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The Evaluation of a Web-Based Physical Activity Intervention in a Predominantly Hispanic College Population

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THE EVALUATION OF A WEB-BASED PHYSICAL ACTIVITY
INTERVENTION IN A PREDOMINANTLY
HISPANIC COLLEGE POPULATION

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by

Dejan Magoč

2009

Dedication

To my wife Tanja, the love of my life,
and our precious daughter Lana, the joy of our lives.

THE EVALUATION OF A WEB-BASED PHYSICAL ACTIVITY
INTERVENTION IN A PREDOMINANTLY
HISPANIC COLLEGE POPULATION

by

DEJAN MAGOČ, M.S.

DISSERTATION

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The University of Texas at El Paso

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for the Degree of

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Abstract

The American Heart Association (AHA) and the American College of Sports Medicine (ACSM) suggest at least 30 min of moderate physical activity at least 5 days a week or 20 min of vigorous physical activity at least 3 days a week. The overall aim of this experiment was to evaluate the efficacy of a web-based intervention – one that relied on existing, easy-to-use course technology – to increase days of weekly physical activity among predominantly Hispanic college students attending a large Southwest University. The principal hypothesis was that the intervention would significantly increase days of physical activity among those participating in the intervention group. This study also examined the presumed mediators of PA behavioral change using constructs derived from Social Cognitive Theory (SCT). It was expected that positive change in presumed mediators, including self-regulation, self-efficacy, social support, and outcome expectations and expectancies would mediate changes in days of PA. One hundred four participants were randomly assigned to either an intervention or a control group. The intervention group participated in a 6-week web-based physical activity program. During this time, they received a total of seven learning lessons based on SCT constructs. The control group did not participate in any learning activities about physical activity and fitness. Instead, they received, web-based, very basic information on physical activity (e.g., the importance of PA). Results of multivariate, univariate, and stepdown analyses for the Treatment Group by Time interaction showed the intervention to increase both moderate and vigorous days of physical activity. Similar multivariate, univariate, and stepdown tests of the SCT constructs did not show the intervention to predictably impact the SCT variables. Overall, the present study found support for the notion that a theory- web-based intervention could successfully increase days of moderate and vigorous physical activity across a 6-week intervention period, relative to a non-theory based control condition. The study failed to find strong support, however, that changes in SCT constructs such as self-efficacy or ability to make plans accounted for such changes.

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Chapter 1: Introduction

In scientific usage, physical activity (PA) is frequently defined as a function of its intensity, duration, and frequency (Haskell et al., 2007). The American Heart Association (AHA) and the American College of Sports Medicine (ACSM) suggest at least 30 min of moderate physical activity at least 5 days a week or 20 min of vigorous physical activity at least 3 days a week (Haskell et al., 2007). Moderate physical activity is defined as any activity that takes moderate physical effort and makes a person breathe somewhat harder than normal (e.g. walking, cleaning) (Booth, 2000). Vigorous physical activity is defined as any activity that takes hard physical effort and make a person breathe much harder than normal (e.g. jogging, skiing) (Booth, 2000). In addition, the recommendations state that a combination of moderate and vigorous physical activity is appropriate. For instance, a person may be moderately physically active on 2 days a week for at least 30 min per day in addition to 2 days of vigorous physical activity for at least 20 min per day.

The relationship between PA and disease is unambiguous and lack of physical activity in the general population has become a major public health concern (Petosa, Suminski, & Hertz, 2003). PA helps metabolism and immune function, minimizes risk factors for many heart diseases, including diabetes and high blood pressure, and is also associated with decreased risk of morbidity and mortality rates from cardiovascular disease (Kujala, Kaprio, Sarna, & Koskenvuo, 1998).

Even though the health benefits of PA are numerous, most adults are not sufficiently physically active (Insel & Roth, 2002; Pratt, Macera, & Blanton, 1999). In fact, many Americans live sedentary lifestyles with approximately one-quarter reporting they engage in no physical activity and only about 25% meeting the recommended levels of PA (Centers for Disease

Control and Prevention [CDC], 2001). This is also true for college students where studies show surprisingly low participation in recommended physical activity, ranging from 40-55% (Petosa et al., 2003; Suminski, Petosa, Utter, & Zhang, 2002). This means that only half of college students are sufficiently physically active and the other half are not getting enough physical activity. This result in college students is troubling because studies have shown that PA decreases over the lifespan (Bradley, McMurray, Harrell, & Deng, 2000; Caspersen, Pereira, & Curran, 2000; McMurray et al., 2000). Therefore, although increased PA would benefit all age groups, it is especially important in young adults because studies show that they become less active as they get older, and because habits learned early in life tend to persist into adulthood (Department of Health and Human Services [DHHS], 1996). Approximately 65% of high school students engage in vigorous physical activity, compared to 32% of 18-24 year-olds and 23% of adults. A similar trend has been reported for moderate physical activity showing that approximately 27% of high school students engage in moderate physical activity, compared to 17% of 18-24 year-olds and 15% of adults (Rovniak, Eileen, & Winett, 2002).

Physical activity intervention is especially important among the U.S.-Mexico border population because it is heavily Hispanic, and Hispanics are one of the most inactive groups in the nation with 33% of Mexican American men and 46% of Mexican American women not participating in any significant leisure time physical activity. The percentages for women are particularly striking since Mexican-American women have the highest risk of diabetes (Crespo, Keteyian, Heath, & Sempos, 1996).

Although, web-based interventions have been successful in multiple studies focusing on PA behavioral changes (for a review, see Vandelanotte, Spathonis, Eakin, & Owen, 2007), delivering web-based PA interventions is not an easy process, especially in choosing the

appropriate method for organizing activities as well as understanding the best way of using websites and other Internet-based technology (Vandelanotte et al., 2007). One of the main limitations of web-based interventions is the need for program planners to have expertise, or access to expertise, so that they can put activities and information on-line. Lack of web-skills, therefore, creates a potential barrier to the provision of web-based PA interventions at many universities. Because most health promotion (HP) specialists have access to course-related web technology (e.g., Blackboard, WebCT), and such applications are easy to learn, a PA intervention that utilized such technology would be easier for many HP specialists to implement, relative to more traditional web interventions that require greater technical skill.

Therefore, the overall aim of this experiment was to evaluate the efficacy of a web-based intervention – one that relied on existing, easy-to-use course technology – to increase days of weekly physical activity among predominantly Hispanic college students attending a large Southwest University. The principal hypothesis was that the intervention would significantly increase days of physical activity among those participating in the intervention group.

In addition to general program efficacy, this study also examined the presumed mediators of PA behavioral change using constructs derived from Bandura's Social Cognitive Theory (SCT), using validated measures from previous research (Bandura, 2004). It was expected that positive change in presumed mediators, including self-regulation, self-efficacy, social support, and outcome expectations and expectancies would mediate changes in days of PA. In summary, the study addressed the following specific aims:

Aim 1: To evaluate the efficacy of a web-based PA intervention, using common course web technology, vs. a control group on days of weekly PA among predominantly Hispanic college students.

Hypothesis 1: A web-based PA intervention would result in increased days of weekly PA in predominantly Hispanic college students relative to participants in the control group.

Aim 2: To evaluate a web-based PA intervention for increasing SCT constructs among college students, including self-regulation, self-efficacy, social support, and outcome expectations and expectancies, and showing that these SCT constructs are mediators of behavioral change in days of PA, among predominantly Hispanic college students.

Hypothesis 2: A web-based PA intervention would result in improvements in SCT constructs among college students and that change in such beliefs would mediate change in days of PA among predominantly Hispanic college students. (Baron & Kenny, 1986).

Potential outcomes of this study included a better understanding of the importance of physical activity as well as the practice of better and healthier lifestyle among participants. More than that, the use of a new intervention technique will introduce a novel method of PA intervention. Specifically, use of existing course technology for PA intervention represents a novel, structured intervention program that has a potential to reach thousands of students because they are not required to meet on campus and because it is easy to learn and implement by health promotion specialists without any formal training in web design. It can also be part of a distance-learning program that can be delivered at a very low and acceptable cost. Finally, this study examined presumed mediators of behavioral change in PA, including SCT constructs.

1.1 BACKGROUND AND SIGNIFICANCE

Physical activity (PA) has been linked to numerous health benefits. It helps metabolism and immune function, and minimizes risk factors for overweight and obesity, heart disease, diabetes, and high blood pressure. Physical activity is also associated with decreased morbidity and mortality from cardiovascular disease (Kujala et al., 1998). Healthy People 2010 (DHHS,

1998) has identified ten leading health indicators that describe the major health concerns in the United States. Of these indicators, low PA, overweight, and obesity are at the top of the list. According to the Behavioral Risk Factor Surveillance System (BRFSS; CDC, 2004), most adults do not exercise regularly and few report participating in leisure time activities. Indeed, many Americans live sedentary lifestyles due to both environmental factors and unhealthy lifestyle choices (CDC, 2003). With increasing reliance on technology, many occupations require almost no physical exertion (e.g., sitting at a desk) and increased wealth and prosperity have also led people to make choices that limit their energy expenditure such as choosing to drive instead of walk, or take the elevator instead of the stairs. The quality of the surrounding neighborhood may also contribute to poor lifestyle choices as a high crime rates might keep people indoors and a lack of parks or recreational programs may also keep people less active.

Although physical activity is important for maintaining physical health, improving psychological wellness, and extending life, Healthy People 2010 states that only 15% of adults participate in the recommended amount of daily or weekly physical activity, and 40% do not participate in any leisure time physical activity at all (DHHS, 1998). Similar results were found by the CDC and other health organizations, reporting that 30% of the American population is completely inactive, 30% engage in regular physical activity, and the majority (roughly 40%) falling somewhere in between (CDC, 2004).

Lack of physical activity can lead to obesity, a serious condition that increases every year. For example, according to BRFSS, in 2007, the prevalence of obesity among adults 18 years of age or older was 25.6%. This is a 1.7% increase from 2005 and 5.8% and 10.3% increase from 2000 and 1995, respectively (Galuska et al., 2008). Overweight and obesity are risk factors for many health maladies including high blood pressure, high cholesterol, heart

disease, stroke, and Type 2 Diabetes (Koch, 2002). For example, Type 2 Diabetes increases by 500,000 cases each year and has shifted the focus of health care in the direction of prevention. In the U.S., approximately 14 million individuals have been diagnosed with diabetes with higher incidents among females than males (Koch, 2002). Healthy People 2010 states national goals related to the prevention of cardiovascular diseases, type 2 diabetes, and obesity for people of various ages and ethnicity. In 1997, there were more than 953,110 death cases attributed to heart disease and stroke, which accounted for 41.2% of all deaths. Furthermore, it has been reported that coronary artery disease accounted for 466,101 deaths in the same year with a higher percentage among Mexican American than non-Hispanic White.

The cost of health care in the U.S. is higher than in any other country in the world, and it continues to rapidly increase every year. For instance, Type 2 Diabetes costs the nation more than \$20 billion annually (Koch, 2002). Furthermore, the cost of health care in the U.S. in 2007 exceeded \$2.2 trillion, which was more than three times that spent in 1990 and more than eight times that spent in 1980 (Centers for Medicare and Medicaid Services [CMMS], 2009). Also, in 2009, the national health care spending almost reached \$2.5 trillion, and it is expected to reach \$4.4 trillion by the year of 2018 (Sisko et al., 2009).

This study addressed two specific goals from Healthy People 2010:

- 22-2 Increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 minutes per day,
- 22-3 Increase the proportion of adults who engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness [for] 3 or more days per week for 20 or more minutes per occasion.

1.2 RATIONALE FOR INCLUSION OF HISPANIC COLLEGE STUDENTS IN A PA INTERVENTION

El Paso, Texas, needs health care prevention as much as any other region in the U.S. This is a 75% Hispanic region dominated by the Mexican culture. El Paso is one of the poorest cities in the nation with an average per capita annual income of \$12,500 (Heath & Coleman, 2003). The economic situation contributes to a lack of health insurance as Condon et al. (1997) reported that 42% of people in El Paso do not have health insurance. Also, 33% of El Paso adults are obese, and 16% of the Hispanics in the El Paso region have been diagnosed with type 2 Diabetes, which is more than 3 times the national average (Heath & Coleman, 2003). In addition, the obesity prevalence among Hispanics is 22.6%, which is higher than among non-Hispanic White (18.7%). However, obesity among Hispanics is even worse in Texas where one third of Hispanics are considered obese (Heath & Coleman, 2003).

Rates of participation in physical activity are higher in non-Hispanic White adolescents compared to Black or Hispanic adolescents (Pratt et al., 1999) and more non-Hispanic White adults meet current recommendations for physical activity than do Black or Hispanic adults (Pratt et al., 1999). In a study among a predominantly Hispanic college population, Magoc and Tomaka (2006) reported that even though participation in some level of physical activity among college students was high (61%), the majority of students who reported some level of physical activity (69%) did not meet the PA recommendations. The need for a PA intervention is important since the results also showed that the rates of overweight and obesity were high, with 41% of the sample being overweight, including 13% who were classified as obese (Magoc & Tomaka, 2006).

Although studies are few, researchers have identified differences between Hispanic and non-Hispanic White populations across a number of dimensions relating to physical activity.

Overall, these studies have suggested that although they have favorable attitudes toward physical activity, Hispanic populations tend to participate in leisure time physical activity less often and less frequently than do their non-Hispanic White counterparts. For example, Hovell et al. (1991) reported that, on average, Hispanic adults walk for only 48 minutes per week and engage in vigorous physical activity less than 2 times a week. Similarly, Crespo et al. (1996) reported that Hispanics were among the most inactive people in the nation with 33% of Mexican American men and 46% of Mexican American women not participating in any significant leisure time physical activity. The percentages for women are particularly striking since women and Mexican Americans are at increased risk of diabetes. Dunn and Wang (2003) also reported that Hispanic and African American college students were less likely to engage in physical activity than were non-Hispanic White students. Mouton, Calmbach, Dhanda, Espino, and Hazuda (2000) have also shown that Mexican Americans are less active and have lower levels of physical activity than European Americans.

The college setting represents an appropriate time for developing and promoting physical activity, particularly since this time represents the transition to adulthood and independence, and it is a time when parents and schools usually have little or no control over physical activity behaviors (Hoerr, Bokram, Lugo, Bivins, & Keast, 2002). Habits developed during college will more likely persist into later adulthood. Moreover, as this generation moves into the workforce, many will enter occupations requiring little physical exertion. Accordingly, the Hispanic college-age population is at an appropriate stage in life for learning effective ways of engaging in regular physical activity and learning skills that will keep them active throughout the lifespan.

1.3 RATIONALE FOR EXAMINING PA INTERVENTIONS IN COLLEGE STUDENTS INCLUDING WEB-BASED INTERVENTIONS

In addition to the reasons cited above, the college setting is also an ideal site for PA promotion because it allows reaching a great number of people. Specifically, the web-based setting can reach more people than a face-to-face setting because it does not require students to meet on campus, and it can be part of a distance-learning program. As such, it can provide health information and encouragement to large number of individuals at lower costs and diminished barriers than face-to-face interaction. Furthermore, the intervention setting is asynchronous, as people can seek advice at any time and place and choose the time when they want to obtain information. This is especially important for people with limited free time, limited access to programs, living in rural areas, or unable to afford participation in group education sessions (Lehmann & Deutsch, 1995). It can also help students maintain physical activity throughout the college years.

The number of people having access and use of Internet is increasing constantly (Napolitano et al., 2003). More than 50% of adults in the U.S. report having Internet access with approximately the same percentage going online daily (Napolitano et al., 2003). Furthermore, approximately 80% of Internet users identify the Internet as an important source of health and medical information, including 44% of people seeking information specifically about fitness and nutrition (Marcus, Ciccolo, & Sciamanna, 2009). Additionally, most college students have 100% free Internet access. Thus, with advantages such as easy access, convenience, flexibility of use, novelty, immediate feedback, a high degree of anonymity as well as keeping information updated and accurate, the internet represents a promising delivery method for administering PA and health behavior change interventions.

1.4 WEB-BASED PA INTERVENTIONS

Web-based interventions are a relatively new approach to health and physical activity promotion. Although at an early stage of development, many published studies have shown some degree of success in PA behavioral changes (Harvey-Berino, Pintauro, Buzzell, & Gold, 2004; McKay, King, Eakin, Seeley, & Glasgow, 2001; Napolitano et al., 2003; Plotnikoff, McCargar, Wilson, & Loucaides, 2005; Spittaels, De Bourdeaudhuij, Brug, & Vandelanotte, 2007; Tate, Wing, & Winett, 2001). Even though many web-based interventions have been successful, there remain a significant number of published studies that did not show any statistically significant increases in desired outcomes (Kosma, Cardinal, & McCubbin, 2005; Marshall et al., 2003; Tate, Jackvony, & Wing, 2003; Woolf et al., 2006).

On the positive side, McKay et al. (2001) evaluated the short-term benefits of an Internet-based supplement to usual care that focused on providing support for sedentary patients with type 2 diabetes to increase their PA levels. The study included 78 sedentary adults with type 2 diabetes who were randomly assigned to either the Internet Active Lives Intervention or an Internet information-only comparison condition. Frequency and duration of PA were assessed on-line at baseline and at 8-week follow up. The participants assigned to the intervention group had access to a diabetes management website as well as a private personal database where they could enter their total minutes of PA per day and track their progress. In addition, the intervention group had access to an on-line support area where they received support from their personal coach regarding their goals and strategies to maintain acquired PA habits. Participants in the intervention group also had the ability to communicate with each other through a conference area where they could share information and encourage each other in their PA program. Participants in the information-only condition had access only to the Internet diabetes

information, blood glucose tracking, and physical activity recording during the 8-week duration of the study. The results of this study showed a significant increase in PA overall and walking in particular in the intervention group compared with no change for the control condition, suggesting that the internet-based program was effective for increasing PA levels.

Positive results were also found in a study by Napolitano et al. (2003) who tested the efficacy of an Internet intervention among 65 sedentary employees of several hospitals in the northeastern U.S. Participants were randomly assigned to either an Internet intervention group or a wait list control group. The Internet intervention was targeted toward the stages of change, and participants in the intervention group had access to the web site for 3 months in addition to weekly e-mail tip sheets that they received as guidance to reach their PA goals over time. The web site included sections, such as Activity Quiz, Safety Tips, Becoming Active, Physical Activity and Health, Overcoming Barriers, Planning Activity, and Benefits of Activity. The weekly e-mail tip sheets included topics, such as getting started, monitoring your progress, setting goals, rewarding yourself, and getting support. Participants who were assigned to the wait list control group were told that they had to wait for 3 months in order to participate. All participants completed assessments at 1 and 3 months, including physical activity stage of change and the Behavioral Risk Factor Surveillance System items. The results of this study showed that participants in the intervention group had significantly higher progress in stage of change and demonstrated higher levels of moderate minutes and walking minutes than participants in the control group. Like the McKay study, this study also showed that the Internet can be an effective tool for increasing physical activity (Napolitano et al., 2003).

Tate et al. (2001) conducted a study to test the feasibility and efficacy of a structured Internet behavioral weight loss program compared with an educational Web site of weight loss

resources on the Internet among 91 healthy overweight hospital employees. Following the initial screening, participants were randomly assigned to either the Internet education (control) or the Internet behavior therapy group. Participants in both groups received one face-to-face group weight loss session and access to a Web site with specific links to Internet weight loss resources. In addition, participants in the Internet behavioral therapy group received behavioral lessons via e-mail, weekly self-monitoring information (regarding weight, calories, fat grams, and exercise energy expenditure), individualized therapist feedback, and access to an electronic bulletin board to facilitate social support among participants. The results of this study showed that participants in the Internet behavior therapy group lost more weight than participants in the education group. In addition, participants in the behavior therapy group had greater reduction in waist circumference compared to participants in the education group at 3 and 6 months follow-up, suggesting that the Internet and e-mail represent useful methods for delivery of structured behavioral programs (Tate et al., 2001).

Plotnikoff et al. (2005) conducted a study on 2121 worksite employees to evaluate a 12-week e-mail intervention program to promote physical activity and increased nutrition. Participants with a mean age of 45 years were randomly assigned to either an intervention or a wait-list control group. Both groups completed self-report measures of PA and nutrition one week before and one week after the intervention. The intervention group received weekly e-mail messages regarding physical activity and nutrition. The control group did not receive any messages during the 12-week study period, but they were told that they would receive all the messages at the end of the intervention period. The results of this study showed that the intervention group reported a significantly higher increase in total physical activity reported as MET/min. They also reported increased confidence to perform PA and higher intention to

engage in PA compared with the control group who actually reported decreased confidence and lower intention across the 12 weeks of the study. The study suggests that e-mail interventions may be a promising delivery method for promoting PA and nutrition (Plotnikoff et al., 2005).

As noted, not all studies have shown positive results. Kosma et al. (2005), for example, conducted a study on 151 adults with physical disabilities to assess the efficacy of a 4-week web-based leisure-time physical activity motivational program based on the Transtheoretical Model. Participants with the mean age of 39 years were randomly assigned to either a treatment or a control group. Both groups were assessed at baseline and 1-month post-intervention using a 13-item five-factor Physical Activity Scale for Individuals with Physical Disabilities. The treatment group received a web-based PA motivational program during the 4-month period focusing on promotion of light/moderate or vigorous recreational activities (e.g., dancing, swimming, walking) using different lesson plans for each week. Lesson plans focused on strategies to overcome barriers to PA, and provide information about benefits of PA, goal setting, self rewarding, use of cues, and making a commitment to the new behavior. The control group received only encouraging messages through e-mail regarding certain aspects in life (e.g., friendship, communication), in order to maintain their interest in the study. At the end of the study, the control group received the web-based intervention program. Although the means were in the expected directions for both the experimental and control groups, the results of this study did not show any statistically significant differences in leisure-time physical activity between groups (Kosma et al., 2005).

Spittaels et al. (2007) evaluated the effectiveness of a computer-tailored physical activity intervention in 526 employees from six worksites in northern Belgium. The participants were randomly assigned to: a group that received computer-tailored physical activity advice and

additional five stage-of-change targeted e-mails; a group that received tailored physical activity advice without e-mails; or a group that received standard advice (control). The tailored intervention was based on physical activity advice, including PA feedback and suggestions for increasing PA, and an action plan as a specific plan to assist participants to put their intentions into actions. In addition, the computer-tailored group received reinforcement e-mail tip sheets to encourage participants to change their behavior. The standard advice group received only advice that included information about the benefits of physical activity, current public health recommendations, information regarding differences between moderate- and vigorous-physical activity, and tips to assist them to become more physically active. The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity and daily sitting time. Although the results of this study showed significant increases in levels of physical activity at 6-month follow-up, all three groups showed similar increases, including controls, and there were no differences between the intervention and control conditions. In addition, the three groups reported significant, but equal decreases in sitting minutes (i.e., sedentary behavior) on both weekdays and weekends. Because of the lack of between group differences, the authors suggested that there was no advantage to web-based activities compared to face-to-face interaction. In addition, and similar to the Kosma (2005) study, neither was superior to the control condition of standard advice (Spittaels et al., 2007).

Marshal et al. (2003) conducted a study on 655 staff at an Australian university to compare the effects of a PA program delivered via an interactive stage-targeted website program to those of stage-targeted print program. Participants, with a mean age of 43 years, were randomly assigned to either Print program or Web program over the 8-week period. Participants in the Print intervention received previously tested “Active Living” booklet based on the

Transtheoretical model of behavioral change, in addition to four encouraging letters, over the 8-week period. The reinforcement letters included specific advice to encourage participants to be active, focusing on cognitive suggestions as well as behavioral strategies such as goal setting, self-monitoring, rewards, using cues, and social support. Participants in the Web intervention received interactive and animated features and stage-based quizzes with feedback on responses in addition to personalized sections on goal setting, activity planning, determining target heart rates, and PA readiness questionnaire. This group also received four e-mails over the 8-week period that were similar to the Print group, but included hyperlinks to a website that was password protected. The results of this study showed that even though there were expected increases in total PA reported by those who were inactive at the baseline in the Print group, and decrease in time reported sitting on a weekday in the Web group, overall there were no statistically significant changes in total reported PA within or between groups (Marshall et al., 2003).

Woolf et al. (2006) conducted a study on 256 patients, ranging from 18-60 years old, to test whether patients were more likely to pursue multiple health behaviors, including physical activity, dietary habits, and smoking and alcohol use, if referred to a tailored Web site that provides valuable information for behavioral change. Patients were assigned to either an intervention or a control condition. Patients in the intervention condition had access to Web pages with broad health promotion resources. Patients in the control condition had access to only static pages with limited information. The results of this study were based on e-mail questionnaires that included data on health behaviors, readiness to change, and user satisfaction, and they were sent to patients 1 and 4 months after their first Web site visit. Stage of change and health behaviors improved in both groups, but similar to several other studies reviewed above,

there were no significant differences observed within or between groups. The difference at 1 month approached statistical significance only in relation to light to moderate PA and readiness to change dietary fat intake. However, no significant differences persisted at 4 months. In addition, even though the study showed patients' satisfaction with the Web site, it suggested that greater interactivity and more detailed information was needed (Woolf et al., 2006).

Tate et al. (2003) conducted a study on 92 overweight adults to compare the effects of an Internet weight loss program alone vs. the same Internet program plus the addition of behavioral counseling via e-mail. The participants with the mean age of 48.5 years and body mass index of 33.1 kg/m² were randomly assigned to either a basic Internet or an Internet plus behavioral e-counseling program. Both groups were seen at baseline, 3, 6, and 12 months for measurements of weight, waist circumference, and fasting blood glucose. Also, both groups attended 1-hour introductory session where they were instructed regarding behavioral weight-control on diet, exercise, and behavioral change. They were also encouraged to self-monitor their daily diet and exercise. Participants in the basic Internet program received a tutorial on weight loss, weekly links to Internet weight loss resources, and weekly e-mails as reminders for their weight submission. Participants in the behavioral e-counseling group also received access to a weight loss counselor who provided feedback on the participants' self-monitoring record, reinforcement, recommendations for change, answers to questions, and general support 5 times per week during the first month, and then once a week during the remaining 11 months. The results of this study showed that the e-counseling group lost more weight at 12 months and had a greater decrease in percentage of initial body weight, body mass index, and waist circumference compared to the basic Internet group. Although the authors concluded that adding e-mail counseling can

significantly improve weight loss, the results showed that the increase in exercise energy expenditure significantly differed between groups only at 3 months (Tate et al., 2003).

Harvey-Berino et al. (2004) conducted a study on 255 overweight and obese adults to investigate the efficacy of an Internet weight maintenance program. After attending an orientation session, all participants participated in the same 6-month weight loss intervention program via interactive television (ITV). The ITV program focused on modifications of eating and exercise habits using behavioral strategies and self-management skills. Participants were required to monitor their dietary intake and the amount of energy expended in PA on a daily basis, which was reviewed by local health educators, dietitians, and the primary therapist. Those who completed the ITV 6-month weight loss intervention program were then randomly assigned to either an Internet support, a frequent in-person support, or a minimal in-person support weight maintenance intervention condition. The maintenance intervention was 12 months. During that time, participants assigned to the Internet support condition had access to chat sessions where discussions were facilitated by the group therapist. In addition, participants in this group received e-mails from their group therapist on a regular basis. Participants assigned to “frequent in-person support” condition met in-person at their ITV studio on a bi-weekly basis for 52 weeks and participated in discussions focused on multi-component weight maintenance programs regarding the problem-solving of difficult eating and exercise situations. The discussions were facilitated by the group therapist. Participants in “minimal in-person support” condition met in person on a monthly basis for the first 6 of the 12 months weight maintenance intervention program. Participants in this group were not contacted in any way from months 7 to 12. Outcomes, including body weight, energy intake, and energy expended in physical activity were assessed at baseline and at 6, 12, and 18 months. The results of this study showed that participants in the

Internet-based condition sustained a larger weight loss over 18 months compared with participants in the other two groups, suggesting that the Internet was an effective way for sustaining long-term weight loss. However, this difference was not statistically significant among groups, still leaving the question regarding which method of intervention delivery was best, unanswered (Harvey-Berino et al., 2004).

In summary, the studies reviewed above all used variations of web-based interventions in their attempts to improve physical activity, many with reasonable success. Even though most interventions targeted an increase in total physical activity, some interventions specifically targeted walking and moderate or vigorous physical activity. Most interventions used one or more behavioral change theories. More than half of the reviewed interventions reported positive results with the best success among interventions that lasted for 3 months or less.

1.4.1 Limitations of Current Web-Based Approaches

Even though many of the web-based PA interventions showed positive results, there remain several limitations to this literature. First, many studies reported low participation rates which were likely related to the recruitment settings and/or people's willingness or ability to participate due to low internet access. This study avoided this problem by focusing on UTEP college students, all of whom had 100% free Internet access, at least while at school. As such this study alleviated this recruitment and participation problem.

Another limitation of previous web-based PA interventions was that some studies did not report baseline physical activity levels of participants, making it difficult to report the overall effectiveness of interventions on physical activity, per se, versus weight or some other outcome. In addition, several studies included high numbers of already sufficiently active participants at baseline, thereby limiting the magnitude of the changes one would expect for a physical activity

intervention. Several of these studies suggested that they may have had better results and would probably be more proficient if interventions had focused more on inactive participants. This study avoided these problems by selecting participants who were physically active less than 3 times per week (on average) and by collecting baseline physical activity levels as well as physical activity levels at 6-week of the intervention.

Third, many studies did not report their outcomes in terms of changes in PA levels, but rather using these changes as secondary outcomes. As primary outcomes, these studies used indirect measures of PA, such as weight change, heart rate, maximal oxygen uptake, or stages of change. This study avoided this problem by mainly focusing on changes in PA levels expressed in days of weekly moderate and/or days of weekly vigorous PA.

Fourth, many studies lack of information of participants' actual use of the web site. Indeed, several studies reported that without linking passwords to participants, it was hard to evaluate participants' overall compliance or the dose of the intervention received (Napolitano et al., 2003). This also made it difficult for these studies to control for whether or not the participants read the assigned materials and completed assignments. This study intended to avoid this problem because it was believed that WebCT allowed instructors to track students' use and completion of the assigned information¹.

Also, many studies used different strategies for delivering web interventions to participants (e.g., e-mail, tip-sheets, discussion boards, chat) which did not make it clear if the effectiveness and positive results of the interventions should be linked to a targeted theory-based web intervention or other components, such as encouraging e-mail contacts, motivating tip sheets, or a combination of the two. This study avoided this problem by delivering a clearly

¹During study implementation, the author learned that this feature was in fact not available in WebCT. As such, it remains a problem with the current study and is addressed in the Discussion section below.

designed web intervention with a focus on SCT constructs as mediators in changes of days of weekly moderate and vigorous PA.

Finally, there is a definite lack of web-based PA interventions among the college student population. And, as noted earlier, the college setting represents a crucial and vulnerable time for developing and promotion of physical activity and its continuation, particularly since this time represents the transition to adulthood and independence. Habits developed during this time will likely persist into later adulthood, helping this population to learn skills that will keep them active through their lifetime. Moreover, most college students have easy access to and familiarity with on-line instruction, also making them appropriate targets for on-line intervention. The present study avoided this problem by focusing exclusively on college students.

1.5 RATIONALE FOR EXAMINING A WEB-BASED PA INTERVENTION IN INCREASING STUDENTS' KNOWLEDGE AND USE OF SCT CONSTRUCTS AS MEDIATORS OF BEHAVIORAL CHANGE IN PA IN HISPANIC COLLEGE STUDENTS

In order to develop more effective physical activity interventions, it is crucial to incorporate theoretical approaches into interventions that adequately explain and predict physical activity (Baranowski, Anderson, & Carmack 1998; Rovniak et al., 2002). Social Cognitive Theory (SCT; Bandura, 1997) has been one of the most widely used Behavioral Change Theories, and its constructs provide a useful framework for the prediction of physical activity behavior and the design of behavioral interventions.

Glanz, Lewis, and Rimer (2002) explain why SCT is relevant to health education and health behavior programs. First, SCT is based on a dynamic relationship between environment, personal factors, and behavior (Allison, Dwyer, & Makin 1999; Glanz et al., 2002). According to SCT, an individual's behavior is determined by each of these three factors. Second, the

constructs from SCT suggest many possibilities for behavioral research and practice in health promotion. In relation to physical activity, for example, SCT explains that an individual needs to feel confident in order to perform a certain behavior. This has been explained through self-efficacy – one of the most essential constructs of SCT. Besides self-efficacy, other key SCT determinants of physical activity include social support, outcome expectations, and self-regulation (Bandura, 1997; Rovniak et al., 2002). Other SCT constructs that appear in studies include environmental factors and behavioral capability (Bandura, 1997).

As noted, self-efficacy reflects one’s confidence in performing a particular behavior (Bandura, 1997; Glanz et al., 2002). For example, somebody with low self-efficacy might think: “PA is not for me because I am not strong enough.” It represents a central component of SCT and an important personal determinant of human behavior. It has also been defined as somebody’s beliefs about their ability to engage in a certain behavior that will lead to expected outcomes (Ryan & Dzewaltowski, 2002). Depending on self-efficacy beliefs, a decision is made whether a behavior will be adopted and maintained.

Behavioral Capability relates to knowledge and skills of a certain behavior. It has been explained that if a person needs to perform a certain behavior, he/she must know what the behavior is (knowledge) and how to do it (skill; Glanz et al., 2002). For example, “I do not know enough about PA.” And, “I am not skilled enough to participate in physical activity.”

Social support represents a form of verbal or behavioral actions in support of a given behavior (Bandura, 2004). There are four types of social support: instrumental, informational, emotional, and appraisal. Instrumental social support includes resources that aid in behavioral processes by a real, physical action (e.g., ride to the gym to help an individual to be physically active). Informational social support includes information that helps a behavioral process (e.g.,

teaching somebody how to ride a bicycle for physical activity). Emotional social support represents the affective support provided by the members of the social network in order to enable a behavior (e.g., encouragement for overcoming barriers in being physically active). Appraisal social support is reinforcement in purpose to motivate behavior (e.g., a parent expressing pride in his child for scoring goals in a game).

A central tenant of SCT is that people tend to adopt actions that will most likely produce positive outcomes and usually tend to avoid actions that will bring unrewarding outcomes (Bandura, 2004). This has been explained through the concept of outcome expectations. There are three forms of outcome expectations: physical outcomes, social outcomes, and self-evaluative outcomes. The physical outcomes are explained as pleasurable effects of the behavior. The social outcomes refer to perceived approval or disapproval of the behavior from members of the social network. The self-evaluative outcomes are positive and negative personal reactions to one's health behavior (Bandura, 2004). In addition to what people expect their action to produce, people also place values on particular outcomes (Baranowski, Perry, & Parcel 2004). This is further refined by the concept of outcome expectancies. Thus, people are more likely to change their behavior if they believed the outcome would match their expectations and if they valued a specific outcome. In contrast, if people believe that the outcome would occur but did not care about it, or if people cared about the outcome but did not believe it was going to happen, it is more likely that people will not change behavior.

Self-regulation refers to individual motivational and self-regulatory skills (Bandura, 2004). Self-regulation allows a person to set goals, track his or her progress, and evaluate his or her capabilities to perform behaviors in given situations. Bandura (2004) pointed out that people cannot influence their motivation and actions without an adequate attention to their performance.

Thus, being able to set goals as well as monitor their progress can help people increase their motivation toward certain behaviors.

Glanz et al. (2002) defined the environmental factors in SCT as factors physically external to the person, but which can affect a person's behavior. They use the term "situation" to refer to the person's perception of the environment. One of the important environmental determinants of physical activity is physical safety. It has been suggested that selecting and creating an environment that supports desired behavior is an important strategy (Ryan & Dzewaltowski, 2002). An unsafe environment can decrease an individual's motivation to be physically active.

Overall, studies have found positive relations between SCT variables and physical activity (Rovniak et al., 2002; Petosa et al., 2003; Wallace, Buckworth, Kirby, & Sherman, 2000; Leslie et al., 1999). For example, Rovniak et al. (2002) used structural equation modeling (SEM) to test an SCT model of physical activity behavior. The model included social support, self-regulation, self-efficacy, and outcome expectations, in relation to physical activity among college students majoring in psychology. In their model, social support was thought to predict self-efficacy. Self-efficacy in-turn was thought to predict physical activity. In addition, self-regulation and outcome expectancies were thought to mediate the relationship between self-efficacy and physical activity. Overall, the results mostly supported the model. In support of the model, self-regulation related to physical activity and mediated the impact of self-efficacy to physical activity. Also in support of the model, social support predicted self-efficacy and had an indirect effect on physical activity. However, although self-efficacy related to outcome expectations, outcome expectations did not significantly predict physical activity, as expected by the researchers (even though the coefficient was in the expected direction). In addition, the

results showed that self-efficacy had the greatest total effect on physical activity, which was largely mediated by self-regulation. Overall, the data supported the use of SCT for prediction of actual physical activity (Rovniak et al., 2002).

In another study, Petosa et al. (2003) used correlation analysis and hierarchical multiple regression models to examine SCT constructs, including social support, self-regulation, outcome expectancy, self-efficacy, exercise role identity, and positive exercise experience, for predicting vigorous physical activity. The correlational analysis largely supported the hypothesis. The regression model also showed that all variables contributed to the prediction of vigorous physical activity accounting for 27% of the variance. Overall, the data supported the use of SCT in prediction of vigorous PA, suggesting that SCT is useful for studying exercise behavior among college students (Petosa et al., 2003).

Wallace et al. (2000) tested personal, behavioral, and environmental factors, based on SCT, in relation to exercise behavior and intentions, based on Stages of Change Model (SCM), among undergraduate students from a large midwestern university, using multiple discriminant analyses. The researchers hypothesized that personal, behavioral, and environmental factors would have a significant impact on Stage of Exercise Behavior Change (SEBC). Overall, the results mostly supported the use of SCT variables for prediction of SEBC. Self-efficacy and family social support were the most important predictors of SEBC for females, while self-efficacy and friend social support were the best predictors for males. Since self-efficacy revealed the most important predictor of SEBC for both males and females, the researchers emphasized the importance of the relationship between exercise self-efficacy and participation in physical activity, stating that individuals who possess a low exercise self-efficacy tend to participate less in physical activity than do individuals with greater exercise self-efficacy (Wallace et al., 2000).

Another study aimed to examine the associations of SCT variables, including self-efficacy, PA enjoyment, social support, and perceived environmental factors, with physical activity among Australian college students, using logistic regression model (Leslie et al., 1999). Overall, the results mostly supported the use of SCT variables for prediction of PA. Social support and enjoyment were the best predictors of PA among both males and females. However, family social support was found to be a stronger predictor than friend social support for females. Surprisingly, self-efficacy was excluded from the regression model because of its strong and direct association with PA.

It is important to note some limitations of the studies reviewed above. One limitation is that most participants were from universities with limited ethnic diversity, so it is difficult to draw conclusions about other ethnic groups, most notably Hispanic populations. As such, the lack of data on Hispanic populations was a major factor guiding the development of this project. Second, these studies are all cross-sectional and none examined the effects of SCT variables in the context of an intervention designed to increase them. These studies are described below.

1.6 INTERVENTION STUDIES USING SCT CONSTRUCTS

Three studies have examined change in SCT constructs as a function of participation in an on-line intervention. In the first, Rovniak et al. (2005) conducted a study with 61 sedentary women to examine the extent to which theoretical fidelity, described as precision in replicating theory-based recommendations, influenced the effectiveness of two walking programs based on social cognitive theory (SCT). Participants were randomly assigned to either a high or low fidelity group. The low fidelity group received an e-mail walking program with general SCT feedback (e.g., “Continue to gradually increase your walking speed.”). The high fidelity group received more specific long- and short-term goals, more specific feedback about performance

(e.g., “Walk each mile between 14:29 and 14:39 minutes.”), more precise self-monitoring, and a brief modeling demonstration. Each group was required to submit their walking logs through e-mail once a week for 12 consecutive weeks. The results of this study showed a significant improvement in 1-mile walk test time for the high fidelity group as well as an increase in their goal setting and positive outcome expectations for walking. Overall, the results suggest that fidelity to theoretical constructs can enhance the effectiveness of PA interventions (Rovniak et al., 2005).

In the second, Grim (2003) conducted a study on 90 predominantly white college students at The Ohio State University to complete a construct validation of a web-based physical activity intervention and to pilot-test the efficacy of the intervention for changing physical activity using SCT constructs over a 10-week period. Participants were self-selectively enrolled in one of the three offered courses: On-line physical activity course, traditional physical activity course, and health course. Participants in the on-line physical activity course received WebCT fitness and self-regulatory knowledge and skill intervention lessons based on SCT constructs. Participants in this group were expected to read lessons and complete weekly assignments, including weekly physical activity logs. Participants in the traditional physical activity course were required to attend a fitness related lecture once a week and three laboratory sessions where they could choose to participate in any one of the activities offered to them (e.g., jogging, weight training). Participants in the health course served as the control group, received only information on cancer, and were not required to participate in any physical activity. The results of this study did not show any significant group differences for moderate or vigorous physical activity. The only significant difference was observed between the online group and health group for self-regulation (Grim, 2003).

Finally, Suminski and Petosa (2006) conducted a study with 425 college students who were enrolled in health and wellness courses at a large midwestern university to examine the effects of a 9-week web-based program on the knowledge and use of social support, self-efficacy, and self-regulation strategies for promoting physical activity. Participants were assigned to one of the three groups: Web-assisted, comparison, and control. Participants in the web-assisted group received information about exercise and fitness and a web-based program, targeting SCT variables, with a goal to help students with cognitive skill development and behavior change. Participants in the comparison group received the corresponding information on exercise and fitness as participants in the web-assisted group, but did not participate in web-based program as those participants in the web-assisted group. Participants in the control group received information in unrelated areas (e.g., sexuality, AIDS awareness). The results of this study showed that participants from the web-assisted group demonstrated a significantly higher increase in knowledge and use of SCT strategies compared to participants from the other two groups. Overall, the results of this study demonstrated that web-based instructions could have a great impact on knowledge and SCT strategies for changing physical activity behavior (Suminski & Petosa, 2006).

In summary, the three studies reviewed above showed that SCT constructs changed as a function of intervention activities. In addition, two of them showed corresponding changes in physical activity, with one study not examining activity. However, neither of these two studies provided statistical evidence of mediation of activity change by SCT constructs.

Overall, research on web-based interventions, studies of SCT as a predictor of physical activity, and SCT-based intervention studies, all support the use of Social Cognitive Theory in the area of PA. This research showed that some constructs, such as self-efficacy, self-regulation,

and social support showed stronger and more consistent relationships with physical activity than some others, such as outcome expectations. Even though theory-based programs and interventions (a) contribute to a variety of positive outcomes, (b) increase people's physical activity, and (c) increase knowledge and positive attitudes toward physical activity, more research is needed so that definite conclusions can be made regarding correlates, predictors, and mediators of physical activity.

As such, the purpose of this study was to evaluate the efficacy of a web-based intervention – one that relied on existing, easy-to-use course technology – to increase days of weekly physical activity among a predominantly Hispanic college students attending a large southwest University. In addition, this study also examined the presumed mediators of PA behavioral change using constructs derived from Bandura's Social Cognitive Theory (SCT), using validated measures from previous research (Bandura, 2004).

Chapter 2: Research Design and Methods

2.1 PARTICIPANTS

The University of Texas at El Paso (UTEP) is a Hispanic-serving institution with a predominately Hispanic population (72.56%) that enrolls over 20,000 students who are 56% female. The average age of enrolled undergraduate students is 23 years and enrolled graduate students is 32 years. Sixty percent are full time students, and the majority of UTEP students (82.89%) are El Paso County residents. Many of these students come from an El Paso Population where 33% of adults are obese, and 16% of the Hispanics in the El Paso region have been diagnosed with Type 2 diabetes – a figure that is more than 3 times the national average (Heath & Coleman, 2003).

To determine how many participants were needed for the study, two power analyses were conducted. Both were based on the literature review with the effect size in behavioral physical activity web-based interventions being small to medium (Vandelanotte et al., 2007). The first power analysis estimated the number of participants needed to obtain a significant interaction in a 2 x 2 mixed factorial design. Using the GPOWER software with small to medium “effect size F statistic” at $\alpha = .025$, it appeared that 31 subjects were needed in each group with sufficient power of .80 to detect the expected group by time interaction. The second power analysis estimated the number of participants needed to obtain a significant between groups difference in days of physical activity at the final 6-week follow-up. Using the GPOWER software with a small to medium “effect size d statistic” at $\alpha = .025$, it appeared that 51 participants are needed in each group with sufficient power of .80 to detect the between groups difference of one day of physical activity. Taking the more conservative estimate of 51 participants, and assuming a 10%

loss of individuals due to attrition (as reported in most of the web-based PA behavioral studies), the study needed a total of 114 participants or 57 participants per group.

This study used ongoing recruitment of participants to reach the target number. The recruitment stopped when 117 eligible part or full-time currently enrolled male and female students 18-40 years of age² from the University of Texas at El Paso (UTEP) were recruited to participate in this study. Inclusion criteria included students who a) were physically active, on average, less than 3 times per week (did not meet the recommended levels for moderate and vigorous PA or any combination), b) did not have risk factors for heart disease or health problems, c) had a BMI less than 40 kg/m², and d) were not currently pregnant. Students were not required to be familiar with Web-based instruction programs, such as WebCT. For students who were not familiar with web instructions, however, there was a 15-minute individual session provided on how to use WebCT.

2.2 RANDOM ASSIGNMENT

Participants in this study were randomly assigned to either an intervention or a control group by flip of a coin. Even though Shadish, Cook, and Campbell (2002) introduce this method as one of the best known in the process of simple random assignments, there is still the slight possibility of having unequal sample sizes especially when it comes to small samples, such as studies with less than 200 participants. To force equal sample sizes when assigning participants into groups, restricted random assignment was used where one of the two participants was randomly assigned to a group by flip of a coin, and the other participant was automatically placed to the other group (Shadish et al., 2002).

² Even though I was aware of the fact that the age range includes adults who already may have developed their habits, I did not want to limit the possibility of getting enough participants who are representative of the college population at UTEP.

2.3 MATERIALS AND MEASURES

PAR-Q. Physical Activity Readiness Questionnaire identifies people for whom physical activity may be inappropriate or may need some special attention when exercising (Thomas, Reading, & Shephard 1992; see Appendix A). Answering “yes” on any of the seven questions regarding general health automatically excluded a student from participation in this study. (No one was prevented from participating using this questionnaire.)

International Physical Activity Questionnaire. The short version of the International Physical Activity Questionnaire (IPAQ) is structured to provide separate scores on three specific types of physical activities (walking, moderate-intensity, and vigorous-intensity) within four domains, including leisure time physical activity, domestic and gardening activities, work-related physical activity, and transport-related physical activity (Booth, 2000; see Appendix A). This study used only measures of moderate and vigorous leisure time physical activity.

Demographic variables. Self-reported information on gender, age, ethnicity, and student status characterized the sample.

Self-Regulation Scales. The Exercise Goal-Setting Scale (EGS) and The Exercise Planning and Scheduling Scale (EPS) measure students’ self-regulation in regard to physical activity (Rovniak et al., 2002; see Appendix A). Rovniak et al. (2002) showed good reliabilities for these scales in a predominantly white student population (.89 and .87, respectively). In our own pilot study, among a predominantly Hispanic college population, we also found good reliabilities for these scales (.92 and .76, respectively; Magoc & Tomaka, 2008).

Social Support Scales. The Family and Friend Support for Exercise Habits Scale assesses social support during the past three months that students received from both friends and family members (Sallis, Grossman, Pinski, Patterson, & Nader, 1987; see Appendix A). Petosa et al.

(2003) showed good reliabilities for these scales in a predominantly white college population (.61 and .91, respectively). In our own pilot study, among predominantly Hispanic college population, we also found good reliabilities for these scales (.89 and .90, respectively; Magoc & Tomaka, 2008).

Self-Efficacy Scale. The Self-Efficacy for Exercise Behavior Scale assesses students' self-efficacy in regard to physical activity (Sallis, Pinski, Grossman, Patterson, & Nader, 1988; see Appendix A). Petosa et al. (2003) showed a good reliability for this scale in a predominantly white college population (.97). In our own pilot study, among predominantly Hispanic college population, we also found a good reliability for this scale (.91; Magoc & Tomaka, 2008).

Outcome Expectations and Expectancies Scale. The self-report questionnaire assesses students' outcome expectations and expectancies in regard to physical activity (Steinhardt & Dishman, 1989; see Appendix A). Petosa et al. (2003) showed a good reliability for this scale in a predominantly white college population (.74). In our own pilot study, among predominantly Hispanic college population, we also found a good reliability for this scale (.91; Magoc & Tomaka, 2008).

Physical Activity Logs. A daily physical activity log instrument measures students' time they spend in moderate and vigorous physical activity, including days when activity was completed, duration of the activity, intensity of the activity, and the actual activity they completed (Dishman & Steinhardt, 1998; see Appendix A). The PA logs were available for students on-line and intended primarily as a device for self-monitoring of behavior. Students were asked, but not required, to submit logs on-line on a weekly basis.

2.4 RECRUITMENT PROCEDURE AND SETTING

To recruit students into this study, flyers were distributed around the UTEP campus. The flyers promoted a Web-based physical activity intervention for students who want to start exercising and/or increase their level of physical activity. In addition, announcements were made through classes. Students who expressed an interest in the study were considered the potential participants in the study. Students interested in the study reported to the primary advisor's research laboratory in the UTEP Union. New students were enrolled in the study every day until the study enrolled 117 eligible students.

Prior to determining eligibility for participation in this study, potential participants were given an IRB-approved consent form to sign (see Appendix A), which explained the purpose and nature of the study and any inherent risks and benefits of the study. It also assured students that results would remain confidential and that their participation was strictly voluntary.

To determine eligibility for participation in this study, potential participants completed the PAR-Q form to make sure that they had no health problems that could possibly prevent them from participation and answered several simple questions to make sure that they met other inclusion criteria listed above. The body mass index (BMI; calculated as weight in kg divided by height in meters squared) was calculated after the anthropometric measurements, including the measurement of students' weight and height, were obtained. The students' height and weight were obtained using a Detecto Model 439 Mechanical Doctor Scale with Height Rod.

After obtaining measurements, study personnel determined eligible students and asked them to complete the initial assessment. No participants were excluded because of pre-existing health conditions. The initial assessment lasted for approximately 20 minutes, and it included measures of demographic variables, IPAQ, self-regulation, social support, self-efficacy, and

outcome expectations and expectancies. The measurements of IPAQ, self-regulation, social support, self-efficacy, and outcome expectations and expectancies were administered again at 6 weeks (the end of the intervention) for both groups. Study personnel randomly assigned students to either an intervention group or a control group by the flip of a coin (described above).

Participants assigned to the intervention group attended an individual 15-minute session to become familiar with the web-based intervention, get information on how to use the web intervention designed for this study, and ask any questions that they may have had in regard to the study. They were told that after the 6-week period, they would be asked to complete a final assessment and would then receive their incentives for the study (\$20 gift card) as well as further instructions on how to continue with their exercise routines after completing the study.

Participants who were assigned to the control group were given a corresponding individual 15-minute session that explained the study and went over the use of web-based physical activity logs and very basic tip sheets on physical activity. They were also told that after the 6-week period, they would be asked to complete a final assessment and receive their incentives for participating in the study, as well as further instructions on how to continue with their exercise routines.

2.5 PROCEDURES

The web-based intervention lasted six consecutive weeks, and students had a 24-hour access to the intervention.

The experimental group participated in a 6-week web-based physical activity intervention. The intervention lessons were designed and based on SCT constructs. Even though the SCT does not provide any specific ordering of constructs, lessons in this intervention were ordered based on previous successful studies that used constructs from the SCT in PA

interventions. In addition, I consulted Dr. Theresa Byrd, a specialist in Behavioral Change Theories, who confirmed that as of her knowledge, no literature on ordering of SCT constructs exist, and the ordering of constructs mainly depends on researches' assumption regarding what concepts should be covered first.

Students participated in a total of seven learning lessons for this study. Lessons for this study were adopted from a study conducted by Grim (2003) and can be found in Appendix B of this document. All lessons were readable and printable online. Each lesson included the purpose of the lesson, the reason why this lesson was important, the information regarding the topic, and information regarding the assignments for the week with due dates for the assignments. Participants were able to print relevant material and assignments for the week, complete them, and submit them on specific dates assigned in advance. Participants were also asked to complete and submit activity logs on weekly basis.

For example, the first learning lesson focused on self-regulation. The purpose of this lesson was to help students to learn how to self-monitor and track their physical activity and heart rate. They were given instructions on how to record each completed exercise into their activity logs, the intensity of the exercise, and perceived exertion during each exercise. The assignments for this lesson included practicing measuring their heart rate during different activities and calculating their heart rate target zone.

The second lesson mainly focused on goal setting and planning. Students were able to learn how to set behavioral goals rather than outcome goals (e.g. weight loss) and how to plan physical activity. Assignments for the week included setting activity goals for the week.

The third lesson focused on tailoring. The main idea behind this lesson was to help students think about exercise as pleasant activity. Students were assigned to walk, jog, and run at

different paces, take their heart rate, and their rating of perceived exertion. After that, students were asked to find their comfort zone, which would be the intensity that was the most comfortable for them. However, they were instructed that the comfort zone may change as they progress and become more fit.

The fourth lesson focused on self-efficacy. The purpose of this lesson was to help students think about barriers that prevent them from exercising on a regular basis and ways to overcome barriers. The assignment for the lesson included writing a list of barriers in a ranked order and setting goals that would help them overcome those barriers.

The fifth lesson focused on social support. The purpose of this lesson was to help students identify different type of social support (e.g., friends and family) available to them. The assignment for this lesson included students' conversation with their friends and family members about their exercise program and their progress, exercising with them, and finding further information that may help them in their exercise program.

The sixth lesson focused on reinforcement. The purpose of this lesson was to help students get motivated with different types of rewards when exercise. It also helped them understand the difference between proper and improper rewards. The assignment included writing exercise goals, reinforcements to each goal, and evaluating the usefulness of reinforcements on their exercise behavior.

The seventh and final lesson focused on outcome expectations and expectancies. The purpose of this lesson was to help students define reasons for exercise, which in turn may help them maintain with their exercise routine. The assignments for this lesson included writing a list of reasons to exercise and defining the most important ones.

WebCT e-mail was used in this study so that students could ask any questions regarding a specific topic or assignments. However, e-mail was not used for the purpose of encouragement or motivation of participants in this study.

Participants were told to read material and complete assignments as much as they could or wanted. Only students who completed the final assessment were included in the final analysis. Most participants completed the final assessment at the research office, however, participants who were not able to come to the research office at the time of completion of the study, were allowed to complete the final assessment on-line. These students returned an electronic copy of the completed questionnaire via e-mail.

The control group did not participate in any learning activities about physical activity and fitness. Instead, they received, on line, very basic information on physical activity (e.g., the importance of PA). All provided information on physical activity was entered at the beginning of the study for the 6-week period and students could access it at any time. However, they were asked to complete physical activity logs (identical to those given to participants in the intervention group) and the assessments prior to and at 6 weeks (identical to those given to participants in the intervention group) of the web-based physical activity study. All lessons for the control group were adopted from The Georgia State University “The Exercise and Physical Fitness Page” at <http://www2.gsu.edu/~wwwfit/physicalactivity.html> and are available in the Appendix C of this document.

2.6 POTENTIAL BENEFITS

One benefit of participating in this study was to increase students’ knowledge about physical activity/exercise and risks from becoming sedentary and obese. Also, students had access to a novel, structured program designed to increase their level of physical activity and

health. Participants were able to understand the theory behind physical activity, which may helped them become more organized with their exercise routine. After the study period, participants (from both the experimental and the control groups) who expressed interest in getting further physical activity and health recommendations were individually advised for 2 months.

After the 6-week assessment, study participants received a Target gift card in the total amount of \$20. They personally needed to come to the research office to pick up their incentives.

2.7 EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS

2.7.1 Testing for Attrition Bias

In longitudinal research, a common problem is loss of sample participants from Time 1 to Time 2. This creates a potential bias if the later sample differs from the initial sample and/or individuals who drop out of the control group differ from those who dropped out of the experimental group. Usually, attrition can bias a sample in two ways. First, the new sample may not continue being representative of a studied population due to change of the characteristics of the sample, thus affecting the external validity. And second, attrition may change the covariance of variables tested, leading to correlations of variables different from correlations in the original sample, thus affecting the internal validity. For these reasons, detecting and correcting for attrition bias may be very important in longitudinal studies.

In this study, a one-way and two-way ANOVA were used to detect attrition bias. One-way analyses were used to compare pretest values of participants who responded to all measurements (Time 2) and participants who dropped out during the intervention time period (Time 1). Two-way analyses were used to compare pretest values of those who remained and

dropped out of the study as a function of the experimental group. For categorical variables (e.g. marital status), the chi-square statistics were used rather than ANOVA.

In the present study, 13 participants dropped out of the study. Among those not completing the study, most mentioned that time limitations were the reason for their withdrawal from the study.

2.7.2 Change in Physical Activity - Primary Analysis

- Question: Are there differences in days of moderate and vigorous physical activity between groups across the two time periods?
- Question: Are there differences in weekly minutes of moderate and vigorous physical activity between groups across the two time periods?

The present study used a 2 x 2 (intervention group by time period) experimental design. The primary independent variables were the intervention group and the measurement time period, whereas the primary dependent variables were days and minutes of moderate and vigorous physical activity (assessed through IPAQ).

Since the same participants were tested on the same variables (from IPAQ) at two time periods (pre-intervention and 6-week), and because of the presence of multiple, potentially correlated dependent measures, MANOVA was used to test for differences between groups in days and minutes of moderate and vigorous physical activity across the two time periods. A significant intervention group by time period interaction such that no differences in days or minutes of physical activity between groups would exist prior to the intervention was expected, however, it was expected that there would be a difference in days and minutes of physical activity between groups after the intervention.

The initial plan to correct for inflated alpha due to multiple ANOVA's using the Bonferoni correction was adapted to fit the MANOVA strategy described above. Specifically each of the two MANOVAs, one for physical activity variables, the other for SCT variables, was assessed at $\alpha = .025$.

2.7.3 Change in SCT Constructs Analysis

- Question: Are there differences between groups on use of SCT constructs across the two time periods?

For these analyses, a 2 x 2 (intervention group by time period) MANOVA analysis strategy was used similar to that used for the PA variables. The independent variables were the intervention group and the measurement time period, whereas the dependent variables were SCT constructs (self-efficacy, self-regulation, social support, and outcome expectations and expectancies). It was expected a significant intervention group by time period interaction such that no differences in use of SCT constructs between groups existed prior to the intervention. However, it was expected that there would be a difference in the use of SCT constructs between groups after the intervention such that the intervention group would show greater changes in self-efficacy, self-regulation, social support, and outcome expectancies.

2.7.4 Mediation Analysis

- Question: Are the changes in SCT constructs accounting for the change in days of moderate and vigorous physical activity?

In the event of a significant intervention effect on days of moderate and vigorous physical activity, a series of regression analysis would be performed to test if the change in SCT constructs accounted for the change in days of moderate and vigorous physical activity. Overall, the analyses would follow the recommendations of Baron and Kenny (1986) for tests of

mediation. These analyses would include tests that satisfy the four criteria for mediation which include: (1) significant associations between the independent variable (IV) and the dependent variable (DV), in this case the intervention and the PA variables, (2) significant associations between the IV and the Mediators, in this case SCT constructs, (3) significant associations between the mediator and the DV, while controlling for the IV, and (4) a reduction in the strength of the association between the IV and DV when the presumed mediators are included in the analysis as covariates.

Chapter 3: Results

3.1 OVERVIEW

The purpose of this study was to evaluate the efficacy of a web-based intervention – one that relies on existing, easy-to-use course technology – to increase days of weekly physical activity among a group of predominantly Hispanic college students attending a large Southwestern University. A secondary purpose was to examine the presumed mediators of PA behavior change using constructs derived from Bandura’s Social Cognitive Theory (SCT), using validated measures from previous research.

The experimental and statistical design was a 2 x 2 mixed factorial design with two levels of treatment (intervention vs. control) as the sole between-subjects factor and time (baseline and 6-week follow-up) as the sole within-subjects factor. Physical activity information and SCT measures were collected at the two time periods. The intervention group received a 6-week web-based physical activity intervention that consisted of seven learning lessons based on SCT and designed to increase level of physical activity among participants. The control group received some basic information on physical activity (e.g., the importance of PA) and access to the web-based activity logs, but did not receive any of the learning lessons.

The remainder of this chapter is divided into several sections including a description of the sample, data screening, participant attrition, descriptive analysis of PA status, approach to primary analysis, primary analysis of PA and SCT variables, and supplemental analysis of potential ceiling effects and regression to the mean.

3.2 SAMPLE

The sample consisted of 117 students at pretest who were randomly assigned to either the intervention or control group. Thirteen participants (11%) were excluded from the final analyses

because they did not return for post-testing, four in the control group and nine in the intervention group. A nonsignificant chi-square test showed these rates of attrition to be equivalent across groups, $\chi^2 = 1.71$, $p = .19$ (also see Participant Attrition section below for additional analyses of attrition). As noted above, most of those who dropped out noted that time constraints were the reason for them discontinuing with the experiment.

Demographic data for the final sample of complete responders ($n = 104$) is presented in Tables 1 and 2. The mean age for the sample was 25 years. The sample primarily consisted of self-identified Hispanic students (78%). A slightly higher percentage of women participated in the study (64%) than men. The majority of participants were full time students (82%) residing mainly in El Paso County (96.6%). The sample had an average BMI of 26 (kg/m^2). Table 1 shows that height and weight were the only two variables where men were significantly different from women, with men being taller and heavier than women. Table 2 shows these same demographic variables separated by treatment group. As shown, there were no significant differences between Treatment Groups at pretest for any of the demographic variables.

Table 3 shows means and standard deviations for main SCT variables and reliability coefficients. As shown, all scales showed good levels of reliability with the exception of self-regulation for plans, which was somewhat lower but acceptable.

Table 1: Sample Demographics by Gender

	Men (n=37)		Women (n=67)	
	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	<i>F or χ^2</i>
Age	25.47 (6.17)	25.97 (7.00)	25.18 (5.70)	.39
Hispanic	78.0%	76.0%	79.0%	.16
Status (full time)	82.0%	81.0%	82.0%	.01
Marital status				.95
Single	74.4%	72.0%	72.2%	
Married	16.2%	14.0%	17.9%	
Separated	1.7%	3.2%	2.0%	
Divorced	4.3%	5.4%	4.6%	
Other	3.4%	5.4%	3.3%	
Residence				.08
El Paso County	96.6%	88.0%	98.0%	
Dona Ana Co.	1.7%	5.4%	.7%	
Juarez	.9%	3.3%	.7%	
Other	.9%	3.3%	.7%	
Height (in)	66.57 (4.47)	70.92 (3.56)	64.19 (2.82)	109.60**
Weight (lbs)	167.11 (41.24)	198.71 (41.53)	149.88 (29.31)	47.79**
BMI (kg/m ²)	26.46 (5.42)	27.87 (5.61)	25.69 (5.19)	3.89

** p < .001

Table 2: Sample Demographics by Treatment Group

		Intervention	Control	
	Mean (SD)/%	Group (n=52)	Group (n=52)	<i>F or χ^2</i>
Age	25.47 (6.17)	25.88 (6.56)	25.06 (5.81)	.46
Hispanic	78.0%	83.0%	73.0%	1.38
Status (full time)	82.0%	78.0%	85.0%	.64
Marital status				.38
Single	74.4%	66.9%	77.8%	
Married	16.2%	18.1%	14.5%	
Separated	1.7%	3.9	.9%	
Divorced	4.3%	7.1%	2.6%	
Other	3.4%	3.9%	4.3	
Residence				.27
El Paso County	96.6%	92.9%	95.7%	
Dona Ana County	1.7%	4.0%	.9%	
Juarez	.9%	2.4%	.9%	
Other	.9%	.8%	2.6%	
Height (in)	66.57 (4.47)	66.84 (4.64)	66.28 (4.31)	.39
Weight (lbs)	167.11 (41.24)	174.88 (49.22)	159.04 (29.20)	3.86
BMI (kg/m ²)	26.46 (5.42)	27.35 (6.10)	25.54 (4.47)	2.89

Table 3: Means, Standard Deviations, and Reliability Coefficients for the Main SCT Variables

SCT Variables	Means (SD)		Cronbach's
	Pre-test	Post-test	Alpha
Self-Efficacy	18.22 (3.94)	17.70 (4.20)	.84
Goals	15.04 (5.02)	16.14 (5.45)	.88
Plans	12.45 (3.82)	13.17 (3.88)	.74
Expectancies	48.07 (15.80)	53.23 (14.95)	.84
Family Social Support	10.68 (5.47)	11.60 (5.79)	.87
Friends Social Support	12.42 (5.61)	12.80 (5.90)	.89

3.3 DATA SCREENING

Prior to analysis, several demographic variables (age, gender, etc.), four physical activity variables (moderate days, vigorous days, moderate minutes, and vigorous minutes), and six SCT variables (self-efficacy, plans, goals, expectancies, social support from friends and social support from family) were examined for accuracy of data entry, missing values, maintenance of distributional assumptions, and univariate and multivariate outliers using SPSS Frequencies and Regression procedures.

There were no missing values detected. Two variables, moderate minutes and vigorous minutes, had extreme positive skewness and were transformed. To improve pairwise linearity and to reduce their skewness, moderate minutes and vigorous minutes were transformed using the SQRT transformation procedure (Tabachnick & Fidell, 2007). Following transformation, the skewness of these variables was reduced considerably, the overall shapes of the transformed variables were much improved, and there were no univariate outliers on any variable.

Four PA and six SCT variables, at pre- and posttest, were screened for multivariate outliers through SPSS Regression. The criterion for multivariate outliers was Mahalanobis distance of 29.59 ($p < .001$) as recommended by Tabachnick & Fidell (2007). Using this criterion, there were no multivariate outliers detected.

3.4 PARTICIPANT ATTRITION

Although attrition rates did not differ by Treatment Group (see above), two sets of analyses further examined participant attrition. Because of the large number of statistical tests involved in these analyses, statistical significance was set at .01. This value represented a compromise position between allowing sufficient sensitivity for analysis of attrition without inflated type I error risk. The first set compared drop-outs to non-dropouts on all demographic,

physical activity, and SCT variables at pretest using one-way ANOVA with drop-out status as the sole independent variable. Results of these 18 analyses revealed no differences between drop-outs and non-dropouts, all $F(1,116) < 3.24, p > .074$.

The second set examined potential interactions between attrition and experimental condition. For these analyses a series of 2 x 2 attrition (drop-out vs. non-dropout) by treatment group (intervention vs. control) ANOVA's were performed on the same 18 variables at pretest. Results of these analyses, again assessed at $\alpha = .01$, also indicated no significant main effects or interactions involving differences between drop-outs and non-dropouts, all $F(1,116) < 4.39, p > .038$. Indeed, the only effect to approach significance at $\alpha = .05$ was an attrition by treatment group interaction for social support from friends, $F(1,116) = 4.39, p = .038$. The next most significant effect was for vigorous minutes of physical activity $F(1,116) = 2.32, p = .131$. Because neither of these effects were significant at .01, and because of the large number of statistical tests, they were not examined further.

In summary, there were no substantial differences between drop-outs and no-dropouts for demographics and study variables and no significant interactions between drop-out status and condition. Even though there was a loss of 11% of participants, drop-outs and non-dropouts were similar in mean scores for each of the study variables both overall and within condition. Therefore, attrition appears to be random and subsequent analyses were conducted without use of covariates. All remaining analyses were conducted using the 104 participants with complete data at pre-test and post-test.

3.5 DESCRIPTIVE ANALYSIS OF PHYSICAL ACTIVITY STATUS, PRE- AND POST-INTERVENTION

This section provides a general description of the levels of participation in moderate and vigorous physical activity at the two time periods. Participants were categorized into three levels of moderate and three levels of vigorous physical activity: Inactive, insufficiently active, and sufficiently active. Based on the American College of Sports Medicine (ACSM) recommendations, insufficiently active was operationalized as engaging in at least one day of physical activity, but not attaining 5 or more days of moderate activity (for at least 30 minutes) or 3 or more days of vigorous activity (for at least 20 minutes). In contrast, sufficiently active was operationalized as engaging in 5 or more days of moderate activity (for at least 30 minutes) or 3 or more days of vigorous activity (for at least 20 minutes). Individuals achieving no days of moderate or vigorous physical activity were considered inactive. (These data are presented here for descriptive purposes and parametric analyses of physical activity are presented below in the Primary Analysis section.)

3.5.1 Frequency of Participating in Moderate and Vigorous Physical Activity by Treatment Group

Table 4 presents the percentages of participants categorized as inactive, engaging in sufficient moderate days of physical activity, and engaging in insufficient moderate days of physical activity at pre-test and post-test for each group. As shown, majorities of participants were insufficiently active at pretest (84.7% and 98.1% for control and intervention groups, respectively). This percentage was relatively unchanged in the control condition. However, over 25% of the intervention participants were sufficiently moderately active at post-test.

Table 4: Participants Engaging in Moderate Physical Activity

Group	Days of Moderate PA During the Past Week	Percent of Students	
		<i>Pre-test</i>	<i>Post-test</i>
Control	0 – <i>inactive</i>	40.4	28.8
	1-4 - <i>Insufficiently active</i>	44.3	57.7
	5+ - <i>Sufficiently active</i>	15.3	13.5
Intervention	0 – <i>inactive</i>	53.8	26.9
	1-4 - <i>Insufficiently active</i>	44.3	46.2
	5+ - <i>Sufficiently active</i>	1.9	26.9

Note: Categorization was based on reported days of moderate PA for at least 30 or more minutes per day during the past week.

Table 5 presents the percentages of participants categorized as inactive, engaging in sufficient days of vigorous physical, and engaging in insufficient days of vigorous physical activity at pre-test and post-test for each group. As shown, the majority of participants in the intervention group were insufficiently active at pre-test (84.6%), whereas 48.1% of the control group participants were insufficiently active at the pretest. This percentage was relatively unchanged in the control condition. However, over 45% of the intervention participants were sufficiently vigorously active at post-test.

Table 5: Participants Engaging in Vigorous Physical Activity

Group	Days of Vigorous PA During the Past week	Percent of Students	
		<i>Pre-test</i>	<i>Post-test</i>
Control	0 - <i>not active</i>	23.1	19.2
	1-2 - <i>Insufficiently active</i>	25.0	34.6
	3+ - <i>Sufficiently active</i>	51.9	46.2
Intervention	0 - <i>not active</i>	40.4	26.9
	1-2 - <i>Insufficiently active</i>	44.2	26.9
	3+ - <i>Sufficiently active</i>	15.3	46.2

Note: Categorization was based on reported days of vigorous PA for at least 20 or more minutes per day during the past week.

Overall, these data suggest that the majority of the sample was inactive at baseline and that many became sufficiently active, especially in the intervention condition. They also show that there were differences in physical activity between conditions, particularly at baseline, a topic that is addressed in the discussion. This baseline difference was confirmed using univariate ANOVA, for moderate physical activity ($M_s = 1.96$ and 1.17 for control and intervention participants, respectively), $F(1, 103) = 5.07, p < .05$, and vigorous physical activity ($M_s = 2.42$ and 1.17 for control and intervention participants, respectively), $F(1, 103) = 16.97, p < .001$.

3.6 APPROACH TO PRIMARY ANALYSES

Multivariate Analysis of Variance (MANOVA) was used as the primary omnibus statistical test to assess changes in physical activity and social cognitive theory between the two Treatment Groups across the two time periods. Since mean differences among groups were tested on multiple dependent variables, MANOVA was viewed as the most appropriate analysis because it is more powerful than ANOVA in such situations. MANOVA also helps to avoid inflated Type I error due to multiple tests of correlated DVs and may reveal differences not shown in separate ANOVAs (Tabachnick & Fidell, 2007). Two MANOVA analyses were conducted, one for each set of dependent variables and both at a corrected alpha rate of .025. The first set consisted of four physical activity variables, including moderate days, vigorous days, moderate minutes, and vigorous minutes. The second set consisted of six SCT variables, including self-efficacy, goals, plans, expectancies, and social support from family and friends.

Univariate ANOVA's and Roy-Bargmann stepdown analyses assisted in the interpretation of significant multivariate effects. In stepdown analyses, each dependent variable is analyzed sequentially with higher priority dependent variables examined first, then treated as covariates for subsequent, and lesser priority, dependent variables. The primary advantage of

stepdown analyses is that they exam the relative redundancy or independence of significant univariate effects.

3.7 PHYSICAL ACTIVITY VARIABLES

The first MANOVA assessed differences in days and minutes of physical activity between the two Treatment Groups across the two time periods. A 2 x 2 mixed between- and within-subjects MANOVA was performed on four physical activity dependent variables: moderate days, vigorous days, moderate minutes, and vigorous minutes. Independent variables were Treatment Group and the time period. As noted above, the dependent variables were entered in terms of priority based on the aim of the intervention, which was to increase days of moderate and vigorous weekly physical activity, with increasing daily minutes of moderate and vigorous physical activity being of secondary priority.

With the use of Wilks' criterion, the MANOVA showed that the combined DVs were significantly affected by time period, Wilks' $\Lambda = .77$, $F(4, 99) = 7.10$, $p < .001$, and the Treatment Group x time period interaction, Wilks' $\Lambda = .81$, $F(4, 99) = 5.83$, $p < .001$, but not by group, Wilks' $\Lambda = .92$, $F(4, 99) = 2.12$, $p > .083$.

Univariate and stepdown analyses of the time main effect are summarized in the top section of Table 6. As shown, there were significant univariate effects for moderate days, vigorous days and moderate minutes. Stepdown analyses were significant only for moderate days. Overall, these analyses showed that physical activity increased over time for all participants as a whole. The univariate tests were significant for moderate days, vigorous days, and moderate minutes indicating that overall participants were moderately active on more days ($M_s = 1.57$ and 2.59 for pre- and post-test time points, respectively), vigorously active on more days ($M_s = 1.80$ and 2.15 for pre- and post-test time points, respectively) and for more moderate

minutes ($M_s = 4.87$ and 6.00 [square-root values] for pre- and post-test time points, respectively). The Roy-Bargmann stepdown tests showed these effects to make redundant (correlated) contributions to the composite DV in MANOVA.

Although the MANOVA was not significant, univariate and stepdown analyses for the Treatment Group main effect are presented in the middle section of Table 6.

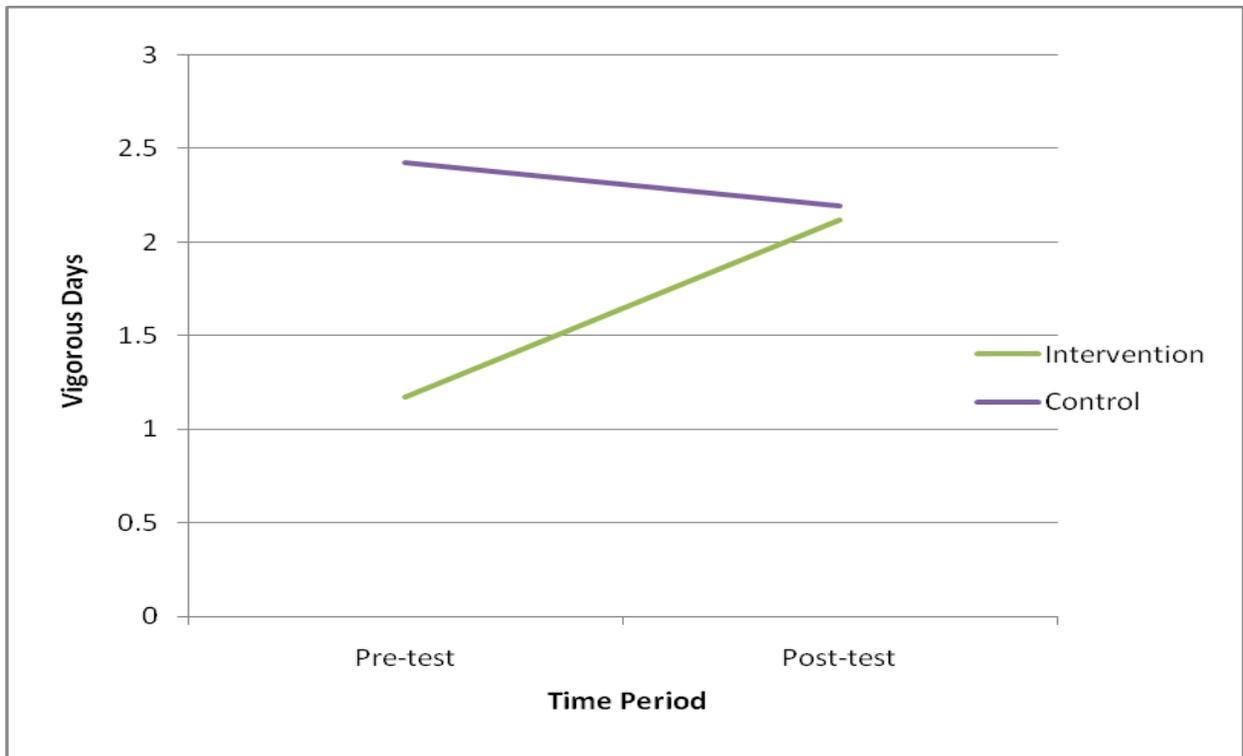
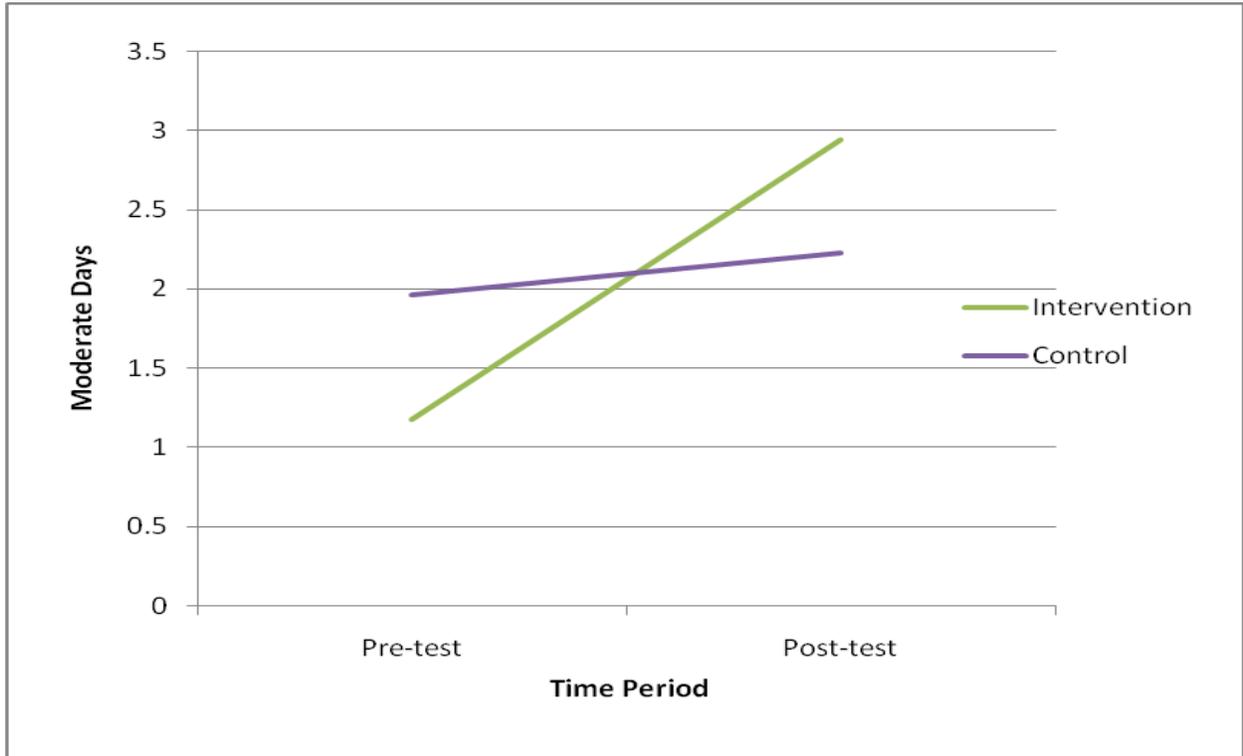
Results of univariate and stepdown analyses for the Treatment Group by Time interaction are summarized in bottom section of Table 6. As shown, there were significant univariate effects for moderate days and vigorous days of physical activity. Stepdown analyses were also significant for both moderate and vigorous days showing these effects to be independent. As shown, two DVs, moderate days of physical activity and vigorous days of physical activity, made unique contributions to the composite DV in MANOVA.

Table 6: Results of Univariate ANOVA's and Stepdown Tests for Physical Activity Variables

<i>Time main effect:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Moderate Days	1,102	21.46	< .001	1,102	21.46	< .001
Vigorous Days	1,102	4.90	.029	1,101	2.96	.088
Moderate Mins	1,102	12.36	.001	1,100	1.41	.238
Vigorous Mins	1,102	.15	.700	1,99	1.84	.178
<i>Group main effect:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Moderate Days	1,102	.01	.903	1,102	.01	.903
Vigorous Days	1,102	6.27	.014	1,101	7.05	.009
Moderate Mins	1,102	1.39	.240	1,100	.79	.377
Vigorous Mins	1,102	2.98	.087	1,99	.68	.411
<i>Treatment Group by Time Interaction:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Moderate Days	1,102	11.62	.001	1,102	11.62	.001
Vigorous Days	1,102	13.32	< .001	1,101	10.43	.002
Moderate Mins	1,102	1.29	.258	1,100	.54	.466
Vigorous Mins	1,102	3.50	.064	1,99	.01	.917

The Treatment Group by time period interactions for moderate days and vigorous days are displayed in Figure 1. To examine the nature of the interactions for moderate days and vigorous days, I estimated the simple effects for time separately for each Treatment Group. For moderate days, the time effect among control participants was not significant, $F(1,51) = .86, p = .357, \eta^2 = .017$, but was significant among intervention participants, $F(1,51) = 28.50, p < .001, \eta^2 = .359$. Similarly for vigorous days, the time effect among control participants was not significant, $F(1,51) = .99, p = .325, \eta^2 = .019$, but was significant among intervention participants $F(1,51) = 18.00, p < .001, \eta^2 = .261$. As Figure 1 shows and as expected, participants in the intervention group showed significant increases in both moderate and vigorous days of physical activity, whereas participants in the control group showed no statistical change.

Figure 1: Pre- to Post-test Changes in Moderate (Upper Panel) and Vigorous (Lower Panel) Days of PA by Treatment Group



Examination of these effects also shows that the groups differed initially in levels of pretest physical activity for moderate days, $F(1,102) = 5.07, p = .027$, and for vigorous days, $F(1,102) = 16.97, p < .001$. These differences were unexpected, given random assignment to condition, but random assignment does not necessarily create equality of pretest values and sampling error can still result in baseline differences at pretest (Shadish et al., 2002). The possible confounding influence of these differences was examined two ways. First, ANCOVA's on post-test differences between treatment groups, using pretest values as a covariate, produced significant results and estimated marginal means that were entirely consistent with the within-subjects analyses reported. Second, the possible influence of regression to the mean on the changes in physical activity from pre-test to post-test was examined in supplemental analyses reported below.

3.8 SCT VARIABLES

A similar 2 x 2 mixed between- and within-subjects multivariate analysis of variance was performed on the six SCT dependent variables: self-efficacy, self-regulation plans, self-regulation goals, expectancies, family social support, and friends social support. Independent variables were intervention group and time period. Because of its consistent role in determining a number of health behaviors, self-efficacy was considered the highest priority variable in the analysis, followed by self-regulation plans. The latter was considered secondary because of the assumption that making plans should be considered one of the first steps in making physical activity as part of a regular/scheduled routine and because many of the learning lessons focused on planning activities. With the use of Wilks' criterion, the combined DVs were significantly

affected by time period, Wilks' $\Lambda = .81$, $F(6, 97) = 3.71$, $p = .002$, and group, Wilks' $\Lambda = .81$, $F(6, 97) = 3.79$, $p = .002$, but not by their interaction, Wilks' $\Lambda = .94$, $F(6, 97) = 1.02$, $p = .415$.

Univariate and stepdown analyses of the time main effect are summarized in the top section of Table 7. As shown, there were significant univariate and Stepdown effects for time on plans, goals, and expectancies, although the univariate effect for plans only approached significance ($p = .055$). Overall, these analyses showed that levels of these SCT variables increased over time for all participants as a whole. Participants increased in perceived ability to make plans regarding PA (Ms = 12.45 and Ms = 13.17 for pre- and post-tests, respectively), in perceived ability to set goals regarding PA (Ms = 15.04 and Ms = 16.14 for pre- and post-tests, respectively), and their expectancies from PA (Ms = 48.07 and Ms = 53.23 for pre- and post-test time points, respectively). Roy-Bargmann stepdown tests showed these effects to make independent contributions to the composite dependent variable in MANOVA.

Univariate and stepdown analyses of the group main effect are summarized in the middle section of Table 7. As shown, there were significant univariate effects for plans, goals, and friend social support. Stepdown analyses were significant for plans and friend social support. Overall, these analyses showed that levels of these SCT variables differed between groups when averaged across both time points. Participants in the control group reported greater ability to make plans (Ms = 13.64 and Ms = 11.99 for control and intervention group, respectively), set goals (Ms = 16.61 and Ms = 14.58 for control and intervention group, respectively), and friend social support (Ms = 14.69 and Ms = 10.53 for control and intervention group, respectively). Roy-Bargmann stepdown tests showed that plans and goals made redundant contributions to the composite dependent variable; however friend social support made an independent contribution to it.

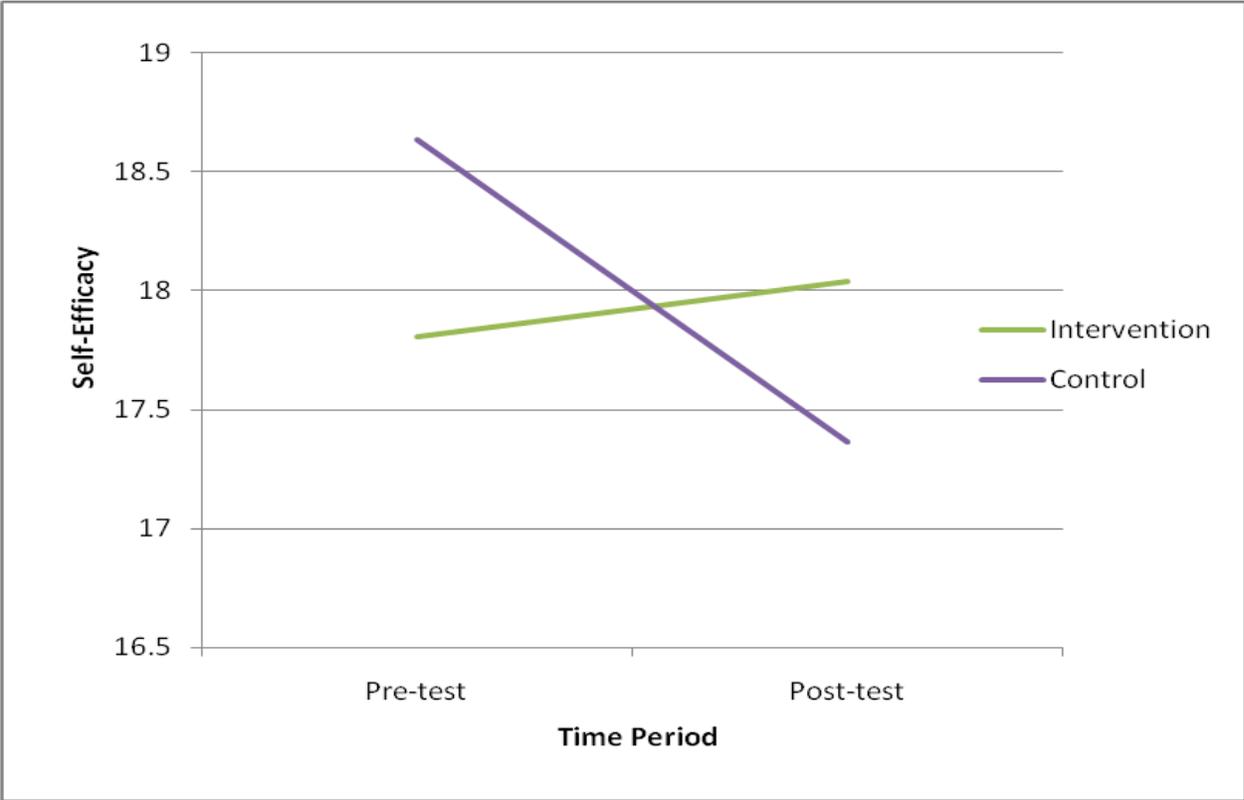
Table 7: Results of Univariate ANOVA's and Stepdown tests for SCT Variables

<i>Time main effect:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Efficacy	1,102	1.99	.161	1,102	1.99	.161
Plans	1,102	3.78	.055	1,101	4.63	.034
Goals	1,102	9.19	.003	1,100	5.78	.018
Expectancies	1,102	10.86	.001	1,99	6.04	.016
Family Supp.	1,102	3.36	.070	1,98	2.48	.118
Friend Supp.	1,102	.91	.342	1,97	.19	.666
<i>Group main effect:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Efficacy	1,102	.01	.914	1,102	.01	.914
Plans	1,102	6.60	.012	1,101	6.89	.010
Goals	1,102	4.61	.034	1,100	.56	.446
Expectancies	1,102	.01	.903	1,99	1.57	.212
Family Supp.	1,102	.10	.749	1,98	.01	.939
Friend Supp.	1,102	17.97	< .001	1,97	12.70	.001
<i>Treatment Group by Time Interaction:</i>						
<i>Variable</i>	<i>df</i>	<i>Univariate F</i>	<i>p</i>	<i>df</i>	<i>Stepdown F</i>	<i>p</i>
Efficacy	1,102	4.15	.044	1,102	4.15	.044
Plans	1,102	2.03	.157	1,101	1.21	.273
Goals	1,102	.31	.581	1,100	.00	.989
Expectancies	1,102	1.40	.239	1,99	.29	.591
Family Supp.	1,102	1.21	.274	1,98	.64	.425
Friend Supp.	1,102	.03	.864	1,97	.01	.924

Univariate and stepdown tests of the Treatment Group by time interaction are shown in the bottom section of Table 7. Overall, however, the lack of a significant multivariate interaction suggests limited to no impact of the intervention on SCT variables. Indeed the only effects to approach significance were the univariate and stepdown tests for self-efficacy (see Table 7). Even though the multivariate criterion was not significant for the interaction, I graphed and examined the univariate interaction for self-efficacy for descriptive/exploratory purposes. Figure 2 shows the interaction. Simple effects tests were significant for the control group, $F(1,51) = 5.45, p = .024, \eta^2 = .097$, but not for the intervention group, $F(1,51) = .22, p = .644, \eta^2 = .004$. As shown in Figure 2, self-efficacy declined among control participants but remained unchanged among intervention participants. This pattern was not consistent with the hypothesized effect of the intervention which was to increase self-efficacy. Overall, the analyses presented thus far show that the intervention had the intended effects on physical activity, but did not have the intended effects on SCT variables.

These results also suggest that the data do not meet the requirements for tests of mediation as outlined by Baron & Kenny (1986). Specifically, the data fail to meet the second requirement, that the IV (in this case Treatment Group) be reliably related to the Moderator. As such, further tests of mediation by SCT variables (Primary Aim 2) were abandoned.

Figure 2: Pre- to Post-test Changes in Self-Efficacy by Treatment Group

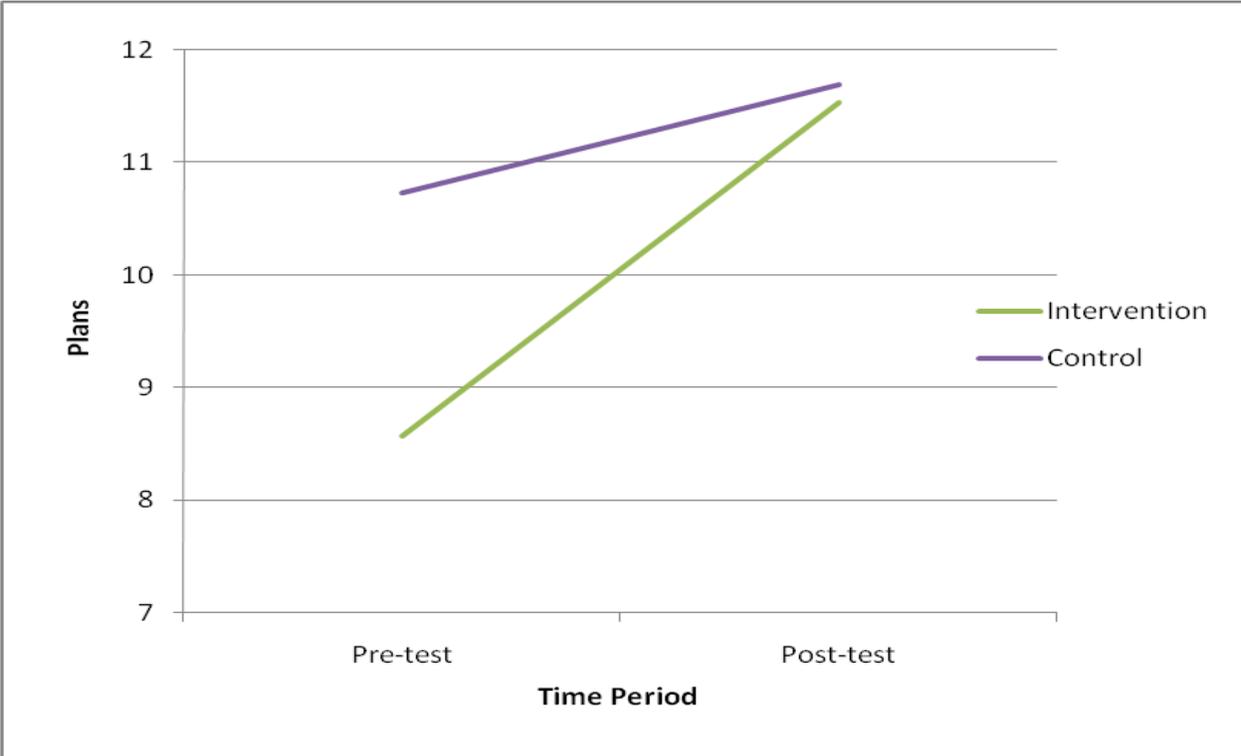


3.9 SUPPLEMENTAL/EXPLORATORY ANALYSES EXAMINING POTENTIAL CEILING EFFECTS FOR SCT VARIABLES

One possible reason for the lack of impact on SCT variables was a ceiling effect where high baseline levels of SCT constructs may have prevented treatment/intervention related increases. To examine this possibility, I conducted a series of three-way ANOVA's. In these analyses, ceiling effects would be indicated by a significant three-way interaction, such that those below the median showed the expected two-way interaction, whereas those above the median did not. Because this hypothesis is directional regarding the three-way interaction, and because interactions are typically difficult to detect in ANOVA due to low subject power (Tabachnick & Fidell, 2007), I evaluated the three-way interactions using a one-tailed statistical test at $\alpha = .05$. Results of these analyses showed significant or near significant three-way interactions only for plans, $F(1,100) = 2.45, p = .06, \eta^2 = .024$, and social support from friends, $F(1,100) = 5.56, p = .01, \eta^2 = .053$.

To probe the three-way interaction for plans, I conducted two two-way ANOVA's, one at each level of the median. Consistent with the ceiling effect hypothesis, the two-way analyses showed a significant Treatment group by time period interaction for those below the median, $F(1,52) = 5.56, p = .022, \eta^2 = .097$, but not for those above the median $F(1,48) = .02, p = .877, \eta^2 = .001$. As shown in Figure 3, among those low in plans at baseline, those receiving the intervention increased their perceived ability to make plans, $F(1,27) = 22.98, p < .001, \eta^2 = .460$, whereas those in the control group did not change, $F(1,25) = 2.77, p = .109, \eta^2 = .100$. This pattern suggests that the intervention had the intended effect on ability to make plans for physical activity, but only for those who were low in such ability at baseline.

Figure 3: Pre- to Post-test Changes in Plans by Treatment Group Below the Median



To probe the three three-way interaction for friend social support, I conducted parallel two two-way ANOVA's, again at each level of the median. These analyses were not significant for those below the median, $F(1,49) = 2.71, p = .106, \eta^2 = .052$, or those above the median $F(1,51) = 2.88, p = .096, \eta^2 = .053$. Because this pattern of simple effects was not consistent with the ceiling effect hypothesis, they were not examined further.

3.10 SUPPLEMENTAL ANALYSES EXAMINING REGRESSION TO THE MEAN AS A POSSIBLE EXPLANATION FOR CHANGES IN DAYS OF MODERATE AND VIGOROUS PHYSICAL ACTIVITY

Because the intervention group had significantly lower levels of PA at baseline compared with the control condition, I conducted a series of supplemental analyses to examine whether regression to the mean was a plausible alternative explanation for the observed changes in moderate and vigorous days of physical activity. Specifically, the significant overall interaction could have been caused by those in the intervention condition who were extremely low at baseline “regressing” toward the other groups at posttest. A regression toward the mean explanation would be supported by a pattern of results where an increasing trend in PA is evidenced *only* by those who are extremely low in PA at baseline, accompanied by little or no change among those relatively higher in PA at baseline (Shadish et al., 2002). A significant three-way interaction would support this hypothesis.

To conduct these analyses, I first divided both sets of participants (intervention and control) into two separate groups: Those above and below their respective medians for days of moderate and vigorous physical activity. I then conducted 2 x 2 x 2, Treatment group (intervention vs. control) x median (above or below) x time period (pre-test vs. post-test) analyses. These analyses did not produce the three way interaction necessary to support a

regression to the mean interpretation of the data, for moderate PA, $F(1,100) = 1.72$, $p = .193$, $\eta^2 = .017$, or vigorous PA, $F(1,100) = 1.12$, $p = .293$, $\eta^2 = .011$.

Figure 4 presents the means for the four groups in regard to moderate physical activity. As shown, both groups of intervention participants (i.e., those above and below the median; depicted as solid lines) increased their levels of PA, although this trend was somewhat stronger among those below the median. Overall, although this pattern suggests some regression to the mean among those below the median at baseline, regression was not evidenced significantly by the expected interaction and cannot explain the significant increase in moderate days of PA among those above the median at baseline, a change that was on the order of one whole day's increase. In other words, the intervention had the intended increase in moderate PA for all the intervention participants, not just those low at the baseline

In contrast, regression to the mean appears to characterize both groups of control participants (i.e., above and below the median; depicted as dotted lines). Those high in physical activity at baseline declined at post-test; those low in physical activity at baseline increased at post-test.

Figure 4: Pre- to Post-test Changes in Moderate Days of PA by Treatment Group Below and Above the Median

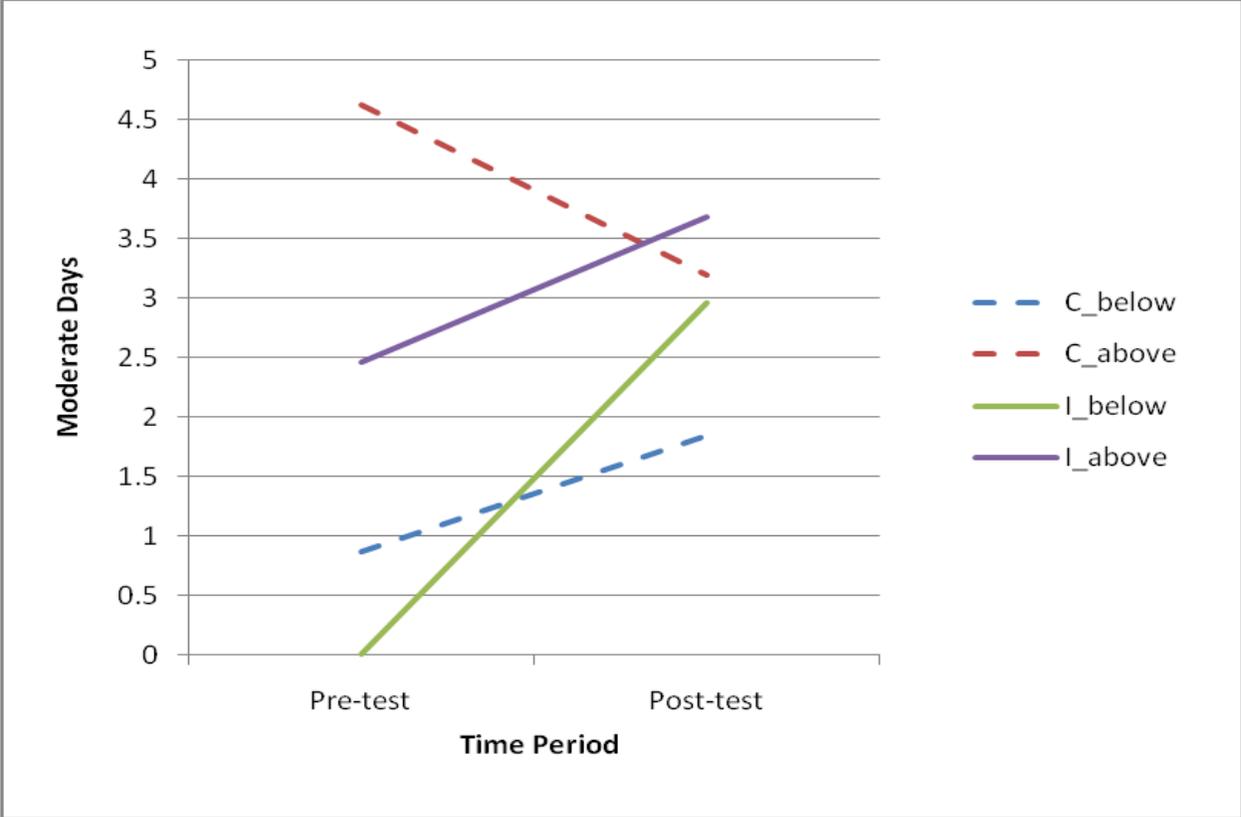
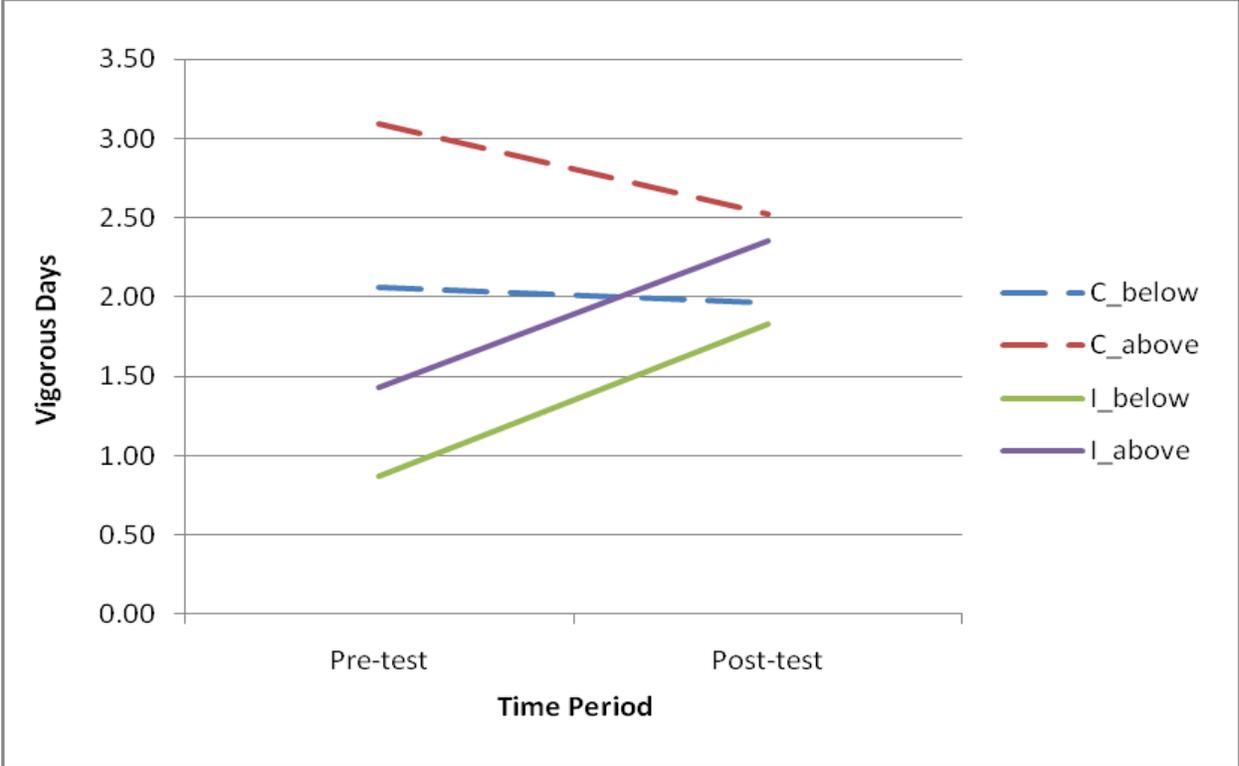


Figure 5 presents a similar pattern of means for the four groups in regard to vigorous physical activity. As shown, both groups of intervention participants (i.e., those above and below the median; depicted as solid lines) increased their levels of vigorous PA. This pattern shows no evidence of regression to the mean. Rather it suggests that the intervention had the same intended increase in vigorous PA for all the intervention participants and not just those low at the baseline.

Among control participants (i.e., those above and below the median; depicted as dotted lines), however, there is again some evidence of regression to the mean, particularly among those high in PA at baseline, who tended to evidence lower values at post-test.

Overall, examination of extreme groups suggests some impact of regression to the mean, especially in the control group, and to a lesser extent in the intervention group (and only for moderate days). Regression to the mean, however, cannot account entirely for the increases in moderate days of physical activity and does not appear to influence days of vigorous physical activity to any measurable extent.

Figure 5: Pre- to Post-test Changes in Vigorous Days of PA by Treatment Group Below and Above the Median



Chapter 4: Discussion

4.1 OVERVIEW

The purpose of this study was to evaluate the efficacy of a web-based intervention – one that relied on existing, easy-to-use course technology – to increase days of weekly physical activity among predominantly Hispanic college students attending a large Southwest University. A secondary purpose was to examine the presumed mediators of PA behavioral change using constructs derived from Bandura’s Social Cognitive Theory (SCT), using measures from previous research.

One hundred four students were randomly assigned to either a web-based intervention or a web-based control group. For both groups, the web-based activities lasted for six consecutive weeks, and students had 24-hour access to the materials.

The experimental group participated in a structured, 6-week physical activity intervention with lessons based on SCT constructs. Even though the SCT does not provide any specific ordering of constructs, lessons in this intervention were ordered based on previous studies that used constructs from the SCT in PA interventions (Grim, 2003). There was a total of seven learning lessons for this study. All lessons were readable and printable online. Each lesson included a purpose of the lesson, the reason why this lesson is important, the information regarding the topic, and information regarding the assignments for the week with due dates for the assignments. Participants were able to print relevant material and assignments for the week, complete them, and submit them on specific dates assigned in advance. Participants were also asked to complete and submit activity logs on weekly basis.

Participants in the control group did not have access to the learning lessons and did not participate in any of the learning activities about physical activity and fitness. However, they

received, on-line, very basic information on physical activity (e.g., the importance of PA). They were asked and encouraged to complete physical activity logs (identical to those given to participants in the intervention group) and the pre and post assessments (identical to those given to participants in the intervention group) of the web-based physical activity study.

Multivariate Analysis of Variance (MANOVA) was used as the primary omnibus statistical test to assess differences in physical activity and social cognitive theory variables between the two Treatment Groups across the two time periods. Univariate ANOVA's and Roy-Bargmann stepdown analyses assisted in the interpretation of significant multivariate effects. Support for the main study hypotheses that students in the web-based intervention would show greater increases in physical activity, was indicated by significant Treatment Group by time interactions on key dependent variables.

Results of multivariate, univariate, and stepdown analyses for the Treatment Group by time interaction showed the expected pattern of effects for moderate days and vigorous days of physical activity. Stepdown analyses were significant for both moderate and vigorous days showing these effects to be independent. Simple effects tests showed that participants in the intervention group significantly increased both moderate and vigorous days of physical activity, whereas participants in the control group showed no changes.

A similar MANOVA, ANOVA, stepdown strategy assessed differences in six social cognitive theory variables (self-efficacy, self-regulation plans, self-regulation goals, expectancies, family social support, and friends social support) between two Treatment Groups across the two time periods. Multivariate, univariate, and stepdown tests of the key Treatment Group by time interaction did not show any significant multivariate interaction suggesting limited to no impact of the intervention on SCT variables. Indeed the only effects to approach

significance were the univariate and stepdown tests for self-efficacy. Examination of the nature of this effect showed it to be inconsistent with the expected pattern. Because these analyses did not demonstrate impact of the intervention on the hypothesized mediators, they precluded any additional testing of mediation according to the logic outlined by Baron and Kenny (1986).

In addition to these analyses, exploratory analysis examined potential ceiling effects for SCT variables using three-way factorial ANOVAs. The results of these analysis suggested that the intervention had the intended effect on ability to make plans for physical activity, but only for those who were low in such ability at baseline. A significant three-way interaction for friend social support also emerged, but the pattern of results did not match predictions for these supplemental analyses.

A second set of exploratory analyses examined regression to the mean as a possible explanation for changes in days of moderate and vigorous physical activity, particularly in light of unexpected between-group differences in physical activity at pretest. These analyses examined whether the observed pattern of changes in physical activity could be explained by the fact that the intervention group had lower activity levels at baseline compared with the intervention group. Overall, these results suggested some impact of regression to the mean, especially in the control group and to a lesser extent in the intervention group. Regression to the mean, however, was not supported statistically and could not account entirely for the increases in moderate days of physical activity and did not appear to influence days of vigorous physical activity to any measurable extent.

Overall, the results of this study found strong support for the efficacy of the intervention for increasing physical activity, but less to no support for the hypotheses that changes in SCT variables would coordinate with and would mediate such changes.

The remainder of this chapter includes discussion of several issues including reasons for the observed effects, implications for SCT assessment and assessment of change, appropriateness of SCT as a model of PA behavior, consistency with past research, limitations, recommendations for future research, and conclusion.

4.2 POSSIBLE REASONS FOR THE OBSERVED PATTERN OF EFFECTS

As noted above, this study found strong support for the efficacy of the intervention for increasing levels of moderate and vigorous physical activity, specifically increases in the range of one day or more for these measures. In contrast, this study failed to find support that the intervention had the intended impact on SCT variables, and found only limited support that SCT variables changed in the expected direction as a function of the intervention.

Regarding changes in physical activity, the experimental design suggests that a structured, 6 week physical activity intervention that involves instructions and lessons based on SCT can substantially increase levels of physical activity. Moreover, it likely does so by increasing the number of days that people engage in physical activity, rather than increasing the number of minutes per day that they do so.

However, by finding that changes in SCT variables did not correspond with changes in activity levels, the observed changes in physical activity cannot be directly attributed to changes in SCT variables such as enhanced self-efficacy, self-regulation, or social support, and suggests the possibility of other reasons for the observed changes (discussed below). This pattern of results is somewhat inconsistent with other studies that have found changes in SCT variables. For example, Rovniak et al. (2005) observed changes in goal setting and outcome expectations after a 12-week intervention among adult women. Grim (2003) observed changes in self-regulation after a 10-week intervention program. Suminski and Petosa (2006) observed changes

in knowledge and skills in using SCT strategies, specifically self-regulation strategies, for changing physical activity behavior.

These investigations are not without their own limitations, however. For example, in contrast with the present study, only the Rovniak et al. (2005) study found corresponding between group effects for physical activity. Moreover, they did not conduct mediational analyses. The Grim (2003) study failed to find group differences in physical activity and Suminski and Petosa (2006) failed to assess change in physical activity. Thus, even including the present study, research on mediation by SCT constructs remains inconclusive.

The Grim (2003) study is a special case because the present study reflected many aspects of it. In particular, the present study (a) used variations of the same learning lessons used by Grim and (b) included similar measures of SCT constructs as Grim. Whereas the present study found significant intervention-related change in physical activity levels as a function of the SCT-based intervention, the Grim study did not. However, the Grim study found significant intervention-related changes in self-regulation for all participants, whereas the present study found such effects only among those low in self-regulation (i.e., plans) at baseline.

There are several possible reasons why the two studies showed different patterns of results. First, the two studies involved somewhat different populations. Specifically, although both involved college students, the Grim study sample was predominantly non-Hispanic, whereas the present study was predominantly Hispanic. Thus, differences in study population may have contributed to the differences in findings. Second, the studies used slightly different measures of SCT constructs. Specifically, whereas the Grim study used complete measures of SCT constructs, the current study used abbreviated versions of the same scales. Although differences in the content of the measures may have contributed to differences in results between

them, the high internal consistency of the shortened scales, relative to their longer versions argues against any meaningful difference in SCT measurement.

Third, and perhaps more importantly, there were several differences in the approach taken by the studies to change SCT constructs and increase PA. One was the time frame of the study. Specifically, whereas the Grim intervention was offered over the course of 10 weeks, the present study had an intervention duration of only 6 weeks. Thus, it is possible that the longer time frame allowed for greater change in SCT variables. SCT-related beliefs (e.g., belief in self-efficacy) are complex and adults may hold them with conviction. As such, it may take longer than 6 weeks for such changes in self-perception to occur.

Related to the argument of overall greater time length may be the issue of time spent on individual topics. The present study allowed for only one-week's focus per topic and the last week actually covered two topics. The longer intervention period used in the Grim study may have allowed several weeks attention for some key concepts, as well as the time necessary to reinforce key concepts. The 6-week time frame used in the present study, in contrast, prohibited returning to and reinforcing key SCT concepts.

The intervention duration argument is more difficult to apply to the differences between the studies in their ability to produce intervention-related changes in physical activity. Recall the present study documented such differences in PA whereas the Grim study failed to show intervention-related change in PA—instead showing nonspecific increases in all study groups including controls. One possibility is that the longer time frame of the Grim intervention actually allowed for habituation of intervention-specific change. Other possibilities are that the differences in the assignment to condition (Grim participants self-selected) or the nature of the

control condition procedures and activities used in the respective studies accounted for such differences.

The Grim study also had several limitations, particularly compared with the present study, which may have also affected their results. For example, the Grim study had relatively low statistical power with fewer than 23 participants in two of the control groups. The present study had 52 participants per condition. Moreover, the Grim study had relatively high attrition rates, in some conditions greater than 30% with no analysis of attrition patterns and no attempts to estimate the effect of missing post-test values. In contrast, the present study had 11% attrition and detailed analyses suggested that attrition and differential attrition were an unlikely cause of the observed patterns at post-test. Taken together, however, the two studies suggest that SCT based online interventions can impact SCT variables (Grim, 2003) and that such interventions can increase physical activity (the present study), however, neither study was able to establish that intervention-related changes in SCT variables mediate changes in PA.

Finally, Type II error is also a possibility in the present study. Simply, the present study, by design or by random error, may have failed to detect processes related to SCT change. This possibility is suggested by the fact that the SCT results for plans were consistent with theory and prior findings, however they were shown only by those low in ability to make plans at baseline.

4.3 ALTERNATIVE THEORETICAL APPROACHES AND EXPLANATIONS

An alternative way of thinking about this study is to ask, why did the intervention work at all; specifically, why did physical activity increase as expected, and potentially in the absence of significant change in SCT-related constructs? Here, there are also several possibilities including changes in beliefs not measured by the study, the perceived responsibility of students in a

classroom setting, and the degree of structure that the learning lessons aspect of the intervention provided.

As noted, other theories may be better at capturing important physical-activity-related beliefs than SCT, such as the Theory of Planned Behavior (TPB). For example, it is possible that the intervention activities had the intended effect on physical activity because they increased positive *attitudes* toward PA and/or increased *subjective norms* to perform physical activity. Unfortunately, these constructs are not part of SCT and were not measured in the present study.

Another possible reason that may explain the success of the intervention is the perceived responsibility of participants. Specifically, the intervention participants, being relatively achievement oriented college students, may have wanted to do well in the “class” and please the investigator (i.e., the “instructor”) by completing the various aspects the study. In other words, they saw the study as another class to be completed, and, as college students wanted to do well in the class.

A related argument is that the intervention format provided structure necessary for sustained physical activity. Specifically, because all the lessons and assignments required participating in physical activity, completing them meant they were more physically active. In contrast, these structured activities and lessons were not available to control participants, hence they had fewer assignments to complete and were less active.

Overall, this argument suggests that structure may be an important, and overlooked, mediator in physical activity intervention studies, including the present one. Specifically, one of the reasons that the intervention was successful at increasing days of physical activity among intervention participants may be due to the highly organized and structured lessons and assignments offered to participants in the intervention group. Throughout the lessons,

intervention participants were told exactly what they were supposed to do, and how and when they needed to complete their assignments. Participants in the control condition received no such structure, and hence may have been less active because of it.

These reasons are consistent with the investigator's personal experience teaching physical activity classes in the Department of Continuing Education. Many times students would repeatedly sign up for the same or similar activity courses mainly because it gave them the structure they needed to engage in regular physical activity. Many took a semester off from these classes only to return the following semester after learning they had difficulty motivating themselves to follow through with this on their own and outside the classroom situation.

However, these reasons do not detract from the success of this intervention because no matter what the reasons for the success were, the intervention helped participants to be more physically active. Indeed, one implication of these results may be that Universities (and other similar agencies) need to offer structured online PA classes if this is what it takes to make individuals become more physically active.

Consistent with this, anecdotal evidence suggests that many of the participants who completed the study were very satisfied and happy with what they received, particularly those in the intervention condition. Most of them signed up for the study with no previous knowledge on how to exercise or what possibilities they may have in regard to physical activity. Moreover, the lessons in this intervention were structured around general physical activities that did not require students to go to the gym or to be at a specific place where they could exercise. Even several participants in the control group came back with positive attitudes toward PA since they were able to use physical activity logs as the primary evidence of what they have done.

4.4 IMPLICATIONS FOR SCT ASSESSMENT AND ASSESSMENT OF CHANGE

The measures of SCT constructs, used in the present study as well as previous studies (Grim, 2003), may have implications for assessment of change in SCT constructs. Recall that the Grim Study found support for intervention-related changes in SCT constructs using them, whereas the present study found only limited support using them. Despite these findings, there are still reasons to believe that the assessment of SCT concepts in this area of research have been suboptimal. One specific criticism is the level of specificity of the SCT measures. Specifically, although internally consistent, the items used to measure self-efficacy and self-regulation (e.g., ability to make plans and set goals) often refer to more stable, trait-like aspects of the individual, rather than reflections of specific behaviors. For example, generic items such as “I plan my weekly exercise schedule” might be more sensitive to change if reworded to more directly reflect recent behaviors, such as, “During the past week, I made plans for my weekly exercise routine”. This idea is consistent with Ajzen’s (2001) argument that items that are more specific in terms of target, action, context, and time frame are likely to show greater sensitivity to change and manipulations, and have more predictive ability of specific behaviors.

Another reason why studies may show inconsistent results is that they assess related, but distinct outcomes. For example, even though all studies assess physical activity of some kind, they do so in very different ways, with some predicting days, others minutes, and some even using physiological measures. Use of different outcome variables, each with unique strengths and limitations, can result in different patterns of results.

4.5 GENERAL CONSISTENCY WITH PAST RESEARCH

As noted in the introduction and recently reviewed by Marcus et al. (2009), no less than 25 published studies have focused on internet-based physical activity interventions among adults

(Marcus et al., 2009) and many of these studies have considered physical activity in addition to other health behaviors (e.g., smoking, weight management, stress). Among these, less than 15 studies focused specifically on change in physical activity behaviors. Most of these 15 studies assessed short-term outcomes without post-treatment follow-up, used an internet-based intervention that also required face-to-face visits, and relied on self-reported data (e.g., days and minutes of physical activity). Overall, the results of these studies have been encouraging in terms of finding significant increases in physical activity over time. One disappointing aspect of these studies, however, is only a few have shown differences between intervention and control groups, suggesting little differential impact of the content of the intervention.

This study also focused on short-term outcomes (6 weeks), had a mix of Internet (primary) and face-to-face (secondary) contact, and relied on self-report data for the primary outcomes. In contrast to many of the previous efforts, however, the results of the present study showed strong, consistent effects showing participants in the intervention group to have greater increases in PA across the intervention period compared with those in control group who did not change. In this regard, the present study provides compelling support that a theoretically-based, highly structured internet-based PA intervention can produce significantly better results than a non-theory-based and less structured approach. As such, this study is consistent with Napolitano et al. (2003), McKay et al. (2001), and Rovniak et al. (2005) who also found strong support for theory-based interventions on physical activity outcomes.

4.6 LIMITATIONS AND RECOMMENDATIONS

Regardless of these advantages, there are still several limitations to the present study and this area of research in general. One issue for this area of research is the post-intervention follow up. Specifically, while interventions were of differing lengths of time (e.g., 1 to 6 months), most

studies did not follow up following the conclusion of the intervention period. As such we do not know whether or for how long changes in behavior promoted by the intervention last without continued intervention. It would be very useful to evaluate the behavioral changes following the conclusion of the intervention (e.g., 3 or 6 months post intervention) to see how well individuals maintained their increased levels of physical activity, or if or how quickly they returned to pre-intervention levels.

Another limitation in the present study, discussed above, was the limited time frame for observing changes in attitudes and beliefs due to the short length of time of the intervention. Specifically, the present study may not have been long or involved enough, or may not have spent sufficient time on each topic (e.g., one week per construct) to result in lasting changes in the self-related beliefs that make up SCT. As noted, SCT constructs are complex and may require more sufficient time than 6 weeks overall, or just one week per topic, for change to happen.

This is important because, whether individuals maintain behavior change, or return to previous levels of activity, might depend on whether changes in personal beliefs (e.g., self-efficacy, outcome expectancies) or program structure were the key reasons for the initial changes in behavior (Glanz et al., 2002). As noted in the introduction, theoretically-oriented researchers maintain that changes in beliefs are essential for maintenance of behavioral change. The structure argument, in contrast, suggests that without structure, it is difficult for individuals to maintain increased levels of physical activity.

As discussed above, although the present study produced changes in behavior, the study failed to show changes in attitudes and beliefs—at least those based in SCT. An alternative explanation offered was the structure of the program used in the present study that contributed to

the changes (e.g., the regular assignments). Although, we cannot conclude that attitudes and beliefs did not change in this study based on null findings, it would be interesting for future research to examine whether the observed behavior changes occurred primarily because of the well-structured programs offered to participants.

My own view favors the structure argument. Specifically, having completed the study, it is very hard to believe that the intervention could have produced the changes in attitudes, beliefs, and behavior in the short 6-weeks duration of the study. More likely, it was the structure of the learning lessons that produced the observed differences between groups. Regardless, these results are promising in term that structured programs can help people change their behaviors if available on a continuing basis. This reasoning begs the question of how can we promote ongoing structured activity in the student, or other, population. One way to promote structure may be for universities to offer consecutive non-credit, on-line courses for students interested in changing their behavior toward physical activity over the long-term. Students would enroll in these courses as many semesters as they wanted to throughout their time at a university. As such, they would experience the benefits of on-line physical activity intervention and satisfy their needs for learning more about physical activity, and become more physically active. Hopefully, after some period of time, self-perceptions would change and physical activity would become a regular daily routine, one that would no longer require the structure that the on-line courses had provided. Although this might take several semesters to develop the habit of PA, it would help them become regularly physically active for longer period of time, perhaps a lifetime.

Another limitation of this study was the implementation of the intervention. Although the intervention was controlled to a certain degree, it could not control for all aspects of behavior among those in the intervention group, such as whether or not these students actually read the

lessons and completed the assignments. In order to complete assignments, students had to go through the lesson first. However, the design of the study and unanticipated limitations of WebCT did not allow for determination of whether students actually read and properly completed each assignment. As such, the compliance of participants and the full impact of the intervention were impossible to assess.

Another issue relevant to on-line intervention research is how completely on-line an intervention can be. In other words, does it require any face-to-face interaction at all? Most studies, this one included, required some degree of personal interaction (e.g., meet with the investigator, sign the inform consent, get information on intervention). Some studies have suggested that interventions might be easier to implement if they could be completed completely from a remote site. First, more participants may be interested in the study since they will not be required to meet at certain sites, so it would save them time. Second, people who need the intervention the most may avoid any hassle or embarrassment from personally meeting with the instructor. This would also allow people who do not reside in the area to participate in the study. Finally, the confidentiality of on-line activities might also enhance the validity of self-reported level of physical activity because people may be more honest when reporting their current levels of PA when not having to face the instructor.

As described above, the assessment of SCT constructs is also a limitation, especially specificity of the SCT measures. Items that are more specific are likely to show greater sensitivity to change and manipulations, and have more predictive ability of specific behaviors.

The ordering of the SCT constructs in this study may have been another limitation. Even though this study followed the example set by Grim (2003) for the presentation order of SCT constructs, alternative ordering of lessons may have facilitated greater change in them.

More generally, another limitation of the present study is the reliance on self-report measures which is common in most studies in this area. The first question that comes to mind is how reliable and valid are these data. People think of physical activity in different ways, and, for some, being physically active means different things than for others. For example, some people consider house- or yard work to be physical activity whereas others may not. Also, some people may report being physically active when they are actually not in order to present themselves favorably or avoid embarrassment. In addition, since all outcome variables were assessed via self-report, participants may have figured out the aims of the study and tried to “help” the experimenter to find positive results. Alternatively, students in the control condition may have realized that they were control participants, and experienced resentful demoralization, resulting in decreased physical activity.

On the other hand, the limited personal interaction between students participating in the study and the presence of a theoretically consistent and expected interaction for the physical activity variables, argues against this possibility. However, measures that did not rely on participant self-report, such as reports by key informants (e.g., friends, roommates) or physiological measures (e.g., VO₂ max) would have been useful in this regard. There may be better ways to approach this issue and more objective measure of the level of physical activity (e.g., using pedometers, heart rate monitors).

Another limitation was the observed failure of random assignment and the presence of substantial pretest differences between groups on some measures. Specifically, the results indicated that despite random assignment to condition, students in the control condition were more active at baseline than were students in the intervention condition. Such sampling error may be due to the way PA was measured in the present study (i.e., asking about activity across

the last week vs. across the last month or longer), which may have facilitated the observation of random variation between groups. Several supplemental analyses (e.g., analyses of regression to the mean and ANCOVA's with baseline values as a covariate), however, showed that the pretest differences could not account for the observed pattern of results.

The final limitation for not observing changes in SCT constructs may be due to low power to detect such changes. Power for this study was based on detecting changes in physical activity and may have been insufficient in detecting changes in SCT constructs.

4.7 RECOMMENDATIONS FOR FUTURE RESEARCH

The limitations of this study point to directions for future studies. For example, one limitation described above was the lack of post-intervention follow up. As such, future studies might include longer-term follow-ups (e.g., 3 or 6 months post intervention), so that it can be determine if changes in physical activity could be sustained over a longer period of time after the end of the intervention. Another limitation described above was the limited time frame for observing changes. Here, future studies might include longer intervention period, so that it can be determined if changes in SCT variables might occur over the longer term. A third limitation described above related to which aspects of the intervention were most important in producing activity change (i.e., structure of the program or changes in beliefs and attitudes). To address this limitation, future studies might test the structure as a mediator, either through assessment or experimental design. Alternatively, future studies might assess additional mediators and examine constructs from alternative theories and models as mediators of behavior change, such as the concepts of attitude and subjective norm from Ajzen's (2001) Theory of Planned Behavior. A fourth limitation described above related to the implementation of the intervention. Future studies might develop procedures for greater monitoring of participation in activities. A

fifth limitation pointed the generality of the SCT measures used. Accordingly, future studies might use measures of SCT constructs that are less dispositional, more sensitive to recent, specific behaviors, or more sensitive to change in general, which would be helpful in assessing the utility of SCT to predict intervention-related changes. A final limitation related to the self-report nature of the measures and accompanying problems. In this regard, future studies might rely on a wider variety of data sources, more objective measures (e.g., using pedometers, heart rate monitors), rather than relying exclusively on self-reported questionnaires.

4.8 CONCLUSION

In conclusion, the present study found support for the notion that an on-line intervention could successfully increase days of moderate and vigorous physical activity across a 6-week intervention period, relative to a non-theory based control condition. The study failed to find strong support, however, that changes in SCT constructs such as self-efficacy or ability to make plans accounted for such changes.

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Appendix A
INSTRUMENTS

University of Texas at El Paso (UTEP) Institutional Review Board
Informed Consent Form for Research Involving Human Subjects

Protocol Title: The Evaluation of a Web-Based Physical Activity Intervention in a Predominantly Hispanic College Population

Principal Investigator: Dejan Magoc, MS

UTEP Ph.D. Program in Interdisciplinary Health Sciences

NOTE: In this consent form, “you” always means the study subject. If you are a legally authorized representative (such as a parent or guardian), please remember that “you” refers to the study subject.

Introduction

You are being asked to take part voluntarily in the research project described below. Please take your time making a decision and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

Why is this study being done?

You are invited to participate in a study under the direction of researcher Dejan Magoc, an IHS PhD student working under the supervision of Dr. Joe Tomaka to be conducted in the Health Promotion department at The University of Texas at El Paso.

The purpose of this study is to evaluate the efficacy of a web-based physical activity intervention to increase physical activity of UTEP students.

Approximately, 160 participants will be enrolling in this study at UTEP.

What is involved in the study?

If you agree to take part in this study, the research team will ask you to sign this informed consent document and complete a questionnaire that assesses your current level of physical activity and your beliefs about physical activity. You will also be assigned to one of two web-based study groups, both designed to help you start and/or increase your level of physical activity. The study will last for 6 consecutive weeks. During this time you will be exposed to specific material about physical activity. You will also be asked to complete several simple assignments and assessments.

The initial measurements of weight and height will be made at the primary advisor's research laboratory in the UTEP Union.

What are the risks and discomforts of the study?

Risks associated with study include those associated with starting or increasing physical activity. Such risks may include stiffness, pain, strains, and physical injury. If you follow the program

carefully, you should be able to avoid these risks. However, you should alert the research team and with your physician if you experience any unusual pain or symptoms.

There is not any known discomfort of the study, including lack of privacy.

What will happen if I am injured in this study?

The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Dejan Magoc, 915-261-2574 and to Lola Norton of the Institutional Review Board (IRB) at UTEP at (915-747-8841) or lola@utep.edu.

Are there benefits to taking part in this study?

After completing the study, all participants will receive a \$20 gift certificate. Potential benefits to you of participating in this study may also include increased knowledge about physical activity/exercise and risks for becoming sedentary and obese; increased strength, increased cardiovascular fitness, elevated mood, and other common benefits associated with regular physical activity.

In addition, this research may help us to understand factors that promote or deter physical activity among UTEP students and design more effective intervention programs.

What other options are there?

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

Who is paying for this study?

Funding for this study is provided by UTEP Department of Health Promotion.

What are my costs?

There are no direct costs. You will be responsible for travel to and from the research site and any other incidental expenses.

Will I be paid to participate in this study?

You will not be paid for taking part in this research study.

What if I want to withdraw, or am asked to withdraw from this study?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty.

If you choose to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

Who do I call if I have questions or problems?

You may ask any questions you have now. If you have questions later, you may call Dejan Magoc at 915-261-2574 (dmagoc@miners.utep.edu) or Joe Tomaka at 747-7237, (jtomaka@utep.edu).

If you have questions or concerns about your participation as a research subject, please contact Lola Norton of the Institutional Review Board (IRB) at UTEP at (915-747-8841) or by email at lola@utep.edu.

What about confidentiality?

Every effort will be made to keep your data confidential. Your responses will be identified only by a code number and never by your name. You may talk individually with any member of the research group if you so desire.

Mandatory reporting

If information is revealed about child abuse or neglect, or potentially dangerous future behavior to others, the law requires that this information be reported to the proper authorities.

Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: _____ Date: _____

Participant Signature: _____ Time: _____

Consent form explained/witnessed by: _____
Signature

Printed name: _____

Date: _____ Time: _____

PAR-Q AND YOU

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. 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: check YES or NO.

YES NO

- | | | |
|-----|-----|---|
| ___ | ___ | 1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor? |
| ___ | ___ | 2. Do you feel pain in your chest when you do physical activity? |
| ___ | ___ | 3. In the past month, have you had chest pain when you were not doing physical activity? |
| ___ | ___ | 4. Do you lose your balance because of dizziness or do you ever lose consciousness? |
| ___ | ___ | 5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity? |
| ___ | ___ | 6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition? |
| ___ | ___ | 7. Do you know of <u>any other reason</u> why you should not do physical activity? |

**Daily Physical Activity Log
Moderate Activity**

Daily physical activity logs are designed for you, so that you can keep track of all the physical activities you do in a week.

1. In the **DAY** column, mark a “0” for no physical activity, or “X” for each day you engaged in **MODERATE** physical activity.
2. In the **TOTAL MINUTES** column, write in the amount of time you did **MODERATE** physical activity that day.
3. In the **ACTIVITY** column, list the **MODERATE** physical activity you did (e.g. walking).
4. In the **PLANNED ACTIVITY** column, specify whether the activity is part of a regular, planned program. Mark "P" if activity was planned. Mark "U" if the activity was unplanned.

MODERATE ACTIVITY: is planned physical activity done to enhance health/fitness which,

1. is continuous for 30 minutes or more (can also be done in 10-min bouts)
2. mildly elevates heart rate
3. mildly elevates breathing rate
4. can hold a conversation while exercising

Examples:

low-impact exercise/strength classes
brisk walking, cycling less than 3 miles,
recreational team sports (volleyball, soccer, etc.)
calisthenics (sit-ups, push-ups. etc.)
golfing without cart, hiking, half-court basketball

DAY	Minutes	Activity	Planned Activity?
Sun	_____	_____	_____
Mon	_____	_____	_____
Tues	_____	_____	_____
Wed	_____	_____	_____
Thur	_____	_____	_____
Fri	_____	_____	_____
Sat	_____	_____	_____

Daily Physical Activity Log
Vigorous Activity

Daily physical activity logs are designed for you, so that you can keep track of all the physical activities you do in a week.

1. In the DAY column, mark a "0" for no physical activity, or "X" each day you engaged in VIGOROUS physical activity.
2. In the TOTAL MINUTES column, write in the amount of time you did VIGOROUS physical activity that day.
3. In the ACTIVITY column, list the VIGOROUS physical activity you did (e.g. running).
4. In the PLANNED ACTIVITY column, specify whether the activity is part of a regular, planned program. Mark "P" if activity was planned. Mark "U" if the activity was unplanned.

VIGOROUS ACTIVITY: is planned physical activity done to enhance health/fitness which,

1. is continuous for 20 minutes or more
2. elevates heart rate
3. breathing, rapidly, deeply
4. can NOT hold a conversation while exercising

Examples:

running or jogging
high-intensity aerobic classes
competitive full-field sports (soccer)
competitive full-court basketball
cycling (10 mph more than 3 miles)
swimming laps

DAY	Minutes	Activity	Planned Activity?
Sun	_____	_____	_____
Mon	_____	_____	_____
Tues	_____	_____	_____
Wed	_____	_____	_____
Thur	_____	_____	_____
Fri	_____	_____	_____
Sat	_____	_____	_____

PHYSICAL ACTIVITY BEHAVIOR QUESTIONNAIRE

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (IPAQ)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week**

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ **minutes per day**

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **minutes per day**

5. Stage of Change

To be considered physically active, you must get at least:

- 30 min of moderate physical activity on 5 or more days a week, OR
- 20 min of vigorous physical activity on 3 or more days a week, OR
- 150 min of moderate and vigorous physical activity combined each week

Given this, how physically active do you plan to be over the next 6 months? (Choose the best answer and check only one.)

I am not currently active and do not plan to become physically active in the next 6 months.

I am thinking about becoming more physically active.

I intend to become more physically active in the next 6 month.

I have been trying to get more physically active.

I am currently physically active and have been for the last 1-5 months.

I have been regularly physically active for the past 6 months or more.

SELF-EFFICACY FOR PHYSICAL ACTIVITY SURVEY

Whether you exercise or not, please rate how confident you are that you could really motivate yourself to do things like these consistently, for at least *six months*.

Please circle the number that reflects you the best.	I know I cannot	2	Maybe I can	3	4	I know I can	5
	1						
6. Stick to your exercise program after a long, tiring day at work	1	2	3	4	5		
7. Stick to your exercise program when your family is demanding more time from you.	1	2	3	4	5		
8. Stick to your exercise program when you have household chores to do.	1	2	3	4	5		
9. Stick to your exercise program even when you have excessive demands at work.	1	2	3	4	5		
10. Stick to your exercise program when social obligations are very time consuming.	1	2	3	4	5		

SELF REGULATION FOR PHYSICAL ACTIVITY

Exercise Goals

The following questions refer how you set exercise goals and plan exercise activities. Please indicate the extent to which each of the statements below describes you:

	Does not Describe	Describes Moderately		Describes Completely	
	1	2	3	4	5
11. I often set exercise goals.	1	2	3	4	5
12. I usually have more than one major exercise goal.	1	2	3	4	5
13. My exercise goals help to increase my motivation for doing exercise.	1	2	3	4	5
14. I usually keep track of my progress in meeting my goals.	1	2	3	4	5
15. I have developed a series of steps for reaching my exercise goals.	1	2	3	4	5

Exercise Plans

The following questions refer to how you fit exercise into your lifestyle. Please indicate the extent to which each of the statements below describes you:

	Does not Describe	Describes Moderately		Describes Completely	
	1	2	3	4	5
16. I never seem to have enough time to exercise.	1	2	3	4	5
17. I schedule all events in my life around my exercise routine.	1	2	3	4	5
18. I schedule my exercise at specific times each week.	1	2	3	4	5
19. I plan my weekly exercise schedule.	1	2	3	4	5
20. Everything is scheduled around my exercise routine.	1	2	3	4	5

OUTCOME EXPECTATIONS AND EXPECTANCIES

Please complete the phrase I exercise to... for each item. Please circle a number that represents how often (FREQUENCY) and the value (IMPORTANCE) for each item:

I exercise to:	FREQUENCY					IMPORTANCE		
	never	rarely	some time	often	very often	low value	med value	high value
21. Feel a positive psychological effect	1	2	3	4	5	1	2	3
22. Experience a sense of accomplishment	1	2	3	4	5	1	2	3
23. Enjoy the activity	1	2	3	4	5	1	2	3
24. Improve mental alertness	1	2	3	4	5	1	2	3
25. Have fun/enjoyment	1	2	3	4	5	1	2	3

SOCIAL SUPPORT FROM FAMILY & FRIENDS FOR PHYSICAL ACTIVITY

Please write one number from the following rating scale in each space

1 **2** **3** **4** **5**
none **rarely** **a few times** **often** **very often**

During the past 3 months, my family

(or members of my household) or friends

Family

Friends

26. offered to exercise with me

A_____

B_____

27. gave me helpful reminders to exercise
("Are you going to exercise tonight?")

A_____

B_____

28. gave me encouragement to stick with
my exercise program

A_____

B_____

29. changed their schedule so we could exercise
together

A_____

B_____

30. discussed exercise with me

A_____

B_____

Appendix B

LEARNING LESSONS

LESSON #1

SELF-REGULATION

The purpose of this lesson is to help you learn how to self-monitor and track your physical activity and heart rate.

During this lesson, you will be required to exercise as many days per week as possible. You will be required to write down your physical activity in your physical activity log each week, and submit your weekly log every week.

Why is it important?

- When trying to begin a long-term exercise program, it is important to know your baseline level of activity.
- To address the progressive overload principle, it is important to keep track of your physical activities, so that the program can be modified logically.
- Self-monitoring has been shown to help people become long-term exercisers.

Activity Log

The purpose of filling out an activity log is to keep track of your exercise. This is important for several reasons. First, you can keep track of your baseline exercise. By doing this, you can see what your current exercise level is. Second, after finding out what your current level is, you can develop an exercise program based on your goals (which will be set in the next lesson). Last, once you begin an exercise program, it is important to keep track of your progress.

Assignment #1

Go to the assignment icon on the course web page and download the activity log for week 1. In the log for this week, and every other week, you will find blanks that you will need to fill in. Note that two activity logs are provided for each week (one for moderate and one for vigorous physical activity). Read the instruction for both and decide which one you need to complete.

Submit your completed log for the week between Saturday at noon and Sunday at 11:00 pm. This is the only time you can submit your log.

Assignment #2

You will practice taking your pulse while sitting, walking, and jogging. Go to the assignment icon and download “Pulse activity”.

CHECKLIST FOR WEEK 1

1. Activity Log recordings, due between Saturday at noon and Sunday at 11 pm.
2. Pulse Activity worksheet, due anytime during the week, no later than 11 pm Sunday evening.

PULSE ACTIVITY

Taking Your Heart Rate

There are two places that you can locate quickly to take your pulse - your neck or your wrist. Using your pointer and middle finger (not your thumb), locate your pulse. Begin counting with zero, and have someone time you for six seconds. After six seconds, take your counts and add a zero to the end (6 seconds X 10 = 60 seconds, or 1 minute). For example, if you count 12 beats in six seconds, you would add a zero, making it 120. This is your heart rate in one minute. Take your heart rate during the three following activities. Record your heart rate in the space provided.

Sitting quietly

Sit quietly for 5 minutes. Record your heart rate (in one minute):

Walking

Walk for at least 10 minutes. Record your heart rate (in one minute):

Jogging/Running

Jog or run for at least 10 minutes. Record you heart rate (in one minute):

Target Heart Rate

It is also helpful to know what your target heart rate zone is, so that you can monitor whether you are working hard enough or are working too hard. Your target heart rate zone is between 60% and 90% of your maximum heart rate. Your maximum heart rate is 220 minus your age. You can see that this range will change as you get older. The following steps will help you calculate your target heart rate.

Step 1: Maximum Heart Rate

220 - Age = Maximum heart rate

220 - _____ = _____

Step 2: Low target heart rate

Maximum heart rate * .60 (60%) = Low target heart rate

_____ * .60 = _____

Step 3: High Target heart rate

Maximum heart rate * .90 (90%) = High target heart rate

_____ * .90 = _____

Target Heart Rate range: _____ to _____
low target heart rate high target heart rate

LESSON #2

GOAL SETTING AND PLANNING

The purpose of this lesson is to help you learn how to set behavioral goals (e.g. walk 3 times a week) rather than outcome goals (e.g. weight loss) and how to plan your physical activities.

Why is it important?

- By setting correct, clearly defined goals, you can observe and experience the achievement of those goals. Each goal attained is called a mastery experience.
- By having mastery experiences over time leads to the achievement of a long-term goal and greater feeling of control over the behavior over time. You can see forward progress in what might previously have seemed a long pointless grind.
- By setting goals, you will also raise your self-confidence, as you recognize your ability and competence in achieving the goals that you have set.
- The process of achieving goals and seeing this achievement gives you confidence that you will be able to achieve higher and more difficult goals.

What is a Goal-Setting?

Goal setting is a formal process for personal behavioral planning. By setting long-term goals, you decide what you want to achieve over the long run, and then systematically move towards the achievement of this long-term goal, through the manipulation of short-term goals.

The process of setting proximal goals and targets allows you to choose where you want to go in your development of health and fitness. By knowing precisely what you want to achieve, you know what you have to concentrate on to do it. You also start to identify things that inhibit your ability to reach these goals. Goal setting is used in behavior change programs to achieve desired behavioral goals. It gives you long-term vision and short-term motivation. During the lesson, you will be required to set exercise goals weekly. You will be required to submit weekly exercise goals online; you will submit these goals every Monday.

Goals are set on a number of different levels:

1. First you decide what you want to do with your life and what large-scale goals you want to achieve.
2. Break these down into the smaller and smaller targets that you must hit so that you reach your lifetime goals.
3. Finally, once you have your plan, you start working towards achieving it.

Creating Good Goals

You will be expected to develop and achieve goals weekly. This process requires that you understand the main parts of a goal, and how they are written.

First thing is to set a long-term goal. The long-term goal will be: ***You will increase your physical activity to as many days as is possible in a week.***

In order to achieve this you will need to develop short- term weekly goals, as well. Meeting all of your short-term goals should help you achieve the long-term goal.

There are 4 components to writing a goal:

1. Who? - Who will be acting upon the goal?
2. What? - What will you be doing?
3. How Much? - How much of it will you be doing?
4. By When? - What is the time limit for the goal?

Look at the goal that is provided above, does it contain the 4 components?

Physical activity goals must be specific. Here are some guidelines to help you in creating your goals:

1. A goal must be observable. You cannot set a goal to feel better next week, since that is not observable. Because we are speaking of behaviors you must have an observable behavior you are targeting. In our case this is easy as we are talking about physical activity.
2. A goal must be quantified, thus the how much. Do we do the behavior for an hour every day or just twice a week for 10 minutes? In either case the quantity has to be specified otherwise we can never know if we achieved the goal.
3. Goals need to be realistic as well. *You need to make sure you do not start with a goal of running 6 miles if you have never run before.* Goals should be challenging yet reachable.

Assignment #1

Go to the Goal-Setting icon on the course web page and download the “Goal-Setting Exercise” for week 2. Create and submit a goal related to your physical activity. A different goal will be submitted each week.

Goal-Setting Exercise

The purpose of creating an exercise goal is to set a goal and see if you can attain that goal. This is important for two reasons. First, you can evaluate your success or failure at meeting the goal. Second, you can identify things that are preventing you from achieving your goal. When establishing goals for your workouts it is important to keep track of your progress and adjust the goals accordingly.

Success on the goal-setting exercise will depend on your ability to create a goal that meets the following criteria:

1. Who? Who will be acting upon the goal?
2. What? What will you be doing?
3. How Much? How much of it will you be doing?
4. By When? What is the proximal time horizon for the goal?

As well as following the guidelines of:

1. A goal must be an observable behavior, you must see it.
2. A goal must be quantified, thus the how much.
3. Goals need to be realistic as well

CHECKLIST FOR WEEK 2

1. Submit goal to website by noon Monday.
2. Activity Log due sometime between noon on Saturday and 11 pm on Sunday.

LESSON #3

TAILORING

The purpose of this lesson is to help you think about exercise as pleasant activity.

Why is it important?

- There are many types of activities that you may not have tried that you may find that you enjoy.
- There may be a specific intensity that you feel more comfortable exercising at when beginning your program.
- If you enjoy the type and intensity of exercise, then you are more likely to continue to exercise.

New Activities

Some people do not exercise because they have not found any activities that they like. Trying new activities not only allows you to experiment with new types of activities, but it also gives you more options for your fitness plan to help alleviate boredom.

Assignment #1

Each time you exercise this week, try a new type of activity. Example activities that you may not have tried are: aerobic classes, such as pilates, kickboxing, funk; playing a pick-up game of basketball, hiking, etc. Try at least three new activities this week.

Download and complete the “New Activities” worksheet from the assignment icon. In addition, you will also record your new activities for the week on the activity log for this week (week 3). Submit your activity log for week 3 between Saturday at noon and Sunday at 11:00 pm.

Assignment #2

You have probably tried several different types of physical activities, and formed an opinion about them. What you have to remember is that physical activity does not have to be really hard or very boring.

Download the “Exercise Preferences” worksheet from the assignment icon. Read the directions on the worksheet and fill in your answers. Submit the assignment no later than Sunday at 11:00 pm.

Comfort Zones

Assignment #3

Many people do not exercise because they think that it is too hard. Others begin exercising at too high of an intensity, and quickly dropout.

There may be a specific intensity that you find to be more enjoyable, or comfortable, exercising at when you begin your exercise program. This is called your “comfort zone”. Your comfort zone is an intensity that you find challenging, yet still enjoyable. In other words, you would be able to continue at this intensity for at least 20 minutes. As your fitness level increases, you will find that your beginning comfort zone will become too easy. You will have to continually re-examine your comfort zone so that you can get both optimal fitness gains and optimal enjoyment.

For your exercise sessions this week, you will do one day of walking or jogging. Your assignment is to complete three different intensities of either activity. For example: Walk slowly, walk at a medium pace, walk at a fast pace, or jog slowly, jog at a medium pace, or run quickly. You will exercise at each intensity for at least 10 minutes. Record your heart rate and how you felt during each intensity of each activity. Use the ‘comfort zone’ form provided in the “assignments” folder on the website. Turn this in no later than Sunday at 11:00 pm.

WEEK 3 CHECKLIST

1. Turn in your activity log for week 3, where you record your new activities for the week, between noon on Saturday and 11:00 pm on Sunday.
2. Complete the exercise preferences worksheet, and submit it to the assignment icon no later than 11:00 pm on Sunday.
3. Complete the “comfort zone” worksheet, and submit it to the assignment icon no later than 11:00 pm on Sunday.

New Activities

Activity #1

Name of activity:

Intensity attempted:

Did you enjoy the activity? Why or why not?

Will this activity help you to become a regular exerciser? Why or why not?

Activity #2

Name of activity:

Intensity attempted:

Did you enjoy the activity? Why or why not?

Will this activity help you to become a regular exerciser? Why or why not?

Activity #3

Name of activity:

Intensity attempted:

Did you enjoy the activity? Why or why not?

Will this activity help you to become a regular exerciser? Why or why not?

Exercise Preferences

Listed below are questions designed to help you identify your exercise preferences. Your preferences should make exercise more enjoyable. Please place a “check mark” next to each statement that applies to you.

1. I prefer to exercise:

Alone

With 1 partner

In a small group (less than 6 people)

Large group (6 or more people)

2. If I had to select ONE preference that I enjoyed the most when I exercised, it would be to:

Listen to music

Watch television

Talk to exercise partner

“zone-out”, meditate, relax my mind

Focus on how exercise feels

Other (list)

3. Which do you prefer - planned exercise (ex. Run 5 miles on Monday, Wednesday, Friday at 7:00) or spontaneous exercise (whenever you feel like it)?

Planned exercise

Spontaneous exercise

4. When I exercise, I prefer:

Resistance training (lifting weights)

Endurance training

Active sports or games (basketball, soccer)

5. When I exercise, I prefer:

Mild pace (breathing just a bit above resting)

Moderate pace (breathing rapidly, cannot maintain a conversation)

Hard pace (breathing rapidly, cannot maintain a conversation)

Very hard pace (all out, as fast as you can)

6. When I do aerobic exercise, I prefer:

Stationary equipment (treadmill, cycle, etc)

Active sports

Walking/running

Aerobic class with leader (aerobic dance, step, tae-bo, etc)

7. When I exercise, I prefer:

Competition with others

Noncompetitive activities

8. How can you use your exercise preferences to help you become a regular exerciser?

Comfort Zone Worksheet

In this activity, you will complete three different intensities of an activity, each **for at least 10 minutes**. You may walk, jog, or bike. When you choose the three intensities, think of going first at a slow pace, then a medium pace, then finally, a fast pace. It is important to understand that each pace is what you feel is slow, medium, and fast, not what you think everyone else thinks is a slow, medium and fast pace. In other words, I may find that I jog at a pace that I feel is fast, but someone who has been running for years may find to be slow or medium. Type the information below.

Activity you chose:

INTENSITY #1: SLOW PACE

What was your heart rate?

How did you feel during the 10 minutes that you attempted this intensity? (Was it easy or hard, did you feel tired, energized, etc)

How did you feel immediately after the exercise? (tired, energized, etc)

Do you think that you could continue at this pace for at least 30 minutes?

INTENSITY #2: MEDIUM PACE

What was your heart rate?

How did you feel during the 10 minutes that you attempted this intensity? (Was it easy or hard, did you feel tired, energized, etc)

How did you feel immediately after the exercise? (tired, energized, etc)

Do you think that you could continue at this pace for at least 30 minutes?

INTENSITY #3: FAST PACE

What was your heart rate?

How did you feel during the 10 minutes that you attempted this intensity? (Was it easy or hard, did you feel tired, energized, etc)

How did you feel immediately after the exercise? (tired, energized, etc)

Do you think that you could continue at this pace for at least 30 minutes?

Review your answers to the questions above.

1. During which intensities were you in your target heart rate zone?
2. Which intensity did you feel most comfortable in?
3. After which intensity did you feel most comfortable?
4. Which intensity(s) do you think that you could do for at least 30 minutes?
5. What is your preferred intensity?

THIS IS YOUR COMFORT ZONE!

You will have to reassess your comfort zone when you begin to see improvements in fitness. You may find that the slow pace is your preferred pace at the beginning, but that it has become too easy. If you keep reassessing your comfort zones, you are less likely to overexert yourself. One reason people stop exercising is because they begin at too difficult of a pace, and exercise is no longer enjoyable. Your comfort zone intensity should be enjoyable.

LESSON #4

SELF-EFFICACY

Self-efficacy is the level of confidence you have in your ability to participate and adhere to regular exercise.

The purpose of this lesson is to help you think about barriers that prevent you from exercising on a regular basis and ways to overcome barriers.

You have been participating in regular exercise and learning various behavior change techniques. These behavior change techniques, if practiced diligently and correctly, will help you adhere to a regular physical activity program after the end of the intervention and throughout life. Self-efficacy is a characteristic that has been shown to be associated with increased adherence exercise rates.

Why is it important?

- People with high levels of self-efficacy for exercise are more likely to be regularly active
- Self-efficacy is task specific. For example, you may have high self-efficacy for playing basketball, but low self-efficacy for participating in a regular exercise program.
- Increasing your self-efficacy for exercise will increase your likelihood for adhering to your exercise program
- High levels self-efficacy is associated with your ability to identify and overcome barriers for exercise.
- Increasing self-efficacy for exercise can be done by:
 - Repetition of successfully performing a specific task (mastery experiences)
 - Increasing exercise by incremental steps (goal setting)

Identifying and Overcoming Barriers

Many things in life make participation in a regular exercise program difficult. Barriers are those things that may make it hard to exercise regularly. Some examples of barriers are: I couldn't get a ride to practice, it is too expensive, or I had too much schoolwork to do.

There are many barriers that people have to overcome when exercising. These barriers can be associated with school or other requirements, some social factors, etc. Overcoming barriers will help you adhere to your physical activity program. Identifying barriers to exercise is the first step in maintaining a regular exercise program.

Once you have identified barriers to exercise, the next step is to set strategy for overcoming them. Think of things that you have done in the past to help you with activity. Also, think of things that you could currently do to help with increasing adherence to physical activity.

Assignment #1

Go to the assignment icon on the course homepage and download and complete the “Identifying and Overcoming Barriers” worksheet. In addition, complete the activity log for week 4.

WEEK 4 CHECKLIST

1. Complete “Identifying and Overcoming Barriers” worksheet by 11 pm on Sunday.
2. Submit Activity Log between noon on Saturday and 11pm on Sunday. This is the only time you can submit your activity log for the week.

Identifying and Overcoming Barriers

Many factors influence whether or not you are active. Barriers to exercise are one of these factors. A barrier is anything that hinders your ability to perform exercise on a regular basis. For example, *I couldn't get a ride to practice, it was raining outside, my gym membership was too expensive to renew, or my schoolwork is too time consuming.*

This assignment is designed to help you determine what your primary barriers are to regular exercise and ways to overcome them.

IDENTIFYING BARRIERS

- 1) Recall your exercise patterns from last week. Think about the barriers that you came across.
 - **Did you run out of time?**
 - **Was the weather bad and you like to exercise outside?**
 - **Did you have other obligations that were more important?**
- 2) How did they affect your activity?
 - **Did you not exercise?**
 - **Did you modify your schedule to include exercise?**
 - **Did you do nothing and skip your exercise session?**

Fill out the table below

Barriers	How did you modify your exercise?
1)	
2)	
3)	
4)	
5)	

LESSON #5

SOCIAL SUPPORT

The purpose of this lesson is to help you identify different types of social support for physical activity (e.g. friends and family) available to you.

Why is it important?

- having a support system helps you adhere to a long-term exercise program
- having an exercise buddy helps motivate you to exercise, and can help alleviate boredom while you exercise

Support for exercise can come in many forms. Some examples are: encouragement, help in making time for you to exercise, exercising with you, providing information, advice, suggestions, or feedback.

This week, you will try to attain different types of support.

1. Find information that can help you with your fitness program
2. Talk to a friend or family member about your exercise program, and how you are progressing.
3. Ask a friend or family member to help you make time to exercise, to encourage you to exercise, and/or to exercise with you.

Assignment #1

Download the “Social Support” worksheet from the assignment icon. Complete and submit it no later than 11:00 pm on Sunday.

WEEK 5 CHECKLIST

1. Submit your social support worksheet no later than 11:00 pm Sunday evening.
2. Submit your activity log for week 5 between Saturday at noon and Sunday at 11:00 pm.

Social Support Worksheet

➤ Informational Support

1. Find information from an instructor, a family member, or friend that will help you with your exercise program. List the type of information that you found, and list who you got the information from.

Information

Person (or people) who supplied the information

➤ Direct Support

2. Ask a family member or friend to help you make time to exercise, or to give you encouragement while you continue your exercise program. List the person who helped or encouraged you, and what they did to support your exercise program.

Person

What they did

3. Ask a family member or friend to exercise with you on a regular basis. List who agreed to exercise with you, how often they will exercise with you, and what types of exercises you will do.

Person

How often they will exercise with you

Types of exercises

➤ Evaluation of Support

1. Which type of support did you find most useful?
2. Which type of support did you not find useful?
3. Were you able to attain all of the above types of support? Explain.
4. How can you use your preferred method of social support to help you reach your behavioral goal?

LESSON #6

REINFORCEMENT

Reinforcements are outcomes that occur after participating in a specific behavior.

The purpose of this lesson is to help you with motivation to exercise using different types of rewards.

Reinforcements are the things that occur immediately after exercise, such as a feeling of accomplishment or a rush of energy. Reinforcements can be either positive or negative. Positive reinforcements give you something positive after completing your exercise. They are called rewards. An example of a reward would be a receiving a positive comment (Nice job!!) after a hard workout. Negative reinforcements remove something negative after completing exercise. Negative reinforcements increase the likelihood of participating in physical activity by removing something negative, such as losing weight.

Why is it important?

- Reinforcements are an important part of self-regulating behavior. By receiving reinforcements for exercise you increase the likelihood for repeating the activity.
 - > If you feel a sense of accomplishment after every time you exercise, you are more likely to continue to exercise regularly.
- Using reinforcements especially rewards, while setting goals for exercise will help you stay motivated for completing exercise goals.
 - > You can reward yourself with a CD after successfully completing your exercise goals for the month.
- Reinforcements should be strategically planned to help reach your exercise goals.
 - > Rewarding yourself with a hamburger after every exercise session will not produce the same results as rewarding yourself with something meaningful after successfully completing your goals for a month.

Using Reinforcements

Using reinforcements for exercise is a very helpful tool, especially when setting goals. Remember, reinforcements can be both positive and negative. They can also be internal or external. Internal reinforcements are your perceptions of the value of the reinforcement. For example, if the sense of accomplishment you feel after completing an exercise session is a valuable feeling for you. An external reinforcement is reinforcement with a particular value, such as buy a new shirt if you achieve your exercise goals.

The first step in using reinforcements is choosing and identifying them appropriately. Reinforcements should provide you with the incentive to participate in physical activity again. When choosing or identifying reinforcements be careful of the **over-justification effect**. This is any external constraint that is imposed on a behavior that may reverse the level of internal motivation for exercise. For example, a person who usually enjoys jogging decides to participate in a study that pays \$10 for each time they run. The monetary reward can possibly make jogging less rewarding intrinsically.

Assignment #1

Go to the assignment icon on the course homepage. Download the Identifying Reinforcement Worksheet.

CHECKLIST FOR REINFORCEMENT LESSON

1. Submit the Identifying Reinforcement worksheet to the assignment icon.
2. Submit Activity Log for week 6 between noon on Saturday and 11pm on Sunday.

Identifying Reinforcement Worksheet

Reinforcements for exercise are the things that happen to you after exercise, such as a feeling of accomplishment or a rush of energy.

- Positive reinforcements give you something positive after completing your exercise. They are called rewards.
 - A reward would be a receiving a positive comment (Nice job!!) after a hard workout.
- Negative reinforcements remove something negative after completing exercise.
 - A negative reinforcement could be losing weight after participating in a long-term exercise program.

Reinforcements can also be internal or external.

- Internal reinforcements are your perceptions of the value of the reinforcement.
 - The sense of accomplishment you feel after completing an exercise session is a valuable feeling for you.
- An external reinforcement is reinforcement with a particular value.
 - Buy a new shirt if you achieve your exercise goals.

Fill in your exercise goal for the week

Identify reinforcement for successfully completing your goal.

Is the reinforcement positive or negative?

Is the reinforcement internal or external?

Evaluate your reinforcements

Do you think that reinforcements that you have chosen will help keep you motivated to continue in your exercise program? Why?

Which type of reinforcements do you think will help you maintain your exercise goals, internal or external? Why?

Rewrite your exercise goal for the week using the type of reinforcement that will most benefit adherence to your exercise program.

LESSON #7

OUTCOME EXPECTATIONS AND EXPECTANCIES

The purpose of this lesson is to help you define reasons for exercise, which may help you stay longer with your exercise routine.

There are many reasons to exercise and not everyone who exercises does it for the same reasons.

Why Is it important?

- By knowing and exploring the many reasons to exercise you can find the mode of exercise that works best for increasing your enjoyment of exercise.
- By choosing the reasons that you find most important you can increase your adherence to your exercise program.
- Exploring the 7 reasons to exercise will give you a feeling for what is enjoyable or not in regard to your exercise program.

Part of maintaining exercise is determining the reasons you exercise or enjoy exercising. This help you select activities and set goals that meet your likes and dislikes. This should increase your adherence to your exercise program. Those who adhere to exercise for years typically know exactly why they enjoy exercise and the types of exercise that are the most enjoyable to them. In general, there are 7 categories of reasons to exercise.

The seven reasons people exercise include:

1. Social Support - An opportunity to get together with existing friends and exercise with them, making exercise a social experience.
2. Social Growth - An opportunity to meet new friends through exercise; many people meet new friends at the gym or on club teams.
3. Thrills - An opportunity to lose control of your body, or have an exciting experience. An example of this is people who like extreme sports, such as snowboarding, skateboarding, etc.
4. Fitness - An opportunity to improve in your fitness level. This can include increases in aerobic capacity, muscular strength, flexibility etc.
5. Competition - An opportunity to beat another person in a sporting competition.
6. Relaxation - An opportunity to escape from daily pressures or daily stresses.
7. Beautiful Movement - An opportunity to experience movement in order to create emotion or communicate feelings. An example would be dancing.

Remember, we all have our own interests and goals for exercise. The key is to find out why you may want to engage in exercise and then focus on those one or two reasons that suit you best.

Assignment #1

1. Download and fill out “Reasons to Exercise” worksheet. This week you need to focus on these seven reasons for exercise while you complete your exercise goals. On Friday, you need to go back to the reasons to exercise rating sheet and reevaluate your reasons for exercise.
2. You should keep the primary reasons you exercise in mind when creating your exercise goals in the future.

Reasons to Exercise

There are many reasons why exercise can be fun. The key here is to determine what reasons you find most appealing. Please rank the reasons to exercise according to your preference. Place a 1 next to the most important reason to exercise. Then place a 2 next to the next most important. Continue until you have ranked all 7.

- _____ Social Support - An opportunity to get together with existing friends and exercise with them, making exercise a social experience.
- _____ Social Growth - An opportunity to meet new friends through exercise; many people meet new friends at the gym or on club teams.
- _____ Thrills - An opportunity to lose control of your body, or have an exciting experience. People who like extreme sports like extreme snowboarding.
- _____ Fitness - An opportunity to improve in your physical capability. This can include increases in aerobic capacity, muscular strength, flexibility etc.
- _____ Competition - An opportunity to beat another person in a sporting competition.
- _____ Relaxation- An opportunity to escape from daily pressures or daily stresses.
- _____ Beautiful Movement- An opportunity to experience movement in order to create emotion or communicate feelings. An example would be dancing.

Appendix C

THE CONTROL GROUP – LEARNING TIPS

WEEK 1

Physical Activity

What Is It?

- Physical activity does not need to be strenuous to achieve health benefits.
- Men and women of all ages benefit from a moderate amount of daily physical activity (for example: 30 minutes of brisk walking or 15 minutes of jogging).
- Previously sedentary people who begin physical activity programs should start with short sessions (5-10 minutes) and build up to the desired level of physical activity.

Why Is It So Important?

- Physical activity improves quality of life.
- Physical activity extends longevity, protects against the development of CHD, stroke, hypertension, obesity, non-insulin-dependent diabetes mellitus, osteoporosis, colon cancer, and depression.
- Physical activity helps maintain full functioning and independence among the elderly.
- Relationships between physical activity and improved health include:
 - A reduced oxygen demand at any given level of physical activity.
 - A reduced tendency for blood to form clots where arteries have narrowed.
 - An increased elasticity in the arteries.
 - Changes in the brain and brain chemistry that may improve mood and cognitive functioning.

Just the Facts, Jack!!

- More than 60% of US adults do not engage in the recommended amount of activity.
- Approximately 25% of US adults are not active at all.
- A 1993 study concerning causes of death in the US: #1 Tobacco, #2 Lack of exercise/poor diet, #3 Alcohol.
- Chronic disease costs the US \$655 Billion in healthcare costs.

General Guidelines

- Control your health status through a medical checkup before beginning a program.
- Progress slowly in the exercise program.
- Choose primarily activities which engage as large a muscle mass as possible, e.g.: jogging, cycling, swimming, cross-country skiing, etc.
- Remember, it is not necessary to be exhausted to achieve improvement in physical fitness.
- The training should be accomplished continuously and intermittently.
- The improvement in physical fitness will depend on your initial fitness level.
- It is never too late to start exercising regularly.

WEEK 2

Incorporating Physical Activity into Your Life

Now that you have been convinced of how important physical activity is to your health and well being, the next step is incorporating it into your life. Lucky for all of us, becoming more physically active is a **cinch**! It's just a matter of incorporating some simple steps into your life. In fact, you probably already are "physically active" and do not even know it.

If you don't like to EXERCISE, don't worry. Exercise is just one aspect of physical activity. The following are some tips to help you get started:

- Tip 1: Make a list of the reasons why you would like to incorporate physical activity into your life. Be sure to include health problems that might be improved by physical activity. If you need help, check out the [benefits](#) listed in our page or the [Surgeon General's Report on Physical Activity](#).
- Tip 2: Make a list of any reasons that keep you from participating in physical activity and think of ways to overcome them.
- Tip 3: If you feel that there is **ANY** health reason why you should not participate in physical activity, check with your doctor before beginning a program.
- Tip 4: See if a friend would like to join you in your quest to become more active. Things are a lot easier and a lot more fun when a friend is involved too!
- Tip 5: Call your local Parks and Recreation Department, YMCA, or community organization to find out if they offer any programs or classes that may interest you. Many community centers and local colleges offer an array of dance classes, exercise classes (yoga, aerobics), cycling clubs, tennis lessons, swimming lessons, basketball, etc.
- Tip 6: Locate parks, and walking trails in your area. Local malls sometimes have walking clubs as well. It is a good place to go when the weather is bad.
- Tip 7: Keep an activity journal. In it, list all of the activities you have done each day and how long you did them. A journal will help you track your progress, help you set goals and identify the activities that you like best.

WEEK 3

Need Help Figuring Out What Qualifies as Physical Activity? Check Out These Suggestions...

There are numerous activities that can be worked into your day that do not involve going to the gym, or an aerobics class. Some alternative ideas are listed below:

- [Walk!](#) Do it with a friend, find a local trail, go to the mall and walk around awhile before you shop. Park as far away from your destination as possible and walk. If you live in town, walk to do your errands. Take a walk during your lunch break. Walk your dog. It is easy!
- Take the stairs. Use the stairs whenever you can. Avoid elevators and escalators. If you work on the 35th floor, do not panic. Take the elevator to the 30th floor and walk the last five flights.
- Take up a sport. Call your local parks and recreation department and find out about local softball, basketball, and touch football leagues, racket sports, soccer, etc.
- [Jump Rope](#). It is cheap, it is easy, and you can do it anywhere (even in a hotel).
- Play Games. Play with your kids. Try these activities...They are fun for the whole family.
 - [In-Line Skate](#)
 - [Swim](#).
 - [Ride your bike](#)
- Dance! Learn to dance. Take tap, ballet, belly dancing, jazz, etc. Social dancing is popular again. Take advantage of classes being offered in your community and have a great time while you are at it.
- Get outside! Try some of these outdoor activities...
 - Garden! Many people do not realize it, but gardening is tough work. Get outside and play in the dirt. Get rid of that riding mower and mow the lawn with a hand mower. It is great exercise.
 - Go hiking.
 - Go canoeing, kayaking, sailing, snorkeling or surfing.
 - Try Horseback riding.
 - Wash and wax your car.
- Clean your house. Vacuuming, mopping, and dusting can be quite a work out.
- Do simple [stretching](#) and calisthenics exercises at your desk.

WEEK 4

Calories Expended During Certain Activities

ACTIVITY	<i>Calories expended in 30 minutes Male (175 lbs)</i>	<i>Calories expended in 30 minutes Female (135 lbs)</i>
Biking 12-13.9 mph (moderate effort)	334	258
Circuit Training	334	258
Stretching, hatha yoga	167	129
Dancing - general	188	145
Dancing - ballet, modern	251	193
House Cleaning - vigorous (mop, wash car)	188	145
House Cleaning - light (dusting, vacuuming)	104	81
Playing w/ kids moderate - walk/run	167	129
Gardening	209	161
Mowing lawn - Hand mower	251	193
Running - 6 mph	418	322
Jogging	292	225
Basketball - Game	334	258
Children's Games	209	161
Football	334	258
Frisbee	125	97
Horseback Riding	167	129
Skating	292	225
Soccer	292	225
Softball/Baseball	209	161
Tennis	292	225
Hiking	251	193
Walking - 4 mph, level surface	167	129
Walking - leisure	146	113
Canoeing/Rowing - moderate	292	225
Kayaking	209	161
Swimming laps freestyle - moderate	334	258

WEEK 5

Physical Activity Pyramid



WEEK 6

Physical Activity Progression

An increase in physical activity is an important part of your weight management program. Most weight loss occurs because of decreased caloric intake. Sustained physical activity is most helpful in the prevention of weight regain. In addition, exercise has a benefit of reducing risks of cardiovascular disease and diabetes, beyond that produced by weight reduction alone. Starts exercising slowly and gradually increase the intensity. Trying too hard at first can lead to injury.

Your exercise can be done all at one time, or intermittently over the day. Initial activities may be walking or swimming at a slow pace. You can start out by walking 30 minutes for three days a week and can build to 45 minutes of more intense walking, at least five days a week. With this regimen, you can burn 100 to 200 calories more per day. All adults should set a long-term goal to accumulate at least 30 minutes or more of moderate-intensity physical activity on most, and preferably all, days of the week. This regimen can be adapted to other forms of physical activity, but walking is particularly attractive because of its safety and accessibility. Also, try to increase "every day" activity such as taking the stairs instead of the elevator. Reducing sedentary time is a good strategy to increase activity by undertaking frequent, less strenuous activities. With time, you may be able to engage in more strenuous activities. Competitive sports, such as tennis and volleyball, can provide an enjoyable form of exercise for many, but care must be taken to avoid injury.

Activity Progression

For the beginner, activity level can begin at very light and would include an increase in standing activities, special chores like room painting, pushing a wheelchair, yard work, ironing, cooking, and playing a musical instrument.

The next level would be light activity such as slow walking of 24 min/mile, garage work, carpentry, house cleaning, childcare, golf, sailing, and recreational table tennis.

The next level would be moderate activity such as walking 15 minute/mile, weeding and hoeing a garden, carrying a load, cycling, skiing, tennis, and dancing.

High activity would include walking 10 minute/mile or walking with load uphill, tree felling, heavy manual digging, basketball, climbing, or soccer/kick ball.

You may also want to try:

- flexibility exercise to attain full range of joint motion
- strength or resistance exercise
- aerobic conditioning

Vita

Dejan Magoč was born in Novi Sad, Serbia where he attended the undergraduate studies. He received his Bachelor degree in 1999 majoring in Physical Education with minor in Coaching from the University of Physical Education. After spending a year in the military, Dejan came to the USA in December 2000 and enrolled in the graduate program at the University of Texas at El Paso (UTEP) in spring 2002. He received his Master of Science degree in 2004 majoring in Kinesiology. During his graduate studies, Dejan worked as a teaching assistant. Upon graduation, Dejan worked as a kinesiology instructor, teaching variety of analysis courses mainly designed for students who are to become physical education teachers.

Dejan entered the Ph.D. Program in Interdisciplinary Health Sciences at UTEP in fall 2005 and successfully defended his dissertation on October 2, 2009. While working on his doctorate degree, his interest extended to the area of health promotion, in particular health behavior change theories. He worked as a research assistant and, in the last year, as a lecturer in the Departments of Kinesiology and Health Promotion. He is currently a lecturer, teaching several courses for the Department of Kinesiology and the University College.

Dejan Magoc actively participated in research activities in several areas. His main interest of research includes physical activity interventions from the prospective of behavior change theories. He attended several conferences and annual meetings, such as the American Public Health Association annual meeting and the Society of Behavioral Medicine annual meeting and scientific sessions, where he presented his work.

Dejan Magoc has been the recipient of numerous awards such as Dodson Fellowship Award for doctoral students at the University of Texas at El Paso and the Academic Scholarship. He was also a recipient of several Travel Conference Awards.

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This dissertation was typed by Dejan Magoč.