help people distinguish between a lapse (e.g., a missed exercise activity or session) and a relapse (e.g., a return to a sedentary lifestyle). Reframing the way people think about lapses in exercise behavior is purported to improve adherence because it challenges the *abstinence violation effect* (AVE). Marlatt and Gordon (1985) define the AVE as the cognitive and emotional reactions to an initial “slip” or lapse in intended behavior following a period of controlled behavior or abstinence. The AVE applies to a wide range of behaviors and stems from the belief that once a person experiences a slip (e.g., misses an exercise session or eats dessert when trying to lose weight), then his/her entire efforts are doomed to failure. Consequently, the person attempting to change his/her behavior may give up entirely. By educating people about the likelihood of lapses and reframing them as temporary situations rather than permanent relapses, people are less likely to cease exercising altogether. Some researchers have even suggested that people should enact a planned lapse in order to practice challenging the AVE.

There is some evidence that individuals who are prone to relapse from exercise programs may have fewer coping strategies when they encounter high-risk situations than do individuals who are more likely to adhere to exercise programs. Simkin and Gross (1994) found that exercise relapsers were unable to generate as many problem-solving solutions to several provided scenarios that
described barriers to exercise as did exercise maintainers. Exercise promotion interventions based on the RPM have been shown to be effective in increasing adherence to exercise programs (Belisle, Roskies, & Levesque, 1987; King & Frederickson, 1984). Interestingly, studies that included a planned relapse as part of a more general intervention have not been effective in preventing relapse from the exercise program (Marcus & Stanton, 1993).

1.4. Model of Action Phases

Gollwitzer (1990) and Heckhausen’s (1991) Model of Action Phases (MAP) posits that the enactment of behavior is the result of two distinct phases: deliberative and volitional. They proposed that goal pursuit begins with a deliberative or motivational phase in which costs and benefits of goal pursuit are evaluated and goal intentions are formed. Forming a goal intention involves making personal commitment to reaching a particular outcome. Strength of commitment to achieving goals is an important component in the deliberative phase of goal-directed behavior. This deliberative phase resembles the motivational phase of the Theory of Planned Behavior (Ajzen, 1991) in that they both result in the formation of a goal intention. According to the Model of Action Phases, the formation of goal intention signals the conclusion of the deliberative phase. Once goal intentions are formed, the initiation of goal-directed actions can be simple if the necessary behaviors are well practiced or routine. However, strong intentions or commitment to a goal does not automatically translate into successful goal attainment. Oftentimes, goal pursuit becomes unnecessarily delayed or comes to a halt (Gollwitzer & Brandstätter, 1997).
Successful goal attainment is dependent upon not only firm intentions to achieve the goal but also upon the resolution of problems associated with initiation and maintenance of the goal-directed behavior. Factors such as the nature of goal framing, the ease of goal implementation, and the temporal proximity of the goals influence the effectiveness of goal pursuit. For example, attainment of goals that are vague, distal, or focus on prevention of negative outcomes as opposed to the promotion of positive outcomes is less likely to be effective (Gollwitzer, 1999). In addition, self-regulatory skills in initiating and maintaining goal-directed behaviors are an essential component of goal pursuit and attainment. The ability to filter out distractions, to inhibit habitual responses, or to cope with competing goals are examples of self-regulatory processes that may influence effective goal attainment. Gollwitzer’s (1993) model of action phases suggests that intended behaviors are most likely to occur when individuals are both motivated to act and have developed strategies or plans that promote enactment of the behaviors.

1.4.1. Implementation Intentions. Planning and rehearsal of goal pursuit have been shown to be an effective method of increasing the likelihood of goal attainment (Gollwitzer, 1999). Specific plans that detail the responses that lead to goal attainment are called implementation intentions. Implementation intentions (IMI) require that one commit oneself to respond in a specific manner in a certain situation. Deciding in advance what to do in a given situation enables one to select the most effective behaviors and the most suitable opportunities. In addition, the formulation of a planned response to relevant situational cues is
purported to increase the efficiency with which one initiates action because it eliminates effortful deliberation and allows one to recognize good opportunities when they present themselves.

Gollwitzer (1993, 1999) has proposed a distinction between goal intentions and implementation intentions. Goal intentions are the type of intentions described in goal theories or the Theory of Planned Behavior (Ajzen, 1985). A goal intention may take the form of “I intend to reach Z,” with “Z” representing the intended behavior or outcome. Formation of a goal intention (during the deliberative or motivational phase) results in a sense of commitment to realize the goal. Implementation intentions (formed during the volitional phase) are subordinate to goal intentions and specify the when, where, and how of responses that lead to goal attainment. An implementation intention usually takes the form of “I intend to do X when I encounter situation Y.”

Gollwitzer, Fujita, and Oettingen (2004) hypothesized that implementation intentions create mental links that facilitate goal attainment through processes related to both the anticipated situation and the intended goal-directed behavior. Formation of an implementation intention implies the selection and mental representation of a critical, anticipated situation which becomes highly activated and therefore, more accessible. The increased accessibility of the mental representation of the anticipated situation should make it easier to detect, to recall, and to attend to the critical situation in the environment even when one is occupied with other things (Gollwitzer, 1999). Several studies have provided evidence in support of the increased accessibility of the anticipated situation
hypothesis. Aarts, Dijksterhuis, and Midden (1999) found that implementation intentions led to faster lexical decision times for words that described the critical situation in a lexical decision task.

In terms of goal-directed behavior, implementation intentions link intended behavior to a chosen critical situation. In a process that is similar to the process in which habitual behavior is acquired through the repeated pairing of the behavior with the context in which it is enacted, mental rehearsal is used to pair the intended behavior with a context including the anticipated time and place in which the behavior should occur (Orbell, Hodgkins, & Sheeran, 1997). The link between the intended behavior and the anticipated critical situation is thought to be achieved in a single mental act, but likely benefits from additional mental rehearsal (Sheeran et al., in press). Furthermore, the mental act of linking the goal-directed behavior to the anticipated situation is assumed to lead to the automatization of the intended goal-directed behavior once the critical situation is encountered. That is, the enactment of the goal-directed behavior becomes swift, efficient, and does not require conscious intent: three characteristic features of automaticity according to Bargh & Chartrand (1999). The specified intended behavior becomes dependent upon relevant situational cues instead of on more controlled, effortful processes. Less cognitively effortful, automatized, planned behaviors are less susceptible to the unwanted influence of distraction, competing goals, or undesired responses than are more cognitively effortful behaviors. Several studies support the automatization hypothesis regarding implementation intentions (Brandstätter, Lengfelder, & Gollwitzer, 2001;
Gollwitzer & Brandstätter (1997). For example, Gollwitzer and Brandstätter (1997) found that participants who formed implementation intentions were able to initiate counterarguments to racist remarks made by a confederate significantly more rapidly than were participants who only had formed goal intentions to initiate counterarguments.

Efficiency of implementation intention effects was demonstrated by Brandstätter, Lengfelder, and Gollwitzer (2001) in multiple studies in which cognitive load was manipulated either by sample selection (e.g., schizophrenic patients or addicts undergoing withdrawal) or use of a dual-task paradigm with college students. Brandstätter et al. found that implementation intentions benefited performance on a computerized go/no go task for schizophrenic patients just as much as for matched controls even though the patients were likely experiencing intrusive thoughts while performing the task. The dual-task paradigm studies with college students in which participants were asked to perform a continuous tracking task while also performing the go/no go task showed that forming implementation intentions did not compromise performance on the go/non go task and did not show evidence of task interference even when the task was very difficult. Evidence for lack of awareness with regard to implementation intention effects comes from a study by Bayer, Moskwitz, & Gollwitzer (as cited in Sheeran et al. in press) in which participants who formed an implementation intention to respond particularly quickly to triangle shapes in a computerized classification task involving geometric figures, showed enhanced performances following subliminal presentation of triangles but not following
subliminal presentation of other symbols. Brandstätter, Lengfelder, & Gollwitzer (2001) describe the formation of an implementation intention as a “conscious mental act that has automatic consequences.”

Several studies have shown that implementation intentions have been useful in promoting health-related behavioral change. Orbell, Hodgkins, & Sheeran (1997) demonstrated that women who were instructed to form implementation intentions to perform breast self-exam (BSE) were almost twice as likely to enact the target behavior one month later than were women who had similarly strong, goal intentions, but who did not form implementation intentions. Similarly, Sheeran & Orbell (1999) found participants in an implementation intention group were significantly less likely to miss their daily intake of vitamin C pills, over both 10 and 21 day periods, than were control groups. Other studies in which implementation intentions have been employed as a health-behavior intervention include establishing healthier dietary habits (Verplanken & Faes, 1999); increasing attendance for cervical cancer screening (Sheeran & Orbell, 2000b); and increasing mobility after joint replacement surgery (Orbell & Sheeran, 2000).

Milne, Orbell, & Sheeran (2002) examined the effects of implementation intentions on exercise behavior in a sample of U.K. undergraduate students. Participants were randomly assigned to one of three intervention groups: control (i.e., no intervention), motivational intervention based on Protection Motivation Theory (PMT), or motivational plus volitional (i.e., PMT plus implementation intention) intervention. PMT also assumes that intention is the proximal cause of
behavior. Protection motivation theory (Rogers, 1983) proposes that two processes, threat appraisal and coping appraisal determine protection motivation. Threat appraisal refers to one's perceptions of vulnerability, perceived severity of disease, and fear arousal. Coping appraisal refers to one’s perceptions of efficacy and costs of a recommended coping response. Protection motivation is operationally defined in terms of the person’s intention to perform the recommended behavioral response and is considered to be the most immediate predictor of health behavior according to PMT (Webb & Sheeran, 2006). It is assumed that an individual will be more likely to intend to adopt the recommended coping response if s/he believes the response will be effective, feels able to perform the recommended behavior, and perceives the behavior is low in perceived costs (Milne, Orbell, & Sheeran, 2002).

Milne et al. (2002) assessed exercise behavior from self-report questionnaires at three time points over a 2-week period. Participants who were in the combined motivational plus volitional intervention (PMT-implementation intention) group were significantly more likely to engage in exercise sessions compared to the other two intervention groups. Ninety-one percent of participants in the combined motivational plus volitional intervention group engaged in exercise versus only 38% of the control group and 35% of the motivational only intervention group. In addition, 100% of the participants in the combined intervention group who exercised, did so in the locations specified in their implementation intentions, 97% exercised at the time specified, and 88% exercised on the day specified.
Additional analyses found that while the motivational intervention alone increased motivation to exercise, it had no significant effect on enactment of exercise behavior.

Many studies have provided evidence of the usefulness of implementation intentions in facilitating the enactment of target behaviors across variations situations. However, the magnitude of the beneficial effects of implementation intentions appears to depend on the presence or absence of several moderators (Gollwitzer et al. (2004). Specifically, implementation intention effects have been shown to be stronger with difficult to initiate behaviors, than with easier to initiate behaviors. For example, implementation intentions were effective in improving performance on prospective memory tasks that required self-initiation of behavior (i.e., not situationally cued), but had no effect on a comparatively easy situationally cued recognition task (Chasteen, Park, & Schwartz, 2001). In addition, implementation intentions were demonstrated to be more effective in increasing performance in a dual-task paradigm for patients with frontal lobe damage (i.e., individuals who typically have problems with executive control or self-regulation) than for college students (Lengfelder & Gollwitzer, 2001). If enacting a behavior is relatively easy, or routinely performed, then motivational factors such as goal intentions or self-efficacy should be sufficient to promote the intended behavior.

Another moderator of implementation intention effects is the strength of respective goal intentions. Orbell et al. (1997) found that implementation intentions positively influenced breast self-exam (BSE) behavior only for women
who reported possessing a strong goal intention to perform BSE. In addition, implementation intention effects are dependent upon the activation of the respective goal intention. That is, implementation intentions do not mechanistically elicit actions in individuals who have not formed corresponding goal intentions. Eighty-nine percent of participants who did not intend to go to a workplace sponsored health and safety training session failed to form an implementation intention even though they had been instructed to do (Sheeran & Silverman, 2003). Sheeran et al. (in press) strongly recommend that implementation intentions should not be viewed as substitutions for interventions that promote goal intentions. These two types of interventions are presumed to affect different processes involved in behavioral enactment. Interventions that promote goal intentions are intended to increase motivation to act while implementation intentions provide the plans that specify when, where, and how to act. Therefore, Sheeran et al. suggest that Implementation intentions should be used in conjunction with motivational or goal intention interventions to reduce intention-behavior discrepancies.

The strength of the commitment to an implementation intention also influences the magnitude of the implementation intention effects. Gollwitzer et al. (2004) varied the strength of commitment to implementation intentions that participants formed. High commitment condition participants were told implementation intentions work well with strict adherence; low commitment condition participants were told implementation intentions work well with flexible
adherence. Gollwitzer et al. found that low commitment to an implementation intention produced significantly weaker implementation intention effects than did high commitment.

Furthermore, the strength of the mental link between the critical environmental situation and the goal-directed behavior likely affects the degree to which implementation intentions are beneficial in promoting goal-directed behaviors. Gollwitzer et al. (2004) suggest that concentrated encoding of the “if-then” plan (i.e., “If situation X arises, then I will perform response Y”), or repetition of a formed “if-then” plan via inner speech should produce stronger mental links which as a result should produce stronger implementation intention effects. Prestwich, Lawton, and Conner (cited in Sheeran et al., in press) examined the efficacy of augmenting implementation intentions with a positive statement about the benefits of planning, cognitive rehearsal of the plan, or use of environmental cues (i.e., a reminder note). Both cognitive rehearsal and environmental cues increased the likelihood of intended behavior compared to the positive statement manipulation. Milne and Sheeran (cited in Sheeran et al., in press) found that participants who were instructed to concentrate on a specified situational cue and the specified behavioral response were much more likely to perform the intended behavior (i.e., visit a target website) than were participants who were instructed to write their implementation intention on a reminder note and display it in a prominent location in their homes (87% versus
40% respectively). These findings suggest that the rehearsal of the situational cue-intended behavior link is crucial for implementation intentions to effectively promote the target health behavior.

Dispositional traits also may moderate the effects of implementation intentions on health behaviors as well. For example, Prestwich, Lawton, Conner, & Taylor (as cited in Sheeran et al. in press) found that implementation intentions were least effective in promoting performance among participants who scored high on conscientiousness as a personality trait. Moreover, Lengfelder and Gollwitzer’s (2001) findings imply that implementation intentions are likely to most benefit individuals who have difficulty regulating their behavior. Recall that Lengfelder and Gollwitzer found that implementation intention effects were greater for patients with frontal lobe lesions than for college students without brain injuries. These findings suggest that there may be a ceiling effect for implementation intentions with regard to persons for whom enacting a behavior is relatively easy and there are few barriers to performing the behavior. In such cases, little additional benefit can be derived from forming an implementation intention and motivational factors such as goal intentions or self-efficacy should be sufficient to promote the intended behavior (Sheeran et al., in press).

1.5. An Integrated Theoretical Approach to Behavior Change

Assuming that goal-directed behavior results from a combination of motivational and volitional processes, a combined intervention that incorporated techniques that focus on both motivational and volitional aspects of behavior enactment should be most effective in promoting health behaviors. Acting on
such an assumption, Prestwich, Lawton, and Conner (2003), examined the effects of an integrated, theory-based intervention on promotion of exercise behavior in college students and staff at a UK university. Prestwich et al. (2003) compared a motivational intervention (the Decision Balance Sheet [DBS]), a volitional intervention (implementation intentions [IMI]), and a combined motivational-volitional intervention (DBS-IMI) with a no intervention control group.

All participants were asked to try to exercise at least two more times per week than they currently exercised, for a period of at least 20 minutes per session, in an individual or non-group based activity. Group or team-based activities were excluded in order to eliminate the motivational impact of exercising in groups. Participants were asked to record their exercise behavior in a diary every week for a period of 4 weeks and data was collected at two time points (at the time of a pre-intervention assessment and at the end of 4 weeks). Exercise behavior intention was assessed using measures based on TPB constructs of behavioral intention and perceived behavioral control. In addition, participants were asked to report their past exercise behavior for the three weeks immediately prior to the study. Participants also were given a fitness evaluation that included fixed rate shuttle jogging over a 7 m distance in time with a beep while wearing a heart monitor. Control group participants were given their exercise diaries and then excused following the initial assessment session.

Participants in the active intervention conditions completed the assessment measures and then the following interventions were conducted:
The motivational (DBS) intervention consisted of asking participants to complete a Decisional Balance Sheet concerning increasing their exercise sessions. On this sheet, participants generated a list of gains and losses from exercise for the self and others; approval and disapproval from self and others; and an “any other” category. After completing the form, participants were asked to think about their responses and the read them to the experimenter who responded with positive feedback. Participants in this condition were asked to retain their decision balance sheet.

The volitional (IMI) intervention consisted of having participants form an exercise implementation intention by specifying the time, place, and type of exercise they would perform over the next four weeks. The combined motivational-volitional (DBS-IMI) intervention consisted of participants completing the exercise decision balance sheet and then forming an exercise implementation intention.

Exercise behavior frequency (number of sessions per week), duration (minutes per session and minutes per week), and physical fitness were measured before and after the intervention. The DBS intervention resulted in increased exercise frequency and duration (overall time per week) when compared to the no intervention control (participants in the no intervention control group actually showed a decrease in exercise behavior). However, both the combined Decision Balance Sheet-implementation intention (DBS-IMI) and implementation intention (IMI) alone interventions produced significantly greater increases in total time spent exercising and in frequency of exercise than did the
DBS intervention alone. The combined DBS-IMI intervention resulted in improved physical fitness and marginal increases in frequency over the IMI alone intervention. Intervention condition did not significantly affect duration of exercise session. Prestwich et al. concluded that a combined intervention that focuses on motivational and volitional processes can lead to important health benefits by promoting physical activity.

1.6. Personality, Self-Regulation of Behavior, and Implementation Intentions

Personality, defined as patterns of thought and behavior that show situational consistency and temporal stability (Karren, Hafen, Smith, & Frandsen, 2001), can affect individuals’ regulation of behavior and goal pursuit. Dispositional characteristics include self-concept, perceptions of others, personal values, morals, expectations, defenses, coping strategies, attitudes, and beliefs (Rothbart, Ellis, & Posner, 2004). Many of these characteristics significantly impact the self-regulation of behavior and therefore should be considered when developing interventions designed to change behavior. One such dispositional characteristic that has been shown to influence self-regulation of behavior is personal disorganization.

Personal disorganization is a dispositional trait conceptualized as a deficiency in one’s overall executive functioning (Mirels, Dean, & Ponton, 1998). Executive functioning is implicated in the coherence, structure, and guidance essential to achieve one’s intended aims or goals. Personal disorganization is
characterized by difficulty in self-regulation, particularly the ability to inhibit prepotent responses. A subjective sense of overall disorganization, inefficiency, and absent-mindedness are key features of personal disorganization.

Individual differences in personal disorganization can be assessed with a self-report instrument called the Sense of Personal Disorganization Scale (SPDS; Mirels, Dean, & Ponton, 1998). Mirels et al. (1998) found that higher SPDS scores are correlated with distractibility, cognitive failures, attentional problems, procrastination, increased negative affect, decreased positive affect, lower self-esteem, and lower personal efficacy. Table 1.1 presents a summary of correlations between the SPDS and a variety of other established dispositional measures. Individuals reporting high levels of personal disorganization as measured by the SPDS (Mirels, et al, 1998) have been shown to experience difficulty with self-regulation and perform more poorly on memory tasks that require self-initiation than did individuals with lower levels of personal disorganization (Dean, 2001).

These studies suggest that certain dispositional characteristics can facilitate or threaten goal pursuit. Gollwitzer et al. (2004) proposed that planning in advance via implementation intentions can promote goal attainment because action control is easier when controlled by situational cues rather than self-initiation. This mode of action is purported to circumvent detrimental self-states, thus, it matters less whether the self is secure, agitated, or calm. By this reasoning, implementation intentions should facilitate the enactment of certain
Measure

<table>
<thead>
<tr>
<th>Measure</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, Fitzgerald, &amp; Parkes, 1982)</td>
<td>.56</td>
</tr>
<tr>
<td>Personal Need for Structure (PNS; Thompson, et al., 1989)</td>
<td>-.18</td>
</tr>
<tr>
<td>Adult Behavior Rating Scale (ABRS - Attentional Problems; Barkley &amp; Murphy, 1998)</td>
<td>.47</td>
</tr>
<tr>
<td>Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)</td>
<td>.40</td>
</tr>
<tr>
<td>State-Trait Anxiety Inventory, Form Y-2 (STAI; Speilberger, Gorsuch, Lushene, Bagg, &amp; Jacobs, 1993)</td>
<td>.37</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965)</td>
<td>-.37</td>
</tr>
<tr>
<td>Marlowe-Crowne Social Desirability Scale (M-C; Crowne &amp; Marlowe, 1960)</td>
<td>-.35</td>
</tr>
<tr>
<td>Procrastination Scale (Tuckman, 1991)</td>
<td>.55</td>
</tr>
<tr>
<td>Positive and Negative Schedule - Positive Affectivity (PANAS; Watson, Clark, &amp; Tellegen, 1988)</td>
<td>-.41</td>
</tr>
<tr>
<td>Positive and Negative Schedule - Negative Affectivity (PANAS; Watson, Clark, &amp; Tellegen, 1988)</td>
<td>.38</td>
</tr>
<tr>
<td>Transparent Bipolar Inventory (&quot;Big Five;&quot; Goldberg, 1992)</td>
<td></td>
</tr>
<tr>
<td>Emotional Stability</td>
<td>-.33</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-.41</td>
</tr>
<tr>
<td>Extraversion</td>
<td>-.24</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>-.27</td>
</tr>
<tr>
<td>Openness to Experience</td>
<td>-.12</td>
</tr>
</tbody>
</table>

Table 1.1  Zero-order correlations between the Sense of Personal Disorganization Scale (SPDS; Mirels, Dean, & Ponton, 1998) and other measures ($p < .05$).
behaviors despite goal-competing inner states such as anxiety, depression, and or negative self-evaluation. Nonetheless, implementation intentions have not been found to be equally effective for all individuals or for all types of tasks. Therefore, it is reasonable to expect that personality variables would moderate the effectiveness of implementation intentions.

1.7. The Present Study

The primary purpose of the present study was to investigate the effects of an integrated, theory-based intervention on the promotion of exercise behavior. More specifically, the present study examined the effects of implementation intentions and relapse prevention interventions on exercise behavior in college students. The methodology of the present study was modeled after the Prestwich et al. (2003) study described earlier in which college students were asked to exercise two more times per week than they currently exercised and to keep diaries of their exercise sessions. Recall that Prestwich et al. used an integrated intervention that focused on both the motivational and volitional processes involved in exercise initiation. The present study differed in that the interventions primarily targeted the volitional phase of exercise initiation and adherence. That is, the implementation intention and relapse prevention interventions described in the present study were not intended to promote exercise behavior by increasing motivation to exercise. Instead, the implementation intention intervention was presumed to promote exercise behavior by encouraging participants to develop specific, planned behavioral responses that would enable them to initiate the intended exercise behavior
when the appropriate situational cues were encountered. As mentioned previously, the formation of an implementation intention is presumed to increase the cognitive accessibility of the mental representation of the anticipated situation thereby making it easier to detect, to recall, and to attend to even when confronted with competing environmental cues. Dependent upon the specified situational cue, initiation of the exercise behavior should be less cognitively effortful and less susceptible to distraction, competing goals, or other potential interferences.

The relapse prevention intervention also was presumed to provide participants with planned behavioral responses that will facilitate their ability to sustain the intended exercise behavior when they encounter situational cues (both internal and external) that might serve as barriers to exercising. In addition, the relapse prevention intervention included cognitive restructuring that provided participants with ways to frame lapses in exercise behavior so as to minimize negative emotional responses associated with failure to perform the intended exercise behavior.

The present study also investigated the effects of dispositional characteristics as moderators of the intervention effects. Prior to the implementation of the interventions, a variety of dispositional factors known to influence self-regulation, and therefore, the enactment of the targeted exercise behavior, was assessed. The primary dispositional factor of interest was personal disorganization which was assessed with Mirels et al.'s (1998) Sense of Personal Disorganization Scale (SPDS).
Lower levels of self-esteem have been associated with personal disorganization and also with lower exercise self-efficacy (McAuley, Blissmer, Katula, Duncan, & Mihalko, 2000). As mentioned earlier, self-efficacy is an important motivational factor in goal pursuit. Therefore, self-esteem was assessed prior to the implementation of the exercise interventions. Participant's tendency toward procrastination was assessed because it is directly related to goal initiation. Research by Carver and Scheier (1981) suggests that pessimists tend to hold negative expectations for the future and consequently, they are less likely to persist in their goals in the face of hardship. Pessimists also have a tendency to disengage from their goals earlier than do optimists (Scheier, Carver, & Bridges, 1994). Dispositional optimism versus pessimism was assessed with the Life Orientation Test-Revised (Scheier, et al., 1994). Affective states including depression also were assessed because low motivation and lack of energy are symptomatic of depression and likely affect intention to exercise. Long-term, low-grade depression can make it challenging for participants to follow through on an exercise plan (Gerrish, 1999).

Given that the present study utilized several self-report measures, the participants' tendency toward socially desirable responding was assessed. Previous studies based on the Theory of Planned Behavior (TPB) usually rely on self-report measures which are vulnerable to self-presentational biases; therefore, Beck and Ajzen (1991) recommend future studies of health behaviors
include the administration of an instrument that assesses impression management such as the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960).

Prior to the implementation of any intervention, exercise intentions, attitudes toward exercise, and exercise self-efficacy were assessed using the Exercise Intention Questionnaire (see Appendix A for questionnaires). Pre-intervention exercise behavior was assessed using measures and exercise logs based on the Prestwich et al. (2003) study and with the Baecke Habitual Physical Activity Scale (Baecke, Burema, & Frijters, 1982), an established measure of physical activity.

1.8. Hypotheses

All participants in the active intervention conditions (i.e., Implementation Intention [IMI], Relapse Prevention [RP], and Combined Implementation Intention-Relapse Prevention [IMI-RP]) were predicted to report greater increases in the frequency and duration of exercise behavior than participants in the control condition. Given the demonstrated robust effects of implementation intentions in promoting a variety of health behaviors in a number of studies, participants in both implementation intention conditions (i.e., Implementation Intention [IMI] and combined Implementation Intention-Relapse Prevention [IMI-RP] conditions) were predicted to report greater increases in exercise frequency and duration than would the participants in the RP intervention condition. Participants in the RP intervention condition were predicted to report greater increases in exercise frequency and duration than would participant in the control
condition, but RP condition participants were not predicted to report greater increases in exercise frequency and duration than would either of the implementation intention condition groups. Lastly, participants in the combined IMI-RP intervention condition were predicted to report the greatest increases in exercise frequency and duration when compared to the other three conditions (i.e., control, IMI, RP) because that condition was predicted to provide participants with the most support in terms of planned behavioral responses for both initiation of and adherence to exercise behavior.

The effects of implementation intentions were expected to be moderated by the dispositional variable of personal disorganization. More specifically, it was predicted that implementation intention interventions (i.e., IMI and IMI-RP interventions) would be most effective in promoting exercise behavior for individuals reporting higher levels of personal disorganization because implementation intentions have been demonstrated to benefit behavioral performance most when the intended task is difficult or when people have difficulty regulating their behavior. Therefore, exercise implementation intentions were predicted to produce the greatest increases in exercise frequency and duration for individuals with higher levels of personal disorganization than for individuals who reported lower levels of personal disorganization. Recall that Prestwich et al., (in press) found that implementation intentions were least effective in promoting performance among participants who scored high on conscientiousness as a personality trait. Prestwich et al.’s findings suggest that there may be some sort of ceiling effect for implementation intention interventions
particularly when the task or target behavior is relatively easy to perform or for individuals who have little difficulty regulating their behavior.

The relapse prevention (RP) intervention also was predicted to be beneficial for individuals who reported high levels of personal disorganization (PD). Anticipation of high-risk situations and pre-planning strategies or behavioral responses to cope with such situations would likely be helpful to high PD individuals by making intended behaviors more readily available to participants when they encounter barriers to exercise.
CHAPTER 2

METHOD

2.1. Institutional Review Board Approval

The Ohio State University Behavioral/Social Sciences Institutional Review Board (IRB) approved research protocol #2004B0337 for the present study including all materials submitted by the investigator (see Appendix A: IRB Research Protocol Approval form).

2.2. Participants and Recruitment

A description of the initial screening phase of the study (Appendix C: Online Experiment Description) was posted on the Internet via the OSU Department of Psychology’s Research Experience Program (REP) website. Students enrolled in an introductory psychology course at The Ohio State University who were at least 18 years old and who were fluent in English were eligible to participate. During the screening phase of the proposed study, participants attended group experiment sessions with up to 12 participants per session and completed packets of questionnaires that assessed physical activity, several dispositional characteristics, and demographic information. Also included
in the packets of questionnaires was an intervention phase recruitment form (Appendix D) that solicited information about respondents’ motivation or interest in participating in the second, intervention phase of the study. Potential participants indicated their interest in participating in the intervention phase of the study by providing their names and contact information on the lower half of the recruitment flyer.

Six hundred and forty-two students participated in the initial phase of the study during which they completed the previously mentioned questionnaires. The students who participated in the study did so in order to satisfy a course requirement for their psychology course. Only participants who indicated that they were interested in participating in an exercise behavior study by completing and returning the recruitment form were recruited for the intervention phase of the study. Participation eligibility was assessed with the Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shepard, 1992) an instrument used to screen for individuals for whom exercise may pose a health hazard. Participants who completed the second phase of the study in its entirety (i.e., all four weeks plus the post-experiment follow-up session) were eligible to participate in a lottery at the end of the academic term in which (4) $25.00 gift certificates to the OSU bookstore were awarded. Lotteries were conducted at the end of each of three academic terms in which the present study enrolled participants (autumn 2004, winter 2005, and spring 2005).

One hundred twenty-four OSU students indicated their willingness to participate in the intervention phase of the present study. Data for eighteen
participants who withdrew before the end of the fourth week of the study were not included in the analyses. In addition, data for fourteen participants who reported such high levels of pre-intervention exercise behavior (i.e., already exercising six or more times per week) that they were considered to be outliers were excluded from the final analyses as well. The final sample consisted of 26 male students and 66 female students ($N = 92$), ranging in age from 18 to 39 with a mean age of 19.71 years. Sample demographic information is summarized in Tables 2.1 (gender), 2.2 (ethnic composition), 2.3 (employment status), 2.4 (education level), 2.5 (marital status), and 2.5 (family income level). Participants whose scores fell in the lower tertile [Sense of Personal Disorganization Scale (SPDS) scores 1 - 29] of the SPDS distribution of scores were designated as low Personal Disorganization (PD) group participants; those individuals scoring in the middle tertile (SPDS scores 30 - 42) were designated as Medium PD group participants; and participants whose SPDS scores fell in the upper tertile (43 - 82) were designated was the High PD group participants.

2.3. Measures

The following measures were administered to participants during the screening phase of the study (see Appendix A for questionnaires used in the present study):

Baecke Habitual Physical Activity Scale (HPAS; Baecke, Burema, & Frijters, 1982). The HPAS is a 16-item, multidimensional questionnaire that assesses work physical activity, sports participation, and leisure physical activity excluding sports during the previous 12-month period of time. For thirteen of the
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (N=26)</td>
<td>36.8%</td>
<td>29.2%</td>
<td>33.3%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Female (N=66)</td>
<td>63.2%</td>
<td>70.8%</td>
<td>66.7%</td>
<td>84.0%</td>
</tr>
</tbody>
</table>

Table 2.1  Gender of sample by condition.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White/Caucasian</td>
<td>100%</td>
<td>91.66%</td>
<td>91.66%</td>
<td>100%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0%</td>
<td>4.17%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Asian</td>
<td>0%</td>
<td>4.17%</td>
<td>4.17%</td>
<td>0%</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>0%</td>
<td>0%</td>
<td>4.17%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 2.2  Ethnic composition of sample by condition.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Time</td>
<td>10.6%</td>
<td>4.2%</td>
<td>0.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Part Time</td>
<td>52.6%</td>
<td>50.0%</td>
<td>37.5%</td>
<td>44.0%</td>
</tr>
<tr>
<td>Unemployed, Seeking Job</td>
<td>10.5%</td>
<td>16.7%</td>
<td>12.5%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Unemployed, Not Seeking Job</td>
<td>26.3%</td>
<td>29.1%</td>
<td>50.0%</td>
<td>36.0%</td>
</tr>
</tbody>
</table>

Table 2.3 Employment status of sample participants by condition.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>89.4%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>96.0%</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>5.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>5.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 2.4 Education level of final sample participants by condition.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single, never married</td>
<td>94.7%</td>
<td>100.0%</td>
<td>95.8%</td>
<td>96.0%</td>
</tr>
<tr>
<td>Married</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4.2%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Divorced</td>
<td>5.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 2.5. Marital status of sample participants by condition.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $15,000 per year</td>
<td>11.1%</td>
<td>13.0%</td>
<td>9.1%</td>
<td>8.0%</td>
</tr>
<tr>
<td>$15,000 – 29,000 per year</td>
<td>5.6%</td>
<td>4.3%</td>
<td>4.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>$30,000 – 44,999 per year</td>
<td>11.1%</td>
<td>4.3%</td>
<td>18.2%</td>
<td>12.0%</td>
</tr>
<tr>
<td>$45,000 – 59,999 per year</td>
<td>11.1%</td>
<td>17.4%</td>
<td>18.2%</td>
<td>8.0%</td>
</tr>
<tr>
<td>$60,000 – 74,999 per year</td>
<td>5.6%</td>
<td>21.7%</td>
<td>18.2%</td>
<td>24.0%</td>
</tr>
<tr>
<td>$75,000 or more per year</td>
<td>55.6%</td>
<td>39.1%</td>
<td>31.8%</td>
<td>44.0%</td>
</tr>
</tbody>
</table>

Table 2.6. Family income level of sample participants by condition. (Note: N=88 due to missing data from participants).
sixteen items, responses are indicated using 5-point Likert-type scales. Three items require respondents to indicate the type of occupation or sports in which they are engaged. Respondents’ occupations and sports are rated as low, medium, or high intensity level, and are factored into the respective work or sports index score. Test-retest reliabilities for work, leisure, and sport indices were 0.88, 0.81, and 0.74, respectively for the sample in the present study.

**Unipolar “Big Five” Markers Inventory (B-5; Goldberg, 1992).** The Goldberg B-5 inventory consists of 100 unipolar trait adjectives such as “responsible,” “unimaginative,” “extraverted,” irresponsible” or “distrustful.” The respondent indicates how accurately each term describes his/her personality using a 9-point Likert scale ranging from 1 (Extremely Inaccurate) to 9 (Extremely Accurate). The unipolar markers inventory has five subscales each representing the broad, “Big-Five” personality traits: openness, conscientiousness, extraversion, agreeableness, and emotional stability. Each subscale is comprised of twenty of the unipolar trait adjectives. Cronbach’s alpha for the five subscales have ranged from 0.82 to 0.96 in multiple studies. Carmines and Zeller (1979) suggested that satisfactory level of internal reliability for widely used scales should be 0.80. Goldberg’s unipolar markers inventory demonstrated evidence of convergent and discriminant validity when compared with existing personality measures (Goldberg, 1992).

**The Sense of Personal Disorganization Scale (SPDS; Mirels, Dean, & Ponton, 1998).** The SPDS is a 12-item self-report measure that assesses the extent to which one asserts s/he is absent-minded, inefficient, forgetful, and
prone to a generalized sense of organization. Respondents indicate their agreement or disagreement with provided statements using a Likert-type scale that ranges from strongly agree (+3) to strongly disagree (-3). Cronbach’s alpha ranged from .85 to .90 in three samples and was related to several other established dispositional measures (e.g., procrastination, self-esteem, anxiety) in expected ways that demonstrates convergent and divergent validity.

Marlowe-Crowne Social Desirability Scale (M-C; Crowne & Marlowe, 1960). The M-C is a 33-item, true-false format measure of socially desirable responding in which respondents indicate whether or not they agree with items such as “I am always careful about my manner of dress,” or “I like to gossip at times.” The scale demonstrated adequate internal consistency (alpha equal to 0.88) and test-retest reliability (correlation of 0.89).

The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). A 16-item modified version of The CES-D was used to assess the frequency and severity of symptoms of depression. Respondents use a 4-point Likert-type scale ranging from 0 (“Rarely or none of the time”) to 3 ( “Most or all of the time”) to indicate how often during the past week they experienced states such as “I was happy,” or “I felt depressed.” Items on the scale assess cognitive, behavioral, physiological, and social aspects of depression, with higher scores indicating greater distress. The modified version of the CES-D demonstrated satisfactory internal reliability with Cronbach’s alpha of 0.88.
The State-Trait Anxiety Inventory (STAI/Y-2; Speilberger, Gorsuch, & Luschene, 1970). The STAI/Y-2 is a long-established instrument designed to assess trait anxiety in adults. The STAI/Y-2 is comprised of 20 statements such as “I feel nervous and restless,” or “I am ‘cool, calm, and collected.” Respondents indicate the degree to which they believe the statements are characteristic of them by using a 4-point Likert scale anchored by descriptors that range from “Almost Never” to “Almost Always.” STAI/Y-2 scores range from 20 to 80 with higher scores indicating higher levels of trait anxiety. Cronbach’s alpha in studies with the general population has ranged from 0.76 to 0.91 (Ray, 1984).

The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item measure of positive and negative affect. Each item consists of a descriptive mood term such as “excited,” “hostile,” or “attentive,” and respondents rate the extent to which they generally experience each mood term with a Likert-type scale that ranges from 1 (“very slightly or not at all”) to 5 (“extremely”). The PANAS has demonstrated satisfactory Cronbach’s alpha reliabilities ranging from .86 to .90 for the PA, and from .84 to .87 for the NA in multiple studies.

The Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965). The RSE is a 10-item Likert scale that assesses self-esteem with items such as “On the whole, I am satisfied with my life,” or “I feel I do not have much to be proud of.” Respondents indicate agreement with each item using a 4-point scale that ranges from “strongly agree” to “strongly disagree,” resulting in a possible total score range from 10 to 40 with higher scores indicating higher levels of self-
esteem. The RSE has Cronbach’s alpha ranging from 0.77 to 0.88 and test-retest reliability (correlations ranging from 0.85 to 0.82; Dobson, Goudy, Keoth, & Powers, 1979; Fleming & Courtney, 1984; Silber & Tippett, 1965). The RSE has been associated with a variety of dispositions that are related to self-esteem (e.g., confidence, popularity, depression, anxiety; Lorr & Wunderlich, 1986; Fleming & Courtney, 1984).

The Procrastination Scale (PS; Lay, 1986). The PS is a 20-item measure of procrastination for student populations. Respondents indicate the extent to which each statement such as “I generally delay before starting on work I have to do,” is characteristic or uncharacteristic of them using a 5-point Likert scale that ranges from 1 (“extremely uncharacteristic”) to 5 (“extremely characteristic”). The scale has demonstrated internal consistency ranged from 0.82 and 0.89 and has been consistently associated in the expected manner with established measures of personality traits such as conscientiousness and neuroticism (Lay, 1986; Schouwenburg & Lay, 1995).

The Life Orientation Test-Revised (LOT-R; Scheier, Carver, & Bridges, 1994). The LOT-R is a 6-item measure of dispositional optimism versus pessimism. Using a 5-point Likert scale that ranges from “I agree a lot” to “I disagree a lot,” respondents indicate their agreement with statements such as “In uncertain times, I usually expect the best,” or “If something can go wrong for me, it will.” Cronbach’s alpha for this measure was reported as 0.78 (Sheier, Carver, & Bridges, 1994). In addition, Scheier and Carver (1985) reported that the LOT-
R is correlated with a wide range of established dispositional variables such as hopelessness, self-esteem, depression, locus of control in expected ways.

The following measures were administered to all participants at the outset of the first intervention session (Appendix A):

**Physical Activity Readiness Questionnaire** (PAR-Q; Thomas, Reading, & Shepard, 1992). The PAR-Q is a 7-item, self-report questionnaire for screening large populations prior to initiating physical activity. The purpose of the PAR-Q is to detect individuals for whom physical activity might be inappropriate or who need to be evaluated by a physician before initiating physical activity. The PAR-Q has been shown to be an effective screening tool and is widely used in health research and medical settings.

**Exercise Intention Questionnaire** (EIQ; Prestwich, et al., 2003) The EIQ questionnaire is a measure of Theory of Planned Behavior variables including intention to exercise, attitude toward exercise, perceived behavioral control, social norms, and past exercise behavior. The EIQ is modeled after items used by Prestwich et al. (items originally suggested by Ajzen, 1985) to assess pre-intervention motivation to exercise. Intention to exercise is assessed by five items such as “I intend to exercise more during the next four weeks,” and “How likely is it that you will exercise more over the next four weeks?” Respondents used a 7-point Likert-type scale and total possible intention scores range from 5 to 35. Cronbach’s alpha for these items was 0.95 for the present sample.

Attitude toward exercise was measured with five 7-point bipolar adjective terms including (3) instrumental terms (wise-foolish, beneficial-instrumental,
good-bad) and (2) affective terms (enjoyable-unenjoyable, pleasant-unpleasant). The possible range of attitude scores is 5 to 35. Cronbach’s alpha for these items was 0.73 for the present sample.

Perceived behavioral control was assessed by four items using a 7-point Likert-type scale. Such items include, “I am confident that if I exercise more over the next four week I could stick with it.” These items yielded a Cronbach’s alpha value of 0.73. Subjective norm was assessed by three items in which participants reported their beliefs about others’ views of the participants’ exercising.

Examples of subjective norm items include, “People who are important to me think I should exercise more during the next four weeks,” and “I feel under social pressure to exercise more over the next four weeks.” Total possible subjective norm scores ranged from 3 to 21. Cronbach’s alpha for these items was 0.76. Past exercise behavior was assessed by both individual questions in which participants were asked to rate their physical activity level or to state how many times per week they exercised prior to the study. In addition, they were asked to complete a table that in which they provided the type, location, time, and duration of past exercise for each of the three weeks immediately prior to their participation in the study.

Exercise Self-Efficacy (ESE; Benisovich, Rossi, Norman, & Nigg, 1998). The ESE is an 18-item, multidimensional, self-report measure of confidence in one’s ability to exercise. Respondents use a 5-point Likert-type scale to indicate how confident they are that they can exercise in a variety of conditions such as “My gym is closed,” or “I am under a lot of stress.” Exercise self-efficacy
subscale included in this measure are negative affect, excuse making, exercise alone, inconvenient to exercise, and resistance from others. Possible total exercise self-efficacy scores range from 18 to 90. Cronbach’s alpha for each of the subscales were 0.82, 0.83, 0.87, 0.77, 0.85, and 0.84, respectively. Test-retest reliability for the present sample was 0.61.

**Exercise Diary** - The exercise diary is a form that was provided to participants for the purpose of recording the type, location, time, and duration of their exercise sessions each week for a period of four weeks.

**Post-Experiment Questionnaire (PEQ)** – The PEQ consists of five follow-up items to assess participants’ retrospective intentions to exercise, perceptions of their ability to achieve their exercise goals, recollections of their use of any plans or strategies to aid the attainment of their exercise goals, details of such plans if any were reported, and finally, barriers to the attainment of exercise goals. The first three items on the PEQ use a closed-ended format (e.g., “When you enrolled in this study, did you intend to exercise at least 2 more times per week for a period of 4 weeks?” 1 = Yes, 2 = No). The last two questions were open-ended questions that permitted respondents to describe in detail any strategies used or barriers that prevented them attaining their exercise goals during the 4-week study.

2.4. Additional Materials

All participants were given an exercise education booklet entitled, “Fitness Fundamentals: Guidelines for Personal Exercise Programs” (Appendix H: President’s Council on Physical Fitness and Sports, 2004) that provided
information about the benefits of exercise, general categories of exercise, and exercise safety precautions (e.g., appropriate exercise attire, modifications for exercising in extreme weather conditions, etc.).

2.5. **Present Study Design and Procedure**

As indicated earlier, the present study was comprised of two phases: the screening phase and the intervention phase.

2.5.1. **Screening Phase.** During the screening phase of the study, instructions to all the participants were the same (Appendix E). The experimenter briefly described the main purpose of the experiment, distributed informed consent forms (Appendix F), and then administered the battery of health behavior and dispositional measures. In addition, a recruitment form (Appendix C) for the intervention phase of the study was distributed to participants. Space was provided on the lower half of the recruitment form on which participants could provide their names and contact information. At the conclusion of each experiment session, participants were given written debriefing statements that more fully described the purpose of the study and provided information about research concerning personality and health behaviors (Appendix G).

Only participants who completed the initial battery of physical activity and personality measures and who indicated that they were interested in participating in a study of factors that influence exercise behavior were invited to participate in the intervention phase of the study. Eligible participants, who indicated interest
in the exercise behavior study, were sent an email invitation (Appendix D) in which they were invited to enroll via the REP website in individual half hour intervention sessions (Appendix B).

2.5.2 Intervention Phase. Prior to intervention sessions, the researcher randomized the assignment of participants into one of four experiment conditions: control, implementation intention (IMI), relapse prevention (RP), or combined implementation intention-relapse prevention (IMI-RP) intervention. At the beginning of every session, the experimenter informed the participant that the focus of the proposed study was to assess factors that influence the performance of exercise behavior (Appendix E). In addition, the experimenter briefly described the study to participants including the nature of their time commitment and that the study involved exercise behavior. Before proceeding, the experimenter asked participants to complete a measure of exercise readiness (the PAR-Q described above) in order to screen for individuals for whom exercise would be contraindicated (e.g., those with chest pains or dizziness when exercising). Participants who endorsed any of the 7 items on the PAR-Q were excluded from the study, but given credit for their participation in the first intervention phase session.

All eligible participants were asked to try to exercise two more times per week than they currently exercised, for at least 20 minutes per session (and told that sessions that exceeded 20 minutes still would count as only one session) and to keep records of their exercise behavior each week for a period of 4 weeks. In addition, they were told that the added exercise behavior must be
performed individually (e.g., cycling, jogging, or swimming) rather than as part of a group or team sport (e.g., aerobics class, basketball game) and that it should increase respiration and produce perspiration. Participants were told that at the end of the 4-week period they would attend a final, half-hour session in which they would complete a few questionnaires.

After ascertaining that participants understood the nature of what they would be doing over the course of the four-week period, the experimenter asked all participants to complete the pre-intervention measures of exercise intention, perceived behavioral control, attitude social norms, past exercise behavior (for the three week period of time immediately preceding the session), and exercise self-efficacy. The definition of exercise described above was the same as had been included in the pre-intervention measures. After completing the pre-intervention assessment measures, participants either were given the additional experiment materials (exercise diary and exercise guidelines booklet) and excused (control group), or they were exposed to one of the three active interventions.

2.6. Interventions

Participants were randomly assigned to one of the four experiment conditions. There were three active exercise intervention conditions which included an Implementation Intention (IMI) condition, Relapse Prevention (RP) condition, and a combined Implementation Intention – Relapse Prevention (IMI-RP) condition. The fourth experiment condition was the control condition.
2.6.1. *Implementation Intention Condition.* Participants assigned to the implementation intention (IMI) condition completed the pre-intervention measures and then were asked to exercise two more times per week than they were currently exercising. Next, they completed the Exercise Implementation Intention form (Appendix B) on which they described their specific plans as to where, when, and how they would exercise two more times per week. Specifically, implementation intention condition participants were asked to complete the following statement with as much situational information as possible:

“During the next four weeks, I will ______________________ on ______________________
(Type of Exercise)
(Day of Week) at ___________________________
(Time of Day)
at / in ____________________________________________.
(Location of Exercise)

In addition, IMI condition participants were asked to read their exercise implementation intention aloud to the experimenter, and then to imagine themselves in the specified situation performing the specified exercise. Participants were asked to repeat the exercise implementation intention by stating to themselves:

“If I find myself [in that situation], then, I will [participant’s named exercise].”
Finally, they were given the exercise guidelines booklet and their exercise diaries, instructed how to complete the diaries, informed to turn them in at the end of each week to the experimenter’s lab for credit, and excused.

2.6.2. Relapse Prevention Condition. Participants assigned to the Relapse Prevention (RP) condition having already completed the pre-intervention assessment questionnaires and having been asked to try to exercise two more times per week than they currently were exercising, completed the Exercise Relapse Prevention form (Appendix B) on which they indicated anticipated barriers to exercising and generated problem-solving solutions to those exercise barriers. The RP condition participants were asked to think about the lists of exercise barriers and solutions that they generated and then, asked to read them aloud to the experimenter. At the conclusion of the session, the participants were given the exercise guidelines booklet and their exercise diaries. The experimenter instructed the participants how to complete the diaries and where to turn them in for credit. Participants were then excused. The experimenter retained participants’ lists of exercise barriers and solutions.

2.6.3. Combined Implementation Intention-Relapse Prevention Condition. Participants randomly assigned to the combined IMI-RP condition completed the same pre-assessment questionnaires mentioned above and were instructed to perform the same exercise behavior as the participants in the other conditions. Then, IMI-RP condition participants were asked to complete the Exercise Implementation Intention form on which they elaborated their specific plans for where, when, and how they would exercise two more times per week, and to
follow the same procedure as for the IMI condition participants. Next, the IMI-RP condition participants were asked to complete the Exercise Relapse Prevention form on which they indicated anticipated barriers to exercising and generated problem-solving solutions to those exercise barriers, to think about the lists they generated, and to read aloud their lists to the experimenter. Finally, the IMI-RP condition participants were given the exercise guidelines booklet and exercise diaries, instructed how to complete the diaries, informed where to turn them in for credit, and excused.

2.6.4. Control Condition. Participants assigned to the control condition completed their pre-intervention assessment questionnaires (PAR-Q, EIQ, and ESE), and were then asked to exercise two more times per week than they were exercising at the time they enrolled in the study. Next, they were given the exercise guidelines booklet, their exercise diaries, instructed how to complete the diaries, informed where to turn them in for credit, and excused.

All participants were asked to return their completed exercise diaries each week to the experimenter’s lab for four weeks, and also picked up blank diaries for each subsequent week of the study. When participants returned their Week 3 exercise logs, their Week 4 blank exercise logs were accompanied by instructions to go online to sign up for their final, post-intervention session in which they completed the Exercise Self-Efficacy measure for a second time. They also completed the post-experiment questionnaire. At the conclusion of the post-intervention session, participants were given debriefing statements that described the purpose of the study and provided information about
implementation intentions and health behavior research (Appendix H).

Participants also were informed that lottery winners would be notified via email at
the end of the academic term.

2.7. Power Analysis

In order to determine the statistical power of the present study to detect
the influence of implementation intentions and cognitive disorganization on health
behaviors, a power analysis was conducted using the procedure described in
Cohen (1992) and the statistical software GPOWER (Faul & Erdfelder, 1992). To
date no published study has directly examined the combined effects of
implementation intentions and dispositional characteristics on exercise behavior.
However, a comprehensive meta-analysis by Gollwitzer and Sheeran (as cited in
Sheeran et al, in press) involving 85 implementation intention studies of which
91% employed experiment designs (i.e., random assignment of participants to
experiment conditions) showed that implementation intentions have an effect of
medium large size on behavioral enactment and goal attainment, \( d_+ = .63 \). In the
52 studies where objective measures of performance (versus self-report only
measures) were employed, Sheeran et al found the effect size for
implementation intentions increased to \( d_+ = .72 \). Another review of 13
implementation studies obtained an effect size of \( d_+ = .54 \) for implementation
intentions (Koestner, Lekes, Powers, & Chicoine, 2002). An a priori power
analysis indicated that with a sample size of 108 and setting alpha equal to 0.05,
the present study would have had sufficient power (approximately 0.82) to detect
a medium-large sized effect (\( f = 0.33 \)) in analysis of covariance. As mentioned
earlier, the full sample recruited for the present study consisted of 124 participants. However, with attrition from the study and the exclusion of 14 other participants, the remaining sample was reduced to 92 participants. A post hoc power analysis of the present study, with a sample size of 92 participants with 4 groups and setting alpha equal to 0.05 revealed that the study had power of approximately 0.74 to detect a medium-large treatment effect.

2.8. Statistical Procedure

Data analyses proceeded in the following manner: First, randomization checks of the final sample \( N = 92 \) of participants into the four different intervention conditions (Control, Implementation Intention, Relapse Prevention, or Combined Implementation Intention-Relapse Prevention) were conducted by investigating whether groups differed significantly with respect to demographic, pre-intervention exercise behavior, or baseline individual difference variables. These variables included age; motivational variables such as exercise self-efficacy, Theory of Planned Behavior constructs including intention to exercise, perceived behavioral control, and social norms; personality variables such as personal disorganization, extraversion, agreeableness, openness, conscientiousness, emotional stability, social desirability, self-esteem, trait anxiety, procrastination, and optimism; and additional psychosocial variables predicted to influence exercise behavior such as depression, positive affect, and negative affect. Pre-intervention exercise behavior (frequency of exercise session, mean exercise session duration, and total exercise time per week) was assessed because it was assumed that previous exercise behavior would be
highly correlated with post-intervention exercise behavior and therefore should be included as a covariate in subsequent analyses of intervention effects on exercise behavior. Univariate analyses of variance were conducted on all variables measured on continuous scales using intervention condition as the between-subject factor. Nominative scale variables were tested using Chi-square tests of independence. Alpha level was restricted to 0.05 for all analyses in this study unless otherwise specified.

Next, an attrition analysis was performed to determine if the participants who withdrew from the study were significantly different from those who remained in the study with respect to demographic, pre-intervention exercise behavior, or baseline individual difference variables. The same set of analyses were performed as mentioned above with regard to age, pre-intervention exercise behavior, motivational, personality, and other individual difference variables. Again, one-way ANOVAs were performed on all continuous variables with participation status (drop-out versus remained) as the between-subjects factor.

A series of Pearson correlational coefficients were computed to explore possible associations among the various individual difference measures and the dependent variables of interest, and to determine if any of the TPB variables or personal disorganization, would be appropriately used as covariates in subsequent analyses. In order to be relevant, the covariates must have been reasonably correlated (absolute value of Pearson $r \leq 0.20$) with the dependent variable of interest, and have been relatively uncorrelated with each other
(Keppel, 1991). In addition, no more than three covariates would have been used in each ANCOVA in order to conserve statistical power.

The primary goal of this study was to compare the efficacy of an implementation intention intervention, a relapse prevention intervention, or an integrated intervention to promote exercise behavior. In order to determine whether the four treatment conditions (Implementation Intentions, Relapse Prevention, Combined Implementation Intention-Relapse Prevention, and Control) produced significant effects on exercise behavior a series of repeated measures analyses of covariance were conducted with intervention condition, personal disorganization group, and sex as the between-subjects factors and the four-week time interval as the within-subjects factor. As mentioned previously, relevant covariates included in each ANCOVA were based on a priori hypotheses and confirmed correlations with the dependent variables. Frequency of weekly exercise sessions, mean exercise session duration, and total exercise time per week were the dependent variables of interest in the principal analyses.

Exercise self-efficacy scores were compared pre- and post-intervention to explore whether intervention condition influenced participants’ confidence in their ability to exercise. A repeated measures analyses of variance was conducted with intervention condition as the between-subjects factor and the pre-intervention and post-intervention (Time1 and Time2) time interval as the within-subjects factor.

Post-experiment questionnaire data were examined to further assess retrospective intention to exercise, to determine whether participants were aware
of experiment interventions (i.e., were participants in the implementation intention conditions more likely to report they had “plans” that helped them to achieve their goals), and to gather additional information about barriers to increasing frequency of exercise sessions during the study. Qualitative and quantitative methods were used to gather relevant information from the post-experiment data.
CHAPTER 3

RESULTS

3.1. Randomization Checks

To ascertain that the randomization of study participants to the four experiment conditions (Control, Implementation Intention, Relapse Prevention, or Combined Implementation Intention-Relapse Prevention) resulted in equivalent pre-intervention groups, one-way analyses of variance were conducted. Means and standard deviations are displayed in Table 3.1. Comparisons of the four intervention groups on demographic and pre-intervention measures of motivational or Theory of Planned Behavior (TPB) constructs (i.e., exercise self-efficacy, intention to exercise, perceived behavioral control, social norm regarding exercise), past exercise behavior or physical activity level did not reveal any significant differences between groups (all p-values > 0.15). Intervention groups did not differ with respect to participants’ age, exercise self-efficacy, perceived behavioral control, attitude toward exercise, and social norm (all p-values > 0.20). Nor did the groups differ significantly with respect to baseline measures of intention to exercise, \( F(3, 88) = 1.78, p = 0.15 \).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Control</th>
<th>Implementation</th>
<th>Relapse Prevention</th>
<th>Combined II-RP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>20.26</td>
<td>3.53</td>
<td>19</td>
<td>19.33</td>
</tr>
<tr>
<td><strong>TPB/Motivational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise Self-Efficacy</td>
<td>58.84</td>
<td>12.28</td>
<td>19</td>
<td>62.46</td>
</tr>
<tr>
<td>Intention to Exercise</td>
<td>32.74</td>
<td>2.26</td>
<td>19</td>
<td>32.42</td>
</tr>
<tr>
<td>Perceived Behavioral Control</td>
<td>22.58</td>
<td>2.87</td>
<td>19</td>
<td>22.79</td>
</tr>
<tr>
<td>Attitude Toward Exercise</td>
<td>29.89</td>
<td>5.26</td>
<td>19</td>
<td>31.38</td>
</tr>
<tr>
<td><strong>Past Exercise Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times Per Week</td>
<td>2.34</td>
<td>1.63</td>
<td>19</td>
<td>2.83</td>
</tr>
<tr>
<td>Mean Frequency Per Week</td>
<td>2.05</td>
<td>1.56</td>
<td>19</td>
<td>2.76</td>
</tr>
<tr>
<td>Mean Session Duration</td>
<td>32.35</td>
<td>26.32</td>
<td>19</td>
<td>46.44</td>
</tr>
<tr>
<td>Mean Total Min Per Week</td>
<td>93.82</td>
<td>95.41</td>
<td>19</td>
<td>126.70</td>
</tr>
<tr>
<td>HPAS Sport Index</td>
<td>3.05</td>
<td>1.39</td>
<td>19</td>
<td>3.30</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPAS Work Index</td>
<td>2.68</td>
<td>0.48</td>
<td>19</td>
<td>2.38</td>
</tr>
<tr>
<td>HPAS Leisure Index</td>
<td>2.99</td>
<td>0.44</td>
<td>19</td>
<td>2.39</td>
</tr>
</tbody>
</table>

Table 3.1 Means and standard deviations of demographic pre-intervention measures of TPB/motivational constructs, past exercise, and physical activity by condition. No significant differences between treatment conditions.
Neither did treatment groups differ with respect to pre-intervention measures of past exercise behavior including reported exercise frequency (i.e., times per week participants exercised - single item response); mean exercise frequency (i.e., times per week participants exercised - calculated from table); mean number of minutes per exercise session; or mean number of minutes per week exercising (all $p$-values >0.15). Neither were there significant group differences based on HPAS Sport Index scores, or other measures of physical activity such as the HPAS Leisure Index or HPAS Work Index scores (all $p$-values > 0.15).

Baseline comparisons of psychosocial variables were conducted between intervention groups, again, to evaluate pre-intervention equivalence of groups. Means and standard deviations are displayed in Table 3.2. A one-way ANOVA revealed a significant difference between treatment groups with respect to mean openness scores, $F (3, 83) = 3.42$, $p = 0.02$. Specifically, participants in the Control condition reported significantly higher trait openness scores as measured by the Goldberg “Big-Five” unipolar markers inventory than did participants in the other three intervention conditions. Pairwise comparisons revealed no significant differences between mean openness scores for the Implementation Intention, Relapse Prevention, or Combined Implementation Intention-Relapse Prevention conditions. Openness scores were not significantly correlated with any of the past exercise behavior variables or the dependent variables (frequency of
<table>
<thead>
<tr>
<th>Variable</th>
<th>Control M</th>
<th>Control SD</th>
<th>Control n</th>
<th>Implementation M</th>
<th>Implementation SD</th>
<th>Implementation n</th>
<th>Relapse Prevention M</th>
<th>Relapse Prevention SD</th>
<th>Relapse Prevention n</th>
<th>Combined I-RP M</th>
<th>Combined I-RP SD</th>
<th>Combined I-RP n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Psychosocial Measures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cognitive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dysorganization</td>
<td>34.58</td>
<td>14.23</td>
<td>19</td>
<td>37.23</td>
<td>15.26</td>
<td>24</td>
<td>35.13</td>
<td>12.86</td>
<td>23</td>
<td>38.00</td>
<td>15.00</td>
<td>24</td>
</tr>
<tr>
<td>Social Desirability</td>
<td>19.00</td>
<td>3.11</td>
<td>18</td>
<td>16.09</td>
<td>5.53</td>
<td>23</td>
<td>16.04</td>
<td>3.88</td>
<td>23</td>
<td>17.12</td>
<td>4.80</td>
<td>25</td>
</tr>
<tr>
<td>Openness*</td>
<td>131.28</td>
<td>15.29</td>
<td>18</td>
<td>120.00</td>
<td>21.35</td>
<td>21</td>
<td>115.54</td>
<td>18.20</td>
<td>24</td>
<td>117.92</td>
<td>13.06</td>
<td>24</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>126.71</td>
<td>27.51</td>
<td>17</td>
<td>116.32</td>
<td>20.42</td>
<td>19</td>
<td>121.70</td>
<td>16.92</td>
<td>23</td>
<td>117.00</td>
<td>22.46</td>
<td>25</td>
</tr>
<tr>
<td>Extraversion</td>
<td>107.44</td>
<td>21.56</td>
<td>16</td>
<td>101.71</td>
<td>14.62</td>
<td>17</td>
<td>100.45</td>
<td>16.69</td>
<td>22</td>
<td>93.73</td>
<td>18.71</td>
<td>22</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>140.33</td>
<td>9.35</td>
<td>15</td>
<td>133.87</td>
<td>17.79</td>
<td>23</td>
<td>130.77</td>
<td>18.25</td>
<td>22</td>
<td>133.28</td>
<td>16.24</td>
<td>25</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>90.43</td>
<td>22.99</td>
<td>14</td>
<td>90.81</td>
<td>21.24</td>
<td>16</td>
<td>93.47</td>
<td>14.84</td>
<td>19</td>
<td>88.50</td>
<td>13.95</td>
<td>20</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>37.63</td>
<td>10.88</td>
<td>19</td>
<td>41.60</td>
<td>10.33</td>
<td>20</td>
<td>38.92</td>
<td>9.26</td>
<td>24</td>
<td>41.00</td>
<td>11.01</td>
<td>23</td>
</tr>
<tr>
<td>Procrastination</td>
<td>54.74</td>
<td>13.64</td>
<td>19</td>
<td>58.21</td>
<td>11.86</td>
<td>24</td>
<td>54.50</td>
<td>9.31</td>
<td>24</td>
<td>60.92</td>
<td>13.00</td>
<td>25</td>
</tr>
<tr>
<td>Dispositional</td>
<td>21.17</td>
<td>5.27</td>
<td>18</td>
<td>21.83</td>
<td>5.34</td>
<td>24</td>
<td>22.21</td>
<td>4.50</td>
<td>24</td>
<td>20.40</td>
<td>5.55</td>
<td>25</td>
</tr>
<tr>
<td>Optimism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Esteem</td>
<td>33.05</td>
<td>4.68</td>
<td>19</td>
<td>32.09</td>
<td>5.98</td>
<td>23</td>
<td>31.68</td>
<td>5.177</td>
<td>22</td>
<td>31.64</td>
<td>5.20</td>
<td>25</td>
</tr>
<tr>
<td><strong>Depressive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>11.21</td>
<td>8.32</td>
<td>19</td>
<td>13.71</td>
<td>9.10</td>
<td>24</td>
<td>11.58</td>
<td>7.66</td>
<td>24</td>
<td>11.72</td>
<td>8.49</td>
<td>25</td>
</tr>
<tr>
<td>Positive Affectivity</td>
<td>35.89</td>
<td>7.28</td>
<td>19</td>
<td>33.83</td>
<td>8.52</td>
<td>24</td>
<td>36.13</td>
<td>5.53</td>
<td>24</td>
<td>35.00</td>
<td>6.73</td>
<td>25</td>
</tr>
<tr>
<td>Negative Affectivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2. Means and standard deviations of pre-intervention measures of psychosocial measures by condition. With one exception, there were no significant differences between the conditions with respect to baseline measures of personality and psychosocial variables. (*Control group had significantly higher mean Openness score than other three treatment groups, $F (3, 83) = 5.19, p = .03$).
exercise sessions per week, duration of exercise sessions, or total weekly minutes of exercise) at any of the four weekly time periods (absolute value of all Pearson r’s ≤ 0.07, all p’s > 0.15.

Additional univariate ANOVAs revealed that the intervention groups did not differ with respect to any other personality or psychosocial variables (all p-values > 0.15). No significant differences were found between treatment groups with respect to personal disorganization, procrastination, self-esteem, optimism, extraversion, emotional stability, agreeableness, conscientiousness, social desirability, trait anxiety, depressive symptoms, positive affectivity, or negative affectivity. In sum, the results suggest that treatment groups could be considered equivalent with regard to key pre-intervention variables of interest.

3.2. Attrition Analysis

An analysis was conducted to compare participants who dropped out of the study with those who remained for the entire four-week period of time. As mentioned earlier, eighteen participants withdrew from the study. Chi-square tests of independence indicated no significant association between intervention condition ($X^2(3) = 3.21, p > 0.15$) and exercise study attrition, or sex ($X^2(1) = 1.17, p > 0.15$) and exercise study attrition (see Table 3.3 and Table 3.4, respectively). That is, participants who withdrew from the study were no more likely to have been assigned into one particular intervention condition than any other. In addition, approximately equal numbers of male and female participants withdrew from the study. A Chi-square test of independence with
<table>
<thead>
<tr>
<th>Participation Status</th>
<th>Control (n = 26)</th>
<th>Implementation Intention (n = 27)</th>
<th>Relapse Prevention (n = 27)</th>
<th>Combined II-RP (n = 30)</th>
<th>$\chi^2 (3)$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remained</td>
<td>19</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>3.21</td>
<td>0.36</td>
</tr>
<tr>
<td>(n = 92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrew</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3. Number of participants remaining versus withdrawing from study by intervention condition.
<table>
<thead>
<tr>
<th>Sex</th>
<th>Men (n = 34)</th>
<th>Women (n = 76)</th>
<th>$X^2$ (1)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remained</td>
<td>26</td>
<td>66</td>
<td>1.17</td>
<td>0.28</td>
</tr>
<tr>
<td>(n = 92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrew</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4. Number of participants remaining versus withdrawing from study by sex.
continuity correction revealed a significant association between ethnicity and participation status ($\chi^2(1) = 8.10$, $p = 0.004$). Ethnic minority participants were significantly more likely to withdraw from the study than were white/Caucasian participants. Participation status by ethnicity is shown in Table 3.5.

Univariate analyses of variance were conducted to compare participants who withdrew from the study with participants who remained in the study on key pre-intervention variables of interest such as age, exercise self-efficacy, intention to exercise, attitude toward exercise, perceived behavioral control, social norms regarding exercise, past exercise behavior, and physical activity. Means and standard deviations are shown in Table 3.6. A one-way ANOVA revealed a significant difference between groups for HPAS Work Index scores, $F(1, 102) = 3.93$, $p = 0.05$. That is, participants who withdrew from the study reported higher levels of physical activity in their daily jobs than did those participants who remained in the study. With respect to age, participants who withdrew did not differ from participants who remained in the study, $F(1, 108) = 2.01$, $p > 0.15$. Study drop-outs and remainers did not differ with respect to self-report measures of TPB constructs intention to exercise, subjective norm, attitude toward exercise (all $p$-values $>0.15$); perceived behavioral control ($p > 0.09$). Nor did the two groups differ with respect to exercise self-efficacy, ($p > 0.15$). Study drop-outs and remainers did not differ with respect to pre-intervention measures of past exercise behavior including exercise frequency, session duration, or total time per week (all $p$-values $>0.15$).
### Table 3.5

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>White/Caucasian (n = 101)</th>
<th>Black (n = 2)</th>
<th>Hispanic (n = 3)</th>
<th>Asian (n = 3)</th>
<th>Asian-Indian (n = 1)</th>
<th>( \chi^2 ) (( r ))</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participation Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remained</td>
<td>88</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>8.10</td>
<td>.004</td>
</tr>
<tr>
<td>(n = 92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrew</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.5 Number of participants remaining versus withdrawing from study by ethnicity. (Note: Chi-square statistic based on 2 x 2 table: participation status (remained versus withdrew) by ethnicity (white versus ethnic minority).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Remainders</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>19.71</td>
<td>3.09</td>
<td>92</td>
<td>18.67</td>
<td>0.69</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td><strong>TPB/Motivational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise Self-Efficacy</td>
<td>60.10</td>
<td>12.57</td>
<td>92</td>
<td>62.11</td>
<td>13.60</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Intention to Exercise</td>
<td>31.52</td>
<td>3.83</td>
<td>92</td>
<td>31.22</td>
<td>4.00</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Perceived Behavioral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>22.03</td>
<td>3.57</td>
<td>92</td>
<td>23.5</td>
<td>2.01</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Subjective Norms</td>
<td>14.46</td>
<td>2.23</td>
<td>92</td>
<td>14.06</td>
<td>2.90</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Attitude Toward</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>30.80</td>
<td>4.11</td>
<td>92</td>
<td>31.06</td>
<td>3.00</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td><strong>Past Exercise Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times Per Week</td>
<td>2.64</td>
<td>1.46</td>
<td>92</td>
<td>2.28</td>
<td>1.27</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Mean Times Per Wk</td>
<td>2.42</td>
<td>1.48</td>
<td>91</td>
<td>2.37</td>
<td>1.56</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Mean Min/Session</td>
<td>38.89</td>
<td>24.08</td>
<td>91</td>
<td>46.56</td>
<td>40.20</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Mean Min/Per Week</td>
<td>106.75</td>
<td>86.52</td>
<td>91</td>
<td>141.04</td>
<td>117.33</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>HPAS Sport Index</td>
<td>3.34</td>
<td>1.25</td>
<td>92</td>
<td>3.38</td>
<td>1.11</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPAS Work Index*</td>
<td>2.63</td>
<td>0.40</td>
<td>87</td>
<td>2.85</td>
<td>0.53</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>HPAS Leisure Index</td>
<td>2.92</td>
<td>0.48</td>
<td>92</td>
<td>3.08</td>
<td>0.46</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.6. Means and standard deviations of pre-intervention measures of TPB/motivational constructs, exercise, and physical activity by participation status. (Note: *Means significantly different, $p = 0.05$; no other significant differences between groups).
Neither did participants who remained in the study differ from those who withdrew with respect to HPAS Sport Index or HPAS Leisure Index scores, (all \( p \)-values >0.19).

Participants who withdrew from the study and those who remained in the study differed at baseline with respect to several personality or psychosocial variables (see Table 3.7 for means and standard deviations). Univariate analyses of variance indicated that participants who withdrew from the study differed significantly from those who remained in the study with respect to mean personal disorganization scores, \( F (1, 106) = 11.72, p = 0.001 \) and a self-reported measure of procrastination, \( F (1, 108) = 6.03, p = 0.02 \) such that participants who withdrew reported significantly higher levels of personal disorganization and procrastination. In addition, study drop-outs significantly differed from study remainers with respect to trait anxiety, \( F (1, 102) = 6.18, p = 0.02 \) and level of depressive symptoms reported, \( F (1, 108) = 5.66, p = 0.02 \). Specifically, participants who withdrew from the study reported higher levels of trait anxiety and depressive symptoms than did the participants who remained in the study. Participants who remained in the study differed from those who withdrew from the study with regard to conscientiousness as assessed by a self-report measure, \( F (1, 98) = 5.15, p = 0.03 \). Study remainers described themselves as being more conscientious than did study drop-outs. With respect to social desirability or defensiveness in responding, the two groups
<table>
<thead>
<tr>
<th>Variable</th>
<th>Remainers</th>
<th>Drop-Outs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Personal disorganization**</td>
<td>36.83</td>
<td>14.42</td>
</tr>
<tr>
<td>Social Desirability*</td>
<td>16.85</td>
<td>4.62</td>
</tr>
<tr>
<td>Openness</td>
<td>120.64</td>
<td>18.00</td>
</tr>
<tr>
<td>Conscientiousness*</td>
<td>119.26</td>
<td>22.14</td>
</tr>
<tr>
<td>Extraversion</td>
<td>100.48</td>
<td>18.46</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>133.86</td>
<td>16.40</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>91.13</td>
<td>17.60</td>
</tr>
<tr>
<td>Trait Anxiety*</td>
<td>39.93</td>
<td>10.35</td>
</tr>
<tr>
<td>Procrastination*</td>
<td>57.60</td>
<td>12.31</td>
</tr>
<tr>
<td>Optimism</td>
<td>21.46</td>
<td>2.13</td>
</tr>
<tr>
<td>Self-Esteem</td>
<td>32.17</td>
<td>5.23</td>
</tr>
<tr>
<td>Depressive Symptoms*</td>
<td>12.04</td>
<td>8.33</td>
</tr>
<tr>
<td>Positive Affectivity</td>
<td>35.20</td>
<td>7.02</td>
</tr>
<tr>
<td>Negative Affectivity</td>
<td>19.57</td>
<td>5.79</td>
</tr>
</tbody>
</table>

Table 3.7. Means and standard deviations of pre-intervention measures of psychosocial measures by participation status.

*p < 0.05, **p < 0.01
differed significantly, $F(1, 105) = 4.13, p = 0.05$ with participants who remained in the study endorsing items consistent with greater social desirability or defensive responding than did participants who withdrew from the study.

Participants who withdrew from the study did not differ from those who remained in the study with respect to self-reports of extraversion, agreeableness, emotional stability, or openness (all $p$-values $> 0.15$). Neither did the two groups differ with regard to self-esteem or dispositional optimism ($p$-values $> 0.10$). Study remainers did not differ significantly from study drop-outs with respect to positive affectivity or negative affectivity ($p$-values $> 0.06$). To summarize, participants who withdrew from the study reported significantly higher levels of personal disorganization, procrastination, trait anxiety, and depressive symptoms than did participants who remained in the study. Furthermore, study remainers reported significantly higher levels of conscientiousness and social desirability than did study drop outs. Exercise study drop-outs and remainers did not differ, however, in terms of age, past exercise behavior, or remaining individual difference variables.

3.3. Correlations Among Individual Difference Variables

Pearson correlations were computed between personal disorganization and each of the other individual difference variables (see Table 3.8). Personal disorganization (SPDS) scores were significantly negatively correlated with measures of agreeableness, conscientiousness, self-esteem, positive affectivity and optimism (absolute value of all Pearson $r$’s $\geq 0.40$, all $p$-values $< 0.001$).
<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise Self-Efficacy</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Attitude Toward Exercise</td>
<td></td>
<td>0.30**</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived Behavioral Control</td>
<td></td>
<td>0.45**</td>
<td>0.32**</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Intention to Exercise</td>
<td></td>
<td>0.35**</td>
<td>0.20</td>
<td>0.60**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Subjective Norm</td>
<td></td>
<td>0.18</td>
<td>0.17</td>
<td>0.28**</td>
<td>0.50**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Personal Disorganization</td>
<td>0.16</td>
<td>-0.16</td>
<td>-0.10</td>
<td>-0.05</td>
<td>0.01</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Extraversion</td>
<td>0.21</td>
<td>0.11</td>
<td>0.12</td>
<td>0.17</td>
<td>0.08</td>
<td>-0.24*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Agreeableness</td>
<td></td>
<td>0.23*</td>
<td>0.22*</td>
<td>0.05</td>
<td>0.03</td>
<td>-0.03</td>
<td>-0.40**</td>
<td>0.34**</td>
<td>1.00</td>
</tr>
<tr>
<td>9. Conscientiousness</td>
<td></td>
<td>0.19</td>
<td>0.22*</td>
<td>0.08</td>
<td>0.05</td>
<td>-0.03</td>
<td>-0.81**</td>
<td>0.26*</td>
<td>0.60**</td>
</tr>
<tr>
<td>10. Emotional Stability</td>
<td>0.05</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.12</td>
<td>-0.17</td>
<td>-0.09</td>
<td>0.30*</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>11. Openness</td>
<td></td>
<td>0.23*</td>
<td>0.10</td>
<td>0.08</td>
<td>0.19</td>
<td>0.13</td>
<td>-0.25*</td>
<td>0.46**</td>
<td>0.53**</td>
</tr>
<tr>
<td>12. Social Desirability</td>
<td>0.21</td>
<td>0.20</td>
<td>0.14</td>
<td>-0.01</td>
<td>-0.14</td>
<td>-0.28**</td>
<td>0.21</td>
<td>0.46**</td>
<td>0.35**</td>
</tr>
<tr>
<td>13. Self-Esteem</td>
<td>0.07</td>
<td>0.20</td>
<td>0.11</td>
<td>-0.01</td>
<td>-0.20</td>
<td>-0.40**</td>
<td>0.42**</td>
<td>0.35**</td>
<td>0.44**</td>
</tr>
<tr>
<td>14. Procrastination</td>
<td>-0.17</td>
<td>-0.18</td>
<td>-0.09</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.67**</td>
<td>-0.29**</td>
<td>-0.38**</td>
<td>-0.71**</td>
</tr>
<tr>
<td>15. Optimism</td>
<td>0.10</td>
<td>0.25*</td>
<td>0.15</td>
<td>0.07</td>
<td>-0.12</td>
<td>-0.42**</td>
<td>-0.37**</td>
<td>0.17</td>
<td>0.37**</td>
</tr>
<tr>
<td>16. Trait Anxiety</td>
<td>-0.08</td>
<td>-0.15</td>
<td>-0.13</td>
<td>-0.02</td>
<td>0.18</td>
<td>0.55**</td>
<td>-0.49**</td>
<td>-0.35**</td>
<td>-0.53**</td>
</tr>
<tr>
<td>17. Depression</td>
<td>-0.14</td>
<td>-0.10</td>
<td>-0.05</td>
<td>-0.05</td>
<td>-0.10</td>
<td>0.49**</td>
<td>-0.40**</td>
<td>-0.32**</td>
<td>-0.50**</td>
</tr>
<tr>
<td>18. Positive Affect</td>
<td>-0.13</td>
<td>0.17</td>
<td>0.10</td>
<td>-0.10</td>
<td>-0.20</td>
<td>-0.47**</td>
<td>0.42**</td>
<td>-0.34**</td>
<td>0.58**</td>
</tr>
<tr>
<td>19. Negative Affect</td>
<td>-0.22*</td>
<td>-0.17</td>
<td>-0.08</td>
<td>-0.03</td>
<td>0.13</td>
<td>0.48**</td>
<td>-0.34**</td>
<td>-0.35**</td>
<td>-0.46**</td>
</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01.

Continued

Table 3.8. Zero-order correlations among baseline individual difference variables.
Table 3.8 continued

<table>
<thead>
<tr>
<th>Variable</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Attitude Toward Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived Behavioral Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Intention to Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Subjective Norm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cognitive Dysorganization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Extraversion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Agreeableness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Conscientiousness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Emotional Stability</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Openness</td>
<td>.23*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Social Desirability</td>
<td>.38** .23*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Self Esteem</td>
<td>.32** .34** .32**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Procrastination</td>
<td>-.31** -.24* -.41** -.27*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Optimism</td>
<td>.29* .17 .23* .78** -.34**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Trait Anxiety</td>
<td>-.50** -.26* -.36** -.85** .51** -.81**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Depression</td>
<td>-.28* -.18 -.29** -.74** .35** -.72** .88**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Positive Affect</td>
<td>.26* .35** .26* .70** -.43** .58** -.75** -.68**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Negative Affect</td>
<td>-.53** -.20 -.37** -.64** .36** -.62** .80** .74** -.52**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05, ** p < 0.01.
Personal disorganization was also significantly negatively associated with extraversion, openness, and social desirability (absolute value of all Pearson $r$'s $\geq 0.24$, all $p$-values $< 0.05$). Significant positive correlations were found between SPDS scores and procrastination, trait anxiety, depression, and negative affectivity (absolute value of all Pearson $r$'s $\geq 0.48$, all $p$-values $< 0.001$); however, personal disorganization was not found to be related to any of the TPB variables (i.e., intention to exercise, attitude toward exercise, perceived behavioral control, or social norm; absolute value of all Pearson $r$’s $\leq 0.10$, all $p$'s $> 0.35$). Neither were SPDS scores significantly correlated with exercise self-efficacy scores ($r = -0.16$, $p > 0.10$).

Exercise self-efficacy was significantly positively correlated with three TPB variables: perceived behavioral control, intention to exercise, and attitude toward exercise (absolute value of all Pearson $r$’s $\geq 0.33$, $p$-values $< 0.001$); but not significantly correlated with subjective norm ($r = 0.18$, $p = 0.10$). In addition, exercise self-efficacy was significantly positively associated with agreeableness and openness (absolute value of all Pearson $r$’s $= 0.23$, $p$-values $< 0.05$). By contrast, negative affect was significantly negatively correlated with exercise self-efficacy ($r = -0.22$, $p = 0.04$).

Perceived behavioral control (PBC) was most highly correlated with intention to exercise ($r = 0.60$, $p < .001$). PBC also was positively correlated with other TPB variables, attitude toward exercise and subjective norm (absolute value of all Pearson $r$’s $\geq 0.28$, $p$-values $\leq 0.01$). Attitude toward exercise was significantly positively associated with conscientiousness, agreeableness, and
optimism (absolute value of all Pearson $r'$ s $\geq 0.22$, $p$-values $\leq 0.01$).

Intercorrelations among the baseline TPB, personality, and other individual difference variables were further investigated. None of the remaining individual difference measures were significantly correlated with any of the motivational/TPB variables.

3.4. Correlations Between Individual Difference and Exercise Variables

In order to determine which baseline individual difference variables, if any, should be included as covariates in subsequent analyses of covariance, correlational analyses were performed to examine relationships between those Individual difference variables and the dependent exercise variables of interest in the present study.

3.4.1 Correlations Between Individual Difference Variables and Exercise Frequency. Exercise self-efficacy was significantly correlated with frequency of exercise sessions (absolute value of all Pearson $r'$ s $\geq 0.32$, all $p$'s $< 0.01$) during each of the four week time intervals of the study. Zero-order correlations are displayed in Table 3.9. Correlational analyses also revealed a significant relationship between perceived behavioral control and exercise frequency. Perceived behavioral control was positively correlated with exercise frequency during all four time intervals (absolute value of all Pearson $r'$ s $\geq 0.24$, all $p$-values $< 0.03$). Attitude toward exercise was significantly positively correlated with frequency of exercise for the first, third, and fourth weeks of the study.
### Table 3.9. Correlations among individual difference measures and frequency of exercise sessions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise Self-Efficacy</td>
<td>.42**</td>
<td>.32**</td>
<td>.36**</td>
<td>.34**</td>
</tr>
<tr>
<td>2. Perceived Behavioral Control</td>
<td>.32**</td>
<td>.29**</td>
<td>.24*</td>
<td>.28**</td>
</tr>
<tr>
<td>3. Attitude Toward Exercise</td>
<td>.36**</td>
<td>.20</td>
<td>.26**</td>
<td>.24**</td>
</tr>
<tr>
<td>4. Intention to Exercise</td>
<td>.10</td>
<td>.07</td>
<td>.04</td>
<td>-.01</td>
</tr>
<tr>
<td>5. Subjective Norm</td>
<td>.06</td>
<td>-.08</td>
<td>-.06</td>
<td>-.10</td>
</tr>
<tr>
<td>6. Personal Disorganization</td>
<td>-.22*</td>
<td>-.15</td>
<td>-.29**</td>
<td>-.22*</td>
</tr>
<tr>
<td>7. Extraversion</td>
<td>.12</td>
<td>.12</td>
<td>.09</td>
<td>.10</td>
</tr>
<tr>
<td>8. Agreeableness</td>
<td>.09</td>
<td>.06</td>
<td>.08</td>
<td>.10</td>
</tr>
<tr>
<td>9. Conscientiousness</td>
<td>.15</td>
<td>.10</td>
<td>.18</td>
<td>.16</td>
</tr>
<tr>
<td>10. Emotional Stability</td>
<td>-.05</td>
<td>.01</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>11. Openness</td>
<td>.05</td>
<td>-.01</td>
<td>-.08</td>
<td>-.04</td>
</tr>
<tr>
<td>12. Social Desirability</td>
<td>.14</td>
<td>.18</td>
<td>.11</td>
<td>.16</td>
</tr>
<tr>
<td>13. Self-Esteem</td>
<td>.07</td>
<td>.11</td>
<td>-.04</td>
<td>-.02</td>
</tr>
<tr>
<td>14. Trait Anxiety</td>
<td>-.07</td>
<td>-.13</td>
<td>-.08</td>
<td>-.04</td>
</tr>
<tr>
<td>15. Procrastination</td>
<td>-.18</td>
<td>-.18</td>
<td>-.31**</td>
<td>-.23*</td>
</tr>
<tr>
<td>16. Depression</td>
<td>-.10</td>
<td>-.08</td>
<td>-.01</td>
<td>-.02</td>
</tr>
<tr>
<td>17. Positive Affect</td>
<td>.18</td>
<td>.14</td>
<td>.02</td>
<td>.10</td>
</tr>
<tr>
<td>18. Negative Affect</td>
<td>-.02</td>
<td>.01</td>
<td>.01</td>
<td>.08</td>
</tr>
<tr>
<td>19. Optimism</td>
<td>.12</td>
<td>.15</td>
<td>.10</td>
<td>.05</td>
</tr>
</tbody>
</table>

* * p < 0.05, ** p < 0.01.
Subjective norm was not significantly correlated with exercise frequency (absolute value of all Pearson $r$'s $\leq 0.10$, $p$'s $>0.15$). Interestingly, analyses revealed no significant relationship between intention to exercise and exercise frequency (absolute value of all Pearson $r$'s $\leq 0.05$, all $p$'s $> 0.15$).

Personal disorganization was significantly negatively correlated with exercise frequency, during three of the four weeks of the study (absolute value of Pearson $r$'s $\geq 0.22$, $p \leq 0.05$). Procrastination was significantly negatively correlated with exercise frequency during the third and fourth weeks of the study (all $r$'s $>-0.23$, $p$'s $< 0.03$), but not during the first two weeks of the study. Correlational analyses failed to detect significant relationships between scores on the remaining individual difference measures and exercise frequency (all $r$'s $\leq 0.18$, all $p$'s $> 0.15$). In sum, correlational analyses identified consistent significant positive relationships between exercise frequency and exercise self-efficacy and perceived behavioral control. Attitude toward exercise also was significantly associated with exercise frequency, but less consistently than were the above-mentioned two variables. Personal disorganization was negatively associated with exercise frequency. A less consistent but significant negative relationship was demonstrated between exercise frequency and procrastination. The remaining individual difference measures were not consistently significantly correlated with exercise frequency.
Correlations Between Individual Difference Variables and Exercise Session Duration. Correlational analyses were performed to examine relationships between individual difference variables and exercise session duration. These analyses failed to detect consistent significant relationships between any of the motivational, TPB, personality, or other psychosocial variables and exercise session duration (see Table 3.10 for zero-order correlations). Exercise self-efficacy, perceived behavioral control, and attitude toward exercise all were significantly positively correlated with exercise session duration (absolute value of Pearson $r$'s $\geq 0.24$, $p$-values $\leq 0.05$), but in each case, only during the fourth week of the study. Correlational analyses revealed no significant association between intention to exercise and session duration (absolute value of all Pearson $r$'s $\leq 0.19$, $p$-values $\geq 0.07$).

Positive affectivity was significantly positively correlated with session duration ($r = 0.21$, $p = 0.05$), but only during the second week of the study. Correlational analyses failed to detect significant relationships between any of the other self-report individual difference measures and exercise session duration (absolute value of all Pearson $r$'s $\leq 0.20$, all $p$'s $> 0.15$). To summarize, correlational analyses indicated that exercise session duration was not consistently significantly correlated with any of the motivational, TPB, personality, or other individual difference variables.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise Self-Efficacy</td>
<td>-.13</td>
<td>.06</td>
<td>.08</td>
<td>.25*</td>
</tr>
<tr>
<td>2. Perceived Behavioral Control</td>
<td>-.11</td>
<td>.05</td>
<td>.13</td>
<td>.27*</td>
</tr>
<tr>
<td>3. Attitude Toward Exercise</td>
<td>.13</td>
<td>.08</td>
<td>.13</td>
<td>.24*</td>
</tr>
<tr>
<td>4. Intention to Exercise</td>
<td>-.19</td>
<td>-.10</td>
<td>-.02</td>
<td>.12</td>
</tr>
<tr>
<td>5. Subjective Norm</td>
<td>-.01</td>
<td>-.12</td>
<td>-.14</td>
<td>-.12</td>
</tr>
<tr>
<td>6. Personal Disorganization</td>
<td>-.17</td>
<td>-.15</td>
<td>-.17</td>
<td>-.03</td>
</tr>
<tr>
<td>7. Extraversion</td>
<td>.03</td>
<td>.09</td>
<td>-.01</td>
<td>-.02</td>
</tr>
<tr>
<td>8. Agreeableness</td>
<td>.02</td>
<td>.09</td>
<td>.09</td>
<td>.04</td>
</tr>
<tr>
<td>9. Conscientiousness</td>
<td>.01</td>
<td>.05</td>
<td>.07</td>
<td>-.07</td>
</tr>
<tr>
<td>10. Emotional Stability</td>
<td>.05</td>
<td>.08</td>
<td>.15</td>
<td>.01</td>
</tr>
<tr>
<td>11. Openness</td>
<td>-.03</td>
<td>.05</td>
<td>-.01</td>
<td>-.03</td>
</tr>
<tr>
<td>12. Social Desirability</td>
<td>.02</td>
<td>.08</td>
<td>.01</td>
<td>.06</td>
</tr>
<tr>
<td>13. Self-Esteem</td>
<td>.10</td>
<td>.17</td>
<td>.16*</td>
<td>.08</td>
</tr>
<tr>
<td>14. Trait Anxiety</td>
<td>-.12</td>
<td>-.16</td>
<td>-.20</td>
<td>-.08</td>
</tr>
<tr>
<td>15. Procrastination</td>
<td>-.10</td>
<td>-.14</td>
<td>-.19</td>
<td>-.03</td>
</tr>
<tr>
<td>16. Depression</td>
<td>-.03</td>
<td>-.01</td>
<td>-.04</td>
<td>.04</td>
</tr>
<tr>
<td>17. Positive Affect</td>
<td>.17</td>
<td>.21*</td>
<td>.16</td>
<td>.06</td>
</tr>
<tr>
<td>18. Negative Affect</td>
<td>-.10</td>
<td>-.07</td>
<td>-.17</td>
<td>-.02</td>
</tr>
<tr>
<td>19. Optimism</td>
<td>.16</td>
<td>.13</td>
<td>.16</td>
<td>.11</td>
</tr>
</tbody>
</table>

* p < 0.05, ** p < 0.01.

Table 3.10. Correlations among individual difference measures and exercise session duration.
3.4.3. Correlations Between Individual Difference Variables and Total Exercise Time Per Week. Correlational analyses detected a significant positive relationship between exercise self-efficacy and total number of minutes per week participants reported they were exercising. The correlation was consistent across all four weeks of the study (all $r$'s $\geq 0.29$, $p$'s $\leq 0.01$). Zero-order correlations displayed in Table 3.11. Analyses also revealed a significant positive relationship between perceived behavioral control and total exercise time per week. Perceived behavioral control was consistently correlated with exercise time per week during each time interval of the study (absolute value of all Pearson $r$'s $\geq 0.21$ all $p$'s $< 0.05$). A similar pattern of association was detected between attitude toward exercise and total number of minutes per week (absolute value of all Pearson $r$'s $\geq 0.25$ all $p$'s $< 0.02$). Subjective norm was not related to total exercise time per week (absolute value of all Pearson $r$'s $\leq 0.15$ all $p$'s $> 0.20$), nor was intention to exercise associated with total exercise time per week (absolute value of all $r$'s $< 0.05$, $p$'s $> 0.20$).

Correlational analyses revealed a significant negative relationship between personal disorganization and total exercise time per week, but only during the first and third weeks of the study (absolute value of those Pearson $r$'s $\geq 0.21$, $p$'s $< 0.05$). Analyses revealed a negative correlation between procrastination and total exercise time per week for three of the four study intervals (absolute value of those three Pearson $r$'s $\geq 0.22$, $p$'s $< 0.05$). Positive affect was shown to have a significant positive correlation with total exercise time.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise Self-Efficacy</td>
<td>.29**</td>
<td>.31**</td>
<td>.30**</td>
<td>.36**</td>
</tr>
<tr>
<td>2. Perceived Behavioral Control</td>
<td>.21*</td>
<td>.24*</td>
<td>.25*</td>
<td>.34**</td>
</tr>
<tr>
<td>3. Attitude Toward Exercise</td>
<td>.33**</td>
<td>.25*</td>
<td>.26*</td>
<td>.30**</td>
</tr>
<tr>
<td>3. Intention to Exercise</td>
<td>.02</td>
<td>.04</td>
<td>.04</td>
<td>.06</td>
</tr>
<tr>
<td>4. Subjective Norm</td>
<td>.02</td>
<td>-.07</td>
<td>-.14</td>
<td>-.12</td>
</tr>
<tr>
<td>5. Personal Disorganization</td>
<td>-.24*</td>
<td>-.18</td>
<td>-.21*</td>
<td>-.15</td>
</tr>
<tr>
<td>6. Extraversion</td>
<td>.10</td>
<td>.10</td>
<td>.02</td>
<td>.08</td>
</tr>
<tr>
<td>7. Agreeableness</td>
<td>.14</td>
<td>.11</td>
<td>.12</td>
<td>.09</td>
</tr>
<tr>
<td>8. Conscientiousness</td>
<td>.17</td>
<td>.10</td>
<td>.10</td>
<td>.06</td>
</tr>
<tr>
<td>9. Emotional Stability</td>
<td>.03</td>
<td>.02</td>
<td>.11</td>
<td>-.01</td>
</tr>
<tr>
<td>10. Openness</td>
<td>.08</td>
<td>.05</td>
<td>-.05</td>
<td>-.02</td>
</tr>
<tr>
<td>11. Social Desirability</td>
<td>.14</td>
<td>.17</td>
<td>.08</td>
<td>.11</td>
</tr>
<tr>
<td>12. Self-Esteem</td>
<td>.11</td>
<td>.11</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>13. Trait Anxiety</td>
<td>-.13</td>
<td>-.11</td>
<td>-.13</td>
<td>-.07</td>
</tr>
<tr>
<td>14. Procrastination</td>
<td>-.25*</td>
<td>-.22*</td>
<td>-.26*</td>
<td>-.17</td>
</tr>
<tr>
<td>15. Depression</td>
<td>-.06</td>
<td>.01</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>16. Positive Affect</td>
<td>.22*</td>
<td>.17</td>
<td>.08</td>
<td>.10</td>
</tr>
<tr>
<td>17. Negative Affect</td>
<td>-.07</td>
<td>.01</td>
<td>-.06</td>
<td>.02</td>
</tr>
<tr>
<td>18. Optimism</td>
<td>.14</td>
<td>.09</td>
<td>.08</td>
<td>.06</td>
</tr>
</tbody>
</table>

* *p < 0.05, **p < 0.01.

Table 3.11. Correlations among individual difference measures and total minutes per week.
per week, but only during the first week of the study \((r = 0.22, p = 0.04)\).

Correlational analyses revealed no further significant relationships between the remaining individual difference variables and total exercise time per week (absolute value of all \(r\)'s < 0.20, \(p\)'s > 0.15).

3.5. Effects of Implementation Intentions and Relapse Prevention Interventions

Analyses were conducted to investigate the effect of the intervention conditions on three measures of exercise behavior: exercise frequency, duration of exercise sessions, and total exercise time per week. Analyses of covariance (ANCOVAs) were conducted to examine the effects of the implementation intentions (IMI), relapse prevention (RP), and combined (IMI-RP) interventions on the above-mentioned exercise behaviors. In each ANCOVA, the associated pre-intervention exercise behavior was highly correlated with post-intervention exercise behavior, and therefore, was used as a covariate. Pre-intervention exercise frequency was significantly positively correlated (all \(r\)'s >0.64, all \(p\)'s < 0.001) with repeated measures (all four weeks) of post-intervention exercise session frequency. Pre-intervention exercise session duration was significantly positively correlated with post-intervention exercise session duration (all \(r\)'s >0.31, all \(p\)'s < 0.001). Pre-intervention total exercise minutes per week were significantly positively correlated with post-intervention total exercise minutes per week (all \(r\)'s >0.49, all \(p\)'s < 0.001).

3.5.1. Frequency of Exercise Sessions. As stated earlier, participants recorded in diaries the frequency of their exercise sessions each week for four weeks during the course of the study. Only recorded exercise sessions that met
the specified criteria (i.e., at least twenty minutes, individual activity versus group or team sports, increased respiration and heart rate) were included in the final analyses. Means and standard deviations of frequency of exercise sessions by intervention group are shown in Table 3.12. An analysis of the exercise frequency data was conducted with an Intervention Condition (4) X Personal Disorganization Group (3) X Sex (2) X Time Interval (4) mixed ANCOVA with pre-intervention mean exercise frequency, serving as a covariate. The purpose of the covariate was to control for individual differences in past exercise behavior. As expected, the ANCOVA results revealed that the pre-intervention exercise frequency covariate was significantly associated with the post-intervention exercise frequency $F(1, 63) = 73.43, p < 0.001$. The pre-intervention exercise frequency covariate accounted for approximately 54 percent of the variability in the data ($\eta^2 = 0.54$). As anticipated, pre-intervention exercise frequency was a strong predictor of post-intervention exercise frequency and accounted for a large portion of the variance.

After partialling out the variability in the data accounted for by the pre-intervention exercise covariate, the analysis revealed a significant main effect for personal disorganization group on exercise frequency, $F(2, 63) = 3.40, p = 0.04$, $\eta^2 = 0.10$. Higher personal disorganization scores were associated with lower frequency of exercise sessions. Means and standard deviations of exercise session frequency are shown in Table 3.13. Pairwise comparisons revealed that exercise frequency significantly differed ($p = 0.02$) between the low and high personal disorganization (PD) group such that participants in the low PD group
<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>Pre-Intervention Frequency of Sessions</th>
<th>Post-Intervention Week 1</th>
<th>Post-Intervention Week 2</th>
<th>Post-Intervention Week 3</th>
<th>Post-Intervention Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N = 19)</td>
<td>2.05 (1.56)</td>
<td>3.73 (2.15)</td>
<td>4.67 (2.54)</td>
<td>4.06 (2.34)</td>
<td>4.28 (1.97)</td>
</tr>
<tr>
<td>Implementation Intention (N = 24)</td>
<td>2.76 (1.37)</td>
<td>4.58 (2.19)</td>
<td>4.45 (2.11)</td>
<td>4.75 (2.93)</td>
<td>4.33 (2.58)</td>
</tr>
<tr>
<td>Relapse Prevention (N = 24)</td>
<td>2.69 (1.47)*</td>
<td>4.54 (2.79)</td>
<td>4.21 (2.60)</td>
<td>4.33 (2.25)</td>
<td>4.38 (2.52)</td>
</tr>
<tr>
<td>Combined II-RP (N = 25)</td>
<td>2.12 (1.51)</td>
<td>4.00 (1.50)</td>
<td>3.84 (1.74)</td>
<td>3.80 (1.80)</td>
<td>3.92 (1.75)</td>
</tr>
</tbody>
</table>

Table 3.12. Means and standard deviations of pre- and post-intervention frequency of exercise sessions by intervention condition. (*Note: N = 23 for the pre-intervention mean for relapse prevention group as a result of missing data.)
<table>
<thead>
<tr>
<th>Personal Disorganization Group</th>
<th>Week 1</th>
<th></th>
<th>Week 2</th>
<th></th>
<th>Week 3</th>
<th></th>
<th>Week 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Low (n = 37)</td>
<td>4.84</td>
<td>(2.51)</td>
<td>4.89</td>
<td>(2.62)</td>
<td>4.97</td>
<td>(2.78)</td>
<td>4.84</td>
<td>(2.41)</td>
</tr>
<tr>
<td>Medium (n = 20)</td>
<td>4.05</td>
<td>(1.73)</td>
<td>3.55</td>
<td>(1.88)</td>
<td>4.15</td>
<td>(1.69)</td>
<td>3.95</td>
<td>(1.79)</td>
</tr>
<tr>
<td>High (n = 30)</td>
<td>3.90</td>
<td>(1.99)</td>
<td>3.87</td>
<td>(1.85)</td>
<td>3.57</td>
<td>(2.01)</td>
<td>3.77</td>
<td>(2.13)</td>
</tr>
</tbody>
</table>

Table 3.13. Means and standard deviations of post-intervention frequency of exercise sessions by personal disorganization group.
exercised significantly more frequently than did those in the high PD group. The comparison between the low and medium PD groups did not reveal a significant difference ($p = 0.06$). Neither was the difference between the medium and high PD groups statistically significant ($p > 0.15$).

There was no significant main effect for intervention condition on frequency of exercise sessions per week, $F(3, 63) = 0.22$, $p > 0.20$. There also were no main effects for sex, $F(1, 63) = 0.19$, $p > 0.20$ or any significant interaction effects (all $p$-values $> 0.20$).

3.5.2. Duration of Exercise Sessions. Participants recorded the duration, in minutes, of each exercise session in their weekly exercise diaries throughout the duration of the 4-week study. Means and standard deviations of pre- and post-intervention exercise session duration in minutes are shown in Table 3.14. An analysis of the exercise session duration data was conducted with an Intervention Condition (4) X Personal Disorganization Group (3) X Sex (2) X Time Interval (4) mixed ANCOVA with mean pre-intervention session duration serving as a covariate. Tests of within subjects effects revealed a significant time interval X condition interaction, $F(9, 198) = 3.34$, $p < 0.01$, $\eta^2 = 0.14$. Inspection of the results revealed a statistically significant difference between time intervals 2 and 3 ($F(3, 63) = 9.18; p < 0.01$), and between time intervals 3 and 4 ($F(3, 63) = 5.48, p < 0.01$) for the relapse prevention condition group. Mean session duration significantly increased between week 2 and week 3 then, significantly decreased for the relapse prevention condition group [see Figures 3.1 (actual means) and 3.2 (estimated marginal means) for graphic representation of
<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>Pre-Intervention Mean Session Duration</th>
<th>Post-Intervention Week 1</th>
<th>Post-Intervention Week 2</th>
<th>Post-Intervention Week 3</th>
<th>Post-Intervention Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N = 19)</td>
<td>32.35 (26.32)</td>
<td>33.94 (20.73)</td>
<td>38.56 (19.85)</td>
<td>38.47 (19.83)</td>
<td>39.94 (13.81)</td>
</tr>
<tr>
<td>Implementation Intention (N = 24)</td>
<td>46.44 (21.29)</td>
<td>43.78 (21.51)</td>
<td>50.79 (27.09)</td>
<td>46.84 (21.13)</td>
<td>43.04 (22.24)</td>
</tr>
<tr>
<td>Relapse Prevention (N = 24)</td>
<td>40.55 (26.45)*</td>
<td>49.71 (31.24)</td>
<td>41.94 (19.06)</td>
<td>53.25 (34.95)</td>
<td>45.75 (31.18)</td>
</tr>
<tr>
<td>Combined II-RP (N = 25)</td>
<td>35.05 (21.59)</td>
<td>41.08 (17.51)</td>
<td>38.09 (18.52)</td>
<td>39.57 (23.43)</td>
<td>36.71 (19.56)</td>
</tr>
</tbody>
</table>

Table 3.14. Means and standard deviations of pre- and post-intervention exercise session duration (in minutes) by intervention condition. (*Note: N = 23 for the pre-intervention mean for relapse prevention group as a result of missing data.)
Figure 3.1. Session duration by condition (actual means).
Figure 3.2. Session duration by condition (estimated marginal means after adjustment for covariate).
session duration means by intervention condition]. No other comparisons between intervention condition and time intervals were significant. Between subjects tests revealed that the pre-intervention session duration (past exercise behavior) covariate was significantly positively related to post-intervention session duration, $F(1, 63) = 8.60, p <= 0.001$, and accounted for approximately twelve percent of the variability in the data ($\eta^2 = 0.12$). After partialling out the variance in the data accounted for by the covariate, the analysis revealed no main effect for the exercise intervention, $F(3, 63) = 1.52, p > 0.15$; personal disorganization group, $F(2, 63) = 1.91, p > 0.15$; sex, $F(1, 63) = 2.34, p > 0.10$, or any significant interaction effects (all $p$-values > 0.15) on session duration.

3.5.3. Total Exercise Time Per Week. Total amount of time per week was calculated from the weekly frequency and session duration data for each participant. Intervention group means and standard deviations for exercise time per week are shown in Table 3.15. Total exercise time per week by condition is represented in Figures 3.1 (actual means) and 3.2 (estimated means after adjustment for covariates). An analysis of the exercise time per week data was conducted with an Intervention Condition (4) X Personal Disorganization Group (3) X Sex (2) X Time Interval (4) repeated measures ANCOVA. Pre-intervention mean time per week (past exercise behavior) served as the covariate. Again, the purpose of the pre-intervention time per week covariate was to control for individual differences in pre-intervention exercise behavior.
<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>Pre-Intervention Time Per Week (In Minutes)</th>
<th>Post-Intervention Week 1</th>
<th>Post-Intervention Week 2</th>
<th>Post-Intervention Week 3</th>
<th>Post-Intervention Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N = 19)</td>
<td>93.82 (95.41)</td>
<td>169.58 (149.23)</td>
<td>200.39 (155.53)</td>
<td>177.97 (145.94)</td>
<td>173.30 (105.79)</td>
</tr>
<tr>
<td>Implementation Intention (N = 24)</td>
<td>126.70 (73.11)</td>
<td>229.44 (165.40)</td>
<td>235.10 (158.94)</td>
<td>239.25 (182.23)</td>
<td>216.96 (175.68)</td>
</tr>
<tr>
<td>Relapse Prevention (N = 24)</td>
<td>108.70 (82.30)*</td>
<td>221.08 (172.39)</td>
<td>187.42 (149.97)</td>
<td>226.46 (179.38)</td>
<td>219.48 (136.05)</td>
</tr>
<tr>
<td>Combined (N = 25)</td>
<td>95.63 (96.17)</td>
<td>170.72 (109.35)</td>
<td>157.76 (109.55)</td>
<td>167.00 (121.55)</td>
<td>167.30 (110.43)</td>
</tr>
</tbody>
</table>

Table 3.15. Means and standard deviations of pre- and post-intervention exercise time per week (in minutes) by intervention condition. (*Note: N = 23 for the pre-intervention mean for relapse prevention group as a result of missing data.*)
Figure 3.3. Total exercise time per week by condition (actual means).
Figure 3.4. Total exercise time per week by condition (estimated marginal means after adjustment for covariate).
The exercise time per week ANCOVA revealed a significant effect of time interval, $F(3, 189) = 10.84$, $p < 0.01$, $\eta^2 = 0.15$, on exercise time per week. An inspection of participants’ mean exercise time per week (irrespective of intervention condition) for each of the four weeks of the study suggests an overall fluctuating pattern in which mean time decreased ($M_1 = 194.31; M_2 = 190.18$), then increased ($M_3 = 200.78$), then decreased again ($M_4 = 191.48$) during the final week. Pairwise comparisons between means for each time interval revealed significant differences between week 2 and week 3 [$F(1, 63) = 15.70$, $p < 0.01$] and between week 3 and week 4 [$F(1, 63) = 16.26$, $p < 0.01$].

The between-subjects tests revealed a main effect for the pre-intervention exercise time per week covariate, $F(1, 63) = 45.24$, $p < 0.001$. As expected, pre-intervention exercise behavior was significantly associated with post-intervention exercise behavior and accounted for approximately forty-two percent of the variance in the data ($\eta^2 = 0.42$). After adjustment for the past exercise behavior covariate, the analysis of covariance revealed no significant main effects for exercise intervention condition $F(3, 63) = 0.40$, $p > 0.15$; personal disorganization group, $F(2, 63) = 1.76$, $p > 0.15$; or sex, $F(1, 63) = 0.56$, $p > 0.15$; nor were there any significant interaction effects (all $p$-values >0.15).

3.6. Exercise Self-Efficacy

As previously mentioned, participants’ confidence in their ability to exercise was assessed during the initial intervention session (Time 1) and then, again during the post-experiment session (Time 2) with Benisovich et al.’s (1998) multidimensional self-report measure of exercise self-efficacy. An Intervention
repeated measures ANOVA revealed a significant effect for time interval for participants' exercise self-efficacy scores, $F(1, 72) = 25.47, p < 0.001, \eta^2 = 0.26$. Further inspection of the results revealed that regardless of intervention condition, participants' self-efficacy scores were significantly lower at the end of the study than they were at the beginning of the study. There were no main effects for intervention condition, personal disorganization group, or sex (all $p$-values > 0.15); nor were there any significant interaction effects ($p > 0.15$).

3.7. Post-Experiment Questionnaire Data

Eighty-three participants completed the post-experiment questionnaire which consisted of five items (PEQ; see Appendix A). The first item on the PEQ asked participants whether or not they had intended to exercise at least two more times per week for a period of 4 weeks during the study. All of the 83 participants completing the PEQ reported that they had intended to do so. The second item asked participants whether or not they were successful in accomplishing their goal of exercising two more times per week than they had been prior to their participation in the study. Approximately 78% reported that they were successful in ($n = 65$) achieving their intended goal of exercising at least two more times per week and approximately 21% ($n = 18$) reported being unable to exercise at least two more times per week. A Chi-square test of independence indicated there was no significant association between condition and participants’ self-report of increased exercise goal attainment ($X^2(3) = 2.93, p > 0.15$).
The third item assessed whether or not participants used any plans or strategies to help them achieve their exercise goals. Thirty-four participants responded and approximately 44% of those participants reported using some sort of plan or schedule to help them achieve their exercise goals. Thirty-two percent reported using motivational techniques such as reminding themselves of the reasons that exercise was beneficial or that they wanted to get in shape before summer. Approximately four participants (11.8%) who responded to this item stated that they relied on peer support (e.g., ran with a friend, worked out with spouse) and another 4 (11.8%) participants reported various other strategies (e.g., “I just did it,” or “I ate fruit before exercising”) to attain their exercise goals. A Chi-square test of independence indicated intervention condition was not significantly associated with plan formation ($\chi^2 (9) = 12.91, p > 0.15$). (Note: Two cells had expected frequencies of <1, and therefore, this Chi-square statistic should be interpreted with caution.)

The final question asked participants to describe in detail reasons why they were unable to exercise at least 2 more times per week if, in fact, they were unable to do so. Twenty-eight participants described specific challenges or barriers to their exercise goal attainment. Nineteen (67.9%) participants reported that coursework, studying, or preparing for exams posed the greatest barrier to exercising two more times per week than they had been prior to participating in the study. Two participants (7%) reported that they were already exercising at such high frequency (i.e., five times per week) that it was difficult to fit more sessions into their schedules. Five participants (17.9%) reported that they
incurred some sort of illness or injury that prevented them from achieving their exercise goals during the study. One participant reported lacking sufficient motivation to exercise more frequently. Another participant reported that holiday travel interfered with her exercise goals.
DISCUSSION

The primary goal of this study was to investigate the effects of a theoretically-based, integrated intervention on exercise behavior in college students. More specifically, this study attempted to investigate the effects of an intervention that combined implementation intentions and relapse prevention methods to increase frequency and duration of exercise behavior. Both implementation intentions and relapse prevention-based interventions previously have been demonstrated to promote a variety of health behaviors including exercise (Maes & Karoly, 2005; Belisle, Roskies, & Levesque, 1987; King & Frederickson, 1984). A secondary goal of the present study was to investigate whether certain dispositional variables, particularly personal disorganization, moderate the effects of implementation intentions. To date, many studies have investigated the effects of implementation intentions on various health behaviors, but few have also investigated the relationship between implementation intentions, health behaviors, and dispositional variables. Furthermore, this study differed from most previous implementation intention intervention studies in that it focused on a complex health behavior (exercise behavior) over an extended period of time (four week interval).
It was predicted that participants in the active intervention conditions (i.e., implementation intention, relapse prevention, and combined implementation intention-relapse prevention) would report greater mean increases in frequency and duration of exercise behavior than would participants in the control condition. Participants in the implementation intention (IMI) and combined implementation intention-relapse prevention (IMI-RP) intervention conditions were predicted to report greater increases in frequency and duration than would the relapse prevention (RP) condition group, and the combined IMI-RP intervention condition group was predicted to report the greatest increases in exercise frequency and duration when compared to the other three conditions (i.e., IMI alone, RP, and control). Moreover, effects of implementation intentions were predicted to be most effective in promoting exercise behavior for participants reporting higher levels of personal disorganization.

In general, data from this investigation did not support the hypotheses regarding the effects of the different intervention conditions on exercise behavior. Exercise frequency, session duration, and total exercise time per week were not significantly increased by implementation intentions, relapse prevention, or the combined implementation intention-relapse prevention interventions.

Past exercise behavior was found to be the strongest predictor of subsequent exercise behavior in each of the exercise behavior analyses. Past behavior covariates accounted for a significant amount of the variability in the data for exercise frequency (54%), exercise session duration (12%), and total exercise time per week (42%) in each of the separate analyses.
Exercise self-efficacy, perceived behavioral control, and attitude toward exercise were significantly positively correlated to exercise frequency and total exercise time per week, but not correlated with exercise session duration. Intention to exercise and subjective norm were poor predictors of any of the subsequent exercise behavior variables. Specifically, in the present study, intention to exercise and subjective norm were not associated with exercise frequency, session duration, or total exercise time per week. Participants’ exercise self-efficacy scores were significantly lower at the conclusion of the study than they were at the beginning of the study.

Personal disorganization was negatively associated with exercise frequency. That is, higher personal disorganization scores were associated with lower levels of exercise frequency. Personal disorganization also was found to be significantly associated with participant attrition from the study. In addition, participants who withdrew from the study differed significantly from study remainers on self-report measures of trait anxiety, depression, and procrastination. Remaining in the study was associated with significantly higher levels of conscientiousness and social desirability. Procrastination was found to be negatively correlated with exercise frequency, particularly during the third and fourth weeks of the study. Perhaps, not surprisingly, the end of the exercise study which also coincided with the end of the academic term posed more of a challenge for those individuals for whom procrastination is a problem. No other individual difference variables were consistently significantly correlated with the exercise behavior variables of interest.
4.1. Implementation Intentions: Commitment and Cognitive Rehearsal

The present study generally failed to replicate the effects of implementation intentions on exercise behavior found in the Prestwich, Lawton, & Conner, (2003) study after which the methodology was modeled. Recall that Prestwich et al. also tested the effects of an integrated exercise promotion intervention on exercise frequency, session duration, and total exercise time per week. Prestwich et al.’s design included an implementation intention (IMI – volitional component) condition, a decision balance sheet (DBS – motivational component) condition, a combined intervention condition (IMI-DBS), and a control or no intervention condition. Prestwich et al. found that the use of implementation intentions resulted in participant reports of increased exercise frequency and total exercise time per week. The combined IMI-DBS condition showed marginally greater increases in exercise frequency and duration than did the implementation intention only condition, and the DBS alone condition resulted in greater increases in exercise frequency and duration than the control condition. Prestwich et al. found no significant intervention effects for duration of exercise session.

In the current research, there was no significant main effect for implementation intention interventions in promoting exercise frequency, duration of exercise sessions, or total exercise time per week. There was, however, a significant interaction effect between intervention condition and time interval for exercise time per week. The implementation intention only group mean time per week was greater than the other three intervention groups during the first two
weeks of the study; then during the third week, the relapse prevention group mean increased and marginally surpassed the mean of implementation intention group. Finally, during the fourth week of the study, the implementation intention group mean declined. It may be the case that implementation intentions are effective in initiating behavior but they do not consistently promote adherence to those behaviors over extended periods of time. Gollwitzer (1999) predicted that implementation intention effects should show temporal stability, but many of the health behaviors in question were only investigated for periods of time lasting three weeks or less. More recently, research has been published that examines the long-term effects of implementation intentions on physical activity, but the results have not been consistent (Luszczynska, 2006; Powers, Koestner, & Topciu, 2005). The combined implementation intention-relapse prevention group consistently reported exercise frequency and duration means as low as those reported by the control group. Possible explanations for the lack of implementation intention effects in the current study are discussed later.

As mentioned previously, Gollwitzer (1999) proposed that several factors moderate the effects of implementation intentions. First, implementation intentions are posited not to work when goal intentions are weak or nonexistent. If the commitment to the goal intention (i.e., “I intend to exercise”) is weak, has been abandoned, or has been completed already, then implementation intentions should not be effective in regulation of behavior (Orbell et al., 1997). In the current study, participants’ commitment to the goal intention may have been weakened by fact that the goal intention (“Try to exercise at least 2 more times...
per week than you are currently exercising”) was set by the investigator and not by the participant. Participants’ motivation to participate in the study was assumed as participation was voluntary in response to flyers and email invitations. Participants’ goal intention to exercise was assessed at two separate times during the study (different measures): at the onset of the intervention phase and during a post-experiment session. At the beginning of the study, participants reported high levels of intention to exercise (although it should be noted that study drop-outs also reported high levels of intention to exercise). Nevertheless, goal intentions can be unstable and the relationship between intentions and behavior can become attenuated as the time interval between the assessment of these two variables increases (Ajzen, 1985).

It is possible that participants’ goal intentions of exercising two or more times per week had been abandoned in favor of competing goal intentions (i.e., goal reprioritization) such as coursework or studying for exams, in which case, implementation intentions would not be effective. Post-experiment questionnaire data give some support to this notion as thirty percent of respondents reported that exams and coursework interfered with their ability to achieve their exercise goals of “2 more times per week.” Discrepancies between the methods that participants and the investigator defined “exercise” and measured exercise sessions (described in more detail under limitations of the study below) may have resulted in participants altering their perceptions of the amount of exercise they had performed that week and therefore, in effect, abandoning their goal intentions. Seehauscn et al. (as cited in Gollwitzer, 1999) found that when
participants were told that their original goal no longer needed to be reached, the effect of forming an implementation intention did not vanish immediately, but was gone completely after 48 hours.

Second, the strength of commitment to the formed implementation intention matters. If participants’ commitment to their exercise plan (i.e., implementation intention) is weak, then the effect should be minimal. If participants were not fully committed to their goal intentions to exercise two more times per week, it is possible that they also may not have been committed to the plans they formed to implement the intended exercise behavior. Studies in which strength of commitment to an implementation intention was varied have demonstrated enhanced or weakened intervention effects (Seehausen et al., as cited in Gollwitzer, 1999). Although it is possible that participants in both of the implementation intention conditions were not sufficiently committed to the intentions they formed, commitment to the implementation intentions per se was not assessed and is a limitation of the present study.

A third and critical factor that moderates the impact of implementation intentions on goal attainment is cognitive rehearsal. Even though research has shown that strong links between intended behavior and environmental cues can be achieved in a single mental act (Taylor, Pham, Rikin, & Armor, 1998), Milne & Sheeran (as cited in Sheeran, Milne, Webb, & Gollwitzer, in press) found that mental rehearsal of the link between the specified cue and the specified response may be crucial in forming effective implementation intentions. In Milne and Sheeran’s study, participants who were instructed to concentrate on the cue-
behavior link when generating their implementation intention were significantly more likely to visit a target website (the intended goal) than were participants who were instructed only to write their implementation intention on a reminder note and place it in a prominent location at home (87% versus 40%, respectively). In the present study, the combined implementation intention-relapse prevention (IMI-RP) condition group consistently performed no better than did the control group in terms of exercise frequency, session duration, or total exercise time per week.

One possibility that suggests itself is that the procedure used for the combined intervention group inadvertently interfered with participants’ cognitive rehearsal of their implementation intentions (and possibly their relapse prevention plans as well). Participants in the combined intervention group were asked, first, to form their implementation intention, and then, immediately thereafter they were asked to complete their relapse prevention barrier worksheets before being excused. By having participants in the combined IMI-RP condition complete their relapse prevention barrier worksheets immediately after forming their implementation intentions, it is possible that they did not have sufficient time to adequately mentally rehearse their exercise implementation intention before being presented with additional information. Furthermore, it is also possible that the addition of the implementation intention somehow interfered with participants’ ability to recall the details of their relapse prevention barrier plans.
Participants in the present study were not permitted to keep any of their materials following the initial experiment session. By comparison, Prestwich et al.’s (2003) combined DBS-IMI intervention group was instructed, first, to complete their decision balance sheets, and then, to form their implementation intentions allowing for cognitive rehearsal of the implementation intentions. Furthermore, participants in both Prestwich et al.’s combined DBS-IMI and DBS alone conditions were permitted to take home their Decision Balance Sheets. Prestwich et al. speculated as to whether allowing participants to keep their DBS at home may have acted as an additional environmental cue (although use of the DBS as a prompt was not tested). Prestwich et al.’s combined DBS-IMI group performed marginally better than did their IMI alone group and recall that significant intervention condition effects were found for both groups. In conclusion, it is seems probable that the procedure used in the present study undermined the effects of the implementation intentions by preventing adequate cognitive rehearsal. Moreover, it appears that the combined intervention condition weakened the effect of the relapse prevention intervention. The addition of the implementation intention in the combined IMI-RP intervention condition may have made it more difficult for participants to recall their relapse prevention alternatives to exercise barriers because this group also consistently performed more poorly than did the relapse prevention alone group.

4.2. **Theory of Planned Behavior Variables and Exercise Behavior**

Theory of Planned Behavior (TPB; Ajzen, 1991) variables including intention to exercise, perceived behavior control, subjective norm, and attitude
toward exercise were measured to assess individual differences in motivation. In addition, past exercise behavior and exercise self-efficacy were assessed as possible additional predictors of exercise behavior. According to the Theory of Planned Behavior, attitudes, subjective norm, and perceived behavioral control all influence intention which is assumed to be the most proximal determinant of behavior and the most important predictor of behavior. Contrary to such assertions, scores from self-reported measures of intention to exercise were not significantly correlated with any measures of subsequent exercise behavior in the present study. Furthermore, as mentioned above, study drop-outs and remainers reported equally high levels of intentions to exercise. Prestwich et al., (2003) found that participants with the strongest intentions to exercise were the most likely to withdraw from their study. The absence of a correlation between reported intention to exercise and subsequent exercise behavior found in the present study is reflective of the “intention-behavior gap” referred to by Sheeran (2002) as cited in Sheeran, Milne, Webb, & Gollwitzer (in press). Sheeran primarily attributed the intention-behavior discrepancy to “inclined-abstainers” (people who intend to act but who fail to realize their goal intentions). In his review, Sheeran found that the median proportion of participants who reported positive intentions but did not perform the intended behavior was 47% and the median proportion of participants with negative intentions (i.e., reported no intention to perform the target behavior) who did subsequently perform the behavior in question was only 7%. In other words, only slightly more than one-
half of the people with positive intentions to engage in health behaviors actually translate those goal intentions into actions.

Past exercise behavior was found to be the strongest predictor of subsequent exercise behavior (i.e., exercise frequency, session duration, and total exercise time per week) in the present study. According to Sheeran and Orbell (1999), such findings in studies that investigate repeated health behaviors (e.g., exercise, diet) are common and pose significant problems for the Theory of Planned Behavior. Several studies have found that past behavior is a superior predictor of subsequent behavior than are intentions, attitudes, subjective norm, and perceived behavior control (Fredricks & Dossett, 1983; Bagozzi, 1981; Bentler & Speckart, 1979). As mentioned previously, one explanation for the difference in association between intention and behavior is that intentions may be unstable. Individuals’ goal intentions can change over time with new information or goal reprioritization. Stable intentions are better predictors of behavior than are unstable intentions; similarly, intentions are better predictors of behavior over short intervals as compared to long intervals (Doll & Ajzen, 1992; Sheeran, Orbell, & Trafimow, 1999).

Sheeran and Orbell (1999) offered another explanation for the intention-behavior gap which is that past behavior is related to subsequent behavior via the non-conscious process in which habits are developed. Behaviors that are performed repeatedly become encoded in memory in such a manner that environmental cues serve to automatically elicit the behavior, not unlike the way in which implementation intentions are formed. According to Sheeran and Orbell,
one’s intentions to perform a new behavior in a familiar context may simply be forgotten (or at least more challenging to implement) particularly for repeated health behaviors when the past behavior is largely habitual and automatic (e.g., routinized sedentary behavior).

Exercise self-efficacy, perceived behavioral control, and attitude toward exercise were significantly correlated with exercise frequency and total exercise time per week. Consistent with Prestwich et al.’s (2003) findings, subjective norm was not found to be significantly correlated with any of the exercise behaviors of interest. Bozionelos and Bennet (1999) suggested that subjective norm may not be a good predictor of exercise level in the general population. Instead, subjective norm may exert more influence among individuals who achieve their group membership as a consequence of participating in physical activity or exercise (e.g., athletes, sportsmen/women). Therefore, it is likely that for college students, even those who very active but who are not student-athletes, subject norm is not a very strong predictor of exercise behavior. None of the TPB variables were consistently significantly correlated with exercise session duration suggesting that the type of behavior measured likely influences the strength of the association.

4.3. Relationships Among Theory of Planned Behavior Constructs

In the present study, only some of the measures of Theory of Planned Behavior Constructs were significantly intercorrelated as predicted by the theory (see Figure 1.1). Perceived behavioral control and subjective norm both were significantly correlated with intention to exercise, but contrary to the TPB, attitude
toward exercise and intention to exercise were not significantly correlated in the present study. Attitude toward exercise was positively associated with perceived behavioral control, but attitude was not associated with subjective norm. The highest correlation among TPB variables was found between perceived behavioral control and intention to exercise.

As mentioned earlier, Armitage and Conner (2002) included self-efficacy in an extended version of TPB because these authors differentiated between internal and external influences on level of perceived control and suggested that both self-efficacy and perceived control over behavior (their variant of perceived behavioral control) should be measured. Recall that self-efficacy concerns one’s confidence in one’s ability or skills associated with a particular behavior and perceived control over behavior concerns the controllability of the target behavior given environmental or situational constraints. Debate has occurred in the research community over whether self-efficacy and perceived behavioral control represent the same or different constructs (Tolma, Reinnerg, Evans & Ureda, 2006; Ajzen, 2002). The present study provides some support for the view that exercise self-efficacy and perceived behavioral control are different constructs. In the present study, exercise self-efficacy and perceived behavioral control were significantly positively correlated, but the magnitude of the correlation was not so strong as to suggest they were the same construct ($r = 0.45$). Furthermore, exercise self-efficacy and perceived behavioral control were correlated with different individual difference variables. Exercise self-efficacy was significantly positively associated with agreeableness and openness, but negatively
associated with negative affectivity. Perceived behavioral control was uncorrelated with these variables. Perceived behavioral control was significantly positively correlated with subjective norm (as predicted by TPB), but no significant relationship was found between subjective norm and exercise self-efficacy. Therefore, these data may provide some empirical evidence for the distinction between self-efficacy and perceived behavioral control.

Exercise self-efficacy and perceived behavioral control have an affinity, but do not appear to represent exactly the same construct. Exercise self-efficacy focuses on self-factors that influence outcomes. Although perceived behavioral control (PBC) can be directed toward internal factors that influence behavior, the focus of PBC is on the controllability of the target behavior. If indeed self-efficacy and perceived behavioral control represent different constructs, then they may differentially influence various health behaviors, potentially moderate the effects of interventions in different ways, and therefore should be assessed separately.

4.4. Exercise Self-Efficacy

An unexpected finding of the present study was in the analysis of participants’ exercise self-efficacy scores. Regardless of intervention condition, participants who remained in the study for its entirety reported a significant decrease in exercise self-efficacy compared to their pre-intervention estimates of exercise self-efficacy. It is possible that participants initially overestimated their confidence in their ability to exercise given the demands of their schedules and other barriers described by participants in the post-experiment questionnaire. It appears that participants subsequently adjusted their estimates of self-efficacy.
after encountering actual challenges to their exercise goals. Speck and Looney (2001) reported that following participation a 12-week study of recorded pedometer-assisted physical activity, individuals reported a decrease in exercise self-efficacy (even with an increase in physical activity). Speck and Looney speculated that individuals’ perceived self-efficacy decreases when they initiate an intended behavior and then encounter actual barriers to the intended behavior.

4.5. Personal Disorganization

Perhaps one of the more interesting and unexpected findings of the present study was the in the attrition analysis. Participants who withdrew from the study reported significantly higher levels of personal disorganization, procrastination, anxiety and depression than did those participants who remained in the study. In addition, study remainers reported significantly higher levels of conscientiousness than did participants who dropped out of the study. Furthermore, higher social desirability scores were associated with study remainers than with study drop-outs. The pattern of attrition from the present study reflects similar patterns demonstrated by participants in a previous study of personal disorganization. Mirels, Nygren, & Dean (1998) found that participants who dropped out of a study of cognitive performance using a computer-generated flight simulation program reported significantly higher levels of personal disorganization than did participants who remained in the study. Regarding those participants who remained in the study, higher social desirability and conscientiousness scores suggest that individuals with greater need for
approval may be more inclined to remain in exercise programs. It is also possible that such individuals are more prone to over report the frequency and duration of their exercise behavior to avoid negative evaluation by others or self.

As mentioned, higher levels of personal disorganization (PD) were associated with lower levels of exercise frequency. In previous studies of personal disorganization, higher Sense of Personal Disorganization Scale (SPDS) scores were associated with forgetting to do things, starting activities, managing time usage, and feeling disorganized (Mirels & Dean, 2000). Participants with higher SPDS scores have reported difficulty persisting and completing intended activities. Presumably, those difficulties would extend to exercise activities as well. It has been speculated that participants reporting higher levels of personal disorganization often can muster enough resources during laboratory tasks to perform adequately, but may fail to do so over long-term tests of planning and organization skills. It appears that more realistic, ecologically valid tests of personal disorganization such exercise program participation or remembering to call and cancel appointments may be more appropriate methods of assessing effects of PD. In any event, it appears that higher levels of personal disorganization may influence intended health behaviors and warrants further investigation in more naturalistic studies. Moreover, these results underscore the importance of assessing dispositional variables in health behavior studies in order to minimize participant attrition and have implications for the development of future exercise behavior interventions in terms of reaching targeted populations.
4.6. Limitations

Participants who volunteered to be in the study may not be representative of average college students in terms of physical activity level. Recent data show that nearly half of young people aged 12-21 in the U.S. are not exercising on a regular basis (CDCP, 2001). However, approximately 70% of the individuals who participated in the present study were exercising three or more times per week and nearly 21% of the individuals who participated in the current study reported they regularly were exercising four or more times per week prior to the study. Only 13% of the sample reported they were exercising less than once per week or not at all prior to their participation in the study. No restrictions were imposed on enrollment in terms of pre-study frequency of exercise behavior. Recruitment for the study was limited only in that participants needed to be OSU students enrolled in an introductory psychology course, English speaking, and for whom physical activity posed no health risks. Therefore, it is possible that the sample in this study is comprised of a group of participants who may be more physically active than the average college student and were motivated to participate in the study because they were already frequently engaging in exercise behavior.

Another concern is the demographic representativeness of the sample. The sample was predominantly white/Caucasian and somewhat restricted in terms of age range of the participants.

The present study was marginally under-powered as the final sample was smaller than originally proposed; however, it is unlikely that increasing the number of participants would have significantly impacted the findings regarding
the effects of implementation intentions. Implementation intention effects have been shown to be medium-large in size and robust (and other published health behavior studies have found significant results with similar size samples (Prestwich, Lawton, & Conner, 2003; Sheeran & Orbell, 1999). More plausible alternative explanations for the non-significant implementation intention results have been described earlier and should be considered.

Another limitation of the present study concerns the methodological problem of measuring participants’ weekly exercise sessions. After examining several participant exercise diaries, it became apparent that discrepancies existed between the investigator’s provided definitions of exercise behavior and of individual exercise sessions, and the definitions of several participants in the study. Recall that participants were told that “exercise” must be physical activity in which they engaged for at least 20 minutes, but sessions exceeding 20 minutes would still count only as one session. In addition, the additional exercise in which they engaged needed to be an individual activity not a group activity such as an aerobics class or a team sport in order to eliminate the motivational effect of exercising as part of a group (Zander as cited in Prestwich et al., 2003). Participants were given this definition of an exercise session during their initial intervention sessions with experimenters. In addition, a written definition of exercise and how many minutes constituted an exercise session were printed on each exercise diary and provided to participants each week of the study. Nonetheless, 26% of participants in the sample reported some sort of group or team activities in their exercise diaries.
Participants were encouraged to report all exercise behavior, not just the two additional sessions each week; however, it is possible that some participants thought that their team or group activities counted toward their additional exercise commitment for the study thereby influencing their perception of the frequency or duration of their weekly exercise behavior. Another 8% of the participants reported each individual exercise activity as though it were a separate exercise session even when, in fact, these activities may have occurred during the same session. For example, if a participant lifted weights, used a treadmill, and then, performed calisthenics all on the same date, beginning at the same time, and at the same location with no time interval of at least 30 minutes between any of the activities, then, the activities should be counted as occurring within one exercise session. Nevertheless, several participants reported individual activities as separate exercise sessions. These activities were combined and scored as single sessions; however, the differences between the ways in which participants and the investigator measured exercise sessions may have contributed to differences in participants’ perception of frequency and duration of exercise sessions. Finally, the present research was limited by the exclusive use of self-report measures. Self-report measures are susceptible to social-desirability bias and over-reporting of exercise frequency, session duration, or time per week may have occurred. Accurate measurement of exercise behavior in long-term studies has been a concern not only for the present study but in other investigations of exercise behavior as well (Klesges, 1990; Sims, Smith, Duffy, & Hilton, 1999). Recommendations have included the
use of objective measures such as attendance records at fitness centers or gyms or physiological measures of fitness in addition to self-report questionnaires or diaries.

4.7. Future Directions

As suggested by previous studies, integrated interventions that incorporate components from both the motivational and volitional phases of health behavior or goal theories should be pursued. Milne, Orbell, and Sheeran (2002) concluded that motivational interventions alone were not effective in promoting exercise behavior, but an intervention that combined both motivational and volitional components (i.e., Implementation intentions) increased exercise behavior in a college student sample. However, the present study demonstrated that combined intervention components should be implemented in such a manner that the effects of each component are maximized and the possible interference of one component with another is prevented. Future implementation intention-based interventions should provide adequate time for cognitive rehearsal. In addition, assessment of commitment to exercise goals and to the implementation intentions that are formed is recommended.

As mentioned, implementation intentions have been effective in initiating behavior, but it has been suggested that they have not been demonstrated to be effective for the maintenance of repeated behaviors over long periods of time (Jackson, Lawton, Knapp, Raynor, Conner, Lowe, & Closs, 2005). For repeated behaviors that occur over extended periods of time, repeated implementation intention interventions could be considered in which participants reestablish their
implementation intentions periodically. Ideally, interventions that focus on the volitional aspects of goal pursuit should have some sort of relapse prevention component to facilitate the maintenance of behaviors particularly when those behaviors are difficult to enact or require more effort to overcome competing established habits.

Another important consideration for future research involves the inclusion of implementation intention intervention studies with samples drawn from both the general population and clinical populations. Many of the published implementation intention studies to date have been restricted to student samples. Jackson et al. (2005) cite three studies in addition to their own in which implementation intentions were not effective in promoting health behaviors for samples recruited from clinical populations. Jackson et al. speculated that the motives of student populations who participate in research projects in order to receive course credit are fundamentally different than those of patients who take part in research. Students were described as being more likely to comply with forming the implementation intention correctly and are more compliant with task demands than are patients. Clearly, additional research is needed with diverse populations to ascertain the generalizability of implementation intention effects.

Future research should further examine the influence of individual difference variables as both moderators of intervention effects and as variables that may contribute to attrition from exercise programs. In the present study personal disorganization was not found to moderate the effects of the interventions used to promote exercise behavior; however, personal
disorganization was significantly correlated with exercise frequency. In addition, personal disorganization was an important factor in terms of participant attrition from the study. Assessing individual difference variables was important both in terms of how those variables (personal disorganization) influenced the dependent variable of interest (exercise frequency), but also in terms of analyzing participant attrition from intervention studies. Attrition analysis data from the present study suggest that it may be the case that for some individuals, the most effective health behavior interventions will be those that also provide some sort of external memory cues (e.g., calendars, planners) as opposed to relying so strongly on self-regulation methods. Interventions that provide peer support (e.g., telephone, email, weekly meetings) may also be effective for individuals with significant difficulty with self-regulation.

4.8. Summary and Conclusions

The present study investigated the effects of an integrated intervention based on implementation intentions and relapse prevention techniques to promote exercise behavior in college students. In addition, the study sought to examine whether personal disorganization would moderate the effects of the implementation intention interventions. Participants in all active intervention conditions were predicted to report greater frequency of exercise, duration of exercise sessions, and total exercise minutes per week as compared to the control condition participants. Participants in the both the combined implementation intention-relapse prevention and implementation intention alone conditions were predicted to report greater increases in exercise frequency and
duration than participants in the other two conditions. Relapse prevention condition participants were predicted to report greater frequency and duration of exercise than would the control condition group. Moreover, participants in the combined implementation intention-relapse prevention group were predicted to report the greatest increases in exercise frequency and duration compared to the other three groups because it was hypothesized that the combined condition provided the most support in terms of planned behavioral responses for both initiation of and adherence to planned exercise behavior. Finally, it was predicted that implementation intention interventions would be most effective in promoting exercise behavior for individuals with higher levels of personal disorganization as implementation intentions are purported to benefit behavioral performance for difficult tasks and for people who have difficulty regulating behavior. In general, data from this investigation did not support the hypotheses regarding the effects of the different intervention conditions on exercise behavior. Limitations of the present study which may have been responsible for the failure to find the expected effects of the interventions were considered. The effects of implementation intentions have been robust for a range of health behaviors in several studies and the results from the present study should in no way diminish the value of implementation intentions as potential interventions for the promotion of exercise behavior. If anything, the present study has underscored the importance of certain factors that moderate the effects of implementation intentions and may help to further the development of such future interventions.
BIBLIOGRAPHY


APPENDIX A

IRB RESEARCH PROTOCOL APPROVAL FORM
BEHAVIORAL/SOCIAL SCIENCES
INSTITUTIONAL REVIEW BOARD
RESEARCH INVOLVING HUMAN SUBJECTS
THE OHIO STATE UNIVERSITY

ACTION OF THE REVIEW BOARD

Research Protocol:

2004B0337 IMPLEMENTATION INTENTIONS, PERSONALITY, AND EXERCISE BEHAVIOR, Herbert L. Mirels, Terry Ransom-Flint, Psychology

presented for review by the Behavioral/Social Sciences Institutional Review Board to ensure the proper protection of rights and welfare of the individuals involved with consideration of the methods used to obtain informed consent and the justification of risks in terms of potential benefits to be gained.

The protocol was APPROVED.

NOTE: Please change the starting date of the study to January 3, 2005 or later to reflect the final modifications approved review.

Approval for proposed research includes all materials submitted by the investigator unless otherwise noted.

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least three (3) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Behavioral and Social Sciences Institutional Review Board for the required retention period. This application has been approved for a period of not more than one year. You are reminded that you must promptly report any problems to the Review Board, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: October 22, 2004
Signed: [Signature]
Chairperson

hs 025h Biomedical approval letter (08.04)
APPENDIX B

QUESTIONNAIRES ADMINISTERED TO PARTICIPANTS
BAECKE HABITUAL PHYSICAL ACTIVITY SCALE (HPAS)

What is your main occupation?

_________________________________________________________

1. At work I sit
   Never  Seldom  Sometimes  Often  Very often

2. At work I stand:
   Never  Seldom  Sometimes  Often  Very often

3. At work I walk:
   Never  Seldom  Sometimes  Often  Very often

4. At work I lift heavy loads:
   Never  Seldom  Sometimes  Often  Very often

5. After work I am tired:
   Very Often  Often  Sometimes  Seldom  Never

6. At work I sweat:
   Very Often  Often  Sometimes  Seldom  Never

7. In comparison with others of my age, I think my work is physically:
   Much Heavier  Heavier  As Heavy  Lighter  Much Lighter
Please make a circle around the appropriate answer for each question, considering the past 12 months:

8. Do you or did you practice sports or physical exercise within the past 12 month?
   Yes                     No

   If yes, which sport or physical exercise do you or did you practice more often?
   __________________________________________________________

   (PLEASE PRINT )

   How many hours a week?
   Less than 1 hour 1 – 2 hours 2 -3 hours 3 - 4 hours More than 4 hours

   How many months a year?
   Less than 1 month 1 – 3 months 4 -6 months 7 – 9 months More than 9 months

   If you practice or practiced a second sport or physical activity, what is it?
   __________________________________________________________

   How many hours a week?
   Less than 1 hour 1 – 2 hours 2 -3 hours 3 - 4 hours More than 4 hours

   How many months a year?
   Less than 1 month 1 – 3 months 4 -6 months 7 – 9 months More than 9 months

9. When compared to others of my age, I think my physical activity during leisure hours is:
   Much More           More           The Same           Less           Much Less

10. During leisure hours, I sweat:
    Very Often   Often   Sometimes   Seldom   Never
11. During leisure hours, I practice sports or physical exercises:
   Never         Seldom         Sometimes         Often         Very often

12. During leisure time, I watch TV:
   Never         Seldom         Sometimes         Often         Very often

13. During leisure hours, I walk:
   Never         Seldom         Sometimes         Often         Very often

14. During leisure hours, I ride a bike:
   Never         Seldom         Sometimes         Often         Very often

15. For how many minutes a day do you walk or ride a bike going back and forth from work, school, or shopping?
   Less than 5 minutes  5-15 minutes  16-30 minutes  31-45 minutes  More than 45 minutes
UNIPOLAR TRAIT TERM INVENTORY (GOLDBERG; BIG-FIVE)

Self-Description Inventory – Form B5

Please use this list of common human traits to describe yourself as accurately as possible. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared with other persons you know of the same sex and of roughly your same age.

Before each trait, please write a number indicating how accurately that trait describes you, using the following rating scale:

Inaccurate  Accurate

Extremely  Very  Quite  Slightly  Neither  Slightly  Quite  Very  Extremely

1  2  3  4  5  6  7  8  9

<table>
<thead>
<tr>
<th>Trait</th>
<th>Inaccurate</th>
<th>Accurate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Extraverted</td>
<td>Negligent</td>
</tr>
<tr>
<td>Agreeable</td>
<td>Fearful</td>
<td>Nervous</td>
</tr>
<tr>
<td>Anxious</td>
<td>Fretful</td>
<td>Organized</td>
</tr>
<tr>
<td>Artistic</td>
<td>Generous</td>
<td>Philosophical</td>
</tr>
<tr>
<td>Assertive</td>
<td>Haphazard</td>
<td>Pleasant</td>
</tr>
<tr>
<td>Bashful</td>
<td>Harsh</td>
<td>Practical</td>
</tr>
<tr>
<td>Bold</td>
<td>Helpful</td>
<td>Prompt</td>
</tr>
<tr>
<td>Bright</td>
<td>High-strung</td>
<td>Quiet</td>
</tr>
<tr>
<td>Careful</td>
<td>Imaginative</td>
<td>Relaxed</td>
</tr>
<tr>
<td>Careless</td>
<td>Imperceptive</td>
<td>Reserved</td>
</tr>
<tr>
<td>Cold</td>
<td>Imperturbable</td>
<td>Rude</td>
</tr>
<tr>
<td>Complex</td>
<td>Impractical</td>
<td>Self-pitying</td>
</tr>
<tr>
<td>Conscientious</td>
<td>Inconsistent</td>
<td>Selfish</td>
</tr>
<tr>
<td>Considerate</td>
<td>Inefficient</td>
<td>Shallow</td>
</tr>
<tr>
<td>Cooperative</td>
<td>Inhibited</td>
<td>Shy</td>
</tr>
<tr>
<td>Creative</td>
<td>Innovative</td>
<td>Simple</td>
</tr>
<tr>
<td>Daring</td>
<td>Insecure</td>
<td>Sloppy</td>
</tr>
<tr>
<td>Deep</td>
<td>Intellectual</td>
<td>Steady</td>
</tr>
<tr>
<td>Demanding</td>
<td>Introjective</td>
<td>Sympathetic</td>
</tr>
<tr>
<td>Disorganized</td>
<td>Introverted</td>
<td>Systematic</td>
</tr>
<tr>
<td>Distrustful</td>
<td>Irritable</td>
<td>Talkative</td>
</tr>
<tr>
<td>Efficient</td>
<td>Jealous</td>
<td>Temperamental</td>
</tr>
<tr>
<td>Emotional</td>
<td>Kind</td>
<td>Thorough</td>
</tr>
<tr>
<td>Energetic</td>
<td>Moody</td>
<td>Timid</td>
</tr>
<tr>
<td>Envious</td>
<td>Neat</td>
<td>Touchy</td>
</tr>
</tbody>
</table>

142
REATIONS INVENTORY (Form SPDS)

Please indicate your degree of agreement or disagreement with each of the statements below. There are no “right” or “wrong” answers. Mark each statement, at the left, according to how much you agree or disagree with it. Use the following code:

+1 Slightly agree -1 Slightly disagree
+2 Moderately agree -2 Moderately disagree
+3 Strongly agree -3 Strongly disagree

1. _______ I spend a lot of time looking for things I have misplaced.
2. _______ I am often overwhelmed by how much work I have left undone until the last minute.
3. _______ I often feel like I am doing things the hard way.
4. _______ I am almost never confused about deciding what things need to get done first.
5. _______ My life often seems very disorganized.
6. _______ Even when I write down what I have to do, I still often forget to do it.
7. _______ Being poorly organized creates serious problems in my life.
8. _______ My work space at home is neat and uncluttered.
9. _______ I frequently find myself using up time and energy on things that are unrelated to my goals.
10. _______ I work efficiently even when there are loud, noisy distractions.
11. _______ My life seems to be lacking a sense of direction.
12. _______ My life would be a lot easier if I could become better organized.
13. _______ It is easy for me to keep my work and responsibilities well organized.
14. _______ I have developed an effective system for filing my important papers.
15. _______ I often seem not to know what my own opinions are.
16. _______ When it comes to long-range projects, I find that I somehow automatically know how to organize my time and priorities.
17. _______ Forgetting to do things has caused problems for me.
18. _______ I find it difficult to think clearly in a cluttered environment.
19. _______ I almost never misplace bills or important papers.
<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1</td>
<td>Slightly agree</td>
</tr>
<tr>
<td>+2</td>
<td>Moderately agree</td>
</tr>
<tr>
<td>+3</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>-1</td>
<td>Slightly disagree</td>
</tr>
<tr>
<td>-2</td>
<td>Moderately disagree</td>
</tr>
<tr>
<td>-3</td>
<td>Strongly disagree</td>
</tr>
</tbody>
</table>

20. _______ I have a clear and steady sense of my own aims and goals.
21. _______ When I do something, I have a pretty good idea of how good or poor it is.
22. _______ I have difficulty keeping my attention focused even when I’m trying to accomplish something important.
23. _______ People who know me well have told me that I am disorganized.
24. _______ I often seem not to know my own mind.
25. _______ I use my time efficiently.
26. _______ I have a tendency to forget to do things that I had planned to do.
27. _______ I have a tendency to forget appointments.
28. _______ I rarely forget birthdays, anniversaries, and other special days.
29. _______ My life seems scattered and lacking clear objectives.
30. _______ I tend to be absent-minded.
31. _______ I rarely have difficulty communicating my ideas clearly.
32. _______ Being easily distracted is a problem for me.
33. _______ I often feel confused when I have a lot of things to do.
34. _______ I am uncomfortable if my desk or workplace is not well organized before I begin working.
35. _______ I often get very frustrated at how disorganized I am.
36. _______ Once I set a goal for myself, I don’t have much difficulty achieving it.
37. _______ I often feel like my goals are not really my own.
38. _______ I would have a hard time getting what I need done if I did not make lists.
39. _______ I prefer jobs that have clear guidelines and instructions, rather than jobs that require frequent decisions on how to proceed.
40. _______ I often have difficulty finding important items because of the clutter in my work area.
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 voting I thoroughly investigate the qualifications of all 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 someone.
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 own 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 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 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 loud-mouthed, 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.
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>F</td>
<td>22. At times I have really insisted on having things my own way.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>23. There have been occasions when I felt like smashing things.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>24. I would never think of letting someone else be punished for my wrongdoings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>25. I never resent being asked to return a favor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>26. I have never been irked when people expressed ideas very different from mine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>27. I never make a long trip without checking the safety of my car.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>28. There have been times when I was quite jealous of the good fortune of others.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>29. I have almost never felt the urge to tell someone off.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>30. I am sometimes irritated by people who ask favors of me.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>31. I have never felt that I was punished without cause.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>32. I sometimes think when people have a misfortune they only got what they deserved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>33. I have never deliberately said something that hurt someone’s feelings.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**CES-D QUESTIONNAIRE**

**Instructions for questions:** Below is a list of the ways you might have felt or behaved recently. Please indicate how often you have felt this way during the past week by writing a number that corresponds to the following choices to the left of each item.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rarely or none of the time (less than 1 day)</td>
<td>Some or a little of the time (1 - 2 days)</td>
<td>Occasionally or moderate amount of time (3 - 4 days)</td>
<td>Most or all of the time (5 - 7 days)</td>
</tr>
</tbody>
</table>

During the past week:

1. I was bothered by things that usually don’t bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt that I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
15. People were unfriendly.
16. I enjoyed life.
Self-Evaluation Form STAI/Y-2

**Directions:** A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe how you generally feel.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel pleasant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I feel nervous and restless.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I feel satisfied with myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I wish I could be as happy as others seem to be.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I feel like a failure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I feel rested.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I am “cool, calm, and collected.”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I feel that difficulties are piling up so that I cannot overcome them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I worry too much over something that really doesn’t matter.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I am happy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. I have disturbing thoughts.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I lack self-confidence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I feel secure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. I make decisions easily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. I feel inadequate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. I am content.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Some unimportant thoughts run through my mind and bother me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Almost Never</td>
<td>Sometimes</td>
<td>Often</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------</td>
<td>--------------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>18.</td>
<td>I take disappointments so keenly that I can't put them out of my mind.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>I am a steady person.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20.</td>
<td>I get in a state of tension or turmoil as I think over my recent concerns and interests.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate to what extent you generally feel this way, that is, how you feel on average. Use the following scale to record your answers.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>very slightly or not at all</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Interested</th>
<th></th>
<th>Irritable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distressed</td>
<td></td>
<td>Alert</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excited</td>
<td></td>
<td>Ashamed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upset</td>
<td></td>
<td>Inspired</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td></td>
<td>Nervous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guilty</td>
<td></td>
<td>Determined</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scared</td>
<td></td>
<td>Attentive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hostile</td>
<td></td>
<td>Jittery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enthusiastic</td>
<td></td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proud</td>
<td></td>
<td>Afraid</td>
<td></td>
</tr>
</tbody>
</table>
Rosenberg Self-Esteem Scale

INSTRUCTIONS: Below is a list of statements dealing with your general feelings about yourself. If you Strongly Agree, circle “SA.” If you Agree, circle “A.” If you Disagree, circle “D.” If you Strongly Disagree, circle “SD.”

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. On the whole, I am satisfied with myself.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>2. At times I think I am no good at all.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>3. I feel that I have a number of good qualities.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>4. I am able to do things as well as most other people.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>5. I feel I do not have much to be proud of.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>6. I certainly feel useless at times.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>7. I feel that I’m a person of worth, at least on an equal plane with others.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>8. I wish I could have more respect for myself.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>9. All in all, I am inclined to feel that I am a failure.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>10. I take a positive attitude toward myself.</td>
<td>SA</td>
<td>A</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>
PROCRASTINATION SCALE

Instructions: People may use the following statements to describe themselves. For each statement, decide whether the statement is uncharacteristic or characteristic of you using the following 5-point scale. Note that the “3” on the scale is Neutral – the statement is neither characteristic nor uncharacteristic of you. On the line to the left of each statement, fill in the number from the scale that best describes you.

<table>
<thead>
<tr>
<th>Extremely Uncharacteristic</th>
<th>Moderately Uncharacteristic</th>
<th>Neutral</th>
<th>Moderately Characteristic</th>
<th>Extremely Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. I often find myself performing tasks that I had intended to do days before. 
2. I do not do assignments until just before they are to be handed in. 
3. When I am finished with a library book, I return it right away regardless of the date it is due. 
4. When it is time to get up in the morning, I most often get right out of bed. 
5. A letter may sit for days after I write it before mailing it. 
6. I generally return phone calls promptly. 
7. Even with jobs that require little else except sitting down and doing them, I find they seldom get done for days. 
8. I usually make decisions as soon as possible. 
9. I generally delay before starting on work I have to do. 
10. I usually have to rush to complete a task on time. 
11. When preparing to go out, I am seldom caught having to do something at the last minute. 
12. In preparing for some deadline, I often waste time by doing other things. 
13. I prefer to leave early for an appointment. 
14. I usually start an assignment shortly after it is assigned. 
15. I often have a task finished sooner than necessary. 
16. I always seem to end up shopping for birthday or Christmas gifts at the last minute.
17. I usually buy even an essential item at the last minute.

18. I usually accomplish all the things I plan to do in a day.

19. I am continually saying, "I'll do it tomorrow."

20. I usually take care of all the tasks I have to do before I settle down and relax for the evening.
LOT-R

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no “correct” or “incorrect” answers. Answer according to your own feelings rather than how you think “most people” would answer.

1 = I agree a lot.
2 = I agree a little.
3 = I neither agree or disagree
4 = I disagree a little.
5 = I disagree a lot.

1. _______ In uncertain times, I usually expect the best.
2. _______ It’s easy for me to relax.
3. _______ If something can go wrong for me, it will.
4. _______ I’m always optimistic about my future.
5. _______ I enjoy my friends a lot.
6. _______ It’s important for me to keep busy.
7. _______ I hardly ever expect things to go my way.
8. _______ I don’t get upset too easily.
9. _______ I rarely count on good things happening to me.
10. _______ Overall, I expect more good things to happen to me than bad.
DEMOGRAPHICS AND HEALTH INFORMATION:

1) What is your sex? 1…MALE  2…FEMALE

2) What is your height to the nearest inch without shoes? (Fill in inches below)

   1…4 Ft. AND _________INCHES  3…6 Ft. AND__________INCHES
   2…5 Ft. AND__________INCHES  4…OTHER______________

3) Please indicate your weight by circling the number next to the appropriate range below:

   1…<100 lbs.  5…131-140 lb  9…171-180 lbs.  13…211-220 lbs.  17…251-260 lbs.
   2…101-110 lbs.  6…141-150 lbs.  10…181-190 lbs.  14…221-230 lbs.  18…261-270 lbs.
   3…111-120 lbs  7…151-160 lbs.  11…191-200 lbs.  15…231-240 lbs.  19…271-280 lbs.
   4…121-130 lbs  8…161-170 lbs.  12…201-210 lbs.  16…241-250 lbs.  20…> 281 lbs.

4) What is your age?

   _____________YEARS _____________MONTHS

5) What is your marital status?

   1…NEVER MARRIED  4…DIVORCED
   2…CO-HABITATION  5…WIDOWED
   3…MARRIED  6…OTHER______________

6) What is the highest level of education you have achieved?

   1…HIGH SCHOOL DIPLOMA  5…DOCTORAL DEGREE
   2…ASSOCIATE DEGREE  6…MEDICAL DOCTOR
   3…BACHELOR’S DEGREE  7…OTHER__________________
   4…MASTER’S DEGREE
7) What is your current work status?
   1…Employed full-time  5…Unemployed, not looking for a job
   2…Employed part-time  6…Retired
   3…Unemployed, on disability  7…Homemaker, not employed outside the home
   4…Unemployed, looking for a job

8) What is your combined family income?
   1…Less than 15,000 a year  4…45,000 – 59,999 a year
   2…15,000 – 29,999 a year  5…60,000 – 74,999 a year
   3…30,000 – 44,999 a year  6…75,000 or greater a year

9) With which ethnic group do you primarily identify?
   1…Black  4…Asian
   2…White  5…American Indian
   3…Hispanic  6…Other (please list)_________________________
PHYSICAL ACTIVITY READINESS QUESTIONNAIRE (PAR-Q)

The PAR-Q is designed to help you help yourself. Many health benefits are associated with regular exercise, and the completion of the PAR-Q is a sensible first step to take if you are planning to increase the amount of physical activity in your life.

For most people, physical activity should not pose any problem or hazard. The PAR-Q has been designed to identify the small number of adult for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them.

Common sense is your best guide in answering these questions. Please read them carefully and check YES or NO opposite the question as it applies to you.

YES  NO  1. Has a doctor ever said that you have a heart condition and recommended only medically supervised activity?

YES  NO  2. Do you have chest pain brought on by physical activity?

YES  NO  3. Have you developed chest pain in the past month?

YES  NO  4. Do you tend to lose consciousness or fall over as a result of dizziness?

YES  NO  5. Do you have a bone or joint problem that could be aggravated by the proposed physical activity?

YES  NO  6. Has a doctor ever recommended medication for your high blood pressure or a heart condition?

YES  NO  7. Are you aware through your own experience, or a doctor’s advice, of any other physical reason against your exercising without medical supervision?

Note: If you have a temporary illness, such as a common cold, or are not feeling well at this time – Postpone participation.

_________________________________       ____________________________
Participant’s Name (Print Please)                                   Participant’s Signature

________________________________________
Date                                                                               Experimenter’s Signature
Exercise Intention Questionnaire

Participant ID # ___________       Sex _______ AGE ________

Please think carefully about your physical activity at home, at work, at school, and during leisure time.

1. Please mark with an “X” one response below that best describes how physically active you feel you are:

_____  I am very physically active.
_____  I am quite physically active.
_____  I am quite inactive.
_____  I am very inactive.

2. During an average week (a full 7 days), how many times do you usually do each of the following for more than 20 minutes at a time?

a) Strenuous physical activity: sports, hard manual labor (e.g., jogging, running, hard swimming, football, basketball, heavy lifting and carrying, shoveling and pushing heavy objects)

Times per week (please circle)

0  1  2  3  4  5  6  7 More ________ (How many?)

b) Moderate physical activity: physical recreation, leisure activities, manual work (e.g., brisk walking, tennis, easy cycling, dancing in a club, easy swimming, lifting and carrying medium weight objects)

Times per week (please circle)

0  1  2  3  4  5  6  7 More ________ (How many?)

b) Mild physical activity: physical hobbies, light recreation (e.g., easy walking, bowling, golf, scrubbing floors, stocking shelves)

Times per week (please circle)

0  1  2  3  4  5  6  7 More ________ (How many?)
Please read carefully the following definitions before continuing to complete this questionnaire:

The word “exercise” in this questionnaire means physical activity that you engage in for at least 20 minutes. It would include activities such as swimming or jogging, but not everyday activities such as walking in a shopping mall.

* * * * *

3. How many times a week do you currently exercise?

____________________

4. How many times did you exercise in the last three weeks? Please detail below what you did, where you did it, and when you did it (if possible) and for how long.

<table>
<thead>
<tr>
<th>Week Number</th>
<th>What Type of Exercise</th>
<th>Where Location of Exercise</th>
<th>When Day of Week, Time</th>
<th>Number of times performed</th>
<th>Duration of Each Exercise Session (in Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Weeks Ago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Weeks Ago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Week Ago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Have you ever exercised over an extended period of time (i.e., months, years) three or more times a week?  
(Please circle one) YES NO

Below are a series of statements relating to your exercise. For each item, please circle one number that most accurately reflects your response. There are no right or wrong answers, so please respond truthfully. Do not think too much about your answer and try to respond with your first impression.

NOTE: The phrase "exercise more" refers to exercising by yourself (i.e., in a non-team sport) two or more times a week than you currently exercise.

* * * * * *

6. I intend to exercise more during the next four weeks.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
</table>
|   | Definitely | Do Not Intend | To Exercise More
|   | Definitely Do | Intend To Exercise More |

7. I am confident if I exercise more over the next four weeks I could stick with it.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Strongly Agree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. People who are important to me think I ….

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
</table>
|   | Should exercise more during the next four weeks
|   | Should not exercise more during the next four weeks |

9. How likely is it that you will exercise more during the next four weeks?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unlikely</td>
<td>Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. My exercising over the next four weeks is (circle one number per row):

a) bad
b) harmful
c) unpleasant
d) unenjoyable
e) foolish

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>good</td>
<td>beneficial</td>
<td>pleasant</td>
<td>enjoyable</td>
<td>wise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. I am determined to exercise more over the next four weeks.

1 2 3 4 5 6  7
Strongly Disagree Strongly Agree

12. I feel under social pressure to exercise more over the next four weeks.

1 2 3 4 5 6  7
Strongly Disagree Strongly Agree

13. I don’t know if I can exercise more over the next four weeks.

1 2 3 4 5 6  7
Strongly Disagree Strongly Agree

14. I want to try to exercise more over the next four weeks.

1 2 3 4 5 6  7
Strongly Disagree Strongly Agree

15. For me to exercise more during the next four weeks will be ….

1 2 3 4 5 6  7
Easy Difficult

16. People who are important to me would …

1 2 3 4 5 6  7
Approve of my exercising more over the next four weeks Disapprove of my exercising more over the next four weeks

17. I am confident that I could exercise more over the next four weeks if I wanted to.

1 2 3 4 5 6  7
Strongly Disagree Strongly Agree

18. I will try to exercise more over the next four weeks.

1 2 3 4 5 6  7
Unlikely Likely
Exercise Self-Efficacy Measure

This questionnaire looks at how confident you are to exercise when other things get in the way. Read the following items and enter on the line opposite the number that best expresses how each item relates to you in your leisure time. Please answer using the following 5-point scale:

1 = Not at all confident
2 = Somewhat confident
3 = Moderately confident
4 = Very confident
5 = Completely confident

_____ 1. I am under a lot of stress.
_____ 2. I feel I don’t have the time.
_____ 3. I am alone.
_____ 4. I don’t have access to exercise equipment.
_____ 5. My friends don’t want me to exercise.
_____ 6. It’s raining or snowing.
_____ 7. I am depressed.
_____ 8. I don’t feel like it.
_____ 9. I have to exercise alone.
_____ 10. I am traveling.
_____ 11. My significant other does not want me to exercise.
_____ 12. It’s cold outside.
_____ 13. I am anxious.
_____ 15. My partner decides not to exercise that day.
_____ 16. My gym is closed.
_____ 17. I am spending time with friends or family who do not exercise.
_____ 18. The roads or sidewalks are snowy.
## Exercise Relapse Prevention

Frequently, when people attempt to increase their exercise behavior, they encounter barriers or “high-risk” situations that may challenge their ability to maintain an exercise routine. High-risk situations can be internal (e.g., mood states or emotions) or external (e.g., a change in weather or social pressure). Identifying and planning for these high-risk situations can help people attain their exercise goals.

Below are several examples of “high-risk” situations that might interfere with your ability to exercise at least two more times each week than you currently exercise. Please read each example, and then, in the boxes on the left side of the page, RANK ORDER from most difficult (#1) to least difficult (#3) your top three most challenging situations in terms of maintaining an exercise routine. If you can think of another high-risk situation not listed below that poses a challenge for you, write it in the space provided below next to “Other.”

Then, list at least one problem-solving solution for each “high-risk” situation that you ranked below. Please be as detailed as possible when generating your solutions.

<table>
<thead>
<tr>
<th>High-Risk Situations</th>
<th>Problem-Solving Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad weather</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
</tr>
<tr>
<td>Negative mood</td>
<td></td>
</tr>
<tr>
<td>Lack of time</td>
<td></td>
</tr>
<tr>
<td>Social situations</td>
<td></td>
</tr>
<tr>
<td>Boredom</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Anticipating and planning for these high-risk situations can help you stick with your exercise routine. Remember, try to exercise at least 2 more times per week than you currently exercise. **However, if you do “slip” or miss an exercise session, THAT DOES NOT MEAN THAT YOU HAVE FAILED IN YOUR EXERCISE ATTEMPTS.** Try to view a slip as an opportunity to examine your exercise strategy and to plan new ways to cope with exercise challenges. If you find that you are struggling to incorporate two more exercise sessions per week, review your problem-solving solutions to your high-risk situations.
Exercise Implementation Intention

Many people find that when they intend to adopt a new behavior such as exercise, they then forget to do it or they never get around to doing it. It has been found that when you form a specific plan of exactly how, when, and where you will carry out the behavior, you are less likely to forget about it or find that you don’t get around to doing it. It would be useful for you to make such a plan of when and where you intend to exercise over the next month. Fill in the following statement providing as much situational information as you can. For example you might write, “I will jog around the oval before I shower and dress for classes on Mondays AND Wednesdays at 8:00 a.m.”.

During the next month, I will ________________________________________
(TYPE OF EXERCISE)
on ________________________________________ at __________________ (DAY or DAYS of WEEK) (TIME OF DAY) at / in __________________________________________________________ (LOCATION)
You may add any helpful details about the situation you described above (e.g., before showering, after breakfast, etc.)
Exercise Log

WEEK #___________ Participant ID #___________

Please complete the diary below after ANY exercise that you do (whether it is “extra” exercise or not). List the type(s), time, location, frequency, and duration of any exercise sessions as soon after finishing the exercise as possible. Try not to forget to complete your diary.

(Try to exercise two more times per week than you were exercising at the beginning of the study. Remember, “exercise” refers to physical activity that you engage in for at least 20 minutes. It would include activities such as swimming or jogging, but not everyday activities such as walking in a shopping mall. Also, the added exercise sessions should be a non-team sport or activity, increase your breathing rate, and make you sweat.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time of Day Exercise Started</th>
<th>Location</th>
<th>Type of Exercise</th>
<th>Duration of Each Exercise Session (in Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At the end of the week, please return your completed exercise diary to Room 215 in Townshend Hall and pick up a new exercise diary for the next week.
Exercise Study Final Session Questionnaire

Please answer the following questions as openly and honestly as possible. There is no penalty associated with any answers to the following items. Circle the number next to your response or print neatly your responses where indicated.

1. When you enrolled in the study, did you intend to exercise at least 2 more times per week for a period of 4 weeks?
   1 ….. Yes, I intended to exercise at least 2 more times per week
   2 ….. No, I did not intend to exercise at least 2 more times per week

2. Did you exercise at least two more times per week than you had exercised prior to participating in this study?
   1…..Yes, each week I exercise at least 2 more times
   2…..No, I was unable to exercise 2 more times per week

3. Did you use any strategies to help you achieve your exercise goals?
   1….. Yes 2….. No

4. If you answered, “Yes” to question #3, please describe in detail the strategy you used to help you achieve your exercise goals. (If you did not use any strategy, skip ahead to question #5).

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

5. If you were unable to exercise at least 2 more times per week during the study, what prevented you from doing so? Please be as specific as possible.

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
APPENDIX C

ONLINE DESCRIPTIONS OF EXPERIMENTS
REP Online Experiment Description for Pre-Intervention Screening Phase of Study

Experiment: CHM-2a

Title: Attitudes, Dispositional Characteristics, and Health Behaviors

Hours: 1.0

Requirements: YOU MUST BE AT LEAST 18 YEARS OLD AND BE FLUENT IN ENGLISH IN ORDER TO BE ELIGIBLE TO PARTICIPATE IN THIS STUDY.

Researchers: Herbert L. Mirels, Ph.D. and Terry Ransom-Flint, M.A.

Description: Participants will be asked to provide written responses to several questionnaires about various health behaviors, attitudes, and dispositional traits.

REP Online Experiment Description for Intervention Phase of Study

Experiment: CHM-2b

Title: Personality, Attitudes About Exercise, and Exercise Behavior – Part I

Hours: 4.5

Requirements: YOU MUST BE INVITED VIA EMAIL TO BE ELIGIBLE TO PARTICIPATE IN THIS STUDY. ALSO, YOU MUST BE AT LEAST 18 YEARS OLD, AND FLUENCY IN ENGLISH IS REQUIRED.

Researchers: Herbert L. Mirels, Ph.D. and Terry Ransom-Flint, M.A.

Description: PARTICIPATION IN THIS STUDY REQUIRES THAT YOU HAVE 1) ALREADY COMPLETED EXPERIMENT CHM-2a. Participants will be asked to complete questionnaires about various health behaviors, attitudes, and dispositional traits. In addition, they will be asked to monitor their exercise behavior over the course of a 4 week period of time. YOU MUST BE INVITED BY OUR LAB IN ORDER TO PARTICIPATE IN THIS STUDY. IF YOU ARE INELIGIBLE AND ENROLL WITHOUT BEING INVITED, YOUR ENROLLMENT IN THE STUDY WILL BE CANCELLED AND YOU WILL NOT EARN PARTICIPATION CREDIT.
REP Online Experiment Description for Post-Intervention Phase of Study

Experiment: CHM-2c

Title: Personality, Attitudes About Exercise, and Exercise Behavior – Part II

Hours: 0.5

Requirements: YOU MUST BE INVITED VIA EMAIL TO BE ELIGIBLE TO PARTICIPATE IN THIS STUDY. ALSO, YOU MUST BE AT LEAST 18 YEARS OLD, AND FLUENCY IN ENGLISH IS REQUIRED.

Researchers: Herbert L. Mirels, Ph.D. and Terry Ransom-Flint, M.A.

Description: PARTICIPATION IN THIS STUDY REQUIRES THAT YOU HAVE ALREADY COMPLETED EXPERIMENT CHM-2a AND CHM-2b. Participants will be asked to complete questionnaires about various health behaviors and attitudes. YOU MUST BE INVITED BY OUR LAB IN ORDER TO PARTICIPATE IN THIS STUDY. IF YOU ARE INELIGIBLE AND ENROLL WITHOUT BEING INVITED, YOUR ENROLLMENT IN THE STUDY WILL BE CANCELLED AND YOU WILL NOT EARN PARTICIPATION CREDIT.
APPENDIX D

INTERVENTION PHASE RECRUITMENT FORM
➢ ARE YOU INTERESTED IN PARTICIPATING IN A STUDY ABOUT FACTORS THAT AFFECT EXERCISE BEHAVIOR?

➢ WOULD YOU LIKE TO EARN 5 MORE CREDITS TOWARD YOUR REP REQUIREMENT?

➢ If your answer is “yes,” then please provide your name and contact information below.

Before you continue, you should know that by providing us with this information you are not obligating yourself to participate in the study. Your contact information will enable us only to email you more information about the study, and then, you can choose to enroll in the study or not. If you do not provide us with this information at this time, however, you will be ineligible to participate in the study.

Yes, I am interested in finding out more about the exercise behavior study. Please send me more information.

Name_________________________________________

Email Address __________________________________

Telephone _____________________________________
APPENDIX E

EMAIL INVITATION TO PARTICIPANTS
Email Invitation to Enroll in Psychology Experiment

Dear Student:

If you have not yet completed all your REP requirements for Psychology 100, read on…you can earn 5 hours of research credit by participating in the following experiment:

Earlier in the quarter, you completed several questionnaires for Experiment CHM-2a. If you remember, at that time you were asked to indicate if you were interested in participating in another experiment that focuses on factors that influence exercise behavior. You gave your name and email address indicating that you were willing to be contacted to find out more about that experiment. That’s why I’m writing.

You are being invited to participate in a research study conducted by our laboratory in which you can earn 5 hours of research experience credit for your Psychology 100 requirements. Professor Mirels’ research group is currently exploring the relationship between attitudes, dispositional characteristics, and exercise behavior. If you still are interested in participating, we would be asking you to monitor your behavior and complete brief questionnaires each week for a period of four weeks. Please note that in order to receive the full 5 hours of participation credit, you would need to participate in the study for the duration of the experiment. In addition, students who remain in the study for the full four weeks, will be eligible to participate in a lottery at the end of the academic term in which the prizes will be (4) $25.00 gift certificates to the OSU bookstore.

If you would like to participate in this study, please go to our webpage on the REP website (www.psy.ohio-state.edu/rep). The experiment is CHM-2b, and you may sign up for any of its posted sessions. Be sure to write down the time, date, and location of the session in which you enroll.

It’s very important that you arrive on time for the study. If you are late, it will not be possible to include you in the session, and it may not be possible to reschedule your appointment. In the event that you need to cancel your appointment, you should call or email us at least 24 hours in advance. The number of the lab is 292-8009, and you can leave a message for Terry Ransom-Flint or Dr. Herbert L. Mirels. You also can contact the researchers at osupersonalityresearch@hotmail.com or mirels.1@osu.edu.

Please feel free to contact me with any questions you may have about this research experience.

Thank you,

Terry Ransom-Flint, M.A.
Doctoral Candidate, Clinical Psychology
The Ohio State University
Columbus, OH 43210
292-8009
APPENDIX F

EXPERIMENTER SCRIPTS
SCREENING PHASE EXPERIMENTER SCRIPT

[Experimenter greets and asks participants to sit apart as they enter the room.]

Hi, this is experiment #CHM-2. My name is ______________________ and I’m a research assistant in the clinical psychology area. I’m going to read to you from a script so that we can make sure that everyone in the study receives exactly the same instructions, but feel free to ask me questions at any point during the experiment if you are unsure about what to do. [Look at participants to see if anyone has a question].

Today’s experiment session will last approximately one hour. The purpose of the study that you are participating in today is to investigate the relationship between attitudes, dispositional traits, and health behaviors. In a little while, I am going to ask you to complete some questionnaires. Some of the items on the questionnaires focus on attitudes or certain health behaviors that some people might consider to be personal information. It’s important that you know that your responses are completely confidential, that you need not answer any questions that make you feel uncomfortable, and that you can withdraw your participation at any time without penalty.

Right now, I'm going to pass out (2) copies of Informed Consent forms to each person. Please read the form carefully and if you agree to participate in the study, sign both copies, give me one copy, and keep the other copy. Are there any questions? [Experimenter passes out informed consent forms, waits and then collects one copy from each participant].
[Experimenter passes out envelopes containing questionnaire packets to participants].

Please complete these questionnaires as openly and honestly as possible and try not to skip any items. Be sure to read carefully the instructions for each questionnaire.

Also, if you are interested in participating in another study that will focus on exercise behavior, please complete your name and contact information on the enclosed sheet in the packet. Please note that by providing your contact information you will not obligate yourself to participate in another experiment. Instead you are only giving experimenters the opportunity to contact you to tell you more about the study. However, if you do not provide your name and contact information at this time, you will not be eligible to participate in the next study.

Are there any questions? [Look around room at participants. Answer questions if there are any; if not, continue]

When you have completed the questionnaires, please put them back in the envelopes and return them to me. Be sure to print your name and sign the sign up sheet so that you will be given credit for your participation today.

[Collect envelopes of questionnaires as participants turn them in. Remind them to sign the sign in sheet, thank them for their participation, and give each one a debriefing statement. Write date, time, location, and experimenter initials in lower right corner of every envelope. Also, note any relevant behavioral observations on participant envelope].
Hi, this is experiment #CHM-2b. My name is _______________________ and I’m a research assistant in the clinical psychology area. I’m going to read to you from a script so that we can make sure that everyone in the study receives the same instructions, but please feel free to ask me questions at any point during the experiment if you are unsure about what to do. Okay? [Look at participant to verify that s/he understands.]

The study that you are participating in focuses on attitudes toward and performance of exercise behaviors. As you know from the information posted on the REP website, your participation in this study will begin today, and then continue over the course of the next four weeks. If you agree to participate in the study, I will ask you to complete some brief questionnaires during this session. Then, you will also be asked to exercise each week for the next four weeks and keep track of your exercise behavior in a diary. At the conclusion of the fourth week, you will be asked to complete a few more questionnaires.

For your participation today, you will earn one-half hour of credit toward your REP requirement. Then, for each of the 4 weeks that you turn in an exercise diary, you will earn another hour of participation credit. Finally, at the end of the 4th week of the study, you will complete more questionnaires in another half hour session. Participants who complete all four weeks of the study will earn a total of 5 hours of REP credit AND they will also be eligible to participate in a lottery at the end of
the quarter in which winners will receive one of (4) $25.00 gift certificates to the
OSU bookstore will be the prizes. Do you have any questions?

Before I continue any further with the study, it's important that you know your
responses are completely confidential, that you need not answer any questions
that make you feel uncomfortable, and that you can withdraw your participation at
any time without penalty. Do you want to continue? [Experimenter looks at
participant. If “yes,” then, continue; if “no,” excuse participant with understanding that
s/he will still receive credit for participating in this session.]

Please read this Informed Consent Form and then sign both copies of it if you
agree to participate in the study. [Experimenter gives participant consent form. If
participant agrees to participate, continue; if participant chooses not to participate, thank
him/her for his/her interest in the study and excuse him/her with the understanding that
s/he will receive credit for this session.]

In addition, because this study involves physical activity on the part of the
participants, you need to read and complete this questionnaire about your
readiness to do so. [Experimenter gives participant a copy of the Physical Activity
Readiness Questionnaire (PAR-Q). If the participant does NOT endorse any of the 7-
items, then continue. If the participant endorses ANY of the 7-items, then s/he is
ineligible to participate in the study and, s/he should be advised that his/her participation
is not possible at this time. Thank the participant for his/her interest in the study and
excuse him/her with the understanding that s/he will receive credit for this session.]
TO ALL PARTICIPANTS:

As I mentioned earlier, we are interested in investigating factors that may affect exercise behavior. Your participation in this study involves your trying to exercise at least two more times per week than you are currently exercising, and keeping a record of your exercise behavior each week for the next four weeks. For the purpose of the study, “exercise” means physical activity that you engage in for at least 20 minutes, and exercise sessions that exceed 20 minutes will still be counted as only one session. Exercise includes activities such as swimming or jogging, but not everyday activities like walking to class or strolling through a shopping mall. The exercise should increase your breathing rate and make you sweat. Also, by exercising more, I mean individual exercise as opposed to a team sport.

After keeping track of your exercise behavior for the next 4 weeks you will be asked to attend one final half hour experiment session in which you will complete a few more questionnaires. Do you have any questions? [Experimenter looks at participant to see if s/he has any questions].

If you are certain that you understand what the study will entail, I will go on. Right now, I’d like you to complete some questionnaires. Please read the instructions carefully and then respond as openly and honestly as possible on each of these questionnaires. Try not to skip any items. [Experimenter gives participants questionnaire packet and pencil].
TO IMPLEMENTATION INTENTION (IMI) CONDITION PARTICIPANTS:

The last page of IMI condition packet of questionnaires contains IMI intervention. When the participant is finished completing the IMI form, say Please read to me your exercise plan. [Note all the information about the type of exercise, location, time, etc.]

To ensure that you have made a link in your mind between the situation you just described and the exercise you will perform, take a moment to imagine the situation and tell yourself, "If I find myself... [IN THAT SITUATION], then I will ... [PARTICIPANT’S NAMED EXERCISE].

[Participant repeats his/her implementation intention]. Thank you. [Experimenter keeps the participant’s exercise IMI plan].

TO RELAPSE PREVENTION (RP) CONDITION PARTICIPANTS:

The last page of the RP condition packet of questionnaires contains the Exercise Relapse Prevention intervention. After the participant completes the form, say: Please think about the answers you just generated on the last page. [Pause 10 seconds].

Now, please read to me the barriers to exercising two more times per week that you anticipated and the problem-solving solutions you generated. [As the items are read, experimenter responds with positive feedback]. Thank you. [Experimenter keeps the participant’s RP sheet].

TO COMBINED (IMI - RP) CONDITION PARTICIPANTS:

[The next to the last page of the IMI-RP combined condition packet of questionnaires contains the Exercise Implementation Intention intervention. Unobtrusively monitor participant’ progress completing the questionnaires. When the participant is finished completing the IMI form, say, Please read me your exercise plan. [Note all the information about the type of exercise, location, time, etc.] To ensure that you have
made a link in your mind between the situation you just described and the exercise you will perform, take a moment to imagine the situation and tell yourself, “If I find myself… [IN THAT SITUATION], then I will … [PARTICIPANT’S NAMED EXERCISE].” [Participant mentally repeats his/her implementation intention]. Thank you. [Experimenter keeps the participant’s exercise IMI plan].

[The last page of IMI-R combined condition packet of questionnaires contains RP intervention.]

After the participant completes the form, say: ] Please think about the answers you just generated on the last page. [Pause 10 seconds]. Now, please read to me the barriers to exercising two more times per week that you anticipated and the problem-solving solutions you generated. [As the items are read, experimenter responds with positive feedback]. Thank you. [Experimenter keeps the participant’s RP sheet].

TO ALL PARTICIPANTS:

[Experimenter hands the participant an envelope containing the participant’s Exercise Log for Week 1 labeled with the participant’s identification number.] Here is your Exercise Log for the first week. Remember, try to exercise at least two more times than you currently exercise and record your exercise behavior on the diary as soon as possible after exercising. [Gesturing to the Exercise Log:] You can see that the Exercise Log includes space for you to include the type of exercise, the location and time of day that you exercise, how many times per week you exercise, and the length of your exercise sessions.

At the end of the week, please put your completed Exercise Log back in the envelope and bring it to Townshend Hall room 215 (on the second floor of
Townshend Hall). When you turn in your Exercise Log at the end of the week, be sure to pick up a new diary for the next week. Your participation credit will be recorded each week after you turn in your log. When you pick up your log for the fourth week, be sure to schedule your final session with the experimenter. During that session, you will turn in your last Exercise Log and complete a few questionnaires. Also, by participating in the study for all four weeks, you will be eligible for the lottery. Do you have any questions about what to do?
[Experimenter responds to any questions that relate to procedural matters].

Thanks so much for your participation today. [Note: Experimenter gives participant written Debriefing Statement at the end of the last experiment session.].
Hi, this is experiment #CHM-2C. My name is ________________ and I’m a research assistant in the clinical psychology area. I’m going to read to you from a script so that we can make sure that everyone in the study receives the same instructions, but please feel free to ask me questions at any point during the experiment if you are unsure about what to do. Okay? [Look at participant to verify that s/he understands.]

The study that you are participating in focuses on attitudes toward and performance of exercise behaviors. As you know from the information posted on the REP website, today’s session will conclude your participation in this study. If you agree to participate in today’s session, I will ask you to complete some questionnaires. For your participation today, you will earn one-half hour of credit toward your REP requirement and also be eligible to participate in the end-of-the-quarter lottery for one of (4) $25.00 gift certificates to the OSU bookstore. Lottery winners will be notified via email during finals week of their status.

Before I continue any further with the study, it’s important that you know your responses are completely confidential and that you can withdraw your participation at any time without penalty. Do you want to continue? [Experimenter looks at participant. If “yes,” then, continue; if “no,” excuse participant with understanding that s/he will still receive credit for participating in this session.]

[Experimenter passes out envelopes containing questionnaire packets to participants].
Please complete these questionnaires as openly and honestly as possible and try not to skip any items. Be sure to read carefully the instructions for each questionnaire. When you have completed the questionnaires, please put them back in the envelopes and return them to me. Be sure to print your name and sign the sign up sheet so that you will be given credit for your participation today.

[Collect envelopes of questionnaires as participants turn them in. Remind them to sign the sign in sheet, thank them for their participation, and give each one a debriefing statement. Write date, time, location, and experimenter initials in lower right corner of every envelope. Also, note any relevant behavioral observations on participant envelope].
APPENDIX G

INFORMED CONSENT FORM
CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

Protocol Title: Implementation Intentions, Personality Correlates, and Exercise Behavior

Protocol Number: ______________________

Principal Investigator: Herbert L. Mirels, Ph.D.

I consent to my participation in research being conducted by Dr. Herbert Mirels of The Ohio State University and his assistants and associates.

The investigator(s) has explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my participation.

I know that I can choose not to participate without penalty to me. If I agree to participate, I can withdraw from the study at any time and there will be no penalty.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at 292-8009 or at osupersonalityresearch@hotmail.com. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

Participant Name: ____________________________________________________________
(Please Print)

Participant Signature: ________________________________ Date: __________

Signed:

________________________________________________________
(Principal Investigator or his authorized representative)
APPENDIX H

DEBRIEFING STATEMENTS
About this study...

Thank you for participating in this study. As was mentioned at the beginning of the experiment session, we are interested in investigating the relationship between personality or dispositional factors and health behaviors. Better understanding of such relationships may help to predict and explain factors that promote health-enhancing behaviors or discourage health-compromising behaviors.

Personality can be thought of as behavioral and emotional tendencies that influence one to act in generally consistent ways. For centuries, philosophers and physicians have theorized about the relationship between health and broad personality types. Modern research has linked certain types of personalities to increased susceptibility to disease. For example, angry, hostile, or aggressive personality styles have been associated with increased risk of heart disease. Depression and anxiety have also been shown to influence our susceptibility to illness. The connection between personality traits and specific health behaviors, however, has not been thoroughly examined.

The study in which you just participated today was designed to help us develop a measure of health behaviors and to explore the relationships between personality traits and specific health behaviors. The pattern of data that you and other participants in our study provide may help us to predict and explain health-enhancing behaviors and health-compromising behaviors.

If you are interested in learning more about factors that influence health behaviors you might want to read the following:


Please note that performance on the measures you completed today may be affected by prior knowledge of the measures. Therefore, please do not discuss with your friends or fellow students specific information about what you did in today’s study.

Should you be interested in our findings or if you have any questions about this study, please feel free to contact Terry Ransom-Flint or Dr. Herbert L. Mirels by phone at 292-8009, or via email (ransom-flint.1@osu.edu or mirels.1@osu.edu).

Again, thank you for participating in our study.
DEBRIEFING STATEMENT FOR INTERVENTION (2nd PHASE)

PARTICIPANTS

About this study...

Thank you for participating in this study. As was mentioned at the beginning of the experiment session, we are interested in how a variety of factors, including planning and personality characteristics, influence health behaviors. In particular, we are interested in how planning and personality might be involved in changing physical activity levels.

Many studies concerned with health behavior have shown that both motivational and volitional processes are involved in adopting health-promoting behaviors. Motivational processes include intention formation and self-efficacy beliefs. Volitional processes include planning, initiation, maintenance, relapse management. In addition, personal characteristics such as procrastination, conscientiousness, distractibility, anxiety, and depression have been shown to influence the initiation and maintenance of various types of behaviors.

The experiment in which you just participated today was designed to investigate the relationship between planning, personality traits, and physical activity levels. The pattern of data that you and other participants in our study provide may help us to develop important interventions that promote health-enhancing behaviors and discourage health-compromising behaviors.

If you are interested in learning more about factors that influence health behaviors you might want to read the following articles:


Please note that performance on the tasks you completed today is affected by prior knowledge of the tasks. Therefore, please do not discuss with your friends or fellow students specific information about what you did in today’s study.

Should you be interested in our findings or if you have any questions about this study, please feel free to contact Terry Ransom-Flint or Dr. Herbert L. Mirels by phone at 292-8009, or via email (ransom-flint.1@osu.edu or mirels.1@osu.edu).

Again, thank you for participating in our study.

189
APPENDIX I

EXERCISE GUIDELINES BOOKLET
FITNESS FUNDAMENTALS

MAKING A COMMITMENT
You have taken the important first step on the path to physical fitness by seeking information. The next step is to decide that you are going to be physically fit. This pamphlet is designed to help you reach that decision and your goal.

The decision to carry out a physical fitness program cannot be taken lightly. It requires a lifelong commitment of time and effort. Exercise must become one of those things that you do without question, like bathing and brushing your teeth. Unless you are convinced of the benefits of fitness and the risks of unfitness, you will not succeed.

Patience is essential. Don’t try to do too much too soon and don’t quit before you have a chance to experience the rewards of improved fitness. You can’t regain in a few days or weeks what you have lost in years of sedentary living, but you can get it back if you persevere. And the prize is worth the price.

In the following pages you will find the basic information you need to begin and maintain a personal physical fitness program. These guidelines are intended for the average healthy adult. It tells you what your goals should be and how often, how long and how hard you must exercise to achieve them. It also includes information that will make your workouts easier, safer and more satisfying. The rest is up to you.

CHECKING YOUR HEALTH
If you’re under 35 and in good health, you don’t need to see a doctor before beginning an exercise program. But if you are over 35 and have been inactive for several years, you should consult your physician, who may or may not recommend a graded exercise test. Other conditions that indicate a need for medical clearance are:

- High blood pressure.
- Heart trouble.
- Family history of early stroke or heart attack deaths.
- Frequent dizzy spells.
- Extreme breathlessness after mild exertion.
- Arthritis or other bone problems.
- Severe muscular, ligament or tendon problems.
- Other known or suspected disease.

Vigorous exercise involves minimal health risks for persons in good health or those following a doctor’s advice. Far greater risks are presented by habitual inactivity and obesity.
DEFINING FITNESS

Physical fitness is to the human body what fine tuning is to an engine. It enables us to perform up to our potential. Fitness can be described as a condition that helps us look, feel and do our best. More specifically, it is:

“The ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure time activities and meeting emergency demands. It is the ability to endure, to bear up, to withstand stress, to carry on in circumstances where an unfit person could not continue, and is a major basis for good health and well-being.”

Physical fitness involves the performance of the heart and lungs, and the muscles of the body. And, since what we do with our bodies also affects what we can do with our minds, fitness influences to some degree qualities such as mental alertness and emotional stability.

As you undertake your fitness program, it’s important to remember that fitness is an individual quality that varies from person to person. It is influenced by age, sex, heredity, personal habits, exercise and eating practices. You can’t do anything about the first three factors. However, it is within your power to change and improve the others where needed.

KNOWING THE BASICS

Physical fitness is most easily understood by examining its components, or “parts.” There is widespread agreement that these four components are basic:

Cardiorespiratory Endurance - the ability to deliver oxygen and nutrients to tissues, and to remove wastes, over sustained periods of time. Long runs and swims are among the methods employed in measuring this component.

Muscular Strength - the ability of a muscle to exert force for a brief period of time. Upper-body strength, for example, can be measured by various weight-lifting exercises.

Muscular Endurance - the ability of a muscle, or a group of muscles, to sustain repeated contractions or to continue applying force against a fixed object. Pushups are often used to test endurance of arm and shoulder muscles.

Flexibility - the ability to move joints and use muscles through their full range of motion. The sit-and-reach test is a good measure of flexibility of the lower back and backs of the upper legs.
BODY COMPOSITION is often considered a component of fitness. It refers to the makeup of the body in terms of lean mass (muscle, bone, vital tissue and organs) and fat mass. An optimal ratio of fat to lean mass is an indication of fitness, and the right types of exercises will help you decrease body fat and increase or maintain muscle mass.

A WORKOUT SCHEDULE

How often, how long and how hard you exercise, and what kinds of exercises you do should be determined by what you are trying to accomplish. Your goals, your present fitness level, age, health, skills, interest and convenience are among the factors you should consider. For example, an athlete training for high-level competition would follow a different program than a person whose goals are good health and the ability to meet work and recreational needs.

Your exercise program should include something from each of the four basic fitness components described previously. Each workout should begin with a warm up and end with a cool down. As a general rule, space your workouts throughout the week and avoid consecutive days of hard exercise.

Here are the amounts of activity necessary for the average healthy person to maintain a minimum level of overall fitness. Included are some of the popular exercises for each category.

WARM UP - 5-10 minutes of exercise such as walking, slow jogging, knee lifts, arm circles or trunk rotations. Low intensity movements that simulate movements to be used in the activity can also be included in the warm up.

MUSCULAR STRENGTH - a minimum of two 20-minute sessions per week that include exercises for all the major muscle groups. Lifting weights is the most effective way to increase strength.

MUSCULAR ENDURANCE - at least three 30-minute sessions each week that include exercises such as calisthenics, pushups, situps, pullups, and weight training for all the major muscle groups.

CARDIORESPIRATORY ENDURANCE - at least three 20-minute bouts of continuous aerobic (activity requiring oxygen) rhythmic exercise each week. Popular aerobic conditioning activities include brisk walking, jogging, swimming, cycling, rope-jumping, rowing, cross-country skiing, and some continuous action games like racquetball and handball.

FLEXIBILITY - 10-12 minutes of daily stretching exercises performed slowly, without a bouncing motion. This can be included after a warmup or during a cooldown.
COOL DOWN - a minimum of 5-10 minutes of slow walking, low-level exercise, combined with stretching.

A MATTER OF PRINCIPLE
The keys to selecting the right kinds of exercises for developing and maintaining each of the basic components of fitness are found in these principles:

SPECIFICITY - pick the right kind of activities to affect each component. Strength training results in specific strength changes. Also, train for the specific activity you’re interested in. For example, optimal swimming performance is best achieved when the muscles involved in swimming are trained for the movements required. It does not necessarily follow that a good runner is a good swimmer.

OVERLOAD - work hard enough, at levels that are vigorous and long enough to overload your body above its resting level, to bring about improvement.

REGULARITY - you can’t hoard physical fitness. At least three balanced workouts a week are necessary to maintain a desirable level of fitness.

PROGRESSION - increase the intensity, frequency and/or duration of activity over periods of time in order to improve.

Some activities can be used to fulfill more than one of your basic exercise requirements. For example, in addition to increasing cardiorespiratory endurance, running builds muscular endurance in the legs, and swimming develops the arm, shoulder and chest muscles. If you select the proper activities, it is possible to fit parts of your muscular endurance workout into your cardiorespiratory workout and save time.

MEASURING YOUR HEART RATE

Heart rate is widely accepted as a good method for measuring intensity during running, swimming, cycling, and other aerobic activities. Exercise that doesn’t raise your heart rate to a certain level and keep it there for 20 minutes won’t contribute significantly to cardiovascular fitness.

The heart rate you should maintain is called your target heart rate. There are several ways of arriving at this figure. One of the simplest is: maximum heart rate (220 - age) x 70%. Thus, the target heart rate for a 40 year-old would be 126.

Some methods for figuring the target rate take individual differences into consideration. Here is one of them:
1. Subtract age from 220 to find **maximum heart rate**.

2. Subtract resting heart rate (see below) from maximum heart rate to determine **heart rate reserve**.

3. Take 70% of heart rate reserve to determine **heart rate raise**.

4. Add heart rate raise to resting heart rate to find **target rate**.

Resting heart rate should be determined by taking your pulse after sitting quietly for five minutes. When checking heart rate during a workout, take your pulse within five seconds after interrupting exercise because it starts to go down once you stop moving. Count pulse for 10 seconds and multiply by six to get the per-minute rate.

**CONTROLLING YOUR WEIGHT**

The key to weight control is keeping energy intake (food) and energy output (physical activity) in balance. When you consume only as many calories as your body needs, your weight will usually remain constant. If you take in more calories than your body needs, you will put on excess fat. If you expend more energy than you take in you will burn excess fat.

Exercise plays an important role in weight control by increasing energy output, calling on stored calories for extra fuel. Recent studies show that not only does exercise increase metabolism during a workout, but it causes your metabolism to stay increased for a period of time after exercising, allowing you to burn more calories.

How much exercise is needed to make a difference in your weight depends on the amount and type of activity, and on how much you eat. Aerobic exercise burns body fat. A medium-sized adult would have to walk more than 30 miles to burn up 3,500 calories, the equivalent of one pound of fat. Although that may seem like a lot, you don’t have to walk the 30 miles all at once. Walking a mile a day for 30 days will achieve the same result, providing you don’t increase your food intake to negate the effects of walking.

If you consume 100 calories a day more than your body needs, you will gain approximately 10 pounds in a year. You could take that weight off, or keep it off, by doing 30 minutes of moderate exercise daily. The combination of exercise and diet offers the most flexible and effective approach to weight control.

Since muscle tissue weighs more than fat tissue, and exercise develops muscle to a certain degree, your bathroom scale won’t necessarily tell you whether or not you are “fat.” Well-muscled individuals, with relatively little body fat, invariably are “overweight” according to standard weight charts. If you are doing a regular program of strength training, your muscles will increase in weight, and possibly your overall weight will increase. Body composition is a better indicator of your condition than body weight.
Lack of physical activity causes muscles to get soft, and if food intake is not decreased, added body weight is almost always fat. Once-active people, who continue to eat as they always have after settling into sedentary lifestyles, tend to suffer from “creeping obesity.”

**CLOTHING**

All exercise clothing should be loose-fitting to permit freedom of movement, and should make the wearer feel comfortable and self-assured.

As a general rule, you should wear lighter clothes than temperatures might indicate. Exercise generates great amounts of body heat. Light-colored clothing that reflects the sun’s rays is cooler in the summer, and dark clothes are warmer in winter. When the weather is very cold, it’s better to wear several layers of light clothing than one or two heavy layers. The extra layers help trap heat, and it’s easy to shed one of them if you become too warm.

In cold weather, and in hot, sunny weather, it’s a good idea to wear something on your head. Wool watch or ski caps are recommended for winter wear, and some form of tennis or sailor’s hat that provides shade and can be soaked in water is good for summer.

Never wear rubberized or plastic clothing, such garments interfere with the evaporation of perspiration and can cause body temperature to rise to dangerous levels.

The most important item of equipment for the runner is a pair of sturdy, properly-fitting running shoes. Training shoes with heavy, cushioned soles and arch supports are preferable to flimsy sneakers and light racing flats.

**WHEN TO EXERCISE**

The hour just before the evening meal is a popular time for exercise. The late afternoon workout provides a welcome change of pace at the end of the work day and helps dissolve the day’s worries and tensions.

Another popular time to work out is early morning, before the work day begins. Advocates of the early start say it makes them more alert and energetic on the job.

Among the factors you should consider in developing your workout schedule are personal preference, job and family responsibilities, availability of exercise facilities and weather. It’s important to schedule your workouts for a time when there is little chance that you will have to cancel or interrupt them because of other demands on your time.

You should not exercise strenuously during extremely hot, humid weather or within two hours after eating. Heat and/or digestion both make heavy demands on the circulatory system, and in combination with exercise can be an overtaxing double load.