THE EFFECTS OF TWO MOTIVATIONAL STRATEGIES ON EXERCISE ADHERENCE AND EXERCISE SELF-EFFICACY IN COLLEGE FEMALES

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December, 2004

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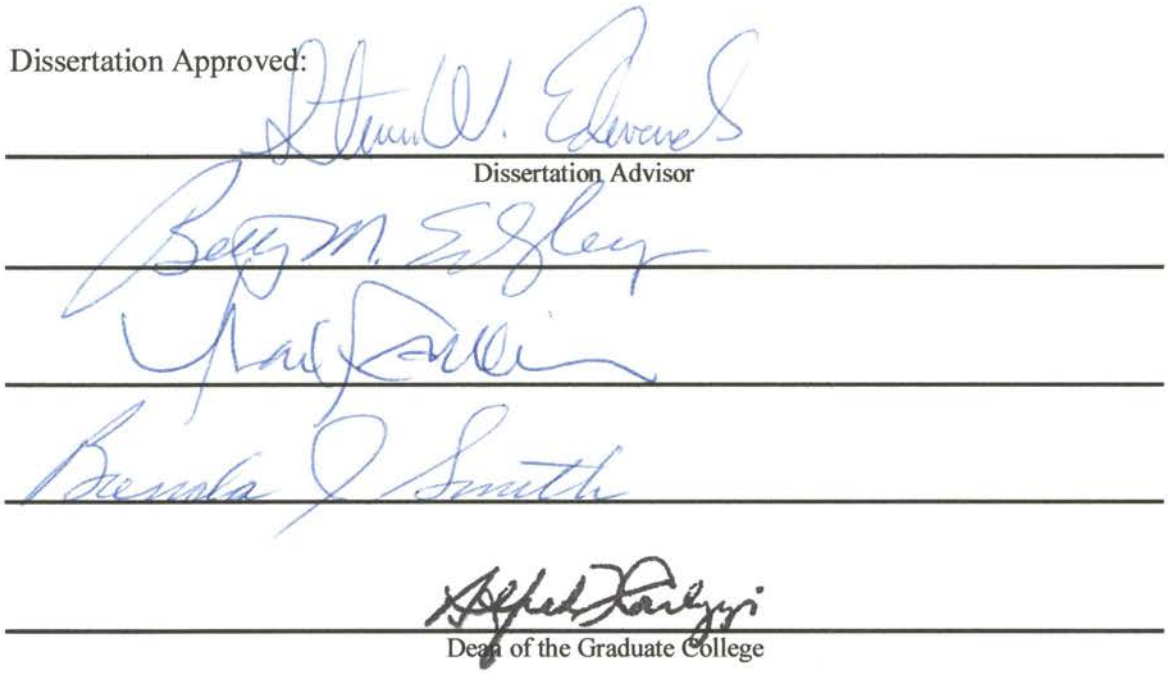
Dissertation Approved:



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PREFACE

We do not know one millionth
of one percent about anything.
Thomas Edison

ACKNOWLEDGEMENTS

I had assumed the completion of a doctoral degree would elicit feelings of relief, happiness, pride and accomplishment. While I do feel these things, what I feel most of all is humbled. There is still so much I do not know. With this new "title" comes great responsibility: to continue learning, to teach and guide students, and most of all, to contribute to a body of knowledge through scholarship and research. The best and the brightest minds throughout history have never stopped asking questions or searching for answers. Above all, they never stopped admitting how much we still don't know.

My journey at OSU began on a rainy spring morning six years ago. My scheduled appointment had fallen through, but luckily Dr. Betty Edgley dropped everything she was doing to talk to me. As she pored over my transcript and made phone calls on my behalf, I thought, "If this is how they treat students, this is where I want to be." Dr. Edgley has continued to guide me as I jumped all the necessary "hoops" from a master's degree to the Ph.D., always making sure each critical detail was in place. I feel immensely blessed to have had her guidance and support in the last year before she retired.

I am also grateful to committee member Dr. Frank Kulling, who always took the time to answer my physiology questions or brainstorm with me, and Dr. Brenda Smith, who unselfishly agreed to be on my committee despite her demanding schedule. Thank you both for the encouragement, knowledge, and advice you have given me.

Much thanks goes to the wonderful staff at the Seretean Wellness Center, especially Robin Purdie and Mary Talley. The Wellness Center has allowed me the opportunity to expand my research skills and provided a support system second to none. Thank you for making this working environment the most positive one I have ever experienced. You have spoiled me for all future jobs!

My family has probably wondered at times just exactly what I was doing, but they have never failed to encourage me. My five siblings are a tremendous backbone of strength, and I hope I can live up to their high expectations. I am especially grateful to Emily, who has shared these years in Stillwater with me. Emily, thank you for the many inside jokes, swim workouts, and late night boxes of Good 'n' Plenty's. Thank you to my mother, whose immense common sense and intuition has taught me more than most college courses (and for free!); and thank you to my father, who has always been and always will be my role model for success, both professional and personal. Don't worry Dad, I will always remember your advice: don't forget to run a virus update on your computer... and yes, don't ever forget your faith. How could I? My faith is the only reason I have gotten to this point.

Much appreciation goes to my longtime friends and surrogate parents, Anne Lott ("Sugar Mama") and David Green ("Bearded Mother"). Thank you for having the insight and kindness to step in when I needed help the most. And as faithful as the rising sun, my training partner Laurie Smith has been everything you could want in a friend, and more. Laurie, you were the inspiration for this dissertation. I will be counting on your infinite wisdom in years to come!

And finally, thank you to a man I truly consider a mentor, friend, and guiding force for the last five years. Dr. Steve Edwards was probably the first person to see beyond my role as "personal trainer" and help me discover a potential I didn't know I had. Slowly and steadily, he ignited in me a desire to learn more, do more, and someday contribute more through research. His encouragement, patience and advice have been beyond measure. Steve – I'm sorry I will never quite understand what degrees of freedom means, but I will always remember you as the first person who made research come alive for me. You have pointed me in this direction, and now I cannot imagine going anywhere else.

Years ago, I read this quote, and it now sticks in my mind:

You are the same person today that you'll be in five years, except for two things: the books that you read and the people that you meet.

Steve Edwards, I consider it an honor and privilege to have met you. Thank you for changing my life and putting me on this path.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

An active mind cannot exist in an inactive body.
-General George Patton, WWII hero

Regular physical activity has long been regarded as part of a healthy life. From Aristotle to Benjamin Franklin to General George Patton, prominent figures throughout history have pointed to the importance of physical activity in a productive life. Recently, this idea has been greatly reinforced through science. A recommendation from the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) summarized the last several decades of investigation in the realm of physical activity (Pate et al., 1995). In short, scientific evidence has demonstrated the effectiveness of regular, moderate-intensity physical activity in reducing the risk of coronary heart disease, hypertension, insulin-resistant (Type 2) diabetes mellitus, osteoporosis, certain cancers, and depression. According to the most recent national estimates by the CDC, as many as 400,000 deaths per year in the United State, more than 16% of total deaths, can be attributed to a sedentary lifestyle and poor diet (Mokdad, Marks, Stroup, & Gerbeding, 2004). Many epidemiological researchers seem to agree that the trend of obesity and inactivity will very soon surpass smoking as the primary

preventable cause of death in the U.S. (Mokdad et al., 2004; Mokdad, Ford, Bowman, Dietz, Vinicor et al., 2001).

It may be argued that one of the most important health-related roles played by physical activity is that of weight regulation. Caloric intake must be balanced by sufficient caloric expenditure in order to maintain a healthy body weight. Currently, almost two-thirds of American adults are classified as overweight or obese, and the rising trend shows no signs of stopping (Flegal, Carroll, Ogden & Johnson, 2002). Outcomes from the third National Health and Nutrition Examination Survey (NHANES III) reveal that the prevalence of overweight and obesity rose eight percent in the six years between 1994 and 2000 (Flegal et al., 2002). Such a sharp increase in such a short time frame clearly points to something at work other than genetic factors (Hill & Peters, 1998). One of the culprits might very well be an environment that encourages as little bodily movement as possible.

Over the past few decades, it has become clear that the highly mechanized, highly industrialized setting of the 21st century makes it difficult to accrue – without conscious planning - sufficient amounts of physical activity for health benefits and weight regulation (Crawford, 2002; Hill & Peters, 1998; McElroy, 2002). The most recent recommendation from the CDC and ACSM suggests that all American adults accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week. The activity should be enough to expend approximately 200 additional calories a day (Pate et al., 1995). These newer guidelines are intended to complement, not supersede, the original ACSM recommendation to exercise vigorously for 20 to 30 minutes at least three times a week (ACSM, 1990). They were presented in light of

growing epidemiological evidence that intermittent bouts of moderate-intensity activity are sufficient to provide protective health benefits. They were also presented in an attempt to induce the sedentary populations to simply move more (Pate et al., 1995). Sadly, this has not happened. Currently, more than 60 percent of American adults are not regularly physically active and 25 percent are completely sedentary (USDHHS, 1996).

Compounding the problem is the abysmally low rate of adherence in those who do actually start an exercise program. Adherence rates have been estimated to range from 50 to 80 percent during the first six months of an exercise regimen, then dropping to 50 percent or below after the first year (Dishman & Sallis, 1994). The low numbers hold true even for participants in randomized, controlled exercise trials where there is typically an abundance of guidance, assistance and support (Martin et al., 1984; Martin, Bowen, Dunbar-Jacob, & Perri, 2000; Martin & Sinden, 2001).

College students are not immune to this trend. It has been suggested that the highest rate of decline in physical activity occurs in late adolescence and early adulthood (ages 18 to 24 years), when the transition from high school to college and/or the workforce takes place (Sallis, 2000; USDHHS, 2000). College students cite the same reasons as other populations for not exercising on a regular basis. These reasons include lack of time, lack of knowledge, exercise sites that are inconvenient or costly, and lack of interest or motivation (Grubbs & Carter, 2002). Since college is a time when young adults begin to establish their lifetime work and leisure habits, it would make sense to target this population in the promotion of regular exercise and physical activity (Calfas, Sallis, Lovato, & Campbell, 1994). However, much of the research involving exercise determinants and adherence has focused on middle-aged and older adults, perhaps

because the health-related problems related to inactivity tend to manifest in these later years. Keeping in mind the adage, "an ounce of prevention is worth a pound of cure," researchers should not overlook the importance of exercise adherence research in young adults who still have the potential to reduce their risk of such problems.

Approximately 300 studies have attempted to identify determinants of physical activity (Sallis & Owen, 1999), and complete books have been written on the subject of exercise adherence alone (see Dishman, 1988; and Rejeski & Kenney, 1988). Such literature provides a wealth of descriptive information regarding the factors that influence individuals to stick with an exercise program over the long term – or eventually drop out. While such information is helpful, it remains relatively static in its value to the health practitioner in need of specific guidelines and behavioral strategies for fostering adherence. In addition, many researchers have called for exercise adherence studies with both an experimental design and a theoretical background (Dishman, 1994; Dishman & Buckworth, 1996; Martin et al., 2000).

The psychological construct of self-efficacy lends itself to theory-based interventions for exercise adherence research. Self-efficacy refers to an individual's own judgment about their ability to successfully perform a task (Bandura, 1977; Bandura, 1997). In other words, the strength of a person's perception that they can successfully engage in a specific behavior increases the likelihood that they will engage in that behavior (in this case, exercise). There is great support in the literature for self-efficacy as both a determinant and a consequence of exercise behavior (Berger, Pargman, & Weinberg, 2002; Fox & Biddle, 1998; Martin & Sinden, 2001; McAuley & Blissmer, 2000). However, the question remains as to what specific motivational strategies might

be employed to develop, or cultivate, exercise self-efficacy in individuals with little or no experience in the exercise world. A few promising studies have shown that manipulating the exercise environment (Turner, Rejeski, & Brawley, 1997) or feedback (McAuley, Talbot, & Martinez, 1999) may affect self-efficacy, while another study supported the idea of actual training in self-efficacy promotion in order to enhance exercise adherence ((McAuley, Courneya, Rudolph, & Lox, 1994).

Another theory with potential for exercise adherence is that of goal setting (Locke & Latham, 1985; Locke, Shaw, Saari, & Latham, 1981). The role of goal setting in task performance has received unequivocal support in organizational and industrial settings, though results have been mixed in the sport and exercise domain. This inconclusive support is likely more due to methodological flaws in the research design rather than an inherent flaw in the theory itself (Kyllo & Landers, 1995; Locke, 1991; Weinberg, 1994). While a variety of studies have examined the effects of goal setting for a specific task in a controlled setting, very few studies have applied the same theory to exercise adherence over several months in a field setting. One study that compared new exercisers who received standard fitness consultations to new exercisers who received standard fitness consultations plus goal setting training saw a significant increase in the adherence of the goal setting group (Annesi, 2002).

There is also the question of what sort of goals work for specific populations. For example, while older adults often cite improved health as an exercise goal (Martin & Sinden, 2001), this is not the case for a younger population, who are more apt to want improvements in appearance and fitness level (Calfas et al., 1994; Grubbs & Carter, 2002; Leslie et al., 2001). However, such goals are often too long-term and general to be

effective (Kyllo & Landers, 1995), and so the need exists to create and employ more short-term goal setting strategies that may induce exercise adherence, particularly in the first critical months of starting an exercise program.

An upcoming physical challenge, or is a familiar and expected goal for individuals involved in organized sports. How well such a goal would work for a more general population – specifically, female college students not involved in college athletics – is not known. Training for an event with a specific training schedule fits much of the criteria for effective goal setting in sport and exercise (Berger et al., 2002; Gould, 2001; Kyllo & Landers, 1995). The criteria includes goals that are challenging but attainable, are explicitly defined, have short- and long-term time frames, and have some sort of specific feedback mechanism built in. The training and completion of a physical challenge has the potential to positively affect the exercise adherence rates of college females. It is also an opportunity to observe any changes in levels of exercise self-efficacy, especially since such training, if viewed as mastery experiences, serves as a source of self-efficacy information (Bandura, 1997).

For a general population, one of the least intimidating challenges might be an organized "road race." Such races typically encourage all levels of ability, from seasoned runners to first-time walkers, and the emphasis is on finishing the event to the best of one's ability rather than "beating" the other competitors. In addition, walking and jogging are activities that are accessible to all fitness levels, can be done alone or with a group, and require no special equipment other than proper footwear. The great majority of these races are "5K's" (3.1 miles), a distance that requires a relatively short amount of training. For these reasons, a road race could be the physical challenge of choice in

which to investigate the effects of such a goal on the self-efficacy and exercise adherence of female college students.

Statement of the Problem

The problem in this study was to determine if there were differences among the exercise adherence rates of three groups of college females engaged in a structured exercise program with different strategies to promote adherence:

Group One - Instructions only

Group Two - Instructions, behavioral self-monitoring, and accountability/feedback

Group Three - Instructions, behavioral self-monitoring, accountability/feedback, and the goal of an upcoming physical challenge (the road race).

The second problem in this study was to investigate if differences existed between the three groups in their levels of exercise self-efficacy, and how this related to the levels of exercise adherence. The third problem in this study was to determine the residual effects of the different strategies two months after the intervention portion was completed.

Purpose for the Study

The preponderance of sedentary adults is one of the greatest public health issues in the United States today. Despite the mounting scientific evidence on the healthy benefits of regular exercise, the vast majority of Americans (about 85 percent) do not meet the minimum requirements to accrue such benefits. One of the most troubling areas is that of exercise adherence. Current research shows that approximately one out of every two American adults who start an exercise program will drop out within a year. Exercise

adherence is not a new area of study; however, the majority of investigations have focused on middle-aged and older adults. Keeping in mind the cost-effective nature of preventive medicine, it would be prudent to focus attention on the young adults who have the most potential to reduce their risk of lifestyle-related diseases.

The results of this study may be useful in both the theory and practice of exercise psychology. Determining how training for a physical challenge affects exercise adherence and self-efficacy will contribute to the body of knowledge in this area. The information has the potential to translate into concrete, real-life strategies for exercise leaders and professionals. In addition, the experimental nature of this study represents an attempt to move forward in this line of inquiry. At present, there is an abundance of literature on the determinants of exercise adherence in an active population, but little on how to establish the desirable determinants in a sedentary population. The possibility that specific strategies - such as those employed in this study - can induce or encourage the desired determinants is an idea worth investigating.

Hypotheses

The following null hypotheses were examined:

Ho_1:

There will be no significant difference in rates of exercise adherence among the three groups of exercisers during the ten-week intervention period.

Ho_2:

There will be no significant difference in levels of exercise self-efficacy among the three groups of exercisers during the ten-week intervention period.

Ho_3:

There will be no significant difference in levels of exercise self-efficacy among the three groups, pre- and post-intervention.

Ho4:

There will be no significant difference in rates of exercise adherence among the three groups of exercisers during the two-month follow-up.

Ho^5:

There will be no significant difference in levels of exercise self-efficacy among the three groups of exercisers during the two-month follow-up.

Delimitations

This study had the following delimitations:

1. Subjects were female students between the ages of 18 and 24 enrolled at Oklahoma State University.
2. Subjects completed a standard PAR-Q (Physical Activity Readiness Questionnaire), a validated health history form intended to screen participants as apparently healthy and ready to begin an exercise program.
3. Subjects were not currently meeting the minimum exercise guidelines to accrue health and fitness benefits (ACSM, 1990).
4. Subjects were randomly assigned to the three different groups.
5. Subjects were asked to complete weekly exercise logs (on paper or electronically) in order to quantify the dependent variable of exercise adherence.

6. For every two-week data point, exercise adherence was measured by total minutes of exercise.
7. Subjects were asked to complete a five-item exercise self-efficacy measure (Marcus, Selby, Niaura, & Rossi, 1992) in order to quantify the dependent variable of self-efficacy.
8. For every two-week data point, exercise self-efficacy was measured with a composite score (possible scores = 5 to 55).
9. All subjects, regardless of group assignment, had the opportunity to attend supervised workouts, fitness lectures, and personal training sessions so that any treatment effects would not be construed as possible artifact due to extra attention.
10. Subjects were asked to report only bouts of "moderate to vigorous intensity exercise" (ACSM, 1990, 2000), as defined in detail in the exercise protocol. Subjects were asked not to report bouts of "lifestyle activity" such as housework or shopping.

Limitations to the Study

The research may have been limited by the following:

1. The subjects were asked to self-report their levels of exercise.
2. The subjects were asked to self-report their levels of exercise self-efficacy.
3. Except for randomization, no attempts were made to account for variability due to existing physical conditions or levels of exercise motivation in the subjects.
4. The subjects were not compensated for their time or efforts; therefore, compliance to the research protocol depended on the personal commitment of each subject.

Assumptions

The following assumptions were made:

1. The subjects made an honest effort in answering the PAR-Q and meeting the study's criteria as sedentary.
2. The subjects made an honest effort to comply with the intervention protocol according to their specific group.
3. The subjects made an honest effort to accurately report their exercise levels for every two-week period during the intervention (10 weeks) and follow-up (8 weeks).
4. The subjects made an honest effort to accurately report their exercise self-efficacy for every two-week period during the intervention (10 weeks) and follow-up (8 weeks).

Definitions

Physical Activity – any bodily movement produced by skeletal muscles which results in energy expenditure (Casperson, Powell, & Christenson, 1985).

Exercise – a subset of physical activity defined as "planned, structured, and repetitive bodily movement done to improve or maintain physical fitness" (Casperson et al., 1985). Subjects in this study were given an extensive list of suggested exercise modalities, included in Appendix E.

Moderate intensity - activity performed at the intensity of 3 to 6 METS (work metabolic rate), the equivalent of walking at 3 to 4 mph (Pate et al., 1995). Subjects in this study were asked to report moderate intensity activity only when it occurred in set exercise sessions, not in lifestyle activities such as housework or walking to class.

Vigorous intensity – activity performed at the intensity of > 6 METS, usually 70 to 90% of maximum heart rate (Pate et al., 1995). Examples would be jogging or step aerobics. Given their young age and healthy status, subjects in this study were encouraged (though not required) to engage in vigorous intensity exercise.

Exercise adherence – in this study, adherence was determined by the total number of minutes a subject reported exercising for every two-week period. To avoid the problem of what some researchers call "non-adherence" – that is, exercising more than the minimum recommendations (Martin & Sinden, 2001), subjects were not given a rigid exercise protocol upon which adherence would be measured. Instead, rates of adherence were considered by comparing the groups against each other.

ACSM 1990 Minimum Exercise Guidelines – For optimal health and benefits, adults should participate in moderate to vigorous exercise for 20 to 60 minutes at least three days a week. The present study chose to use these guidelines as compared to those below for the following reasons:

1) It was expected that formal exercise sessions would be easier to track and report as compared to accumulated activity, and

2) There is evidence that the more moderate guidelines would not create enough physical stimulus to produce given benefits in a young, healthy population (Leslie et al., 2001; Shephard, 1997).

ACSM/CDC 1995 Physical Activity Guidelines – To reduce the risk of certain diseases, adults should accumulate 30 minutes of moderate activity on most, if not all, days of the week. Such activity can be walking (3 to 4mph) or activities of daily living such as housework and yard work.

Self-efficacy - a core concept in the Social Cognitive Theory (Bandura, 1977, 1997), referring to the underlying confidence an individual has toward a specific behavior, which allows him or her to carry out the necessary actions to accomplish that behavior. Self-efficacy is believed to be situation specific and reciprocal (Bandura, 1997; McAuley & Blissmer, 2000); therefore, individuals with high levels of exercise self-efficacy are more likely to participate in exercise and are more likely to feel confident because of their participation.

Goal Setting – Locke and colleagues defined a goal as "attaining a specific standard of proficiency, usually within a specified time limit" (1981, p. 145). The theory of goal setting proposes that individuals and organizations will be more successful at a given task if goals and timelines are in place. Strategies for successful goal setting often include the following: setting challenging but attainable goals, setting specific rather than general

goals, setting both long and short term goals, and choosing goals that are personally meaningful (Berger et al., 2002; Gould, 2001; Kyllo & Landers, 1995).

Physical Challenge – For the purposes of this study, a physical challenge will be defined as an exercise "event" that stretches individuals beyond their everyday physical abilities whether in duration, intensity, or both. The challenge will include some sort of performance element, such as completing an organized road race.

5K (3.1 miles) Road Race – an organized group run, usually sponsored by a local organization for the purpose of promoting physical activity and/or raising money for a charity or cause. Although usually called a "race" or "run," most events welcome participants of all levels from elite runners to first-time walkers. Participants are timed and prizes are awarded, but the overall emphasis is typically on completion and personal accomplishment rather than winning.

REVIEW OF THE LITERATURE

Introduction

Most Americans are fully aware of the benefits of regular physical activity. It is difficult, if not impossible, to turn on the television or glance at a magazine without seeing some sort of message about the physiological or psychological advantages of "being fit." This idea has been reinforced through the mass media (Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998), through scientific evidence (Pate et al., 1995), and even the federal government with campaigns such as Healthy People 2010 (USDHHS, 2000). Statistics from a variety of sources, most notably the Centers for Disease Control and Prevention and the U.S. Department of Health and Human Services, reveal that the proliferation of pro-exercise information and images has not translated into increased physical activity for the majority of the population. In fact, more Americans are sedentary and overweight than ever before (USDHHS, 1996, 2000).

Prevalence of Inactivity

In 1996, the Office of the U.S. Surgeon General issued its first report on the many benefits of physical activity (USDHHS, 1996). Underpinning the report were recommendations from a variety of professional organizations, including the Centers for Disease Control (CDC), the American College of Sports Medicine (ACSM), the National

expend about 200 calories a day) is more important than the specific manner in which the activity is performed (Pate et al., 1995). These recommendations have been embraced by health professionals who advocate making small "lifestyle changes," such as taking the stairs, doing yard work manually, and parking farther away (Crawford, 2002; Hill & Jeffery, 1998; Jeffery & French, 1999).

However, even with the relaxed guidelines, fewer Americans are moving than ever before at both work and play. The average American spends most of their workday sitting behind a desk, and most of their leisure time sitting in front of a television or computer screen. The combination of automobiles, computers, electronic household appliances and labor saving devices, and so forth contribute to a highly mechanized environment that allows little opportunity for physical exertion (Hill & Peters, 1998). By now it is clear that for sufficient activity to occur, exercise must be a planned and prioritized. Thus far, planning such exercise is something few Americans seem unable or unwilling to do.

College Students and Inactivity

One might think that energetic college students would have no problem fitting in the amount of physical activity necessary to accrue health benefits and prevent weight gain. However, it has been suggested that the highest rate of decline in physical activity occurs in late adolescence and early adulthood (ages 18 to 24 years), when the transition from high school to college and/or the workforce takes place (Casperson, Pereira, & Curran, 2000; Sallis, 2000; USDHHS, 2000). Furthermore, more college students – about 20 percent - are overweight now than ever before (CDC, 1997).

Many chronic diseases start in childhood, adolescence, or early adulthood. Both cross-sectional and longitudinal studies suggest that excessive inactivity (particularly television viewing) contributes to obesity in children and adolescents (Ebbeling, Pawlak, & Ludwig, 2002; Kimm & Obarzanek, 2002). A recent analysis of data from NHANES indicates that since 1970, the prevalence of overweight and obesity in persons between ages 2 and 19 has risen 182 percent while the extent, or amount, has risen 247 percent (Jolliffe, 2004). In other words, not only have more young people become overweight in the last three decades, but those overweight persons have become heavier. The extra weight, coupled with the inactivity, puts the child at higher risk for "adult" diseases such as hypertension, hyperlipidemia, cardiovascular disease, and Type 2 diabetes, in addition to psychosocial consequences such as depression and negative stereotypes (Ebberling et al., 2002). The alarming presence of such risk factors in children and teenagers is highlighted in the Bogalusa Heart Study, a two-decade study that examined cardiovascular risk factors in more than nine thousand young people ages 5 to 17 (Freedman, Dietz, Srinivasan, & Berenson, 1999). Researchers reported that overweight children were anywhere from 2.4 (elevated cholesterol) to 12.6 (elevated insulin) more likely to have at least one risk factor for heart disease. Another study went beyond the risk factors and investigated the presence of atherosclerosis, using autopsy reports of 2876 subjects between ages 15 and 34 (Strong et al., 1999). The Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Study found fatty streaks and clinically significant lesions in the right coronary arteries of more than 60% of the subjects in the ages 15 to 19 group, with this number rising to 80% for subjects in the 30 to 34 group.

In an ideal world, healthy lifestyle habits would be firmly established in childhood and then carried on through adolescence and adulthood. However, since children have limited control over their environment, the transition to independence in college represents a critical opportunity for young adults to either establish healthy habits or change unhealthy ones. Unfortunately, it appears as though the probability of remaining sedentary is significantly stronger than the probability of remaining or becoming active (Baranowski et al., 1997).

The findings from the National College Health Risk Behavior Survey (NCHRBS), a nationally representative sample of undergraduates (n = 4609), found that less than 40 percent of students met the minimum national guidelines for exercise (moderate to vigorous exercise for a minimum of 20 minutes, three times a week). Even fewer students (19.5%) reported daily participation in moderate activities such as walking or riding a bicycle (CDC, 1997). About a third of the students reported regular participation in strengthening exercises such as push-ups. The same survey also reported that female students were significantly less likely than male students to participate in exercise, especially vigorous exercise (CDC, 1997).

College students seem to be facing a double-edged sword: one, they now reach college age more sedentary than ever before (Ebberling et al., 2002; Kimm & Obarzanek, 2002); and two, they face an almost inevitable decline in physical activity in the shift from high school to college (Baranowski et al., 1997; Calfas et al., 2000). Some of this may be due to age and reasons not well understood; Sallis (2000) synthesized several studies on age and physical activity and summarized that the greatest period of decline was during adolescence, culminating in the late teens. The other, perhaps more evident,

reason, is that the transition to college often brings new demands and responsibilities – academic, financial, social - as well an overwhelming array of activities that compete for a student's time. Unless a student is a collegiate athlete or extremely determined to exercise, it is very likely that regular workouts will get lost in the shuffle of college life (Calfas et al., 2000).

The drop in physical activity is particularly disturbing for two reasons, as succinctly pointed out by Leslie and colleagues (2001) in an examination of college students in both the U.S. and Australia. The researchers note that by virtue of their education level, the college students of today will become the future policy makers of tomorrow. Thus, their habits, beliefs and attitudes on physical activity will be influential in shaping community norms and values (Leslie et al., 2001, p. 117). In addition, most college students spend a great deal of time of sitting at desks and in front of computer screens, a pattern that will very likely be repeated when they enter the workforce (Fotheringham, Wonnacott, & Owen, 2000; Leslie et al., 2000). If the students do not learn how to incorporate physical activity into their life as sedentary college students, it is doubtful they will do so as sedentary adults in the workforce. In fact, most recent graduates report being *even* less active once they enter the workforce (Anderssen et al., 1996; Calfas et al., 1994). Motivating college students to develop good exercise habits *before* they leave the college setting is a crucial step in reducing the rates of adult inactivity, and is also a tremendous justification for studying this particular population (Calfas et al., 2000; Fotheringham, Wonnacott, & Owen, 2000; Leslie et al., 2000; Sallis, Baumen, & Pratt, 1998).

Studies that document the benefits of physical activity from college age to old age are understandably rare. However, an often-cited study by Paffenbarger et al. (1986) does just that. Researchers followed up on 16,936 college alumni and found a decreased rate of mortality of up to 49 percent in subjects who maintained regular physical activity from their college years into their 70's and 80's. In addition to improved health, there is also the potential savings in health care dollars. A stratified analysis of the 1987 National Medical Expenditures Survey estimated that if every sedentary American over age 15 began a regular program of moderate exercise, the savings to annual medical costs might be as much as $76.6 billion, if adjusted for inflation for the year 2000 (Pratt, Macera, & Wang, 2000).

Consistent across both cross-sectional and longitudinal studies is the finding that young adult females are less likely to exercise than males (De Bourdeaudhuij, Sallis, & Vandelanotte, 2002; Casperson, Pereira, & Curran, 2000; CDC, 1997; Dinger, 2000; Hall, Kuga, & Jones, 2002; Sallis, 2000). Female subjects in the National College Health Risk Behavior Survey reported less vigorous exercise than male subjects, a finding repeated by a study of exercise determinants in 347 multicultural college students. Regardless of race or ethnicity, males reported more vigorous physical activity than females (Hall et al., 2002). The majority of females who do exercise seem to prefer more moderate-intensity physical activity, such as walking or stretching (CDC, 1997; Hall et al., 2001; Leslie et al., 2001; Sallis, 2000). While it is positive that female students are at least engaging in some sort of activity, there is evidence that the females are not balancing out the lower-intensity exercise with a longer duration. In addition, low-intensity activities such as walking may not provide the biological stimulus necessary for

fitness gains in healthy young adults (Shephard, 1997). It appears that not only are too few female students exercising, but the females that are may not be exercising at the optimum intensity and duration.

Evidence from a seven-year study on students in The Netherlands provides further rationale for the importance of promoting exercise to college females (De Bourdeaudhui et al., 2002). Researchers used tracking methods to determine if students who exercised in college continued to do so seven years later, and if so, what were the primary determinants. Surprisingly, significant tracking was found for women but not for men. In other words, females who demonstrated higher levels of physical activity in college continued to do so seven years later. Similar results were seen in a three-year study called Project GRAD in the U.S. (Calfas et al., 2000). Project GRAD was a randomized, controlled, behavior-change intervention designed to help college seniors start an exercise program. Half the students took a knowledge-based health and fitness class, while others took a health and fitness class that incorporated cognitive-behavior change strategies and included personalized follow-up for 18 months. Follow-up results, two years after the students graduated, were for the most part disappointing. There were no significant differences between the control and intervention group. However, the intervention appeared to be significantly more effective for females in promoting strength training and moderate-intensity activities. Researchers note that this could partly be due to the males' higher levels of activity at baseline, which further demonstrates the need for targeting college females (Calfas et al., 2000). The authors also point out that the somewhat lackluster results of this tightly designed, well-executed study demonstrate the

enormous difficulty of motivating individuals to not only exercise but to stay with some sort of exercise routine.

Exercise Adherence

Once individuals decide to increase their level of physical activity, the battle is only half won. The next challenge is to continue, even when the circumstances are less than ideal. Research has consistently shown that between 20 to 50 percent of individuals drop out of an exercise program within the first six months (Dishman, 1988). In a review of 127 studies testing different exercise interventions, many of the studies with follow-up components reported a return to pre-intervention levels within weeks (Dishman & Buckworth, 1996). The determinants of exercise adherence are varied and the list continues to grow as research increases in this area. Determinants include demographics, time constraints (real or perceived), environmental constraints (real or perceived), social and family dynamics, past and present behaviors, and the cognitive and personality variables of each individual (Berger, Pargman, & Weinburg, 2002). In regards to the latter, the personality variable of self-efficacy has received the most support of any single variable in predicting exercise adherence (Berger et al., 2002; Marcus et al., 1992; Martin et al., 2000; McAuley et al., 1994) and will be discussed in depth later in this literature review.

Exercise adherence is difficult to study, and much has been written on how to improve the process. First, there is the problem of how exactly to measure adherence. Some studies have used "total time" in minutes or hours; others have used miles jogged, fitness classes attended, and so forth. Compounding the problem of the many different variables is the perplexing issue of matching up duration with intensity and modality,

plus the variety of methods for recollection (Dishman, 1994; Leith & Taylor, 1994; Martin et al., 2000; Martin & Sinden, 2001). Second, there persists a need for longitudinal studies in this area (Dishman, 1994; Leith & Taylor, 1994), but trying to measure adherence over months and years is extremely difficult, partly due to the reasons listed above and partly due to the natural attrition and non-compliance that occurs over time, thus diminishing the statistical power of the investigation (Martin & Sinden, 2001). Some researchers suggest that adherence needs to be measured on a daily basis, or at least a weekly basis (McAuley et al., 1994), a research protocol that requires considerable commitment on the part of the subject. Third, there is currently a large body of correlational and cross-sectional studies on exercise adherence, but far fewer cause and effect investigations. Some researchers argue that experimental designs are the only way to "move forward" at this point (Leith & Taylor, 1992; Martin et al., 2000). Fourth, there is serious need for experimental exercise adherence studies with a theoretical background; e.g., the social cognitive theory or theory of planned behavior (Dishman & Buckworth, 1996; Martin et al., 2000). However, in some cases, even these theories may fall short, as they were developed to elucidate the processes by which people decide to adopt a new behavior and not necessarily the process by which they maintain it (Martin & Sinden, 2001). Finally, there is the question of correlating adherence results with actual physiological fitness results. In other words, is it enough merely to see an increase in time spent exercising, or should those results be also filtered through fitness tests and biometric data designed to demonstrate the expected "benefits" of exercise adherence (Dishman, 1994; Leith & Taylor, 1992; Martin & Sinden, 2001).

Despite the challenges, the need for experimental, theory-based studies in exercise adherence continues to grow (Dishman & Buckworth, 1996; Fogelholm & Kukkonen-Harjula, 2000; Martin et al., 2000), especially in conjunction with increased demand for obesity research. After a review of 46 randomized, controlled, weight-loss trials, researchers concluded that the abysmal rates of adherence to the prescribed exercise protocol were largely responsible for the inconsistent, inconclusive results (Fogelhomlm & Kukkonen-Harjula, 2000). The researchers contend that exercise adherence or lack thereof will continue to be a severely limiting factor in obesity research. These researchers and others call for more studies in the area of exercise adherence as a way to combat the growing epidemic of obesity (Flegal et al., 2002; IOTF, 1998).

Across populations, older adults appear to demonstrate better exercise adherence rates than younger adults (Martin & Sinden, 2001). A review of 21 randomized, controlled exercise adherence trials found an average compliance rate of 78%, higher than the 50% or less associated with younger adults (Dishman & Sallis, 1994). Researchers have suggested that older adults, especially when retired, are more compliant because they are more concerned about their physical health and usually have more time than the younger adults in the workforce (Lee et al., 1996). The Martin and Sinden (2001) review teased out a list of exercise adherence characteristics, which included a history of exercise and physical activity, high self-efficacy in the exercise domain, and better health/fitness at a study's baseline. Whether such characteristics are also influential in the exercise adherence of young adults is unknown.

Most exercise adherence research involves one or more strategies designed to elicit a behavioral change. Strategies include exercise education (Cain, 1996; Calfas et al., 2000; Loughlan & Mutrie, 1997); instruction, group or individual (Keele-Smith & Leon, 2003; Klonoff, Annechild, & Landrine, 1994), social support through group affiliation or personal trainers (Annesi, 1999; Jeffery et al., 1998; King & Frederickson, 1984) self-monitoring or monitoring by another individual; (Keele-Smith & Leon, 2003; Jeffery et al., 1998) relapse prevention (King & Frederickson, 1984, Marcus & Stanton, 1993); and reinforcement or rewards (Jeffery et al., 1998; Marcus & Stanton, 1993). In addition, one unique study examined the role of beta-endorphins in encouraging exercise adherence (Klonoff et al., 1994).

One of the largest studies looking at the effects of exercise education and instruction on adherence was Project GRAD, or Graduate Ready for Activity Daily (Calfas et al., 2000). Almost 340 university seniors were randomized into two groups. The control group received traditional classroom lectures on health and fitness, while the intervention group received the same information in a format designed to stimulate cognitive-behavioral changes. The intervention group also attended activity "labs" with group and personalized instruction. Physical activity levels in the intervention subjects tended to increase during the class, and then gradually decreased to baseline levels by the two-year follow-up. While the intervention group's pattern was not surprising, the behavior of the control group was. Those subjects decreased their physical activity during the class but then gradually increased until they were near or at baseline levels at the two-year follow-up. A published evaluation of the study concluded that the program

might have more conclusive results in the future if it were aimed at university freshmen rather than seniors (Sallis et al., 1999).

Another study examining the role of exercise education randomized 53 young women into two aerobics classes. The control group attended a traditional group workout three times a week while the intervention group attended the workout and also received basic facts and information about exercise (Cain, 1996). There were no significant differences between the groups in the number of classes attended or the attrition rate for each group (control = 48%, intervention = 35%). However, the distribution of basic exercise information was found to be a relatively effective, low cost way to promote exercise in another study (Loughlan & Mutrie, 1997). Sedentary young and middle-aged adults (n = 179) at a worksite were randomly assigned to three groups. The control group received basic information on exercise while the two intervention groups received either a fitness assessment (focusing on physiological variables) or an exercise consultation (focusing on behavior change variables). All three groups followed the same pattern: a significant increase in activity during the first three months, then a gradual decline during the last three months. There were no significant differences among the groups, leading the researchers to conclude that the information method was perhaps just as effective (and less costly) as the other two for promoting the adoption of exercise, though none were effective for promoting adherence (Loughlan & Mutrie, 1997).

Another study examined the role of education and instruction to design individualized exercise instructions for subjects in the intervention group (Keele-Smith & Leon, 2003). This study recruited 149 young adults (mostly female) and randomized the subjects into a control group, which was monitored each week by phone, and the

intervention group, which received the individualized instructions based on responses to a meta-motivational state questionnaire. The intervention group was also monitored and received feedback. At the end of five weeks the intervention group demonstrated significantly higher levels of exercise than the control group, giving support to the idea of designing exercise programs that match an individual's motivational state.

Social support, especially from friends and family, is consistently related to higher rates of exercise adherence in observational studies (Berger et al., 2002). However, this leaves the question of what happens to individuals who lack that supportive "home environment." Some experimental studies have tested the effectiveness of a social support system constructed by the researcher. For example, new exercisers at a private fitness center were randomly assigned to a control group ($n = 62$) or a treatment group ($n = 47$) designed to encourage group cohesion and affiliation (Annesi, 1999). The treatment group was further divided into four smaller groups based on members' schedules, then invited to participate in an instructor-led warm-up and cool-down before and after their regular individual workouts. Results for the first five weeks did reveal better attendance and less attrition in the treatment group and a significant increase in scores that measured group affiliation. However, the intervention was designed to be 15 weeks long, but only data for weeks one through five could be analyzed due to the substantial drop-out rate from both groups in the later weeks.

Social support in conjunction with relapse preparation training was examined in a five-week study on sedentary college females (King & Frederickson, 1984). Fifty-eight subjects were given an exercise orientation and jogging protocol to follow, and then

randomly assigned to three treatment groups and a control group. The treatments included a group that received relapse preparation training, a group that was encouraged to jog with each other and received special team building exercises, and a group that received both treatments. Jogging during the study was measured via self-monitoring. During the intervention period, subjects in the relapse preparation only group and social support only group initiated significantly more jogging workouts than the other two groups. At the three-month follow-up (a one time activity recall), a significantly greater percentage of subjects in the relapse preparation only group reported consistent jogging over the other three groups. While it was surprising that the group that received both treatments did not fare better, researchers point to the consistently low group cohesiveness scores in that group, despite the team-building exercises.

A different kind of social support was evaluated in an 18-month study of obese men and women (Jeffery et al., 1998). Subjects (n = 193) were randomized into five treatment groups: standard behavioral therapy (STB), STB with supervised group walks three times a week; STB and the assignment of a personal trainer who walked with them, made follow-up calls, and so forth; STB with supervised group walks and monetary incentives; and a group that included all treatment variables. While the role of social support was present in all groups that participated in the supervised walks, the researchers were particularly interested in the personal trainer's role as both social support and a method of strengthening exercise antecedent cues. The primary outcomes of the study were exercise adherence (measured in attendance at supervised walks and self-reported activity) and weight loss. The treatments of the personal trainer, monetary incentives, and the combination of both enhanced attendance at the supervised walks; however, this

did not result in a higher energy expenditure overall. Furthermore, long-term weight loss was not significantly improved in the three groups that demonstrated greater adherence to the walks. The researchers concluded that supervised exercise might not be an optimal exercise target for obese patients, as even the best treatment group averaged less than 50% attendance. The researchers also pointed out that the exercise level for this study, and similar studies (energy expenditure1000 calories/week), was probably too low to promote weight loss (Jeffery et al., 1998).

Incentives in the form of prizes and feedback also had disappointing results in an exercise adherence study by Marcus and Stanton, though relapse preparation fared better (1993). Sedentary young and middle-aged females (n = 120) were invited to participate in free exercise classes for 18 weeks. The control group received no other treatment, while one group received relapse prevention training and another group received reinforcement through feedback and prizes. Attendance for the relapse group was significantly higher during the first half of the program but dropped during the second half and at the two-month follow-up. There were no differences between the reinforcement group and the control group. The overall attrition rate was substantial, averaging 72 percent by the end of the 18 weeks.

Another study offered free exercise classes to promote exercise adherence (Klonoff, Annechild, and Landrine, 1994), also with somewhat lackluster results. The researchers explained that they took great care to schedule classes at convenient times and locations, yet out of a university population of 13,000, only 30 females were interested. Such a low turnout seems surprising, but telling, given that people often use the excuse of "no money for gym membership" as a reason for not exercising. This study

was unique in that the researchers examined the pre and post serum beta-endorphin levels as a biological factor in exercise adherence. Despite the popular notion that exercise increases endorphin levels, and that is why people report they "feel better," this is not necessarily supported by research (Farrell et al., 1987). Data from this study did not support the endorphin hypothesis either. The beta-endorphin levels in the untrained subjects did not change significantly after 30 minutes of intense aerobic activity, neither pre nor post intervention. In addition, there were no relationships between endorphin levels and exercise adherence. On a positive note, the subjects who attended more classes had significantly higher scores for self-reported happiness and euphoria. However, such information is not very helpful in explaining *how* to induce non-adherers to keep exercising so that they might also enjoy feelings of greater well-being.

Self-Efficacy

People give many reasons for not exercising, but three primary excuses that consistently emerge are lack of time (real or perceived), lack of energy, and lack of motivation (Berger et al., 2002, p.192). These are individual barriers, meaning they fall under an individual's control, as opposed to environmental ones (such as lack of safe places), which are often out of one's control. It only makes sense, then, that certain personality and cognitive variables play an influential role in a person's ability to override individual barriers and maintain an exercise routine. Self-efficacy is one of those variables.

The construct of self-efficacy has received the most support of any one variable in predicting adherence, accounting for up to 35% of the variation in physical activities in

most studies (Berger, 2002; Fox & Biddle, 1998; McAuley & Blissmer, 2000; Martin & Sinden, 2001). It is a core concept of Albert Bandura's Social Cognitive Theory, sometimes called the theory of motivation (Bandura, 1997). Defining it formally, Bandura states self-efficacy as "... a generative capability in which cognitive, social, emotional, and behavioral sub-skills must be organized and effectively orchestrated in order to produce a given level of attainment..." (p. 36). Self-efficacy is not merely one's skills, but the underlying belief, or confidence, which gives one the ability to execute the required actions and skills to achieve the desired results. There is a reciprocal nature in self-efficacy: the stronger a person's perception that they can successfully engage in a behavior, the more likely it is they will engage in that behavior (Bandura, 1997).

Self-efficacy is very situation specific (Bandura, 1997). An individual can demonstrate high levels of self-efficacy in one domain but not another, even if the domains are related. For example, an individual may have high levels of self-efficacy to run everyday but very low self-efficacy to stretch afterwards. Self-efficacy has been described as the "I can do it...!" feeling people have in certain situations but not in others (Fox & Biddle, 1998). McCauley and Blissmer (2000) refer to self-efficacy as a situation specific sense of control.

Researchers have examined self-efficacy in many arenas, from academics to organizations to the adoption of health behaviors. For the last two decades, it has found a place in the sport psychology world (Moritz et al., 2000). A meta-analysis of 45 studies concerning self-efficacy and sport performance found a correlation of .38 between the two variables (Moritz et al., 2000). Although .38 is only a low correlation, the relationship was significant ($p<.001$), and this correlation is consistent with those found

in self-efficacy studies with other topics (e.g., self-efficacy and academic performance or academic persistence). More recently, researchers studying the patterns and behaviors of recreational exercisers (as opposed to athletes) have turned an eye to self-efficacy as well, with many promising results.

Across populations, self-efficacy appears to be a robust determinant of exercise adherence. In a review of 21 randomized controlled trials involving older adults and exercise adherence, Martin and Sinden (2001) concluded that the best adherers were individuals who were fitter at baseline, did not smoke, had a history of physical activity, and demonstrated higher levels of exercise self-efficacy at the study's onset and follow-up. In another study, Garcia and King (1991) randomly assigned 74 older adults into four different exercise conditions and followed their adherence rates for one year. The researchers reported that exercise self-efficacy was significantly associated with adherence at both 6 months ($r = .42$) and 12 months ($r = .44$). Self-motivation was also measured, but surprisingly, there was no significant relationship between that construct and adherence.

Self-efficacy also plays an important role in the exercise prescription of medical patients, especially those in cardiac rehabilitation (Ewart, 1989; Kaplan et al., 1994; Lox & Freehill, 1999). Results in such studies suggest that self-efficacy predicts changes in exercise behavior better than generalized experiences of locus of control, which has been more commonly addressed by health researchers. When patients adhered to the exercise interventions, they reported higher levels of exercise self-efficacy and a higher quality of life in general. Perhaps most importantly, exercise self-efficacy was a significant

predictor of long-term survival compared with standard psychological indicators (Kaplan et al., 1994).

Finally, cross-sectional studies of college populations point to the important role of exercise self-efficacy in that population. A survey of 937 undergraduates and their exercise habits revealed that exercise self-efficacy was the single greatest predictor of consistent exercise behavior in females, followed by social support from family (Wallace et al., 2000). Self-efficacy was the third greatest predictor for males, behind social support from friends and a personal history of physical activity. Another study involving college students measured baseline exercise levels and exercise self-efficacy levels (along with other psychological variables) in 52 physically active students (Sullum & Clark, 2000). When an exercise assessment was collected eight weeks later, it was found that the students who had stopped exercising had reported significantly lower levels of self-efficacy than the exercise maintainers at the first baseline assessment. Both studies used a validated, five-item scale by Marcus et al. (1992) to measure exercise self-efficacy in the students.

In addition to being a solid determinant of physical activity, it appears self-efficacy can also be a consequence (McCauley & Blissmer, 2000), which is consistent with Bandura's (1997) views that the relationship between self-efficacy and behavior is bi-directional. There is much literature to support the idea that participants who report higher levels of exercise specific self-efficacy demonstrate higher levels of exercise adherence (Dzewaltowski, 1994; Fox & Biddle, 1994; McCauley et al., 1994; McCauley & Blissmer, 2000). The existence of these higher levels seems particularly true at the adoption and adaptation stages of an exercise program and less so in the maintenance

stage. However, when activity is measured in long-term follow-ups for exercise studies, self-efficacy has again been shown to be a significant determinant of activity (McCauley & Blissmer, 2000). Although less common in the literature, self-efficacy expectations are also considered as important outcome variables of exercise behavior; that is, self-efficacy can be increased as a result of exercise (McCauley & Blissmer, 2000). Understandably, this is more difficult to measure, especially in the absence of controlled exercise programs. In addition, since self-efficacy is usually measured in the context of a time-limited study, it is difficult to assess further development of this variable at the end of the program when participants are truly "on their own."

Although there is considerable literature on the role of self-efficacy as an exercise determinant, and some literature on self-efficacy as a consequence of exercise, there is very little to explain the exact mechanism of this relationship. In other words, is it possible to structure optimal conditions and interventions where exercise self-efficacy can develop and therefore have a positive affect on exercise behavior. Some researchers have attempted to manipulate self-efficacy by either changing the environment (Turner et al., 1997) or changing the feedback given to participants (McAuley et al., 1993). Results indicated that exercising in a socially enriched environment with friendly instruction in contrast to a bland social environment resulted in higher levels of exercise self-efficacy and affect (Turner et al., 1997). Another study demonstrated that participants who received positive feedback during exercise reported higher levels of self-efficacy and less physiological stress than participants who were exercising at the same intensity but received no such feedback (McAuley et al., 1999). While these studies clearly point to

the importance of the exercise environment for influencing self-efficacy, it is difficult to know the success of such strategies in long-term exercise adherence.

According to Bandura (1997), there are four primary sources of efficacy information: mastery experiences/accomplishments, social modeling, social and verbal persuasion, and interpretation of physiological arousal. Some studies have attempted to incorporate one of more of these strategies to increase exercise self-efficacy in participants. McCauley et al. (1994) recruited 114 sedentary, middle-aged males and females and randomly assigned them to two supervised walking programs for five months. Both groups received the same amount of attention from the exercise technicians and walking group leaders. However, the control group received standard information on health issues such as high blood pressure, while the treatment group received "efficacy promotion" classes. Such classes were based on the four primary sources mentioned above. For example, the completion of exercise logs and monthly timed walks served as sources of mastery experiences/accomplishments, while the formation of "buddy groups" served as social persuasion information. At the end of the study, the data indicated a significant difference in exercise adherence between the two groups – the treatment group walked more frequently and for longer distances. Monthly assessments of self-efficacy revealed higher self-efficacy in the treatment group for the first and middle stages of the intervention but not the last month. This is consistent with other studies that show a more prominent role of self-efficacy during the beginning stages of exercise adoption and a less important role later on. Some have argued this occurs because as individuals adapt to an exercise program, both physiologically and psychologically, the role of efficacy becomes less of a predictive factor in what is now an

established behavior (McCauly, 1992). In any case, the researchers in the walking study note that adding efficacy promotion training required no more effort than standard health education and could be easily incorporated into structured exercise programs for all age groups (McAuley et al., 1994).

A similar study demonstrated the potential of self-efficacy training when applied to healthy eating and weight loss in college students (Roach et al., 2003). Researchers randomly assigned 66 students into two weight-loss groups. Each group attended weekly classes on topics related to healthy eating and weight loss, but the treatment group also participated in activities intended to promote self-efficacy for weight loss. At the end of 12 weeks, the treatment group had lost more weight, but the loss was not significant. However, the data indicated a significant inverse correlation between the increase in self-efficacy and the loss in weight with the treatment group. Again, the researchers noted that the addition of self-efficacy promotion was a relatively simple tool to add with promising results (Roach et al., 2003).

In addition to the different sources of efficacy information, it has been suggested there are also different types of self-efficacy in relation to the same behavior (Maddux, 1995; Rodgers & Sullivan, 2001). In terms of exercise, the following three have been proposed: task self-efficacy, for performing elemental aspects of the behavior; coping self-efficacy, for performing the behavior under challenging circumstances; and scheduling self-efficacy, for learning to incorporate the new behavior into a set routine (Rodgers & Sullivan, 2001). One study examined how two different types of exercise prescriptions affected these different types of self-efficacy in the participants (Rodgers et al., 2002). Sedentary, young to middle-aged adults (n = 56) were randomly assigned to a

low intensity, long duration exercise prescription, or a high intensity, short duration exercise prescription. The two aerobic conditions were designed to produce similar aerobic gains as not to confound the efficacy results with different fitness benefits. Both groups were found to increase in task self-efficacy, but the high intensity, short duration group showed a significant increase in coping self-efficacy and over time, a significant increase scheduling self-efficacy. It appears that even though participants in both groups completed all exercise sessions over four months, the high intensity, short duration group felt more confident about fitting those workouts into their schedule. These findings are particularly interesting since it is the norm to prescribe low intensity, long duration exercise at the beginning of an exercise program. The researchers conclude that this might not be the best choice for every individual in terms of establishing a favorable cognitive mindset (Rodgers et al., 2002).

The above studies examined self-efficacy as it relates to chronic bouts of exercise, but some researchers have also looked at how self-efficacy relates to exercise in the acute sense. Rudolph and McAuley (1996) found that when male college students performed a graded exercise test on the treadmill, the subjects showed a significant increase in their levels of exercise self-efficacy (specific to running) after finishing the test. In other words, once they successfully completed the test, the subjects felt more efficacious about repeating it again. In addition, the subjects who showed higher levels of running self-efficacy prior to the test reported lower levels of RPE (ratings of perceived exertion) during and after the test, indicating a higher tolerance for the physical stress of vigorous exercise. The data supports the idea that one's perception of their exercise capabilities

can affect their perceptions of effort during the exercise, regardless of actual ability (Rudolph & McAuley, 1996).

In a similar study, the same researchers examined a possible relationship between the physiological mechanism of adrenocortical activity, a biological marker for stress, and self-efficacy (Rudolph & McAuley, 1995). It was thought that the more fit subjects with higher levels of running self-efficacy would feel less stress about a treadmill test and therefore secrete less salivary cortisol prior to the test. While researchers reported a difference between the subjects, it was not significant. However, the data did reveal a significant inverse relationship between enhanced post exercise efficacy levels and post-exercise salivary cortisol levels in all subjects. The subjects who felt the most confident and efficacious about their performance had the lowest biological markers of stress. The researchers conclude that these findings support Bandura's premise that mastery experience/accomplishments can serve as boosters of self-efficacy (Rudoph & McAuley, 1995).

Goal Setting Theory

The promotion of exercise specific self-efficacy can be considered one type of cognitive behavioral treatment intended to promote exercise adherence. Goal setting is another. It has been proposed that goal setting successfully directs attention and action, mobilizes energy expenditure, prolongs maintenance of effort, and motivates individuals to develop self-regulation strategies (Locke et al., 1981). A meta-analysis of goal setting studies indicated that 99 out of 110 studies empirically demonstrated positive or partially positive effects of goal setting on task performance (Locke et al., 1981). Given such

robust findings, it seems intuitive that goal setting may be a promising strategy for increasing exercise adherence.

The goal setting theory was first developed by Locke and colleagues and based on the initial concepts of task and intentions (Locke et al., 1981; Locke & Latham, 1985; Weinberg, 1994). Locke and colleagues defined a goal as "attaining a specific standard of proficiency, usually within a specified time limit" (1981, p. 145). Goal setting is usually tested by comparing the performance of individuals who set certain type of goals with the performances of individuals who set no goals or are simply told to "do their best." In the past thirty years, there has been a proliferation of studies investigating the effects of goal setting in a variety of organizational and industrial settings. Only recently has the theory moved into the domain of exercise and sports performance.

Despite antidotal and observational evidence that goal setting plays an important part in sport (Weinberg et al., 1993), there have been relatively few experimental studies testing the direct effects of this theory. One of the first studies on goal setting in sports found that archers who effectively set goals had higher performance levels than archers who did not (Barnett & Stanicek, 1979). Another early study examined goal setting in youth hockey players and concluded that players most effectively enhanced their performance on an endurance task by using specific, difficult, and group set goals (Botterill, 1977). An often cited field study on intercollegiate swimmers also provided evidence for goal setting (Burton, 1989). Swimmers who participated in a five month goal setting training program demonstrated better performances and more positive psychological attributes towards swimming than those who did not.

Locke and Latham (1985) suggested that goal setting in sports could work even better than goal setting in organizations, since the measurement of an individual's performance is typically more objective in the sports environment. However, a review by Weinberg (1994) concluded that two decades of testing goal setting in the sports setting has left equivocal results and a lack of understanding of the goal setting process. Kyllo and Landers (1995) were slightly more positive; a meta-analysis 36 studies indicated that goal setting had a moderate effect on sport performance, depending on the type of goals set. Both reviews pointed to a variety of methodological flaws that may have contributed to inconclusive results and called for further research (Kyllo & Landers, 1995; Weinberg, 1994). Earlier, Locke himself (1991) pointed out that the largest problem in the manipulation of exercise goal setting was that participants in the control group often self-set specific goals for themselves.

While experimental studies of goal setting in sport are limited, similar investigations in the domain of exercise adherence are truly sparse. One such study followed a cohort of middle-aged beginning exercisers after randomly assigning them to either a control group or a goal setting group (Annesi, 2002). All 100 participants were provided individual appointments with a trained exercise professional every six weeks for the duration of the study (one year). The control group's sessions focused on general health and fitness knowledge as well personal modifications to their exercise plans. The treatment group received similar knowledge and modifications, but a large part of their sessions focused setting exercise goals using a protocol consistent with the goal setting theory (Locke & Latham, 1985) and the personal construct theory (Kelly, 1955). After one year, the data showed that attendance to the exercise protocol (three times a week at a

fitness center) was significantly greater for the goal setting group ($p<.0001$). In addition, the attrition rate for the control group was 74% while the attrition rate for the goal setting groups was only 30%. Such results indicate the potential for introducing a goal setting protocol to beginning exercisers, especially since it took no more time or resources than the "standard" exercise consultations. However, the researcher admits a limitation of the study is the homogenous sample (Italian adults) and very specific experimental setting (Annesi, 2002).

Another study with beginning exercisers evaluated two types of goal setting in a group of sedentary middle-aged adults (Martin et al., 1984). One group was assigned to follow the daily jogging or walking distance goals set by the researchers, while the other group was encouraged to set daily distance goals for themselves based on how they felt. The participants with the flexible goals had significantly higher levels of attendance during the intervention. Furthermore, 47% of those who set their own goals were still exercising in a three-month follow-up. That may not sound like much, but still higher than the 28% of the exercising participants from the fixed goal group.

Other studies have investigated the effects of goal setting in recreational exercisers, but the research typically occurred in controlled lab settings and measured specific exercise tasks rather than overall adherence (Lerner & Locke, 1995; Smith et al., 1996). For example, Lerner and Locke (1995) randomly assigned college males to one of five sit-up task conditions: medium goal with face-to-face competition; high goal with competition; medium goal with no competition; high goal with no competition; and a "do your best" group. Although the medium and hard goal groups significantly outperformed the "do your best" group, the presence or absence of competition made no difference.

Smith and colleagues also used a sit-up task to compare different goals (1996). College females were randomly assigned to one of four groups: specific goal, long-term only; specific goals, long and short term; a "do your best" goal; and no goal. Although there was a significant difference between the specific goal groups and the "do your best" and control group, there was no difference between the two specific goal groups.

It is difficult to interpret the results of task specific exercise studies when considering long-term exercise adherence. Especially problematic is the issue of personal investment in the goal. In general, goals that are meaningful and important to the participant are more likely to serve as sources of motivation (Berger et al., 2002). It is hard to say how meaningful the goal of timed sit-up task is to college students, especially when mere participation is rewarded with extra class credit. In order to evaluate the effects of goal setting on exercise adherence in college students, there is a need for studies with goals that attempt to elicit feelings of personal investment and "ownership."

There are other guidelines to consider for effective goal setting in exercise adherence. Some coincide with Locke's original theory; some have been modified through subsequent research. For example, Locke predicted a linear relationship between goal difficulty and performance enhancement, with difficult goals defined as those in which "no more than 10 percent of subjects can reach them" (1991, p. 314). However, a goal that is attained by less than 10 percent may be perceived as unrealistic and unattainable and actually be counterproductive, especially when the overall goal is simply to get people moving. In a meta-analysis of 36 studies, the data supported the effectiveness of moderate goals over difficult ones in the exercise and sport setting (Kyllo & Landers, 1995). Most of the literature on goal setting for exercise adherence

recommends setting goals that are challenging but attainable, moderate but realistic (Berger et al., 2002; Gould, 2001; Kyllo & Landers, 1995).

Other guidelines include setting goals that are both long term and short term (Berger, 2002; Kyllo & Landers, 1995). While a long term goal provides information about the "final destination," the short term and intermediate goals serve as progress markers. This can also work to enhance an individual's exercise self-efficacy, as the completion of short-term goals can serve as mastery experiences and reinforce the individual's belief that he or she can stay on track (Bandura, 1977). Kirschenbaum agreed, suggesting that short-term goals increase the effectiveness of long-term goals by giving more immediate opportunity to evaluate performance and serve as efficacy information (1985).

Finally, one of the strongest recommendations of the goal setting theory is the idea of setting specific versus general goals (Lerner & Locke, 1995; Locke et al., 1981; Locke & Latham, 1985; Kirschenbaum, 1985; Kyllo & Landers, 1995; Weinberg, 1994). Specific, quantifiable goals, often with a set of explicit strategies, help an exerciser stick to a routine by laying out what exactly needs to be done and how. Although exercisers need some flexibility with their goals, the overall general goal of "to do my best" is not supported by the literature.

Computer Use and Physical Activity

Computers and physical activity make strange bedfellows. On the one hand, few activities, with the exception of television, encourage as much sedentary behavior as computer usage (Fotheringham, Wonnacott, & Owen, 2000). On the other hand,

computers and particularly Internet access offer great potential for the mass dissemination of health and fitness related information in a cost-effective manner (Dirkin, 1994; Marcus et al., 1998).

It is well established that increased television viewing is inversely related to physical activity participation, and positively correlated to rates of obesity in children, adolescents, and young adults (Kimm & Obarzanek, 2002; Pate, Heath, Dawda, & Trost, 1996). Whether such findings can be extrapolated to computer usage is still under investigation. However, as computers become more and more common in both work and leisure activity, it would be wise for researchers to examine ways in which this ubiquitous mode of communication can be used to effectively deliver exercise promotion material.

Electronic communication offers the opportunity to supplement or replace the traditional face-to-face counseling in exercise interventions. Such communication can provide feedback that is discrete, immediate, frequent, and convenient, which are certainly advantages in a world where everyone is overscheduled and pressed for time. In addition, some participants may actually prefer the protection of screen communication compared to a face-to-face meeting (Dirken, 1994). And for some, the novelty of electronic communication may make standard information more appealing. A study that examined the computer usage and exercise habits of almost 700 young adults found that the vast majority preferred to gain information through computers rather than print media (Fotheringham et al., 2000). The same study also revealed that individuals who reported the highest amount of computer usage also reported the lowest amounts of exercise, thus reinforcing the paradox of using computers to promote physical activity.

However, computers are here to stay, and so health professionals and researchers have a responsibility to examine how they can best be utilized in controlled interventions and public health initiatives (Marcus et al., 1998). For this reason, the author chose to include the Internet as a method of both data collection and subject communication throughout the intervention and follow-up portion of an 18-week study to increase exercise adherence in college females.

Summary

The incidence of obesity and inactivity in Americans continues to rise, presenting a major health problem with no easy answers. The most recent estimate by the Centers for Disease Control and Prevention attribute about 400,000 deaths annually to a sedentary lifestyle and poor diet (Mokdad et al., 2004). About 85 percent of Americans do not engage in sufficient physical activity to accrue health benefits (USDHHS, 1996, 2000). In addition, about half of those who do start an exercise program drop out within a year (Dishman, 1988). Young adults are no exception to this trend, as the steepest decline in physical activity appears to occur in the transition from high school to college or the workforce (Casperson et al., 2000; Sallis, 2000). College females appear to be more sedentary than college males, and those that do engage in exercise usually choose activities of a lesser intensity (CDC, 1997; Casperson et al., 2000; De Bourdeaudhuij, et al., 2002; Sallis, 2000).

Despite an abundance of exercise adherence research, there is still a pressing need for studies with an experimental design and a theoretical background (Dishman & Buckworth, 1996; Leith & Taylor, 1992; Martin et al., 2000). At present, the majority of

studies are observational or correlational, leading some researchers to argue that the only way to "move forward" in this line of inquiry is through experimental studies. In addition, there is a need for studies that choose and manipulate variables based on a theoretical background, such as the theory of planned behavior or the social cognitive theory (Dishman & Buckworth, 1996). Other problems associated with exercise adherence research include the difficulty of retaining subjects, the problem of how exactly to record exercise, and the relationship of adherence to actual physiological results (Dishman, 1994; Fogelhom & Kukkonen-Harjula, 2000; Leith & Taylkor, 1992; Martin & Sinden, 2001; McAuley et al., 1994).

The psychological construct of self-efficacy offers promise as both a consequence and determinant of physical activity, accounting for up to 35% of the variability in exercise adherence (Berger, 2002; Fox & Biddle, 1998; McAuley & Blissmer, 2000; Martin & Sinden, 2001). Self-efficacy is a core concept of Bandura's Social Cognitive Theory (Bandura, 1997), generally described as the underlying belief, or confidence, that gives an individual the ability to execute the required actions to achieve the desired results. Self-efficacy is very situation specific, so an individual who feels confident about their ability to exercise in various circumstances would presumably exhibit high levels exercise self-efficacy. For the last two decades, self-efficacy has been studied in the sport psychology world (Moritz et al., 2000). More recently researchers have started studying the patterns of recreational exercisers and their levels of exercise self-efficacy.

Another theory with potential for exercise adherence is the theory of goal setting. This theory of "attaining a specific standard of proficiency within a specified time limit" was first developed by Locke and colleagues as a way to improve efficiency in

organizations and industrial settings (Locke et al., 1981). It has since moved into the world of sport psychology research and now exercise adherence. However, the majority of experimental studies using goal setting have been conducted in a controlled lab setting with a specific physical task, such as maximum sit-ups in one minute (Lerner & Locke, 1995). Very few studies have examined the effects of setting long term physical goals on exercise adherence in a sedentary population. Guidelines to consider when setting goals include the following: goals that are both short and long term, goals that challenging but attainable, and goals that are specific versus general (Lerner & Locke, 1995; Kyllo & Landers, 1995, Weinberg, 1994).

In closing, this study attempted to use the goal setting theory as a strategy to motivate sedentary college females to adhere to an exercise routine. Goal setting was examined as a determinant of exercise adherence while exercise self-efficacy was examined as a consequence. The study of exercise in young adults, especially females, is warranted due to the literature that indicates the growing prevalence of inactivity and obesity among college students.

CHAPTER THREE

METHODS AND PROCEDURES

Introduction

The purpose of this study was to determine the effects of two motivational strategies on exercise adherence and exercise self-efficacy in college females. In the following sections the methods and procedures of the study will be clearly defined. This section will define the subjects in the study and how they were recruited; describe the instruments used to clear the subjects for participation and measure exercise self-efficacy; describe the data collection method for exercise adherence and exercise self-efficacy; outline the preliminary procedures of the study; describe the methods and procedures used throughout the study; and briefly discuss the analysis that was used to report the study's findings and conclusions.

Subjects

The subjects in this study were healthy, sedentary female students enrolled at Oklahoma State University and between the ages of 18 and 24 (mean age = 20.3). The intervention portion of the study started with a total of 74 subjects. Complete data sets were available for 43 subjects at the end of the 10-week intervention. Eight subjects who dropped out contacted the investigator and explained why (illness, auto accident, surgery, pregnancy, life circumstances, and dissatisfaction with group assignment). The other

subjects stopped keeping their exercise logs but did not formally withdraw from the study and did not answer the investigator's phone calls or emails.

Subjects in the study had to meet the following criteria: apparently healthy, as determined by completion of the PAR-Q form (Appendix A); and sedentary, as determined by self-reports of their current activity habits. Sedentary was defined as not meeting the 1995 ACSM minimum exercise guidelines (engage in moderate to vigorous physical activity for 20-60 minutes, minimum three times a week). Subjects who were pregnant, in physical therapy for an injury, participating in collegiate athletics, or being treated for a medical condition were excluded from the study.

The study's proposal was approved by the Institutional Review Board (IRB) at Oklahoma State University before the recruitment process began. Subjects were recruited through flyers posted around campus and recruitment speeches given to sorority houses, dormitory halls, and undergraduate classes within the School of Applied Health and Educational Psychology. Interested females were given informational flyers with a website address where they could electronically register to be in the study. Recruitment was done during the first two weeks of the fall semester, 2003.

A total of 130 subjects signed up to be in the study; however, only 82 came to the first orientation meeting. Seventy-eight met the criteria for the study and agreed to the study's protocol (18 freshmen, 20 sophomores, 19 juniors, 15 seniors, 2 graduate students). All subjects reported that they were not currently meeting the 1990 ACSM minimum guidelines for exercise (moderate to vigorous exercise for 20 to 60 minutes, three times a week). All subjects completed a PAR-Q form (to be further defined in this chapter) in order to clear them to begin an exercise program.

After the first meeting, the subjects were randomly assigned one of three groups (two treatment groups, one control group) and given a subject number. The groups will be further defined in this chapter. The intervention portion of the study ran for ten weeks. The follow-up portion ran for eight weeks. Data for exercise adherence and exercise self-efficacy were collected at two-week data points for the duration of the study (18 weeks total). Although data was collected for each two-week period, subjects were reminded to complete their exercise logs on a weekly basis. It was the hope that more frequent reminders would lead to a higher compliance rate to the record keeping.

Instrumentation

PAR-Q

The PAR-Q (Physical Activity Readiness Questionnaire) was used to clear the subjects for exercise. The PAR-Q is a one-page validated instrument endorsed by the American College of Sports Medicine (ACSM, 2000, p. 23) for use with an apparently healthy population with no symptoms of chronic disease. Subjects completed and signed the PAR-Q's at the first orientation meeting. The investigator screened all PAR-Q's for possible contraindications to exercise before assigning subjects to groups. If a PAR-Q question was left blank or unclear, the investigator contacted the subject by phone to clarify. None of the subjects answered the PAR-Q's in a way that indicated a medical condition where exercise would be contraindicated (ACSM, 2000).

A form was attached to the PAR-Q that asked for demographic information, contact names and numbers, additional health history, exercise history, and any special concerns the subject might have. Subjects could indicate if they wished for the

investigator to call them to answer any additional questions in private. A copy of the PAR-Q and attached form can be seen in Appendix A.

EXERCISE ADHERENCE

Exercise adherence was determined by how many total minutes a subject exercised at each two-week data point. Due to the anticipated variability in exercise routines, the investigator decided that duration in minutes, rather than frequency of sessions, would be a more accurate reflection of the total amount of exercise time. Subjects were asked to self-report their exercise bouts by using either an electronic log on the study's website or paper logs provided by the investigator. The logs asked for the subject number, date of exercise, duration of exercise, and type of activity. Electronic entries went directly to an online computer file that only the investigator could access with a code word. The investigator collected the paper logs from subjects at the end of the follow-up period.

The exercise protocol for each group followed the ACSM minimum exercise guidelines: three times a week for 20 to 60 minutes. Therefore, subjects were instructed to complete three log entries for each week, or six log entries for each data point. If the subjects did not exercise three times, they were told to mark "zero" for each missed exercise session. If subjects exercised more than the minimum guidelines, they were instructed to log those sessions as well so the additional minutes could be added. The investigator sent an email to all subjects every week of the study reminding them to complete their logs.

Copies of the electronic version of the exercise adherence form can be seen in Appendix G.

EXERCISE SELF-EFFICACY

The subjects' exercise self-efficacy was measured each week with the Exercise Self-Efficacy Scale (ESES), a validated five-item scale designed to measure confidence in one's ability to persist with exercising in various situations (Marcus, Selby, Niaura, & Rossi, 1992). An 11-point scale is used to rate each item, with 1 indicating "not at all confident," and 11 indicating "very confident." The potential scores range from 5 – 55. Marcus et al. developed the instrument based on a principal components factor analysis which found that the two primary exercise self-efficacy factors were resisting relapse and making time for exercise (Sallis, Pinski, Patterson, & Nadar, 1988). From those two factors came the following five question topics:

- Exercising when tired
- Exercising when in a bad mood
- Exercising when pressed for time
- Exercising when on vacation or away
- Exercising when the weather is bad (Marcus et al., 1992)

Marcus et al. reported that the test-retest reliability for the ESES was 0.90. The scale was originally used in a study by the same researchers to examine correlations between exercise self-efficacy and the different stages of change (Transtheoretical Model). It has since been used in subsequent research, including two studies with college students (Sullum & Clark, 2000; Wallace et al., 2000).

Subjects had a choice to complete the ESES either electronically or on paper copies provided by the investigator. Every two weeks, the investigator sent an email reminding subjects to complete the ESES for that particular data point. Copies of the

electronic exercise self-efficacy scale can be seen in Appendix G, directly following the exercise adherence log.

Preliminary Procedures

Subjects who signed up to participate were asked to attend an orientation meeting at a campus location. The same orientation meeting was held on three different evenings in order to accommodate schedules. At this time, subjects were thoroughly briefed by the investigator on the components and protocol of the study. All subjects were asked to read and sign an informed consent and were given a copy to keep for themselves (Appendix B). Subjects were also asked to complete and sign the PAR-Q and attached forms. All forms had been approved by the IRB at Oklahoma State University prior to conducting the study.

The investigator also distributed checklists describing the three groups. Subjects were told they would be contacted via email within the next five days regarding their subject number and group assignment. The investigator stressed that groups would be randomly assigned without regard for subject preference. Subjects who felt apprehensive about being assigned to a certain group were encouraged to withdraw from the study before randomization took place.

The investigator then explained the exercise protocol and distributed exercise "packets." These packets were essentially three ring binders with specific instructions on the exercise protocol, as well as general information on aerobic exercise, strength training, flexibility, sample workouts, exercise FAQ's, and so forth. The investigator was responsible for all information in the packets and the assembly of the packets. All

subjects were invited to attend thrice-weekly group workouts and weekly fitness lectures for the ten weeks of the intervention. The lecture schedule and group workout format can be found in Appendix C, while an outline of the fitness packet can be found in Appendix D. Finally, the investigator gave each subject a list of abnormal responses to exercise and read over the list with them (Appendix F).

Upon completion of the orientation meetings, the investigator organized a folder for each subject. The PAR-Q, informed consent, and additional information were carefully compiled. All folders were stored in a secure location where only the investigator had access. The investigator then randomly assigned the 78 subjects into three groups. Each subject was individually emailed her subject number and her group assignment.

Within the first week, four subjects in Group One (control) dropped out, citing they were unhappy with their group assignment. This brought the total number of subjects for the study to 74.

Intervention Procedures For All Groups

All subjects, regardless of group assignment, had the opportunity to attend supervised workouts, fitness lectures, and personal training sessions so that any treatment effects from the motivational strategies would not be construed as possible artifact due to extra attention given to the treatment groups.

- All subjects were invited to attend group workout sessions (three times a week) that included aerobic training (walking/jogging) and resistance training. All workouts were held on the university track or, in the case of inclement

weather, inside the university wellness center. The investigator or a trained assistant led all the group workouts.

- All subjects were invited to attend a weekly lecture on a fitness topic of interest (e.g., abdominal exercises, interval training, fad diets). The same lecture was held twice in order to accommodate schedules. Any notes or handouts from the lectures were distributed by email the following week so that every subject would have an opportunity to add them to her fitness packet.
- All subjects were invited to set up a one-on-one appointment with the investigator if she (the subject) needed extra assistance with her exercise program. Twenty-six subjects took advantage of this opportunity.

None of the subjects were paid for their participation in the study, nor did they have to pay for additional assistance from the investigator. All subjects were responsible for their own transportation to group workouts or fitness lectures.

Group Assignments

GROUP ONE (n = 22)

Group One served as the control group. This group received the standard treatment for all three groups (group workouts, fitness lectures, one-on-one training sessions). Group One subjects received a generic email from the investigator every week reminding them to complete their exercise adherence logs. Every two weeks they were reminded to complete the ESES. If a subject in Group One contacted the investigator for additional assistance or with questions, the investigator obliged. However, the

investigator did not communicate with Group One subjects other than the weekly generic emails.

Group One started out with 26 subjects. However, within one week of being assigned to the control group, four subjects dropped out citing dissatisfaction with their group assignment.

GROUP TWO (n = 26)

Group Two served as the accountability/feedback group. Social support, and the idea of being accountable to someone, is often cited as a determinant of exercise adherence (Annesi, 1999; Berger et al., 2002; Jeffery et al., 1998; King & Frederikson, 1984). The formation of this group served two purposes: one, it tested the effects of accountability as compared to the control group; and two, it helped to further isolate the variable of goal setting for Group Three. Without Group Two, it would be difficult to say if any differences in Group Three from the control group were due to treatment effects (goal setting) or the extra attention and accountability factor for that group.

Group Two received the standard treatment for all three groups. In addition, they received a phone call or email each week inquiring about their workouts. Subjects who responded were given specific feedback, encouragement and suggestions.

Group Two was also reminded via email to complete their exercise logs every week and to complete the ESES every two weeks.

GROUP THREE (n = 26)

Group Three served as the goal setting, or road race, group. Aside from the standard treatment given to the other two groups, subjects in this group were entered in a local 5K (3.1 miles) road race. Each subject was given a detailed ten-week training schedule, as

the end of the intervention phase was designed to culminate with the road race. The training schedule also included basic information on related topics such as injury prevention, choosing the right shoes, and so forth. It was stressed to all Group Three subjects that the goal was to successfully complete the race, whether running, jogging, or walking.

Group Three received a phone call or email from the investigator each week inquiring about their workouts. Like Group Two, they would receive specific feedback and encouragement. As expected, the subjects in this group initiated more communication with the investigator as the race time grew nearer, but the investigator did not initiate extra communication other than what Group Two received. The only exception was the week prior to the race when a pre-race meeting was held to determine transportation to the race and other organizational details.

The Race

It was intended that Group Three subjects would participate in an organized 5K road race located in the same town as the university. In fact, the entire intervention was planned around the date of this race. One week into the study the local race was cancelled. An alternative road race on the same date was found, though this race was in another city 70 miles away. The investigator arranged the event so that the subjects could participate at no personal cost.

The week before the race, the investigator held a pre-race meeting. The meeting was offered at three times for the convenience of the subjects. The investigator arranged transportation for subjects who needed it, distributed maps and directions to subjects who

chose to drive themselves, and gave everyone a checklist with information on apparel, checking in, the pre-race meal, and so forth. Since the race was early in the morning, some subjects also requested wake-up calls from the investigator.

On the race day, 21 out of the 26 subjects in Group Three successfully completed the Tulsa Jaycees 5K Turkey Trot. All subjects received a long-sleeved T-shirt with the race's logo. In addition to the subjects from Group Three, one subject from Group One and two subjects from Group Two also participated in the race.

Follow-up Data Collection

In an attempt to determine any residual effects of the treatment, there was a follow-up period for two months after the 5K road race. Subjects were instructed to continue to complete their exercise logs and ESES for each data point. The investigator sent an email reminder to the subjects each week for the eight weeks following the race. However, there was no further communication between the investigator and subjects. To serve as an incentive, prizes were promised to subjects who continued to keep their logs over the follow-up period.

During the second week of the spring semester, the investigator held a series of follow-up meetings. The same meeting was held on three different nights to accommodate schedules. At this meeting, the investigator passed out an informal questionnaire in order to gather qualitative information about the study. Also, subjects who had been keeping paper logs turned those in. All 29 subjects who continued to track their exercise adherence and self-efficacy during the break came to the follow-up

meeting. Fitness related door prizes were given away, ranging from resistance bands to a free gym membership.

Data Preparation

Data for exercise adherence and exercise self-efficacy was retrieved from the paper logs and the computer file. Complete data sets for weeks 1-10 were available for 39 subjects. Subjects missing two or more of the five data points were excluded. Subjects missing a single data points were given the group mean for that data points, bringing the total of complete data sets to 43. Only 29 complete data sets were available for data analysis for the follow-up period

Analysis

A 3 x 5 repeated measures ANOVA was used to determine if significant differences occurred among the groups in their levels of exercise adherence and exercise self-efficacy during the intervention period (group at three levels, time at five levels for the five data points of the intervention period). This same analysis was used to determine if any significant changes in self-efficacy occurred within each group during the intervention period. A 3 x 4 repeated measures ANOVA was used to determine if significant differences occurred among the three groups in their levels of exercise adherence and exercise self-efficacy during the follow-up period (group at three levels, time at four levels). Finally, a one-way ANOVA was used to determine any significant differences among the three groups at the first data point. This was done to capture any initial changes that may have occurred due to the group assignment.

All analyses were performed on SPSS 11.0 using a .05 level of significance. If a significant F value was obtained, appropriate post-hoc procedures were used to explore the results.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction and Descriptive Data

This chapter reports on the data analysis of the study and then discusses the results in relationship to the stated hypotheses. The intended purpose of the study was to determine the effects of two motivational strategies on exercise adherence and exercise self-efficacy in college females. The three groups were as follows: Group One (control), which received fitness instruction only; Group Two (accountability), which received fitness instruction plus was accountable to the investigator for their workouts; and Group Three (road race), which received fitness instruction, was accountable to the investigator, and was entered to participate in a local 5K road race. Exercise adherence was assessed by total minutes of exercise for each two-week data point throughout the duration of the study. Exercise self-efficacy was assessed by a composite score on a five-item exercise self-efficacy scale (ESES) that the participants completed at each data point.

The study began with 74 subjects, all female. The mean age was 20.3 ± 1.79. Although the subjects reported themselves to be sedentary (i.e., not currently meeting the ACSM minimum exercise guidelines), the majority reported being active in high school (team sports, cheerleading, and dance) but had become sedentary since starting college. These findings are consistent with the literature that claims a steep decline in physical

activity during the young adult years, especially in the transition from high school to college (Baranowski et al., 1997; Calfas et al., 1994; Sallis, 2000).

Pre-intervention, there were no significant differences among the groups in age or exercise history (Tables I and II). Exercise history was determined by the subjects' self-reports of whether they had consistently participated in high school athletics or other physical activity for a minimum of one year prior before coming to college.

TABLE I

Total subjects (N) and group (n) Descriptive Statistics

Group	Mean Age	N	Standard Deviation	Percent
Control	19.9	22	± 1.44	29.7
Accountability	20.3	26	± 1.18	35.1
Road Race	20.5	26	± 1.79	35.1
Total	20.3	74	± 1.29	100.0

TABLE II

Group (n) Descriptive Statistics for Exercise History

Group	Exercise History	Group Percent	No Exercise History	Group Percent
Control	14	63.6	8	36.4
Accountability	19	73.1	7	26.9
Road Race	15	57.7	11	42.3

As explained in Methods and Procedures, many subjects had missing data. At the end of the intervention, complete data sets were available for 39 subjects. Subjects who were missing only a single data point were given the group mean for that time period, bringing the total of complete data sets to 43. There were 11 data sets available for the control group; 11 data sets available for the accountability group; and 21 data sets available for the road race group.

Hypotheses

Two hypotheses were tested to determine if there were significant differences in exercise adherence and exercise self-efficacy among the three groups over time. In addition, a third hypothesis was tested to determine if there were significant differences in exercise self-efficacy within each group over time. A fourth and a fifth hypothesis concerning exercise adherence and self-efficacy during the follow-up period were not tested due to insufficient data. The issue of non-compliance to the data collection process will be addressed in the discussion portion of this chapter.

The following null hypotheses were tested at the .05 level of significance using a 3 x 5 repeated measures ANOVA (3 groups, 5 data points of time). Exercise adherence was measured by total minutes of exercise for each data point while exercise self-efficacy was measured by composite scores on the exercise self-efficacy scale.

Results of Hypothesis 1

Ho_1: There will be no significant differences in rates of exercise adherence among the three groups of exercisers (control, accountability, and road race) during the ten-week intervention.

Exercise adherence was measured by total minutes of exercise for each two-week period, or data point. The mean and standard deviations for each group can be found in Table III.

TABLE III

Mean Exercise Time over Ten Weeks

	Wks 1-2	Wks 3-4	Wks 5-6	Wks 7-8	Wks 9-10
Group 1	117.3min	152.5min	120.4min	85.0min	138.8min
n = 11	(± 89.81)	(± 179.42)	(± 75.59)	(± 93.62)	(± 90.34)
Group 2	186.2min	174.5min	165.2min	160.4min	132.2min
n = 11	(± 140.64)	(± 163.02)	(± 80.02)	(± 96.74)	(± 120.23)
Group 3	225.9min	186.4min	170.1min	187.2min	204.4min
n = 21	(± 129.48)	(± 94.49)	(± 124.83)	(± 89.73)	(± 121.02)

Group 1 = control
Group 2 = accountability
Group 3 = road race

A 3 x 5 repeated measures ANOVA tested for any main effects found during the ten week study on the parameters of group (control, accountability, and road race) and

time (data points 1 through 5). The ANOVA was also used to analyze if there was an interaction between group assignment and time. The results are shown in Table IV.

This ANOVA revealed no significance at the $p < .05$ level for the main effect of time ($F_{4,40} = .818$, $p = .515$). There was no significant difference between the groups ($F_{2,40} = 2.887$, $p = .067$) or between the groups over time ($F_{8,160} = .747$, $p = .650$). The overall null hypothesis was not rejected.

TABLE IV

3 x 5 Repeated Measures ANOVA for Exercise Adherence

Source	SS	df	MS	F	Sig.
Group	188817.897	2	94408.948	2.887	.067
S/G	1308222.336	40	32705.558		
Time	27943.676	4	32705.558	.818	.515
Group X Time	51015.628	8	6376.953	.747	.650
Time x S/G	1365984.651	160	8537.404	.650	
Total	2941983.9	214			

Results of Hypothesis 2 and 3

Ho_2: There will be no significant differences in levels of exercise self-efficacy among the three groups of exercisers during the ten-week intervention.

Ho_3: There will be no significant differences in levels of exercise self-efficacy within the three groups of exercisers during the ten-week intervention.

Exercise self-efficacy was measured by a composite score collected at each two-week data point. Group means and standard deviations can be found in Table V.

A 3 x 5 repeated measures ANOVA was conducted to test Hypothesis 2. The ANOVA tested for the main effect of group assignment and also an interaction effect between group assignment and time.

The same ANOVA was used to test Hypothesis 3. The ANOVA tested for the main effect of time over the ten-week intervention. Results can be found in Table VI.

TABLE V

Mean Exercise Self-Efficacy Scores over Ten Weeks*

	Wks 1-2	Wks 3-4	Wks 5-6	Wks 7-8	Wks 9-10
Group 1	24.9	23.0	22.7	19.6	23.9
n = 11	(± 13.92)	(± 14.35)	(± 13.06)	(± 11.89)	(± 13.21)
Group 2	27.0	25.4	25.4	26.9	25.8
n = 11	(± 7.42)	(± 9.89)	(± 7.06)	(± 7.39)	(± 7.07)
Group 3	30.8	25.95	27.7	30.3	33.62
n = 21	(± 9.41)	(± 10.93)	(± 13.19)	(± 11.24)	(± 10.17)

* = scale range: 5 - 55

TABLE VI

3 x 5 Repeated Measures ANOVA for Exercise Self-Efficacy

Source	SS	df	MS	F	Sig.
Group	1752.619	2	876.309	2.097	.136
S/G	16718.665	40	417.967		
Time	300.133	4	75.033	1.608	.175
Group X Time	438.664	8	544.833	1.175	.317
Time x S/G	7464.703	160	46.654		
Total	26674.781				

This ANOVA revealed no significance at the $p < .05$ level for the main effect of group ($F_{2,40} = 2.097$, $p = .136$). There was also no significant difference among the groups over time ($F_{8,160} = 1.175$, $p = .317$). The null hypothesis for Hypothesis 2 was not rejected.

The ANOVA revealed that within groups, there was no significant change in self-efficacy over the duration of the ten–week study ($F_{4,40} = 1.608$, $p = .175$).
The null hypothesis for Hypothesis 3 was not rejected.

Results of Hypotheses 4 and 5

Ho_4: There will be no significant differences in levels of exercise adherence among the three groups of exercisers during a two-month follow-up.

Ho_5: There will be no significant differences in levels of exercise self-efficacy among the three groups of exercisers during a two-month follow-up.

It was originally planned to do a 3 x 4 repeated measures ANOVA (three levels of group, four levels of time) with the exercise adherence and exercise self-efficacy data for the four data points at follow-up. However, only 29 subjects completed the exercise logs during the follow-up period, which spanned finals week, Christmas, and the winter break. Strangely, a few of these 29 subjects had not kept complete logs during the intervention portion of the study, even further reducing the number of complete data sets from weeks 1 to 18. Due to these very low numbers, the investigator decided not to run the analysis.

The group means and standard deviations are present in Table VII.

TABLE VII

Mean Exercise Time during Follow-up

	Wks 11-12	Wks 13-14	Wks 15-16	Wks 17-18
Group 1	61.2min	62.5min	38.2min	51.9min
n = 8	(± 89.55)	(± 96.21)	(± 57.06)	(± 70.70)
Group 2	87.1min	49.3min	30.0min	62.8min
n = 7	(± 64.02)	(± 64.05)	(± 43.30)	(± 87.31)
Group 3	152.1min	151.7min	178.9min	185.9min
n = 14	(± 108.64)	(± 140.58)	(± 191.83)	(± 173.27)

Additional Analysis

Although not in the original set of hypotheses, the investigator decided to run one more statistical test using data from all 74 subjects. This analysis was intended to examine exercise rates at the very first data point, immediately after the subjects were assigned to their groups. A one-way ANOVA revealed a significant difference among the groups ($F_2 = 6.295$, $p = .003$). The ANOVA table is presented Table VIII. A Bonferroni post hoc test was run to pinpoint the difference between the control group and the road race group. Again, this analysis was run in order to tease out any changes that may have occurred among the groups once subjects were given their group assignment. Results are presented in Table IX. In this table, the underlined means indicate no significant difference.

The additional analysis was run to further explain the obvious differences in exercise time that the repeated measures ANOVA did not capture. The one-way ANOVA indicated that the road race group, once finding out their group assignment, immediately decided to set higher exercise workloads for themselves and then sustained those workloads over time. The other two groups set lower workloads, with the control group setting a significantly lower workload. Approximately half of the subjects in Groups One and Two dropped out of the study during the next ten weeks, while those who stayed in held their workloads fairly steady. In this way it appears as though the goal of the road race elicited higher levels of motivation, as made manifest by the higher exercise levels, at the very beginning of the study. Since all three groups received the same amount of exercise instruction in the beginning, the goal of the road race was the only different variable for Group Three.

Table VIII

One-way ANOVA for Exercise Adherence after Group Assignment

Source	SS	df	MS	F	Sig.
Between Groups	138786.38	2	69393.192	6.295*	.003
Within Groups	782647.45	71	11023.204		
Total	921433.84	73			

TABLE IX

Exercise Adherence Group Means – Bonferroni Post Hoc

Group One	Group Two	Group Three
97.05	147.62	204.58

* underlined means indicate no significant difference

Discussion of Results

This study compared the effects of two different motivational strategies on exercise adherence (as measured in minutes) and exercise self-efficacy (as measured by the ESES) in college females. This section will expound upon the above strategies and compare the results to findings in the literature. In addition, this section will present qualitative data and anecdotal information that may provide additional insight for future studies that involve college females. Topics of interest include the results from the attrition rate, the role of goal setting, the self-efficacy instrument, the use of the Internet to collect data, and the subjects' perception of exercise.

ATTRITION

The attrition rate in this study was substantial, especially for Groups One and Two. Group One started with 22 subjects and dropped down to 11, while Group Two started with 26 and dropped down to 11. It should be noted that while 26 subjects were assigned to Group One, four withdrew from the study the first week, citing dissatisfaction with their assignment to the control group. Over time, the other subjects either stopped exercising, stopped keeping their exercise logs, or both. It is difficult to ascertain why the subjects stopped keeping their logs. It is possible they may have kept exercising but decided the logs were too much trouble. More likely, they may have stopped exercising and then decided it was pointless to log exercise sessions that did not occur – despite reminders every week that logging a non-session was just as important as logging a session. In any case, the investigator could not make assumptions about the subjects' exercise habits based on their non-compliance to data collection process, so a great deal of the data from the later weeks of the intervention had to be thrown out.

If the subjects did indeed stop keeping their logs because they stopped exercising, this would be consistent with the literature, which cites a drop-out rate of 50% or more among young exercisers (Dishman, 1988; Dishman & Buckworth, 1994; Fogelhorlm & Kukkonen-Harjula, 2000; Martin et al., 2000). Also consistent with the literature is the high drop-out rate in the critical first few weeks of attempting to make a behavior change (Dishman, 1988). However, the high drop-out rate in Groups One and Two helps to highlight the relatively high adherence rate in Group Three. Only five subjects dropped out of Group Three and three of those were due to extenuating circumstances (e.g., an auto accident, an unplanned pregnancy, and foot surgery). Judging by attrition rate alone, it appears that the goal of a road race helped to keep the subjects motivated enough to stick it out whereas subjects in the other groups did not. There is a chance that the subjects in Groups One and Two felt as though their data was not as "important" as Group Three, and so did not enter it. However, every attempt was made to tell the subjects that each data entry was very important no matter what their group assignment.

High attrition rates are common in exercise adherence studies. When Jeffery et al. (1998) provided different levels of support to obese exercisers, ranging from personal trainers to supervised walks to monetary incentives, even the groups with the highest adherence rates fell short of 50 percent attendance at the supervised walks. A study that examined the effects of small group cohesiveness on exercise adherence had to exclude ten weeks worth of data because the drop-out rate was so high (Annesi, 1998). An extensive review of randomized, controlled weight loss studies pointed to the abysmal adherence rates to given exercise protocols as the reason why such studies often had inconclusive results (Fogelholm & Kukkonen-Harjula, 2000).

For this reason, it is important to note that the road race group in this particular study demonstrated a lower attrition rate than the other two groups. The road race group was more compliant to both the exercise protocol and the data collection process. In a line of inquiry where high attrition is the norm, it might be useful to think outside the box as to how to keep subjects motivated to participate. Setting a physical challenge such as a road race is an example of that.

GOAL SETTING THEORY

Two things of note regarding goal setting: one, the almost immediate response of the subjects in Group Three; and two, the difference between meeting the goal of an exercise protocol and the goal of an external event (i.e., the road race). First, the immediate response of the subjects in Group Three was unexpected. It had been anticipated that they would demonstrate higher rates of exercise over time, as the date of the road race grew nearer, and the other two groups would demonstrate lower rates. Instead, subjects in Group Three immediately responded to their group assignment by establishing significantly higher exercise levels for themselves, and then maintaining that workload over time. It was almost as though the subjects knew what was expected of them, and most of them chose to rise to the challenge. In contrast, the other two groups set lower workloads for themselves at the beginning and seemed to maintain that over time as well – at least the subjects who remained in the study. Again, it is hard to know what happened to the exercise patterns of the subjects who dropped out. However, the overall positive response of Group Three provides support for the idea of using a physical challenge as a motivational strategy to increase exercise adherence.

The second issue is the type of goal that is set. For example, some might argue that adherence to the exercise protocol is actually a goal in and of itself. While it is true that such of goal might work for some individuals, it is evident by the exceptionally high rates of inactivity that it does not work for everyone. Clearly, for the majority of the population, an exercise goal needs to be framed in a different way.

A younger population is less apt to be motivated to exercise for improved health. Most college students cite improved appearance and fitness levels as reasons to exercise (Calfas et al., 1994; Grubbs & Carter, 2002). One thing of interest about the population of this study was the high rate of participation in organized athletics in high school and then a sharp drop-off since entering college. It was important to develop a goal for this population that might provide a more exciting contrast to the usual adherence goal of exercising a certain amount each week. The road race served as that goal.

The road race met the criteria of successful goal setting (Gould, 2001; Kyllo & Landers, 1995). As a 5K race, the goal was difficult but attainable, especially since the subjects could decide how they would like to complete the race according to their personal fitness level. Having the option to walk, jog, or run also made the goal more flexible. The ten-week training period would probably qualify as short-term, yet it was long enough to create a sense of commitment. Most importantly, the goal was very specific with a definite pay-off at the end. That idea of a pay-off is probably the most critical difference between setting a goal to simply adhere to an exercise protocol in contrast to setting a goal such as an athletic event. Although the athletic goal requires adherence to the protocol, the overall pay-off and subsequent bragging rights offer far more appeal.

To date, much of the research done on goal setting in the exercise domain has focused on task performance in a controlled setting - for example, a variety of timed sit-up tests (Locke & Lerner, 1995; Smith et al., 1996). One has to wonder how much "ownership" the subjects felt for such goals, especially since they were receiving class credit for merely participating in the study. In contrast, an athletic event that occurs in a public domain offers subjects the opportunity to put some personal investment into the goal. A fundamental aspect of goal setting in exercise is that the individuals must feel the goal is at least partially their own (Berger et al., 2002; Gould, 2001). It could be argued that in this present study, the road race, the investigator set the goal for the subjects and therefore absolved them of personal ownership. However, the investigator merely gave the subjects the challenge and the tools to meet it. Whether the subjects chose to meet the goal was truly a personal decision; i.e., they received no class credit or money for doing the race. Eighty percent of the subjects in Group Three chose to participate. This certainly gives support to the idea that once the subjects were presented with a goal, they "bought into it" and therefore set higher exercise levels for themselves.

SELF-EFFICACY THEORY

The literature consistently supports the psychological construct of self-efficacy as the single greatest determinant of exercise adherence (Berger, 2002; Fox & Biddle, 1998; McAuley & Blissmer, 2000; Martin & Sinden, 2001). Sometimes called the theory of motivation, it represents an individual's underlying belief that he or she is capable of executing the necessary actions to achieve desired results (Bandura, 1977, 1997). Self-efficacy can be both a determinant and a consequence of exercise behavior.

It was anticipated that the exercise self-efficacy of the subjects in this study would increase or decrease along with their rates of exercise adherence. This would indicate that as time went on, the exercising subjects were feeling more confident about their ability to exercise under any circumstance. However, the data in this study did not follow any particular pattern and certainly did not support the self-efficacy theory. Often, the self-efficacy score a subject entered seemed incongruent with her levels of exercise; e.g., a subject who only exercised once in two weeks might mark all "10's" (a very high score for self-efficacy) while a subject who exercised every day marked all "4's" (a very low score).

It is very possible that the subjects did not really understand the scale or did not want to take the time it took to self-reflect upon their attitude toward exercise for that point in time. For example, some subjects gave each item the same exact score each time even though the items were measuring very different situations. Finally, an off-hand remark by one subject at the follow-up meeting could also be revealing. She said, "The scale asked me about my confidence to exercise but not whether I really felt like doing it. They're two different things." In other words, the scale (in following with Bandura's theory) assumes that confidence will translate into action. Perhaps for many of these subjects, this was not the case.

It is surprising that the subjects seemed to have trouble with the self-efficacy scale, because this particular instrument had been used in at least two other studies with college students (Sullum & Clark, 2000; Wallace et al., 2000). However, both of those studies were cross-sectional, observational studies where self-efficacy was measured with the scale only once. In the original study for which the scale was designed, self-efficacy

was only measured once and correlated with phases from Prochaska and DiClemente's stages-of-change model (Marcus et al., 1992). It is quite possible that the scale is only appropriate to be used once in a cross-observational study in order to determine changes among individuals in a sample. The scale may not be appropriate for repeated uses as a way to capture changes in the same individual over time.

USE OF THE INTERNET FOR DATA COLLECTION

The Internet has become a popular source of communication for school, work, and play in the 21st century. Recently it has also become an option for data collection in research. The use of the Internet for data collection and communication in this study yielded some interesting and often surprising results.

Prior to subject recruitment, the investigator established a website on a free web page provided for graduate students within the College of Education. During recruitment, interested females could type in the web address and go directly to the site devoted to the study. The site explained the study in-depth and gave potential subjects the opportunity to quickly register online. This process was tremendously helpful during the recruitment process. The investigator knew from assisting in other studies that college students are usually reluctant to make phone calls to inquire about information. Using this method prevented the cumbersome routine of "phone tag" and saved time for both the investigator and the subjects. It also gave the subjects an opportunity to learn more about the study and its protocol before the orientation meetings.

Electronic communication worked well as a way for the investigator to communicate with subjects, both individually and by group. During the weekly follow-ups for Groups Two and Three, the investigator used both the phone and email; however,

the subjects overwhelmingly preferred the email method. On average, the investigator responded to between 40 and 50 emails a week from subjects, with questions ranging from the getting a side stitch while jogging to the best way to lose abdominal fat. The hundreds of questions and comments from subjects throughout the study provided a wealth of qualitative data that might prove useful at a later time. Electronic communication was an effortless way to collect and store that data.

Finally, the electronic method made data collection considerably easier for the investigator. Once the subjects entered their data, it went immediately to a secure computer file that only the investigator could access. In addition, the investigator felt confident that the information entered was valid, as all subjects needed both a password and a subject number to gain access to the data entry page.

However, the Internet method of data collection also had drawbacks. Surprisingly, many subjects did not like it and preferred to keep paper logs. Some explained it was just easier, while others claimed they had trouble gaining access to a computer. This was surprising to the investigator, as there seemed to be no lack of computers on campus. Nonetheless, it is something to keep in mind for future studies using Internet data collection. Many subjects seemed to have trouble recalling the date and duration of their exercise session. This could be remedied in the future by using a data entry page with visuals such as a calendar and various prompts for time and activity. It is difficult to know how to solve the other problem subjects seemed to have, which was remembering their subject number. Finally, when using electronic methods one must consider the "faceless" component that may have contributed to the high attrition rates in this study. It is possible that many subjects felt ignored or uncommitted under the

anonymity of filling out a computer exercise log every week and when they grew tired of doing it, they simply stopped.

SUBJECTS' PERCEPTIONS OF EXERCISE

The exercise guidelines for this study gave fairly explicit guidelines on what constituted as "exercise." Examples of this can be seen in a page from the exercise guidelines in Appendix E. Subjects were instructed not to include what are often called "activities of daily living" (e.g., housework, shopping, running errands) in their exercise logs. The rationale for this, as explained in the Introduction and Methods chapters, is that the activities of daily living are probably of too low an intensity to stimulate physiological benefits in young, healthy adults (Leslie et al., 2001; Shephard, 1997).

However, many subjects either did not understand this distinction or were simply intent on having an entry in their exercise log. Activities entered as exercise included housework, shopping (especially at Wal-Mart), walking from bar to bar, standing up at football games, walking around amusement parks, babysitting, "pomping" (preparing homecoming displays), and sex. Although interesting, this data could not included in the final analysis.

If the subjects were sincere with their entries, it sends a somewhat depressing message about young adults and exercise. Ideally, the late teens and early 20's are a time when individuals should increase their fat-free mass and bone density in preparation against the age-related declines later in life. If there was ever a time for individuals to engage in vigorous exercise, now is the time. If college females are already considering housework to be "exercise," they do not have much wiggle room for a decline in activity later in life.

LIMITATIONS AND STRENGTHS

While the high attrition rate of this study was not unexpected, and does serve to highlight the potential of the road race strategy, it still contributed to a loss of statistical power. Limited manpower and resources made it difficult, if not impossible, to keep track of every subject and their compliance to the data collection protocol. On the other hand, the close personal contact of the investigator with many subjects could have contributed to unaccounted variability. For example, a subject's decision of whether to attend a group workout could have depended on whether or not she liked the investigator who was leading the workout.

As mentioned before, the exercise self-efficacy scale did not generate useful data. Another limitation was the relatively short length of the study (18 weeks). While there are some studies in the literature as short as five weeks (Keele-Smith & Leon, 2002), with the majority ranging from 8 to 10 weeks, it only makes sense that the longer adherence can be tracked, the more accurate the picture will be. Finally, this study exemplifies the usual disadvantages associated with certain populations. Simply put, college students are not always very reliable or consistent.

A definite strength of this study was the experimental design with a large enough sample size to allow random assignment. This study also employed a strong theoretical background, attempting to use the goal setting theory as a determinant of exercise and exercise self-efficacy as a consequence. A criticism of much exercise adherence research is that it merely describes or explains the phenomena and is atheoretical in nature. The subject area is in need of studies that attempt to contribute to the line of inquiry by manipulating variables related to exercise adherence and testing the effects (Dishman &

Buckworth, 1994; Leith & Taylor, 1992; Martin et al., 2000). On a more practical level, this study employed real-life, replicable strategies that could be used in a variety of exercise settings at a relatively low cost.

SUCCESS STORIES

This study was unable to confirm through statistical significance the lasting effects of the road race strategy on the exercise adherence in college females. However, the personal significance of the race experience in some of the subjects cannot be underestimated. The race day was very exciting for most of the subjects, and many of them voluntarily kept in contact with the investigator after the study, eager and excited to share their latest fitness developments.

All of the subjects who participated in the 5K road race successfully completed it. Many of them had invited their parents to come watch. The remark the investigator heard over and over again was, "No one ever thought I would do something like this." One particularly poignant moment occurred when the last subject finally crossed the finish line. She was overweight and had said her family had a strong history of obesity, heart disease, and diabetes on both sides. Event at the moment she pinned on her race number, this subject talked about backing out. When she finally finished, her primary objective was to get a race T-shirt so she could prove to her family she had done this event. The subject said no female in her family had ever done anything remotely physical, and certainly no one would believe she had run a road race! At last contact with the investigator in January, the subject revealed she was not running very much but finally had the confidence to go to aerobics classes, and she really loved that type of exercise.

Two subjects went on to participate in a "Jingle Bell Jog" just a month after the Turkey Trot road race. One subject, who also liked to cycle, decided to enter a duathlon (a bike/run event) in the spring, while another subject decided to train for the popular 15K "Tulsa Run" road race in October in order to "keep me motivated to run during the summer." Two subjects will be jogging/walking as a ½ marathon relay team in the "Oklahoma City Memorial Marathon" in April. And finally, one subject told the investigator she had bought a marathon training book and was planning on completing one before the end of 2004. Her success is particularly noteworthy because of her athletic history. She was a competitive cheerleader all through high school but was ten pounds too heavy for the collegiate cheering squad (it should be noted she is not overweight, just very muscular). She originally joined the study because she thought it might help her lose weight for the cheerleading try-outs. Her last conversation with the investigator revealed that she was trading in the cheerleader aspirations for running races. She expressed confidence in this newfound ability and relief at not worrying so much about her weight. Hers is just one story, but it exemplifies the potential of a motivational strategy that helps college females feel empowered about their bodies and eager to exercise because they truly enjoy it.

CHAPTER FIVE

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this chapter was to summarize the findings outlined in the previous chapter; discuss the conclusions that were drawn from the study; and make recommendations for future research in the area of exercise adherence. The findings and conclusions were based upon data gathered in an 18-week study, although only data from the first ten weeks were used. The purpose of the study was to determine the effects of two motivational strategies on exercise adherence and exercise self-efficacy in college females. The three groups were as follows: a control group (Group One), which received exercise instruction; an accountability group (Group Two), which received exercise instruction and were accountable to the investigator for their workouts each week; and a road race group (Group Three), which received exercise instruction, were accountable for their workouts, and were entered to participate in a 5K road race.

The study began with a total of 74 subjects (mean age = 20.3), all female students enrolled at Oklahoma State University. The subjects were randomly assigned to groups, with all groups receiving the same exercise protocol to follow. Data were collected for each two-week data point. Exercise adherence was measured by how many total minutes

the subject reported exercising. Exercise self-efficacy was measured by a composite score from a validated self-efficacy scale.

Findings

Three hypotheses were tested to determine if there were significant differences among the three groups and within each group over time for the intervention portion of the study. Two hypotheses regarding the follow-up portion were not tested due to insufficient data. Repeated measures of analysis (ANOVA) were used to analyze the first three hypotheses while additional analysis was done using a one-way ANOVA and a Bonferroni post hoc assessment.

The following null hypotheses were tested at the .05 level of significance. Investigation of each hypothesis was made on comparison of the three groups over the ten-week intervention period.

Ho_1: There will be no significant differences in rates of exercise adherence among the three groups of exercisers (control, accountability, and road race) during the ten-week intervention. The null hypothesis was accepted.

Ho_2: There will be no significant differences in levels of exercise self-efficacy among the three groups of exercisers during the ten-week intervention. The null hypothesis was accepted.

Ho_3: There will be no significant differences in levels of exercise self-efficacy within the three groups of exercisers during the ten-week intervention. The null hypothesis was accepted.

The following hypotheses were not tested due to insufficient data.

Ho_4: There will be no significant differences in levels of exercise adherence among the three groups of exercisers during a two-month follow-up.

Ho_5: There will be no significant differences in levels of exercise self-efficacy among the three groups of exercisers during a two-month follow-up.

An additional analysis was run to further explain the obvious differences in exercise time that the repeated measures ANOVA did not capture. Using the exercise adherence data from the first data collection point, a one-way ANOVA indicated significantly higher levels of exercise in the road race group as compared to the control group. This is meaningful because it points to how the goal of the road race appeared to provoke higher levels of exercise from the beginning. The road race group maintained these levels throughout the ten weeks. The ability to detect further differences among the groups over time was probably diminished by the high attrition rate in Groups One and Two.

Conclusions

Based upon the initial findings in this study, it would be easy to assume that the goal of training for a road race has no effect on exercise adherence or exercise self-efficacy in college females. However, a closer examination reveals some important findings that promote the potential of use of this strategy. While the high attrition rates in Groups One and Two lessened the statistical power of the original analysis, they also served to highlight the strong adherence rates in Group Three. It was clear that the motivation of the road race helped to keep those subjects more compliant to the study's protocol and data collection methods. Further analysis with data from the first data point lends more support to this idea. Once the subjects in Group Three learned they would be

expected to participate in a road race, they set high exercise levels for themselves and maintained them. Finally, the success stories from Group Three speak well for this strategy. Although such stories hold no weight in quantitative terms, they provide evidence that it is possible to take a group of sedentary females and help some of them find an enjoyable form of exercise that they will continue to perform.

Perhaps the most important finding of this study is the promise of a motivational strategy that can be implemented into other exercise adherence studies. How well the goal setting theory works to help individuals stick to an exercise program is an area largely unexplored in exercise adherence research. In this study, the investigator examined the goal of a road race for college females. Future studies could replicate this idea, with appropriate changes to maintain a large sample size, or use the idea as a stepping-stone to other goal strategies with other populations. The underlying theme would be helping sedentary individuals discover their "inner athlete" by using the goal of some kind of athletic event. While it will not work for everyone, it holds promise to work for some. Every tactic that can be added in the fight against inactivity is a move toward a stronger, healthier, more active nation.

Recommendations for Future Studies

Although this study was unable to quantify the effects of a road race goal on exercise adherence, the idea has merit for future studies. The idea of goal setting in exercise adherence, especially in setting an athletic goal for a sedentary population, has yet to be explored. Listed below are recommendations and ideas for further exploration:

1. A similar study needs to be conducted using a much larger sample size of college females and a longer follow-up period. With enough assistance and resources, perhaps the attrition rate could be reduced enough to detect any significant differences among the groups, especially in a follow-up period that might extend from six months to a year.
2. A similar study needs to be conducted using a different instrument to assess exercise self-efficacy.
3. A similar study needs to be conducted with different or improved methods to collect exercise adherence data. Examples include daily email reminders, electronic or paper calendars with activity prompts, more assistance to make follow-up calls, and so forth.
4. A similar study needs to be conducted using both males and females so that gender differences may be addressed.
5. A similar study needs to be conducted that expands the notion of training for a road race by incorporating different race lengths or different athletic events. For example, many females might be interested in training for an annual three-day walk that raises money for breast cancer.
6. A similar study needs to be conducted that assesses the subjects' motivation to exercise pre- and post-intervention and follow-up. It would be interesting to see how the motivation to exercise might change as a result of the training.
7. A similar study needs to be conducted that assesses the subjects' self-perception or body image pre- and post-intervention and follow-up. As in motivation, it

would be interesting to see how an individual's body image might change as a result of training.

8. A similar study needs to be conducted that addresses the issue of social support and its effects on exercise adherence. For example, some subjects could be assigned "exercise buddies" with other subjects and given assistance in planning partnered workouts. An appropriate instrument to measure levels of social support could be utilized pre- and post-intervention.
9. A similar study needs to be conducted that also measures physiological variables (e.g., aerobic capacity, muscular endurance, anthropomorphic measurements) in conjunction with exercise adherence.
10. A similar study needs to be conducted using a different population, such as older adults or children.

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APPENDIXES

APPENDIX A

HEALTH SCREENING FORM

(PAR-Q)

Physical Activity
Readiness Questionnaire
(revised 1994)

PAR-Q & YOU

(A questionnaire for people age 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active everyday. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly; circle YES or NO.

YES	NO	1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
YES	NO	2. Do you feel pain in your chest when you do physical activity?
YES	NO	3. In the past month, have you had chest pain when you were not doing physical activity?
YES	NO	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
YES	NO	5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?
YES	NO	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
YES	NO	7. Do you know of any other reason why you should not do physical activity?

Please turn this page over to complete the other side....

 Supported by: Health Canada

If you answered YES to one or more questions:

Talk to your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want – as long as you start slowly and build up gradually. Or, you many need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

If you answered NO to all questions:

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- Start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- Take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

Delay becoming much more active if:

- If you are not feeling well because of a temporary illness such as a cold or fever – wait until you feel better; or
- **If you are or may be pregnant** – talk to your doctor before you start becoming more active.

Please note:

If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

I have read, understood and completed the questionnaire. Any questions I had were answered to my full satisfaction.

NAME: _____

SIGNATURE: _____ DATE: _____

SIGNATURE OF PARENT: _____
OR GUARDIAN (for participants under age of majority)

WITNESS: _____ DATE: _____

Supported by: Health Canada

CONTACT INFORMATION:

Name: _____ Age: _____

Stillwater address: _____

Phone numbers: (H) _____(C) _____ (W) _____

Email address: _____

What is the best way to contact you w/messages? _____

Which phone number is the best one to talk to you personally, and what are the best times to call?
_____

Are you able to access the Internet at least once a week? _____

Check your preferred method for keeping a weekly activity log.

_____ Paper logs provided by study ____ Electronically through study's website

ACTIVITY INFORMATION: **(feel free to write on the back of this page!)**

1. During the past month, approximately how many times did you exercise per week?
(please circle one)

Not at all 1–2 sessions 2 -3 sessions More than 3 sessions

2. If you did exercise, approximately how long were the sessions?

Less than 20 minutes 20 – 30 minutes More than 30 minutes

3. If you do exercise, what type of activities do you usually choose? *(please write in space provided)*

4. Describe your exercise "history" (Did you play sports in high school, have you lifted weights before, etc? Please include approximate time frame)

5. Where do you plan to exercise? (home, gym, OSU facilities, etc)

6. Do you have any concerns about your health or physical condition that you would like to discuss before participating in this study? *(if yes, please explain or indicate you would like me to contact you).*

APPENDIX B

INFORMED CONSENT

Informed Consent

A. AUTHORIZATION

I, _____, hereby authorize or direct Elizabeth Stewart or her agents, to perform the follow treatment or procedure.

B. DESCRIPTION OF RESEARCH AND ASSOCIATED RISKS/BENEFITS

1. **Name of research project:** "The effects of two motivational strategies on exercise adherence and exercise self-efficacy in college females."

2. **Researcher:** This study is a dissertation project conducted by Elizabeth Stewart, a doctoral student in the Health and Human Performance program at OSU.

3. **Purpose:** The purpose of the research is to investigate the effects of two motivational strategies on exercise adherence and exercise self-efficacy in college females. More specifically, this research endeavors to see which strategy (motivational feedback vs. motivational feedback plus competition) provokes a greater adherence rate to an exercise program and makes participants feel more confident about their exercise ability. The expected duration is 8 weeks for the intervention time and a 12 week follow-up.

4. **Procedures:** The procedures utilized include the assignment of an exercise protocol, an activity log to keep track of exercise adherence, and a weekly questionnaire to answer on exercise self-efficacy. For the third group, the procedures also include participation in a local 5K road race (run, jog, or walk).

5. **Experimental aspect:** The procedure that is experimental is participation in a local 5K road race. The idea is to see if making a commitment to participate in an athletic event increases exercise adherence.

6. **Possible Risks:** Possible risks include those that are part of any standard exercise program. You may experience some temporary muscle soreness, especially in the beginning of the program, and discomfort due to heat and humidity. Depending on the nature of the environment you choose to exercise in, you may assume more risk in some situations than others (i.e., jogging in the street as opposed to jogging on a track). None of these risks are beyond those that a healthy individual would experience in starting their own exercise program. However, in the interest of your safety and health, you are strongly encouraged to follow this study's exercise guidelines and safety tips. You have been provided with information to make your exercise experience as safe as possible; however, the researcher is not responsible for injury or mishap that may occur to yourself or others while exercising.

7. **Benefits:** Benefits are many. First, for those wanting to start an exercise program, but not quite what to do, this study provides both the necessary incentive and instruction. Second, this study provides safe and effective exercise information and a structured program to follow. Normally, that is what individuals pay a personal trainer for, and even then, not all personal trainers have the same degree of education and certification. This study follows a protocol endorsed by the American College of Sports Medicine, which sets the international standard in exercise programming. Third, this study has the potential to help make a long-lasting and positive change in your overall health.

8. **Confidentiality:** Every attempt will be made to protect your confidentiality. Your PAR-Q forms and these informed consents will be kept in a locked file cabinet in the office of an OSU faculty member. If you choose to do the paper version of the activity logs, those will also be kept in the file cabinet. If you choose to electronically fill out your activity log, the information will be kept in a computer file that can only be accessed by the researcher.

9. **Contacts for Possible Concerns:** This study involves no greater risk other than what you may encounter starting any exercise program. However, for your safety, you will be given a checklist of abnormal exercise responses. If you experience any of the responses, contact a physician (contact information below). In addition, if you experience a muscle strain or sprain, contact an athletic trainer (contact information below). You are encouraged at any time to contact the researcher with questions about exercise-induced changes in your health, and she will attempt to help you find the right healthcare provider at the lowest cost (information below). However, you will not be compensated by the researcher for any costs incurred through the exercise program or resulting health concerns. If you have any questions about your rights as a subject, please contact the Institutional Review Board (IRB) at OSU.

10. **Contact Information:**

Elizabeth Stewart (Investigator)
Address: Seretean Wellness Center, 1514 W. Hall of Fame, Stillwater 74078
Phone: (405) 372-5102 or (405) 744-6395
Email: fitstudy2003@yahoo.com

OSU University Health Services
Address: 1202 W. Farm Rd, Stillwater 74078
Phone: (405) 744-7665
Walk-in appointments every weekday from 8am to 5pm ($7 charge on bursar)

Seretean Wellness Center
Address: 1514 W. Hall of Fame, Stillwater 74078
Phone: (405) 744-9355, 744-7414
Free consultation w/certified athletic trainer
(Mon, Fri 8:30am-12:30 and Tue-Wed-Thur 8am – 11:30)

Institutional Review Board (IRB)
Contact: Sharon Bacher, IRB Executive Secretary
Address: 415 Whitehurst, Stillwater, 74078
Phone: (405) 744-5700

C. VOLUNTARY PARTICIPATION

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I also understand that I am free to withdraw my consent and end my participation in this project at any time without penalty after I notify the researcher (Elizabeth Stewart, contact by phone at 405-372-5102). I also understand that my participation in the exercise program is voluntarily and that any costs incurred are my responsibility, and not that of the researcher.

D. CONSENT DOCUMENTATION FOR WRITTEN INFORMED CONSENT

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____(a.m./p.m.)

_____

Name (printed clearly) (Signature)

I certify that I have personally explained all elements of this form to the subject before requesting the subject to sign it.

Signed: _____

APPENDIX C

GROUP WORKOUTS &

LECTURE SCHEDULE

Fitness Lectures

All lectures will take place in Seretean Wellness Center lecture hall immediately following group workouts. Lectures will start between 4:45 to 5pm on Sundays and between 8:45 to 9pm on Mondays. The lectures/demonstrations will last between 20 to 30 minutes followed by Q & A. Handouts will be provided and emailed to all participants the following day as a Word attachment.

Fitness 101 – What it all means Instruction of home exercises	Sept 14th & 15th
Create a strength workout in any gym What exercises works what muscles	Sept 21st & Sept 22nd
No lecture – FALL BREAK	Sept 28th & 29th
Metabolism 101 Body fat: gaining it, burning it, and how accurate are those tests anyway?	Oct 5th & 6th
Fitness Focus: Abdominal Training	Oct 12th & 13th
Fitness Focus: Hips & Gluteals Training	Oct 19th & 20th
Exercise Facts & Fallacies: Common Mistakes	Oct 26th & 27th
Nutrition Update: Why Fad Diets Don't Work	Nov 2nd & 3rd
Interval Training, Circuit Training, Personal Training	Nov 9th & 10th
Pre-Race Meetings	TBA

Group Workouts

When:

- Sundays, 4pm (Elizabeth) – Optional lecture follows in Seretean lecture hall
- Mondays, 8pm (Elizabeth) – Optional lecture follows in Seretean lecture hall
- Wednesdays, 8pm (Kelley/Kara)

There will be no workouts Sept 27 – Sept 29 (Fall Break)

Where:
OSU track on north side of Hall of Fame Avenue.

For Who:
All participants in this study. It doesn't matter which group you're in.

The Program:

- Sign in
- 30 minutes aerobic activity
- 15 - 20 minutes resistance exercises (lunges, push-ups, dips, resistance bands)

When you get there, please sign in and then start warming up with a brisk walk or slow jog. We will usually do different aerobic drills on different days so just wait for instructions! (If you want to do more than 30 minutes of aerobic, feel free to come earlier or stay later.) At times we may go to the stadium or cross-country track.

The Purpose:
Some people find being in a group or being accountable really helps them stick to a program. In addition, this is a good time to ask Elizabeth fitness-related questions in person.

Suggestions on what to wear/bring:

- Comfortable exercise clothes and decent shoes. If you don't have pockets, use a safety pin to pin your car key to your shorts.
- A bottle of water
- Watch w/minute hand so you can time yourself
- Extra T-shirt or towel if you don't want grass stains on your knees

Cancellations:
We will exercise if it's between 35 and 90 degrees and not raining or snowing. If Elizabeth has an emergency and cannot be there, she will either find an assistant or notify through email

APPENDIX D

FITNESS PACKET

OUTLINE

Fitstudy 2003 Training Packet

Table of Contents

APPENDIX E

EXERCISE PROTOCOL

Exercise Protocol

For optimal results, national recommendations suggest the following:

Aerobic exercise, a minimum of 3x a week, for 20 to 60 minutes

An easy rule to follow is – the higher intensity the exercise is, the shorter you can make the duration (example – jog for 20 minutes). A lower intensity exercise should be done for a longer duration (example – walk for 40 minutes). More examples follow.

Higher Intensity Activities (may do for shorter duration):

- Running (6mph or faster)
- Jogging (4.5 mph or faster)
- Elliptical Trainer (without holding on to handles, different resistances/inclines)
- Walking (4.0 mph or faster) with an incline of 5% or higher
- Stairmaster (without holding on to handles)
- Aerobics classes (step, dance, or kickboxing)
- Jump rope
- Walking or running up stairs in the dorm/stadium (always walk down to reduce stress on knees)

More Moderate to Low Intensity Activities (should do for longer duration):

- Stationary bike or cycling outdoors (since biking is non-weight-bearing, your body does not have to work as hard to support itself)
- Swimming or water aerobics
- Walking on level ground or slight incline (4mph or slower)
- Stairmaster or Elliptical Trainer (holding to handles, staying at same pace)

Components of an aerobic workout are outlined on the next page and will be covered in the first lecture.

In addition to aerobic conditioning, strength training is also an important part of any workout routine. Benefits, suggestions, and sample workouts are listed in the "Strength Training" portion of this document and will be covered in several of the lectures. To reap benefits, you don't need to spend forever in the gym. For optional results with the minimum time commitment, national recommendations suggest the following:

1 or 2x strength sessions a week (8-10 exercises working major muscle groups)

Ideally, this should be in addition to your aerobic workouts. To save time, you may do aerobic and strength training on the same day.

Suggested Forms of Exercise:

- Running
- Jogging
- Brisk walking (for exercise, not to class)
- "Cardio" equipment (stairmaster, elliptical trainer, stationary bike, etc)
- Jump rope
- Aerobics/dance classes or videos
- Swimming
- Roller blading
- Intramural sports/club sports
- Cycling
- Hiking

Though the following activities are not always aerobic, you may also count them toward your three sessions per week:

- Pilates
- Yoga
- Strength training
- Abdominal training
- Intramural sports/club sports

Do NOT count activities such as walking to class or housecleaning. The idea is to try to incorporate additional activity into your life, above and beyond what you're doing now.

If you have any questions about an activity, please just ask!

Aim for 3x workouts a week, 20 to 60 minutes, of any of the above activities.

APPENDIX F

ABNORMAL RESPONSES to EXERCISE

GUIDELINES for SUBJECTS

ABNORMAL RESPONSES TO EXERCISE

It is normal to be a little sore and tired within the first few days or even weeks of starting an exercise routine. However, the following responses are NOT normal (ACSM, 2000).

Muscle soreness that does not go away after several days.

While it is common to be sore for a few days at the onset of an exercise program, chronic muscle soreness is a sign of over-training.

Marked Changes in Appetite.

It is normal to feel slightly hungrier when you're exercising regularly, yet also feel decreased appetite immediately after an exercise sessions. However, you should not experience a severe change in hunger or appetite.

Marked Changes in Fatigue or Sleep.

With the right amount of exercise, most people report they feel more energetic and sleep better. While exercise should leave you comfortably "tired," you not feel overly fatigued or weary. You should not experience severe changes in sleeping patterns.

Changes in Menstrual Patterns – especially missing 3 or more periods.

This is often a sign of over-training and/or poor nutrition.

Exercise-induced headaches, dizziness, nausea and/or difficulty breathing.

If you are sick, you should not exercise. If exercise brings on the above conditions, this warrants medical attention.

If you experience the above conditions, please contact Elizabeth ASAP and make an appointment at the OUS Student Health Services or your personal physician. If you feel you have strained a muscle or sprained a joint, please contact Elizabeth and make an appointment to see the student-services athletic trainer or your personal physician.

OSU University Health Services
1202 W. Farm Rd, Stillwater 74078
(405) 744-7665
Walk-in appointments, weekdays from 8am to 5pm ($7 bursar fee)

Seretean Wellness Center / Student-services athletic trainer
1514 W. Hall of Fame, Stillwater 74078
(405) 744-7414
Free consultation w/certified athletic trainer
Mon & Fri (8:30 to 12:30) and Tue-Wed-Thur (8a to 11:30)

APPENDIX G

EXERCISE ADHERENCE LOG

EXERCISE SELF-EFFICACY SCALE

(INTERNET VERSION)

Fitness Study 2003

This website is for the use of registered participants in a Doctoral Research Project.

Elizabeth Stewart

Doctoral Candidate
Oklahoma State University
College of Education

Participants in the Fitness Study,
Please click the Fitness Activity Log button
to submit your daily activity.

Fitness Activity Log

Information on the design, implementation, and results of this study can be obtained by contacting Elizabeth Stewart at:
ees@okstate.edu

Fitness Study Activity Log

Welcome to the Fitness Study Activity Log!
I appreciate the time you've taken to track your exercise sessions for this week.
Keep up the good work!

Reminders:

- Identify yourself through your subject I.D. number only.
- You need to record at least THREE sessions for the week whether you exercised or not.
- For each missed exercise session:
  - Enter "missed" for Question 3
- Please be as honest and as accurate as possible.
- If you exercised more than three times,,, Congratulations! Please enter and submit all additional entries.
- Remember to enter and submit only ONE DAY at a time, even if you are entering multiple days in one sitting.

Part One: Activity Log

Question 1: Please enter your Subject ID Number.

Question 2: Please enter the date of the exercise session.
[year-month-day = 030724]

Question 3: Please describe the Type of Activity you performed. Please be brief if possible.

Question 4: Please enter in minutes the length of the exercise session.

Part Two: Exercise Self Efficacy Scale

Answer and submit Part Two only once a week. Preferably at the end of the week.

Question 5: I am confident I can participate in regular exercise: when I am tired.

- 0 Does not apply to me.
- 1 Not at all confident.
- 2
- 3
- 4
- 5
- 6 Somewhat Confident
- 7
- 8
- 9
- 10

○ 11 Extremely confident.

Question 6: I am confident I can participate in regular exercise: when I am in a bad mood.

○ 0 Does not apply to me.

○ 1 Not at all confident.

○ 2

○ 3

○ 4

○ 5

○ 6 Somewhat Confident

○ 7

○ 8

○ 9

○ 10

○ 11 Extremely confident.

Question 7: I am confident I can participate in regular exercise: when I feel I don't have the time.

○ 0 Does not apply to me.

○ 1 Not at all confident.

○ 2

○ 3

○ 4

○ 5

○ 6 Somewhat Confident

- 7
- 8
- 9
- 10
- 11 Extremely confident.

Question 8: I am confident I can participate in regular exercise: when I am on vacation or away from school.

- 0 Does not apply to me.
- 1 Not at all confident.
- 2
- 3
- 4
- 5
- 6 Somewhat Confident
- 7
- 8
- 9
- 10
- 11 Extremely confident.

Question 9: I am confident I can participate in regular exercise: when the weather is too hot, too cold, too rainy, etc.

- 0 Does not apply to me.
- 1 Not at all confident.
- 2

- ○ 3
- ○ 4
- ○ 5
- ○ 6 Somewhat Confident
- ○ 7
- ○ 8
- ○ 9
- ○ 10
- ○ 11 Extremely confident.

Thank you again for your cooperation!

Submit Form | Reset Form

APPENDIX H

IRB APPROVAL

Oklahoma State University
Institutional Review Board

Protocol Expires: 8/5/2004

Date: Wednesday, August 06, 2003 IRB Application No ED0412

Proposal Title: THE EFFECTS OF TWO MOTIVATIONAL STRATEGIES ON EXERCISE ADHERENCE AND EXERCISE SELF-EFFICACY IN COLLEGE FEMALES

Principal Investigator(s):

Elizabeth Stewart
615 S. Washington #1
Stillwater, OK 74074

Steven Edwards
432 Willard
Stillwater, OK 74078

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 415 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

#2

VITA

Elizabeth Eleanor Stewart

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE EFFECTS OF TWO MOTIVATIONAL STRATEGIES ON EXERCISE ADHERENCE AND EXERCISE SELF-EFFICACY IN COLLEGE FEMALES

Major Field: Health, Leisure and Human Performance

Biographical:

Personal Data: Born in Bartlesville, Oklahoma, February 1st, 1971, daughter of Dan and Melinda Droege.

Education: Graduated from Bartlesville High School in 1989 in Bartlesville, Oklahoma.
Received Bachelor of Arts degree in Communications from University of Tulsa, in May, 1993.
Received Master of Science degree from Oklahoma State University, in December, 2001.
Completed the requirements for the Doctor of Philosophy degree at Oklahoma State University, in December, 2004, in Stillwater, Oklahoma.