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This study examined the relationships between perceived physical competence, social anxiety, and the participation in leisure time physical activity among college students. Data was collected using pen and paper questionnaires that were distributed to a sample of students from the University of North Carolina at Greensboro during the Spring 2014 semester. The questionnaire included assessments of leisure time physical activity levels as well as scales that measured perceived physical competence and social anxiety. Relationships between these variables were analyzed broadly as well as across gender and BMI levels. The results suggested that higher levels of perceived physical competence were generally associated with higher levels of leisure time physical activity, and that higher levels of social anxiety were generally associated with lower levels of leisure time physical activity. On average, males indicated participating in more leisure time physical activity than females. Additionally, males exhibited higher levels of perceived physical competence and lower levels of social anxiety than females. Future research and implications for practitioners was proposed and discussed.

ASSESSING PHYSICAL ACTVITY LEVELS AMONG COLLEGE STUDENTS: THE RELATIONSHIPS BETWEEN PERCEIVED PHYSICAL COMPETENCE, SOCIAL ANXIETY, AND THE PARTICIPATION IN LEISURE TIME PHYSICAL ACTIVITY

by

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

Many adverse health conditions have been shown to be correlated to a lack of physical activity (U.S. Department of Health and Human Services, 2008; Warburton, Nicol, & Bredin, 2006). The prevalence of some of these conditions, such as coronary heart disease and high blood cholesterol, appear to be on the decline (National Center for Health Statistics, 2011). However, other conditions may be taking their place. Obesity levels are at all-time highs across demographics (Ogden, Carroll, Kit, & Flegal, 2012), and the prevalence of diabetes and high blood pressure is increasing (National Center for Health Statistics, 2011). In a study that examined the top behavior-related causes of death in the United States (U.S.), physical inactivity and several risk factors related to it (high blood pressure, overweight-obesity, high blood glucose, and high LDL cholesterol) ranked as numbers two through six (Danaei et al., 2009). The same study estimated that in 2005, physical inactivity and obesity alone accounted for 10 percent of the total deaths in the U.S. The financial burden of these two factors is also great. In 2003, the national costs of physical activity and excess weight combined were estimated to be over $507 billion (Chenoweth & Leutzinger, 2006).

These findings are peculiar considering a thorough body of research suggesting that regular participation in physical activity can help to protect against many of the aforementioned health conditions (U.S. Department of Health and Human Services,

1996). Physical health benefits of physical activity include, but are not limited to: lower mortality rates, decreased risk of overweight-obesity, decreased risk of coronary artery disease, and decreased risk of type 2 diabetes (U.S. Department of Health and Human Services, 2008; Warburton et al., 2006). Benefits can stretch into other domains of health as well, including decreased rates of anxiety, decreased rates and treatment of depression, increased cognitive function in older adults, and improved physical self-perception (Fox, 1999; U.S. Department of Health and Human Services, 2008).

Despite these numerous benefits, research suggests that many Americans do not meet national recommendations for physical activity (U.S. Department of Health and Human Services, 2014). These recommendations include the accumulation of at least 150 minutes of moderate intensity aerobic activity each week (U.S. Department of Health and Human Services, 2008). Based on these guidelines, the Healthy People 2020 database estimates that at least half of American adults do not get enough regular physical activity, and about one third do not participate in any leisure time physical activity (LTPA) at all (U.S. Department of Health and Human Services, 2014). The percentage of adolescents who meet recommendations is even lower at 18.4%, though this is likely a result of more demanding recommendations for this age group (60 minutes of activity every day; U.S. Department of Health and Human Services, 2014).

Reasons for the low levels of physical activity in the U.S. appear to be varied, as numerous barriers to physical activity have been identified including cost, lack of time, feeling tired, and other obligations/commitments (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). More recently, researchers have used ecological models to examine

behavior in healthy lifestyles, such as the participation in physical activity (Sallis, Cervero, Ascher, Henderson, Kraft, & Kerr, 2006). These models demonstrate the importance of studying behaviors across multiple domains, one of which includes intrapersonal or individual factors. Crawford and Godbey (1991) suggested that examining individual factors is the first step in determining behavior in leisure activities such as LTPA. Two such factors that may be correlates to physical activity are perceived physical competence (PPC; i.e., the level of competence one feels regarding their physical skills) and social anxiety (SA; i.e., the degree to which one fears being evaluated in social situations; Ridgers, Fazey, & Fairclough, 2007; Sallis, Prochaska, & Taylor, 2000). As of now, there is limited research that examines how these variables act as contributors to physical activity and how they may interact with each other.

In addition to the current lack of information about PPC and SA as potential barriers, there remain gaps in other areas of the literature on physical activity that need to be addressed as well. The first gap is the inclusion of muscle-strengthening activity in research that examines levels of physical activity. In addition to the aerobic recommendations, the national guidelines for physical activity also recommend participation in muscle-strengthening activity on at least two days per week (U.S. Department of Health and Human Services, 2008). Until recently, most large-scale studies have focused only on aerobic physical activity, neglecting the additional recommendations for muscle-strengthening activity. Studies have shown that muscle-strengthening activity provides health benefits independent from those provided by aerobic activity, such as increased bone mass (Nickols-Richardson, Miller, Wootten,

Ramp, & Herbert, 2007; Warburton et al., 2006), prevention of the loss of lean muscle mass (Candow, Chilibeck, Abeysekara, & Zello, 2011), and enhanced ability to perform activities of daily living (Alexander et al., 2001). When taking the complete set of guidelines into account, it is estimated that only 20.8% of American adults meet the objectives for both aerobic and muscle-strengthening physical activity (U.S. Department of Health and Human Services, 2014).

Another gap that needs to be addressed is the lack of research that specifically examines physical activity behaviors among college students. Evidence shows that levels of physical activity decrease throughout adolescence and into adulthood (Brodersen, Steptoe, Boniface, & Wardle, 2006; Kjønniksen, Torsheim, & Wold, 2008), making college an important transitional period for many Americans. Based on current research, physical activity levels in college students appear to be slightly higher than that of the general adult population (American College Health Association, 2013), but further information on the activity behaviors of this age group is surprisingly limited. In particular, research is needed to address barriers to physical activity that are specific to college students. Additionally, and in response to the first gap, data on adherence to the complete set of guidelines including both aerobic and muscle-strengthening activity among college students is needed.

The first purpose of this study was to gather information on levels of leisure time physical activity among a sample of college students and then to determine how many of these students meet national guidelines for physical activity, including both aerobic and muscle-strengthening activity. The second purpose of this study was to examine the

relationships between PPC, SA, and participation in LTPA among a sample of college students. It is hoped that examining these relationships more closely will lead to practical solutions to help mitigate potential personal barriers to physical activity (i.e., low PPC and/or high SA). By doing so, we can increase LTPA levels among college students with the ultimate goal of improving the health and well-being of those who are affected by these barriers through the many benefits of physical activity.

CHAPTER II

DEFINITIONS OF TERMS

body mass index (BMI); an index that is used to classify underweight, normal weight, overweight, and obesity in adults; calculated as weight in pounds divided by height in inches squared (lbs/in^2) and multiplied by 703 (Centers for Disease Control and Prevention, 2014; World Health Organization, 2006)

leisure time physical activity (LTPA); physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person (Physical Activity Guidelines Advisory Committee, 2008)

metabolic equivalent (MET); a unit used for describing the energy expenditure of a specific activity; the ratio of the rate of energy expended during an activity to the rate of energy expended at rest (U.S. Department of Health and Human Services, 2008)

moderate aerobic physical activity; physical activity that requires a moderate amount of effort and quickens your breathing but does not leave you out of breath; aerobic activity of an intensity between 3.0 and 5.9 metabolic equivalents (U.S. Department of Health and Human Services, 2008)

muscle-strengthening physical activity; activity that causes the body's muscles to work or hold against an applied force or weight and may include resistance training using weights or body weight (U.S. Department of Health and Human Services, 2008)

perceived physical competence (PPC); the belief that one can participate and perform well in physical activities (Anderson, 2004)

physical activity; any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level (U.S. Department of Health and Human Services, 2008)

social anxiety (SA); a state of worry or apprehension that occurs in or as a result of social situations and often manifests itself in the fear of being evaluated by others (Watson & Friend, 1969)

vigorous aerobic physical activity; physical activity that requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate; aerobic activity of an intensity greater than or equal to 6.0 metabolic equivalents (U.S. Department of Health and Human Services, 2008)

CHAPTER III

LITERATURE REVIEW

The purpose of this study was to examine levels of leisure time physical activity (LTPA) among a sample of college students and provided information on adherence to national guidelines for physical activity. Additionally, it examined how two psychological variables - perceived physical competence (PPC) and social anxiety (SA) - are related to these levels of activity. PPC is defined as the belief that one can participate and perform well in physical activities (Anderson, 2004). SA is a state of worry or apprehension that occurs in or as a result of social situations and often manifests itself in the fear of being evaluated by others (Watson & Friend, 1969). Both PPC and SA are psychological constructs that have the potential to act as barriers to LTPA (Ridgers, Fazey, & Fairclough, 2007; Sallis, Prochaska, & Taylor, 2000). Therefore this study assessed how PPC and SA may interact with each other as well as how closely they are related to several measures of LTPA among college students. The research helped to provide a better understanding of these relationships and assessed potential barriers to physical activity within the college student population.

The following literature review will highlight why participation in physical activity is important, what the current guidelines and trends for physical activity are, what type of barriers contribute to a lack of participation in physical activity, and how PPC and SA fit into these barriers.

Definitions of Physical Activity

Physical activity is defined as "any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level" (U.S. Department of Health and Human Services, 2008, p. 2). In a research context, participation in physical activity typically refers to exercise, which is physical activity that is planned with the intent to improve one or more components of health, and is typically performed during leisure time (Physical Activity Guidelines Committee, 2008). Most current studies do not use a firm definition of LTPA and typically consider it to be any physical activity that is not done for occupational, household, or transportation purposes (e.g., Fransson, Alfredsson, de Faire, Knutsson, & Westerholm, 2003; Teychenne, Ball, & Salmon, 2008). The Physical Activity Guidelines Advisory Committee (2008) more concretely defines LTPA as "Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person" (p. C-2). Unfortunately, some of the literature on physical activity does not specify if LTPA specifically was the variable being studied. However, it could be assumed that findings that apply to physical activity in general also apply to LTPA.

Impacts of Physical Activity on Health and Well-Being

Regular participation in physical activity has been shown to provide numerous benefits to health and well-being (U.S. Department of Health and Human Services, 1996, 2008). There is especially strong and consistent evidence for physical activity's positive impacts on physical health (U.S. Department of Health and Human Services, 1996,

2008), however, studies have also demonstrated positive relationships between physical activity and emotional and cognitive health as well (Colcombe & Kramer, 2003; Goodwin, 2003; Mikkelsen et al., 2010; Paffenbarger, Lee, & Leung, 1994; Teychenne, Ball, & Salmon, 2008; U.S. Department of Health and Human Services, 1996, 2008; VanKim & Nelson, 2013). Furthermore, there is clear evidence of a dose-response relationship between physical activity and positive health outcomes (Janssen & Leblanc, 2010; U.S Department of Health and Human Services, 2008; Warburton et al., 2006). In other words, the impact of benefits increases as physical activity increases through frequency, duration, intensity, or a combination of each. In regards to LTPA specifically (physical activities performed that are not required as essential activities of daily living), Abu-Omar and Rütten (2008) suggested that it has a greater positive impact on health indicators than occupational (e.g., manual labor at work), domestic (e.g., household chores), or transportation (e.g., walking to work) physical activity. Additionally, one study of over 1,400 women found that those with high LTPA levels reported higher degrees of well-being compared to those with low LTPA levels (Blomstrand, Björkelund, Nashmil, Lissner, & Bengtsson, 2009). The same study also found that an increase in LTPA over time coincided with an increase in self-reported well-being.

One of the most consistent findings in the literature is the evidence that those who are more physically active have lower rates of all-cause mortality (U.S. Department of Health and Human Services, 1996; Warburton, Nicol, & Bredin, 2006). Kujala, Kaprio, Sarna, and Koskenvuo (1998) found this relationship to hold true even after accounting for genetic factors by monitoring deaths within the Finnish Twin Cohort. A dose-

response relationship is evident in these findings, with rates of all-cause mortality decreasing as physical activity levels increase. Janssen, Carson, Lee, Katzmarzyk, and Blair (2013) studied activity levels measured by metabolic equivalents (METs) and their effects on mortality levels. A MET is a unit used for describing the energy expenditure of a specific activity based on the rate of energy expenditure at rest (U.S. Department of Health and Human Services, 2008). For example, brisk walking is considered to expend energy equal to 3.3 METs (U.S. Department of Health and Human Services, 2008). Therefore, 150 minutes of brisk walking would be equal to 495 MET-minutes. Overall, it is estimated that a person can gain up to 5.5 years of life by being regularly active to a level greater than or equal to 500 MET-minutes per week, which is equivalent to current national guidelines for physical activity (Janssen, Carson, Lee, Katzmarzyk, & Blair, 2013). In addition to its relationship with all-cause mortality, research shows that physical activity can protect against several adverse health conditions which include but are not necessarily limited to: overweight-obesity, cardiovascular disease, type 2 diabetes, hypertension, adverse cholesterol levels, and certain types of cancer (U.S. Department of Health and Human Services, 2008).

The impacts of physical activity on overweight-obesity are especially important considering the current prevalence of these conditions in the United States. Overweight and obesity levels are typically assessed using body mass index (BMI), which is an index based on height and weight measurements that is used to classify underweight, normal weight, overweight, and obesity in adults (World Health Organization, 2006). An individual is considered overweight if their BMI is between 25 and 29.9 kg/m^2, and obese

if their BMI is greater than or equal to 30 kg/m^2. Obesity rates have drastically increased since the 1980s in both adults and children (Flegal, Carroll, Kit, & Ogden, 2012). Currently, about 34% of adults and 18% of children in the United States are considered obese (National Center for Health Statistics, 2011). Recent data suggest that obesity rates may be beginning to level off overall, however, they still show a linear increase in adult men as well as an increase in overall BMI (Flegal et al., 2012). Furthermore, while there are disparities in levels of obesity among several different subgroups (e.g., racial/ethnic, educational, income), the increase in obesity and BMI is consistent across all of these groups, indicating a true society-wide issue (Ljungvall & Zimmerman, 2012). Obesity is not the only issue, as the percentage of American adults who are considered overweight (including obese) is estimated to be as high as 69% (National Center for Health Statistics, 2014). This is a major concern as studies have shown that being even moderately overweight can significantly increase health risks (Must et al., 1998; U.S. Department of Health and Human Services, 2001).

There is evidence that both aerobic and muscle-strengthening activity can help to combat overweight-obesity by contributing to weight loss and the maintenance of a stable weight (U.S. Department of Health and Human Services, 2008). In a review of interventions that targeted weight loss and maintenance through physical activity, Wing (1999) found that exercise only interventions contribute to modest weight loss in both men and women. Though not significantly different, the exercise plus diet programs that were included in the review almost always resulted in more weight loss than diet only programs. In terms of muscle-strengthening activity, Wing's review found no significant

differences in weight loss between resistance training and resistance training plus diet conditions, however, more recent evidence may suggest otherwise. For example, one study on weight loss in overweight adults found that resistance training in addition to a structured diet resulted in greater reduction in body fat than the diet only group (Avila, Gutierres, Sheehy, Lofgren, & Delmonico, 2010). Although findings appear to be mixed and the effects of physical activity on body weight are typically modest, even a moderate reduction in body weight can reduce the risk of cardiovascular health issues (Wing et al., 2011).

In addition to its impacts on overweight-obesity, studies have shown that muscle-strengthening activity provides other physical health benefits independent from those provided by aerobic activity. The effects of muscle-strengthening activity on musculoskeletal health have been well-studied, showing that participation in resistance training can both increase and maintain bone mass (Nickols-Richardson, Miller, Wootten, Ramp, & Herbert, 2007; Warburton et al., 2006). As stated, muscle-strengthening activity has been used in interventions to promote weight loss (i.e., Wing, 1999), but just as importantly it has been shown to be effective in preventing the loss of lean muscle mass as well (Candow, Chilibeck, Abeysekara, & Zello, 2011). Lastly, participation in muscle-strengthening activity can enhance ability to perform activities of daily living, particularly in older adults (Alexander et al., 2001). These findings indicate that research examining the benefits of muscle-strengthening activity on physical health is growing. However, historically musclle-strengthening physical activity has not received the same amount of attention as aerobic activity.

The consistency with which physical activity - both aerobic and muscle-strengthening - has been shown to affect numerous aspects of physical health is hard to ignore. However, it would be incomplete to focus only on the physical health domain, as physical activity may also contribute to other measurements of health and well-being. For example, regular participation in physical activity has also been shown to be associated with lower rates of depression (Paffenbarger, Lee, & Leung, 1994; Teychenne, Ball, & Salmon, 2008; Mikkelsen et al., 2010) and has been effectively used as a treatment for those who are already depressed (Babyak et al., 2000). Both aerobic and muscle-strengthening activity have been shown to be effective at reducing symptoms of depression (Dunn, Trivedi, & O'Neal, 2001). The biggest limitation in these studies and others that examine the relationships between physical activity and measures of emotional health is that they are based on cross-sectional data, and thus a causal relationship cannot be inferred. In other words, it is not necessarily known if physical activity prevents against developing symptoms of depression or if those who are already depressed are simply less likely to be physically active. Though not as thoroughly studied as depression, similar positive relationships exist between physical activity and anxiety (Goodwin, 2003; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). Prospective cohort studies have shown that people who are more active are less likely to be diagnosed with an anxiety disorder (Beard, Heathcote, Brooks, Earnest, & Kelly, 2007) or to report symptoms of anxiety at follow-up (Jonsdottir, Rodjer, Hadzibajramovic, Borjesson, & Ahlborg, Jr., 2010). Meta-analyses show that participation in exercise almost always results in a reduction in measures of anxiety (Pettruzzello et al., 1991). The social aspect

of many forms of physical activity may play a role in acting as a mediator to the impacts on stress and mental health (VanKim & Nelson, 2013). Additionally, social interaction has also been cited as an important motivator for participating in physical activity (Humbert et al., 2008). Therefore, the social aspect of certain modes of physical activity may be particularly important to its impacts on mental and emotional well-being.

Research on the effects of physical activity on cognitive health has thus far been inconclusive, though there is evidence to suggest that a relationship exists between regular activity and cognitive performance, particularly in older adults (Colcombe & Kramer, 2003; U.S. Department of Health and Human Services, 1996, 2008). Meta-analyses have found chronic exercise to be associated with small but significant effects on cognition (Colcombe & Kramer, 2003; Etnier et al., 2006). However, these studies have also found that cognitive function was not associated with physical fitness (Angevaren et al., 2008; Etnier et al., 2006), suggesting that the effects may be a result of other factors associated with regular exercise.

Guidelines for Physical Activity

In an attempt to help realize the many benefits of physical activity, a series of guidelines for activity have been suggested by several national and governmental organizations over the years. The current national guidelines for physical activity were developed by the U.S. Department of Health and Human Services (2008) to serve as a standard set of guidelines and eliminate confusion between differences among past recommendations. These guidelines recommend the weekly accumulation of at least 150 minutes of moderate aerobic physical activity, or 75 minutes of vigorous aerobic physical

activity, or an equivalent combination of both moderate and vigorous aerobic activity (U.S. Department of Health and Human Services, 2008). The Centers for Disease Control and Prevention website (2014) loosely defines moderate aerobic activity as "working hard enough to raise your heart rate and break a sweat," and states that vigorous activity "means you're breathing hard and fast, and your heart rate has gone up quite a bit." These definitions are based off of objective measures of energy expenditure as measured by METs. Moderate intensity activity is defined as 3.0 to 5.9 METs, while vigorous activity is 6.0 METs or more (U.S. Department of Health and Human Services, 2008).

In addition to the recommendations for aerobic activity, the U.S. Department of Health and Human Services guidelines also recommend participation in muscle-strengthening activity on at least two days of the week. Muscle-strengthening activity is defined as activity that causes the body's muscles to work or hold against an applied force or weight and may include resistance training using weights or body weight (U.S. Department of Health and Human Services, 2008).

While the exact percentages vary, research suggests that many Americans do not meet national guidelines for activity (U.S. Department of Health and Human Services, 2014). In a comparison of three national surveillance systems, the number of adults who were considered physically active based on national guidelines from Healthy People 2010 ranged from 30.2% to 48.3% (Carlson, Densmore, Fulton, Yore, & Kohl, 2009). The set of guidelines used in this study recommended at least 30 minutes of moderate aerobic activity on five or more days per week, or at least 20 minutes a day of vigorous aerobic activity on 3 or more days per week. These differ from current guidelines in that they

recommend a set duration and frequency for activity rather than allowing for total accumulation of activity per week. Since the current guidelines for activity were released in 2008, the percentage of adults who meet aerobic objectives has ranged from 43.5% to 48.8% (U.S. Department of Health and Human Services, 2014). Typically, males have been found to be more active than females in moderate aerobic, vigorous aerobic, and muscle-strengthening activity (National Center for Health Statistics, 2011).

In regards to LTPA specifically, the CDC's State Indicator Report (2010) estimated that over a quarter of American adults (≥18 years) do not participate in any LTPA at all. The U.S. Department of Health and Human Services (2014) estimated this number to be closer to one third of adults who do not participate in any LTPA. A study by Brownson, Boehmer, and Luke (2005) found that participation in LTPA has stayed relatively consistent over the past several decades in the United States. However, the same study found that physical activity as a result of occupation, household work, and transportation has decreased over this same time period, while rates of sedentary behavior have increased. This has resulted in a net loss of physical activity despite the relatively stable rates of LTPA **(**Brownson, Boehmer, & Luke, 2005). Consistent with other measures of physical activity is the finding that a greater proportion of males participate in LTPA compared to females (National Center for Health Statistics, 2011).

One drawback with many current assessments of physical activity is that they are only measurements of aerobic activity and neglect to include levels of muscle-strengthening activity that are also found in national guidelines. It has not been until recently that more focus has been put on activity recommendations as a whole. The U.S.

Department of Health and Human Services (2014) has been tracking this data since 2008 and has found that only about one quarter of American adults participate in muscle-strengthening activity on two or more days a week. In combination with aerobic recommendations, this means that in 2011, only 20.8% of adults met the objectives for aerobic activity and muscle-strengthening activity.

Physical Activity in the College Population

An increase in age has consistently been found to be correlated with a decrease in physical activity (Sallis et al., 2000), particularly throughout adolescence and into adulthood (Brodersen, Steptoe, Boniface, & Wardle, 2006; Kjønniksen, Torsheim, & Wold, 2008). Additionally, it is important to note that physically active behavior during college has been shown to carry over into adulthood (Calfas, Sallis, Lovato, & Campbell, 1994). Therefore the transitional period into adulthood is a critical point to address barriers to participation in physical activity. Although college students are theoretically included in national studies on physical activity in adults, specific research on this population is surprisingly limited. One analysis of over 127,000 college students found that 42.2% met the objectives for aerobic activity (Mack, Wilson, Lightheart, Oster, & Gunnell, 2009). Data from the American College Health Association (2013) show that 50.1% of American college students met recommendations for aerobic physical activity (measured in this study as at least 30 minutes of moderate aerobic activity 5 or more days a week or at least 20 minutes of vigorous aerobic activity 3 or more days a week). Gender differences were present in this data, showing that males are more likely than females to meet recommendations for activity at 54.5% for males compared to 47.8% for females. A

meta-analysis of physical activity behaviors in college students (Keating, Guan, Pinero, & Bridges, 2005) found a range of physical inactivity between about 40% to 50%. This analysis reported conflicting findings regarding gender differences, with some studies reporting no differences and others reporting that male students were more likely to participate in vigorous activities.

As is the case with aerobic activity levels, data describing muscle-strengthening activity in college students is somewhat limited. In an analysis of 4,609 American college students, Lowry et al. (2000) found that 29.9% of students surveyed participated in muscle-strengthening activity on at least 3 days per week. While this is one of the only large-scale studies to examine muscle-strengthening physical activity levels in college students, it did not analyze the combination of aerobic and muscle-strengthening activity to determine adherence to total activity guidelines. The lack of large-scale studies of physical activity in college students coupled with the focus on aerobic activity levels has led to a void in the data that examines full adherence to national guidelines in this population. Considering the importance of this time period in developing healthy behaviors, more research is needed on the levels and preferences of LTPA among college students.

Barriers to Physical Activity

As low levels of physical activity and the health problems associated with them continue to pervade our society, researchers and professionals have turned to determining the factors - both motivators and barriers - that influence participation in physical activity. One of the difficulties with this research is the sheer number of factors that have

the potential to contribute to participation in LTPA. In an effort to address this limitation, some researchers (e.g., Giles-Corti & Donovan, 2002; Gyurcsik, Spink, Bray, Chad, & Kwan, 2006; Sallis et al., 2006) have adopted the use of ecological models which attempt to explain behavior by examining how people interact with their environments. While there is no universally-accepted ecological model, most that have been used in research are similar in structure in that they address several domains of contributors (e.g., Giles-Corti & Donovan, 2002; Gyurcsik, Spink, Bray, Chad, & Kwan, 2006; Sallis et al., 2006).

In regards to ecological models that specifically promote active lifestyles, Sallis et al.'s (2006) Social Ecological Model of Active Living (SEMAL) proposed a framework that accounts for individual (also referred to as personal or intrapersonal), social (also referred to as interpersonal), environmental (also referred to as structural) and policy factors. This model addresses four domains of active living: active recreation, active transport, household activities, and occupational activities. The current study focused on the active recreation domain, and as such the factors discussed apply mainly to active recreation or more generally LTPA.

Individual factors may include psychological and biological variables as well as the demographics of the individual. Therefore, the personal piece of the SEMAL may include anything from positive or negative attitudes towards activity to biological responses to being active. Social factors are those that involve the interaction between the individual and others and may include things such as support networks and social norms. Environmental factors pertain to a person's physical surroundings and may include

accessibility to facilities, availability of programming, and weather conditions. Lastly, policy factors are decisions that are implemented on a community-wide level and could affect anything from land use procedures to budgeting for recreational programs (Sallis et al., 2006).

Sallis, Owen, and Fisher (2003) suggested that a key piece to ecological models is that there are multiple influences on the behavior being measured, and that these influences interact across levels. They imply that it is these combinations of variables that together affect behavior, and therefore it is suggested that interventions attempt to target multiple levels of influences to maximize behavior change. This in effect broadens the scope of explaining behavior rather than focusing on a single contributor. Using the example of increasing LTPA, a fitness center may offer an athletic program that: emphasizes enjoyment and fun over competitiveness to increase the motivation to participate (personal); targets families to be active together in order to promote support groups (social); and provides a safe and accessible facility open to all families (environmental). Additionally, a policy factor could include funding from the local level to support community fitness centers.

Sallis et al. (2006) stated that "psychosocial models can be integrated into ecological frameworks to provide specific hypotheses for a given level, such as intrapersonal" (p. 299). In other words, it is possible to use any number of theories within the SEMAL in order to explain individual components. Leisure Constraints Theory (LCT; Crawford, Jackson, & Godbey, 1991) is a theoretical model that relies heavily on an ecological perspective to explain behavior in leisure activities. LCT is based on an

ordered model that includes intrapersonal, interpersonal, and structural (i.e.,environmental) constraints. The theory posits that the absence of or the negotiation through each level of constraints will lead to participation in the desired activity. Conversely, significant constraints at any level will result in non-participation. A key component of LCT is that its model is set up in a hierarchical order such that one must first overcome his or her intrapersonal barriers, followed by interpersonal barriers, and lastly structural barriers. The authors state that "intrapersonal constraints on leisure participation are conceptualized as being the most powerful, due to the fact that they condition the will to act, or the motivation for participation" (Crawford et al., 1991, p. 314).

In summation, LCT is a theory that acknowledges the importance of studying behavior from multiple perspectives, but suggests that the first step to the process must be at the intrapersonal level (Crawford et al., 1991). There is some evidence in recent research that supports this suggestion. For example, some of the most commonly cited barriers to physical activity - lack of time, other priorities, and being too tired - are intrapersonal in nature (Salmon, Owen, Crawford, Bauman, & Sallis, 2003; Tergerson & King, 2002). In addition to being common, these barriers were found to be more closely related to participation in LTPA than environmental barriers such as access and proximity (Salmon et al., 2003). However, Sallis et al. (2006) suggested that interventions based solely on intrapersonal factors have thus far been shown to be relatively ineffective, hence the use of a model that also incorporates social, environmental, and policy factors. This had led to a growth in research that attempts to promote active lifestyles from a

wide-angle lens, mainly involving changes in policies that affect communities of people rather than interventions that only affect the individual. However, the intent of environmental and policy changes is still to address barriers on an individual level. Therefore if we are to adopt LCT as a means of explaining behavior (specifically behavior in LTPA), it is important to continue to examine intrapersonal constraints while keeping in mind how they may interact with and be influenced by interpersonal, structural, and policy factors as well. This is especially true in the college population, as it has been suggested that current research lacks multiple-level approaches that examine college student's physical activity behaviors (Keating, et al., 2005). In essence, LCT can be used within the SEMAL to help bridge the gap between intrapersonal, interpersonal, environmental, and policy factors.

Perceived Physical Competence and Social Anxiety as Barriers

Two potential intrapersonal barriers to the participation in LTPA are the concepts of perceived physical competence (PPC) and social anxiety social (SA). Both PPC and SA should be considered intrapersonal factors, as they deal with the attitudes and perceptions of the individual. However, SA by definition is multidimensional, as it is a psychological outcome that is dependent upon the social environment. Therefore, it may be influenced by more than just the intrapersonal domain of the SEMAL. It is also reasonable to expect feelings of PPC to be influenced by other factors. Therefore, while this study follows the framework put forth by LCT by examining the relationships between LTPA and two intrapersonal variables (PPC and SA), the discussion of how

these variables influence LTPA is focused on the full SEMAL including social, environmental, and policy factors.

There is currently limited research on both PPC and SA as barriers to participation in LTPA. Specifically, discussion of these potential barriers from an ecological perspective is needed. Furthermore, while both PPC and SA have been studied on a limited basis in their independent relationships with physical activity (e.g., Mullan, Albinson, & Markland, 1997; Norton, James, Burns, Hope, & Bauer, 2000; Sollerhed, Apitzsch, Råstam, & Ejlertsson, 2008), there is especially limited research that examines how these two constructs might interact with one another.

Perceived physical competence. PPC (also sometimes referred to as perceived physical ability) is an intrapersonal factor that has been studied as a motivator for participation in physical activity. PPC is considered to be the belief that one can participate and perform well in physical activities (Anderson, 2004). Its origins lie in the global construct of self-esteem, which is defined as "the summary judgment of how well the self is doing in specific areas and overall based on one's personal value system and standard" (Buckworth, Dishman, O'Connor, & Tomporowski, 2013, p. 297). Self-esteem consists of several subcomponents, including academic esteem, social esteem, emotional esteem, and physical esteem. PPC is in turn a facet of physical self-esteem (Buckworth et al., 2013).

In general, higher levels of competence are associated with higher levels of physical activity (Anderson et al., 2009; Crocker, Eklund, & Kowalski, 2000; Hildebrand & Johnson, 2001). This relationship appears to hold true for college students, who have

reported being more likely to get involved in physical activities in which they feel more competent performing (Hildebrand & Johnson, 2001). One explanation for this relationship is that high competence contributes to the enjoyment of an activity, which is strongly associated with participation (Humbert et al., 2006).

PPC can vary among different groups. For example, PPC levels are typically lower in females (Crocker et al., 2000, Mullan, Albinson, & Markland, 1997; Sollerhed, Apitzsch, Råstam, & Ejlertsson, 2008) and those who are overweight as categorized by BMI levels (Southall, Okely, & Steele, 2004). It is important to note that competence has also been discussed as an outcome of physical activity, and that most research that examines these two variables is correlational in nature and thus cannot establish a cause and effect relationship (e.g., Sallis, Prochaska, & Taylor, 2000).

PPC has historically been measured in several different ways. One of the most common instruments used to do so is the Physical Self-Efficacy Scale (PSE; Ryckman, Robbins, Thornton & Cantrell, 1982), which is grounded in the construct of self-efficacy and attempts to measure self-efficacy in situations that require some sort of physical act or skill. The Perceived Physical Ability (PPA) subscale of the PSE measures how good one perceives their physical skills to be. Ryckman et al. (1982) found that PPA was associated with more frequent participation and better performance in physical tasks and involvement in sports. The second component of the PSE is the Physical Self-Presentation Confidence subscale (PSPC), which measures the amount of confidence one has in displaying physical skills in the presence of others. While the PSE and specifically the PPA subscale have been used in many studies since its creation (e.g., Thornton,

Ryckman, Robbins, Donolli, & Biser, 1987; Valois, Shephard, & Godin, 1986), as a context-specific scale it lacks face validity and uses outdated language.

Another common tool used to measure competence is the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989). This profile consists of five subscales: sport competence, physical condition, body attractiveness, physical strength, and physical conditioning. Crocker et al. (2000) found that scores from the sports competence subscale correlate positively with participation in physical activity in elementary school students. Boys had higher scores of competence than girls in this study, however, the relationships between competence and the participation in physical activity was not significantly different between genders. In other words, while boys had higher scores of competence, they also participated in more physical activity.

A more recent scale that uses PPC as one of its components is the Athletic Identity Questionnaire (AIQ) developed by Anderson (2004). This instrument is composed of four subscales: athletic appearance, importance of physical activity, competence, and encouragement from others. Though the instrument was developed to measure an overall sense of identity, its subscales have also been shown to be independently valid (Anderson, 2004). One study that examined AIQ scores and physical activity in adolescents and children found that competence was positively associated with physical activity in children and positively associated with sports team participation in both children and adolescents (Anderson et al., 2009). Though to date there is limited research that utilizes the AIQ and/or its subscales, it has been tested for validity and its

measurement of competence was a better fit for this study than other instruments such as the PPA subscale of the PSE or the sports competence subscale of the PSPP.

Social anxiety. Anxiety is defined as "a state of worry, apprehension, or tension that often occurs in the absence of real or obvious danger" (Buckworth et al., 2013, p. 161). Social anxiety is therefore the experience of these feelings in social situations (Norton et al., 2000). It also includes the tendency to deliberately avoid social situations and the fear of being negatively evaluated by others (Watson & Friend, 1969). Buckworth et al. (2013) described those who experience SA as having a fear of embarrassment in social situations that may cause them to avoid potentially enjoyable experiences. This term has been measured using many generalized instruments across disciplines. These include the Fear of Negative Evaluation Scale (Watson & Friend, 1969), the Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975), and the Social Physique Anxiety Scale (Hart, Rejeski, & Leary, 1989).

In general, these scales have typically shown that there is a negative relationship between SA and participation in physical activity (Hartmann et al., 2010). For example, fear of negative evaluation (FNE) is a measurement of SA and is defined as “the apprehension about others’ evaluations, distress over their negative evaluations, avoidance of evaluative situations, and the expectations that others would evaluate oneself negatively” (Watson & Friend, 1969, p. 449). FNE has been shown to be associated with lower physical activity levels, lower perceived physical health, and higher BMI in primary school children (Hartmann et al., 2010).

SA can also be the result of public self-consciousness (Schieier & Carver, 1985). Self-consciousness can be defined as "a general awareness of the self as a social object that has an effect on others" (Fenigsteins, Scheier, & Buss, 1975). Fenigstein, Scheier, and Buss (1975) developed the Self-Consciousness Scale, which is an instrument that attempts to measure generalized self-consciousness and includes a subscale relating specifically to SA. These authors argue that SA is the response to, and therefore a byproduct of, self-consciousness. However, it is unclear if this particular scale has ever been used to measure self-consciousness or SA as a correlate to physical activity.

Research has also attempted to examine SA as it relates to specific parts of the self, as is the case with social physique anxiety (SPA; Hart et al., 1989). SPA assesses other people's evaluations of one's physique. In a study of female college students, Crawford and Eklund (1994) found that SPA was not significantly correlated to frequency or duration of exercise, but that it was related to attitudes towards the setting in which exercise took place. More specifically, SPA was negatively correlated with settings that emphasized physique. It is also important to note is that SPA may have an inverse relationship with measurements of perceived physical ability (McAuley & Burman, 1993).

A weakness of general measurements like the ones discussed above is that they are global scales of social anxiety and do not take into account anxiety based on specific situations. In other words, it is possible for an individual to exhibit anxiety in one context (e.g., public speaking) but not another (e.g., physical activity). In an attempt to resolve this issue, Norton, Hope, and Weeks (2004) developed the Physical Activity and Sport

Anxiety Scale (PASAS), an instrument that measures anxiety as it relates specifically to physical activity and athletic situations.

In their initial development of the PASAS, Norton et al. (2004) tested the instrument in several studies which included reliability tests, test-retest analysis, multi-model validation, and exploratory factor analysis. All of these tests were conducted using undergraduate student samples. The researchers found that the PASAS may negatively correlate with perceived performance in a physical activity better than general scales of social anxiety. In other words, those with high PASAS scores rated their own performances in an activity as being poorer when compared to those with low PASAS scores. The scale has also been used to examine SA in patients with mental illness (De Herdt et al., 2013) and in athletes, independent exercisers, and non-exercisers in a college population (Holm-Denoma, Scaringi, Gordon, Van Orden, & Joiner, 2009). The Holm-Denoma et al. study examined in part the relationship between PASAS scores and symptoms of eating disorders and found that higher levels of sports anxiety were correlated to bulimic symptoms and "drive for thinness." However, to this author's knowledge the PASAS has yet to be tested as a correlate to participation in LTPA.

Relationships between social anxiety and perceived physical competence. While there is growing evidence that both PPC and SA may be correlates of participation in LTPA in certain situations, little research has examined the relationship between the two constructs. In theory, the PSE attempts to measure similar ideas, but its PSPC subscale is a measure of self-confidence rather than anxiety, and its PPA subscale is not applicable to many situations. One study using a more recent measurement scale (FNE) found that

among primary and secondary school students, there was a weak negative correlation between FNE and perceived athletic competence (Ridgers, Fazey, & Fairclough, 2007). However, these measurements were not tested against the students' participation in physical activity. As stated earlier, SPA has been shown to have a negative relationship with PPC in at least one study (McAuley & Burman, 1993), but this is a measure of SA only as it relates specifically to body image and does not cover the entirety of the construct.

There is insufficient research particularly regarding how these two factors may interact with one another at different levels. For example, it may be assumed that an individual with high SA and low PPC (both in regards to physical activity) will be less active compared to those with low anxiety and high competence. However, what happens to activity levels when a person exhibits high SA but also high PPC? Is this person more likely to be physically active? Is he or she more likely to participate in only certain types of physical activity or only be active in certain environments? There are many questions left unanswered when it comes to the relationships between PPC, SA, and LTPA. This study assessed measurements of each of these variables in a college student population and attempt to provide a clearer understanding of their relationships.

Conclusion

This review has highlighted much of the current literature on LTPA as well as the factors that contribute to it. Despite the clear and well-established benefits of regular physical activity, many Americans do not meet national guidelines for physical activity (U.S. Department of Health and Human Services, 2014). This includes both aerobic

activity and muscle-strengthening activity, the latter of which has not received adequate attention in the literature on physical activity. This is true among the general population as well as in young adults attending college, which is a critical time period for establishing physically active behaviors as students enter adulthood. The use of ecological models that examine participation in physical activity suggest studying several domains of contributors, including intrapersonal, interpersonal, environmental, and policy factors. Two intrapersonal factors that have shown potential to be correlates to LTPA but have not yet been studied thoroughly enough are PPC and SA. There are many questions left unanswered by the literature when it comes to the relationship between these two variables and their effects on the participation in LTPA. There is particularly limited information on college students' activity levels and measures of PPC and SA. Additionally, there appear to be differences in levels of LTPA, PPC, and SA between genders and BMI levels. Therefore, the purpose of this study was first to determine the current levels of LTPA among a sample of college students, and then to determine how PPC and SA may contribute to these behaviors. Following are a series of research questions that were designed to meet this purpose.

Research Questions

1. What are the current levels of LTPA among college students?

    A. What are the current levels of total aerobic, moderate aerobic, vigorous aerobic, and muscle-strengthening activity among college students?

    B. What are the adherences rates to national guidelines for physical activity among college students?

2. What are the relationships between PPC, SA, and the participation in LTPA in college students?

A. Is there a correlation between PPC and the participation in LTPA (measured in frequency, total time, and specific modes)?

B. Is there a correlation between SA and the participation in LTPA (measured in frequency, total time, and specific modes)?

C. Is there a correlation between PPC and SA?

D. Can PPC and SA be used to predict participation in LTPA

E. Is there an interaction between PPC and SA that effects participation in LTPA?

F. Do any of these relationships differ between gender?

G. Do any of these relationships differ across BMI levels?

CHAPTER IV

METHODS

Participants

A total of 186 participants participated in the study. The participants consisted of college students who at the time were attending the University of North Carolina at Greensboro (UNCG). A convenience sample was used consisting of students who were enrolled in undergraduate level courses within the Department of Community and Therapeutic Recreation (CTR) during the Spring 2014 semester. Web-based courses and independent studies were excluded from the study, resulting in a total of ten possible classes from which to draw participants. Due to the overlap of students enrolled in more than one CTR class, only eight of the ten eligible classes were used.

College students were selected for this study in part due to the convenience of accessing potential participants, but also for factors that may play a role in the study's outcomes, such as the existing recreational facilities and programs made available to students by many colleges and universities. For example, UNCG Campus Recreation provides opportunities for students to participate in club sports, intramural sports, individual and group fitness, outdoor recreational trips, aquatics, and many other programs that promote physical activity (The University of North Carolina Greensboro, 2014). The accessibility to these programs may attenuate some of the typical barriers associated with a lack of participation in physical activity (e.g., accessibility issues, lack

of time, etc.) and in turn maximize the influence from the measured variables. Additionally, there is surprisingly little research that has been conducted on the leisure time physical activity (LTPA) levels among college students as well as the types of physical activity in which they participate. Finally, with the current literature finding a decline of physical activity through adolescence into adulthood, the college population represents a critical group of individuals in terms of affecting physically active behavior as adults.

Measures

All data was collected using paper questionnaires consisting of several existing instruments adapted from their original forms as well as questions unique to this study. The independent variables included: a continuous measure of social anxiety (SA) (as it relates specifically to physical activity) and a continuous measure of perceived physical competence (PPC). Dependent variables included: participation total aerobic LTPA, participation in moderate aerobic LTPA, participation in vigorous aerobic LTPA, participation in muscle-strengthening LTPA, and likelihood of participating in specific modes of LTPA. Demographic data collected included gender, race/ethnicity, age, academic year, and height and weight (used to calculate body mass index [BMI]). The full questionnaire used in this study can be found in Appendix A.

Perceived physical competence. PPC was measured using a modified version of the competence subscale of the Athletic Identity Questionnaire (AIQ; Anderson, 2004). This is a five question subscale that asks respondents to rank statements regarding competence in physically active situations on a 5-point Likert scale, from "Not at all

descriptive of me" to "Very descriptive of me." For example, "I could participate in several types of physical activity if I wanted to." In two studies that took place during the development of this instrument, the competence subscale was found to have good reliability ($\alpha = .79$ and $\alpha = .81$). The subscales were also compared to physical activity behaviors to assess construct validity (Anderson, 2004). This scale was modified by rewording questions that reference athletics or athletic ability to instead reference general physical activity. Scores gathered from this scale were averaged by summing the values selected for each item and dividing by five. This resulted in a continuous range of possible scores from 1 to 5. The modified scale used for PPC can be found in question 9 of the full questionnaire found in Appendix A.

Social anxiety. Social anxiety was measured using a modified version of the Physical Activity and Sport Anxiety Scale (PASAS; Norton, Hope, & Weeks, 2004). This scale asks respondents to rank statements regarding social anxiety in physically active situations on a 5-point Likert scale, from "Extremely uncharacteristic of me" to "Extremely characteristic of me." For example, "I worry about what people will think of me when I am physically active." This instrument has been shown to have good test-retest reliability ($r = .84$), excellent internal consistency during both initial testing ($\alpha = .91$) and during retesting ($\alpha = .92$), and was tested for convergent and divergent validity across several existing instruments (Norton et al., 2004). For use in this study, the scale was modified in the following ways: rewording of questions to generalize them to physical activity rather than sports or exercise; removal of two questions that did not apply to this study as they were too specific to a particular sporting situation; and

removal of one question that was determined to be redundant after rewording. Additionally, the anchors of the scale were changed to "Not at all descriptive of me" and "Very descriptive of me" in order to maintain consistency across all scales used throughout the questionnaire. The scores for this scale were calculated by summing the selected values for each item, which resulted in total scores that ranged from a possible 13 to 65. The modified scale used for SA can be found in question 10 of the full questionnaire found in Appendix A.

Other related questions. A third set of questions that addressed ideas similar to PPC and SA was also included in the questionnaire. These questions were determined to be related to but not covered by the PPC or SA measures and were rated on a 5-point Likert scale from "Not at all descriptive of me" to "Very descriptive of me." Questions included, for example, "I feel like I lack the skill to participate in certain types of physical activities" and "I feel uncomfortable being physically active around people who are more fit than I am." These questions were included for exploratory reasons only and were not used in any part of the analysis for this study.

Leisure time physical activity. Participation in LTPA was measured using a series of questions adapted from existing scales, namely the Godin Leisure-Time Exercise Questionnaire (Godin & Shepard, 1985) and the International Physical Activity Questionnaire (Craig et al., 2003). For each category of LTPA, participants were asked to record the frequency (number of times per week) and total minutes per week in which they participated in LTPA during a typical week. For the purposes of this study, definitions for moderate aerobic physical activity, vigorous aerobic physical activity, and

muscle-strengthening physical activity were adapted from current definitions and examples used by both the Centers for Disease Control and Prevention (2014) and the Godin Leisure-Time Exercise Questionnaire (Godin & Shepard, 1985). Moderate aerobic physical activity was defined in the questionnaire as "physical activity that requires a moderate amount of effort and quickens your breathing but does not leave you out of breath." Vigorous aerobic physical activity was defined in the questionnaire as "physical activity that requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate." Muscle-strengthening physical activity was defined in the questionnaire as "physical activity that is non-aerobic and works the major muscle groups (legs, hips, back, chest, abdomen, shoulders, and arms)." Examples for each type of physical activity were provided to help clarify definitions for the participants. Participation in specific modes of physical activity was measured using a 5-point Likert scale, from "Not at all likely" to "Very much likely," for the question: "If available and feasible (i.e., the activity is offered in your area, you can afford it, you have time to do it, etc.), how likely would you be to participate in the following types of physical activity?" Specific modes of activity included competitive team sports, competitive individual sports, walking for physical activity, group exercise/fitness classes, weight training, and races. These modes were selected for being common types of physical activity and because it was hypothesized that they could logically be related to PPC and SA.

Body Mass Index. Height and weight measurements were collected from participants in order to calculate body mass index (BMI). BMI was calculated by using the formula: weight (lbs) / [height (in)]^2 x 703 (Centers for Disease Control and

Prevention, 2014). According to the CDC (2014), classifications for BMI levels include underweight (below 18.5), normal (18.5 – 24.9), overweight (25.0 – 29.9), and obese (30.0 and above).

Demographics. Demographic data collected included gender (male, female, transgender, or other), age, year in school (freshman, sophomore, junior, senior, graduate student) and racial and/or ethnic identity (black or African American, East Asian or Asian American, Hawaiian or Pacific Islander, Hispanic of Latino, Middle Eastern or Arab American, Native American or Alaskan Native, South Asian or Indian American, White or Caucasian, multiracial, or other). Participants were able to select as many options for race and/or ethnicity as applied.

Procedures

The procedures and questionnaire used in this study were submitted to the UNCG Institutional Review Board (IRB) and approval to conduct the study was granted in November 2013. Due to the fact that the instruments used in this study were slightly modified from their original versions, a pilot study of approximately 12 participants was conducted in order to assess the face validity of the modified scales as well as to estimate the time it would take to complete the full questionnaire. Data was collected between January 27 and February 6, 2014. The Department of Community and Therapeutic Recreation (CTR) faculty members were asked for time during each of their undergraduate level classes within this timeframe to distribute the questionnaires to their students. The author of the study was present for each class and distributed the questionnaires personally.

The questionnaire included a cover letter which detailed the rights of the students as outlined by IRB regulations should they choose to participate in the study. The cover letter also explained the study's consent procedures and informed the participants that by completing the questionnaire, they give their consent to participate in the study. The cover letter used for this study can be found in Appendix B. Additionally, the author verbally informed the students of these procedures, the purpose of the study, and the fact that their participation in the study was entirely voluntary and would not affect any part of their course grade. Questionnaires were completed during class and all completed questionnaires were collected directly by the author. In the event of overlap in which a student had already taken the questionnaire in a different class, they were instructed to not complete the questionnaire a second time. Participants were provided with contact information should they have any questions or concerns about the study. All documents used in these procedures were approved by the IRB. Only the author and faculty advisors had access to the questionnaires and data.

Data Analysis

Descriptive statistics were reported for all study variables. All statistical analyses were conducted using IBM SPSS Statistics version 21. An alpha level of .05 was used across all tests to determine statistical significance. Missing data was not included in any of the analyses.

To assess Research Question 1A, "What are the current levels of total aerobic, moderate aerobic, vigorous aerobic, and muscle-strengthening activity among college students?", descriptive statistics were run to provide means and standard deviations of

time and frequency for total aerobic activity, moderate aerobic activity, vigorous aerobic activity, and muscle-strengthening activity. As one minute of vigorous activity is considered equivalent to two minutes of moderate activity (Department of Health and Human Services, 2008), vigorous activity was multiplied by two before being added to moderate activity in order to calculate total aerobic activity.

Research Question 1B asked, "What are the adherence rates to national guidelines for physical activity among college students?" To analyze this question, both total aerobic and muscle-strengthening activity were assessed. Participants who participated in 150 minutes or more of aerobic activity per week were considered to have met guidelines for aerobic activity. Participants who participated in muscle-strengthening activity on 2 or more days per week were considered to have met guidelines for muscle-strengthening activity. Participants who met both criteria were considered to have met total guidelines for activity.

To answer questions 2A, 2B, and 2C, a Pearson correlation matrix was run with all of the following variables: PPC, SA, moderate aerobic time, moderate aerobic frequency, vigorous aerobic time, vigorous aerobic frequency, muscle-strengthening time, muscle-strengthening frequency, total aerobic time, total aerobic frequency, likelihood of participating in competitive teams sports, likelihood of participating in competitive individual sports, likelihood of participating in walking for physical activity, likelihood of participating in group exercise/fitness classes, likelihood of participating in weight training, and likelihood of participating in races. Question 2A assessed the correlations between PPC and each measure of LTPA. Question 2B assessed the

correlations between SA and each of the measures of LTPA. Question 2C assessed the correlation between PPC and SA.

Research Question 2D asked, "Can PPC and SA be used to predict participation in LTPA?" Regression analysis is a process that can be used to calculate the predicted value of a dependent variable based on its relationship with one or more independent variables. In this case, a standard linear multiple regression test was run using PPC and SA as predictor/independent variables and LTPA as the outcome/dependent variable. In other words, the regression output was used to determine whether LTPA could significantly be predicted based on known values of PPC and SA. For this analysis, a separate test was run for each measure of LTPA as the outcome variable. An interaction variable (PPCxSA) was then added to the regression analysis in order to answer Research Question 2E, "Is there an interaction between PPC and SA that effects participation in LTPA?" This model used PPC, SA, and PPCxSA as predictor variables and LTPA as the outcome variable. Again, a separate test was run for each measure of LTPA.

Lastly, Research Questions 2F and 2G asked, "Do levels of PPC, SA, and LTPA differ between gender?" and "Do levels of PPC, SA, and LTPA differ across BMI levels?" Independent samples t-tests between males and females were run to assess differences in PPC, SA, and levels of LTPA across gender. Pearson correlation tests between BMI, PPC, SA, and measures of LTPA were run to assess relationships along the continuous scale of BMI. One-way ANOVAS were used to determine differences in PPC, SA, and LTPA measures between BMI groups (underweight, normal weight,

overweight, and obese). Descriptive statistics of BMI broken down into groups were also run.

CHAPTER V

RESULTS

Participant Descriptions

A total of 186 undergraduate students participated in the study. Approximately 76% were female and 24% were male. The mean age of the sample was 21.61 (*SD* = 4.73) with a range of 18-55 years old. The participants represented the full range of academic years, including 27 freshmen, 40 sophomores, 60 juniors, and 58 seniors. The majority of the respondents were white/Caucasian (61.8%), while 23.7% were black/African American, and 9.7% were multiracial. The mean Body Mass Index (BMI) of the responding students was 24.94 (*SD* = 4.99), which is considered normal weight. In terms of BMI categories, 2.3% were underweight, 58.7% were normal weight, 20.3% were overweight, and 18.6% were obese. Respondent characteristics are reported in Table 1 (Appendix C).

Levels of Leisure Time Physical Activity

Results showed that the vast majority of respondents (93.5%) participated in some kind of leisure time physical activity (LTPA) during a typical month. The mean frequencies of LTPA were 3.44 times per week for moderate aerobic activity (*SD* = 2.02) and 2.02 times per week for vigorous aerobic activity (*SD* = 1.90). Average total time spent being physically active was 145.81 minutes per week for moderate aerobic activity (*SD* = 117.19) and 96.82 minutes per week for vigorous aerobic activity (*SD* = 121.75).

All means and standard deviations for LTPA measures can be found in Table 2 (Appendix C).

Total time spent in aerobic activity averaged 336.81 minutes per week (*SD* = 317.05). When total aerobic time was broken down into activity level categories based on the 2008 Physical Activity Guidelines for Americans (U.S. Department of Health and Human Services, 2008), 9.5% of respondents were considered inactive, 20.7% were low-active, 33.5% were medium-active, and 40.8% were high-active. Table 3 (Appendix C) provides the full data for frequencies and percentages of activity levels.

For muscle-strengthening physical activity, the mean frequency was 2.33 times per week (*SD* = 2.31) and the mean total time was 88.12 minutes per week (*SD* = 112.16). More than 26% of the participants did not participate in any muscle-strengthening physical activity.

The activity with the highest mean likelihood of participation was walking for physical activity (*M* = 3.78, *SD* = 1.25) while the lowest mean likelihood of participation was for competitive individual sports (*M* = 2.46, *SD* = 1.38). Full descriptive statistics for the likelihood of participating in certain modes of activity are reported in Table 2 (Appendix C).

Nearly 75% of participants met national guidelines for aerobic physical activity by being active for at least 150 minutes of moderate aerobic activity, or 75 minutes of vigorous aerobic activity, or an equivalent combination of both. Additionally, 64.5% of participants met the guidelines for muscle-strengthening activity by participating in it at least two times per week. Therefore, when taking into account both aerobic and muscle-

strengthening activity, only 55.3% of participants met the full recommendations for physical activity.

Relationships between SA, PPC, and Participation in LTPA

The mean score of perceived physical competence (PPC) among the sample was 3.99 (out of 5; *SD* = .80). The mean score for social anxiety (SA) was 31.03 (out of 65; *SD* = 12.53). The following results describe how these scores relate to several measurements of LTPA and to each other. A description of each measurement of LTPA can be found in Appendix D.

Correlations between PPC and LTPA

Pearson correlation tests were used to determine the association between PPC and each measure of LTPA. Strength of association was assessed using the following criteria: r value ≥ .500 = strong; r value .300 - .499 = moderate; and r value < .300 = weak.

Results showed that PPC was positively correlated to every measure of LTPA except for walking for physical activity and group fitness/exercises classes. A strong positive correlation existed for competitive team sports, $r(184) = .515$, $p = .000$. Moderate positive correlations were found for total aerobic frequency, $r(181) = .436$, $p = .000$; total aerobic time, $r(177) = .442$, $p = .000$; vigorous aerobic frequency, $r(181) = .466$, $p = .000$; vigorous aerobic time, $r(177) = .386$, $p = .000$; muscle-strengthening frequency, $r(182) = .317$, $p = .000$; muscle-strengthening time, $r(177) = .368$, $p = .000$; competitive individual sports, $r(184) = .356$, $p = .000$; and weight training, $r(184) = .362$, $p = .000$. Weak positive correlations existed for moderate aerobic frequency, $r(184) = .280$, $p = .000$; moderate aerobic time, $r(180) = .270$, $p = .000$ and races, $r(184) =$

.204, p = .005. PPC was moderately and negatively correlated to walking for physical activity, r(180) = -.347, p = .000. There was no significant correlational relationship found between PPC and fitness classes.

Correlations between SA and LTPA

The same tests and criteria that were used for PPC were also used for testing SA. Tests revealed that SA exhibited moderate negative correlations with total aerobic time, r(174) = -.320, p = .000; vigorous aerobic frequency, r(178) = -.389, p = .000; vigorous aerobic time, r(174) = -.328, p = .000; and competitive team sports, r(181) = -.336, p = .000. Weak negative correlations were found with total aerobic frequency, r(178) = -.287, p = .000; moderate aerobic time, r(177) = -.191, p = .011; muscle-strengthening time, r(174) = -.225, p = .003; competitive individual sports, r(181) = -.207, p = .005; and weight training, r(181) = -.227, p = .002. SA was not strongly correlated with any measure of LTPA. SA was also found to be moderately and positively correlated to walking for physical activity, r(178) = .304, p = .000. No significant relationships were found between SA and moderate aerobic frequency, muscle-strengthening frequency, fitness classes, and races.

Correlation between PPC and SA

Pearson correlation tests revealed a strong negative correlation between PPC and SA, r(181) = -.614, p = .000. All correlations can be found in Table 5 (Appendix C).

PPC and SA as Predictors of Participation in LTPA

A standard multiple linear regression analysis was used to test whether or not PPC and SA could be used together to predict participation in LTPA. In this analysis, PPC and

SA were used as predictor variables and participation in LTPA as the outcome variable. A regression test was run for each measure of LTPA as an outcome variable. Full results from the regression analyses are reported in Table 4 (Appendix C).

The regression model with PPC and SA as predictors significantly predicted participation in LTPA across every measure with the exception of fitness classes. PPC was determined to be the driving force behind this, as it significantly contributed to every model except for fitness classes, while SA did not significantly contribute to any of the prediction models. The strength of effect sizes of the significant models varied greatly with R^2 values ranging between .039 and .262. The most significant effects were found in competitive team sports and vigorous aerobic frequency, for which the model accounted for 26.2% and 24.2% of variance, respectively.

Interaction between PPC and SA on the Participation in LTPA

An interaction variable (PPC x SA) was added to the standard multiple regression model to test whether or not there was an interaction effect between PPC and SA on the participation in LTPA. This model used PPC, SA, and PPC x SA as predictor variables and participation in LTPA as the outcome variable. Again, a regression test was run for each measure of LTPA as an outcome variable. The only significant interaction found using this model was for the likelihood of participating in weight training, $F(3,197) = 12.406$, $p = .000$. In other words, the extent to which PPC affected the likelihood of participating in weight training was dependent on SA, and vice versa. PPC, SA, and PPC x SA all significantly contributed to this particular model, however, these variables only accounted for 5.1% of the variance in the dependent variable of weight training. No other

significant interactions were found for any other measure of LTPA. Due to the lack of significant results regarding the interaction between PPC and SA, further analyses were not conducted.

Differences between Groups

Gender. Slight differences in LTPA levels were found between genders. Males were more likely to meet aerobic activity guidelines, with 87.8% of them meeting the requirements compared to 70.5% of females. There was virtually no difference in the likelihood of meeting guidelines for muscle-strengthening activity (65.1% of males vs. 64.3% of females). The number of participants who met total activity guidelines was also similar at 58.5% of males and 54.3% of females. Independent samples t-tests showed that males spent significantly more time than females participating in total aerobic, $t(47.55) = 2.91$, $p = .005$, moderate aerobic, $t(50.79) = 2.84$, $p = .007$, vigorous aerobic, $t(50.07) = 2.53$, $p = .015$, and muscle-strengthening activity, $t(45.13) = 2.20$, $p = .033$. Additionally, males participated in total aerobic activity, $t(181) = 2.66$, $p = .008$, and vigorous aerobic activity, $t(181) = 2.74$, $p = .007$, significantly more often. Differences in activity levels by gender are reported in Table 2 (Appendix C).

In terms of specific modes of activity, males were significantly more likely to say they would participate in competitive team sports, $t(184) = 4.14$, $p = .000$, and weight training, $t(184) = 2.75$, $p = .007$. Females were significantly more likely to say they would participate in walking for physical activity, $t(56.32) = -4.73$, $p = .000$, and fitness classes, $t(184) = -7.05$, $p = .000$. There were no significant differences in the likelihood

of participating in individual team sports or races. Differences in the likelihood of participating in specific modes of activity are reported in Table 2 (Appendix C).

Gender differences were also apparent in scores of both PPC and SA. Independent samples t-tests revealed that males in this sample had significantly higher scores for PPC, t(111.77) = 6.07, p = .000, and significantly lower scores for SA, t(181) = -2.92, p = .004. Differences in PPC and SA scores by gender are reported in Table 2 (Appendix C).

BMI. Pearson correlation tests were used to determine the relationships between BMI, PPC, SA, and LTPA. The same criteria that was used for the PPC and SA correlation analyses to determine strength of association was also used for the BMI analyses. BMI exhibited a weak negative correlation with PPC, $r(170) = -.235$, $p = .002$, and a weak positive correlation with SA, $r(167) = .221$, $p = .004$. Weak negative correlations were also found between BMI and total aerobic frequency, $r(167) = -.187$, $p = .015$; vigorous aerobic frequency, $r(167) = -.210$, $p = .006$; vigorous aerobic time, $r(165) = -.164$, $p = .035$; and likelihood of participating in races, $r(170) = -.164$, $p = .032$.

One-way ANOVAs were used to determine whether or not there were significant differences in PPC, SA, and LTPA measures between BMI levels (underweight, normal weight, overweight, and obese). These analyses indicated that there were significant differences between BMI levels for total aerobic frequency, $F(3,165) = 3.305$, p = .022, vigorous aerobic frequency, $F(3,165) = 3.990$, p = .009, and PPC, $F(3,168) = 1.613$, p .048. However, further analyses using Tukey post hoc tests revealed only one

significantly different finding: normal weight individuals had significantly higher scores for PPC than obese individuals, $p = .031$.

CHAPTER VI

DISCUSSION

The purpose of this study was to first determine the current levels of leisure time physical activity (LTPA) among a sample of college students, and then determine how perceived physical competence (PPC) and social anxiety (SA) may contribute to LTPA behaviors. The data collected provided information on all three of these variables and the subsequent analysis examined how they interact and/or contribute to one another.

Overall Activity Levels

The results from this study provided some insight into the physical activity habits among college students, particularly regarding the relationships between PPC, SA, and LTPA. The participants in this sample reported generally higher levels of aerobic activity when compared to other college and university students in the United States (Mack et al., 2009). This resulted in almost three quarters of the sample meeting guidelines for aerobic physical activity greater than or equal to 150 minutes of moderate aerobic activity per week. However, when taking into consideration the additional recommendations for muscle-strengthening activity (participating in muscle-strengthening activity at least two times per week; U.S. Department of Health and Human Services, 2008), the number of students who met complete guidelines for activity dropped by nearly 20%. This drop is similar to what has been reported in the general adult population in the United States (U.S. Department of Health and Human Services, 2014). While the majority of health

benefits that result from participation in physical activity have been associated with aerobic activity (U.S. Department of Health and Human Services, 1996), it is important for people to understand the benefits of muscle-strengthening activity as well. A drop in adherence rates due to the inclusion of muscle-strengthening criteria means that the full benefits of physical activity are not being realized in many individuals, even many who do meet recommended levels of aerobic activity. To make sure that students are receiving the full benefits of physical activity, colleges should implement programming that emphasizes both aerobic and muscle-strengthening activity. This may include both educational and recreational programs, examples of which are given later. We should ensure that the perception of physical activity is more than just aerobic activity and adopt a holistic perspective that involves a variety of activities, including muscle-strengthening activities such as weight training, yoga, and body weight exercises. It is also important to teach students about the additional benefits of muscle-strengthening activities. Many universities offer programming and facilities for both aerobic and muscle-strengthening activity such as intramural and club sports, recreation and fitness centers, outdoor programs, aquatics, and others. However, students may avoid certain types of activity if they are unaware of its benefits. Further work must be done to address physical activity preferences (i.e., aerobic vs. muscle-strengthening) and how or if they are tied to perceived benefits of the activity.

PPC and SA as Predictors of LTPA

Correlation tests revealed clear relationships between PPC, SA, and LTPA. Higher levels of PPC were consistently associated with higher levels of or likelihood to

participate in LPTA. Higher levels of SA were associated with lower measurements of activity in 9 of the 14 variables used to measure LTPA. Additionally, the strength of the correlations was generally weaker for SA than they were for PPC. These results suggest that PPC is a stronger predictor of LTPA than is SA, which was confirmed with the subsequent regression models. Important to note is that PPC and SA were strongly and negatively correlated to each other, which is consistent with other studies that have examined similar concepts (Ridgers et al., 2007; Ryckman et al., 1982). This implies that the majority of people who exhibit higher PPC will also exhibit lower SA, and vice versa. It is therefore possible that the two variables may influence one another and in turn influence participation in LTPA. For example, low levels of PPC may be exacerbated by feelings of SA and lead to the avoidance of physical activities. Considering the correlations between these variables and participation in LTPA, if we can increase PPC and decrease SA, we may be able to increase participation in LTPA among college students and in turn help them realize the many benefits of regular activity. Southall, Okely, and Steele (2004) have suggested that PPC is derived from two sources: actual competence and social support. Therefore, universities must offer opportunities for students to develop their actual physical competence (through experience) as well as provide positive social support from teachers, staff, and peers.

It is interesting to note that walking for physical activity was negatively correlated to PPC and positively correlated to SA. This is contrary to the rest of the measurements of LTPA. These results would suggest that those who feel they have high physical ability levels are less inclined to participate in walking, an activity that requires a very low

amount of skill. Instead, these individuals may spend their time participating in activities that require more technical skill, such as competitive team sports (with which PPC was strongly correlated). In contrast, those with high SA were more likely to say they would participate in walking for physical activity. Considering the apparent anxiety-reducing effects of exercise (Petruzzello et al., 1991), it is illogical to think that participation in walking is causing higher SA in these participants. Instead, those with high SA may prefer walking as a means of exercise due to the low skill level required and the fact that there is little on which to be evaluated or judged. There are two logical steps that could be taken to address this finding. The first would be to attend the need for walking infrastructure (trails, greenways, sidewalks, etc.) as well as access to such infrastructure in order to encourage those with high SA to more regularly participate in an activity that is not associated with anxiety. The second would be to adapt other modes of activity to make them less anxiety-inducing. An example of this would be programming that involves non-competitive sports that encourage participation in traditional sports but in a pressure-free environment. Many college intramural programs attempt a similar strategy by offering students the opportunity to sign up for differing levels of competition (e.g., beginner, intermediate, advanced). Perhaps a larger push in promoting the non-competitive nature of these lower skill level divisions is needed to engage students who exhibit higher levels of SA.

The regression models provide further insight into the relationships between PPC, SA, and LTPA, particularly when examining PPC as a predictor of LTPA. These tests showed that a model consisting of PPC and SA significantly predicted participation in

LTPA for every variable except fitness classes. However, this predictive value was mainly driven by PPC which was significant in every model. The lack of significance in the SA variable suggests that the ability of SA to predict LTPA drops out when paired with PPC as an additional predictor. This finding is reasonable considering the strong correlation between PPC and SA, and the tendency for PPC to be more strongly correlated with measures of LTPA in this sample. It could therefore be suggested that practitioners, at least on the college level (such as recreational program supervisors, social event committees, etc.), should focus more on students' perceived competence levels than their anxiety levels. It is possible, and could be supported by this data, that high SA results from low PPC. This is a similar idea to what Humbert et al. (2006) found in their study on factors influencing physical activity among youth: when children felt they were not skilled enough to participate in an activity, it resulted in feelings of intimidation and in turn a lower likelihood of participation. These findings would suggest that adopting practices that increase levels of competence and efficacy will in turn decrease levels of anxiety and intimidation. This might include physical activities or physical education classes that focus on teaching skills and building competence. In a statement regarding the state of physical education programs in the United States, the American Heart Association (2006) recommended that physical education programs at all school levels should provide substantial amounts of physical activity in addition to teaching students the skills they need in order to engage in lifelong physically active behavior. In other words, building PPC through the teaching of physical skills may improve long-term participation in LTPA.

The addition of an interaction between PPC and SA into the regression model revealed only a weak effect for one measure of LTPA (weight training). Again, considering the strong correlation between PPC and SA, this result is reasonable. However, it is unclear why the interaction effect is present in weight training and not in any other measure of LTPA. This finding may warrant future research specifically on PPC, SA, and participation in weight training activities, particularly considering the aforementioned benefits of muscle-strengthening physical activity (U.S. Department of Health and Human Services, 2008).

The one anomaly within the results was the likelihood of participating in group exercise/fitness classes. There were no significant correlations between this activity and either PPC or SA, and the regression model did not predict participation in the activity. The only significant correlations exhibited by group exercise/fitness classes were weak associations with vigorous aerobic time, team sports, and races, and a moderate association with walking for physical activity. All of this suggests that the participation in group exercise/fitness classes is not affected by either PPC or SA, and is likely more dependent on other factors not examined in this study. For example, gender could be a more important predictor of participation in this activity. In this sample, females were significantly more likely to say that they would participate in fitness classes, and other research has found that preferences in physical activity for female college students often involve aerobics, dance, and yoga (Keating, et al., 2005). Therefore, if colleges are interested in increasing the level of participation of fitness classes, it could be suggested that they put more effort into designing and marketing classes towards male students in

addition to females. However, regardless of male participation, this data provides evidence that fitness classes are a strong option for providing opportunities for females to be physically active.

Another factor that may play an important role in the participation of fitness classes is the social aspect of participating in a group physical activity. Qualitative studies have shown that social interaction is an important motivator for participating in physical activity for both children and adults (Allender, Cowburn, & Foster, 2006; Humbert et al., 2008). Additionally, social support systems have been shown to be a strong correlate to physical activity (Sallis et al., 1999). Fitness class environments in theory can provide both social interaction and social support for participants. Of course, social environments also provide the possibility of SA. However, as SA was not related to fitness classes in this sample, it is possible that SA is mitigated by the types of social systems found in a fitness class environment. This suggestion warrants further research in regards to the social environment that fitness classes provide, particularly across gender. With further evidence it could be suggested that practitioners should attempt to replicate the same environment provided by fitness classes into other types of physical activities in order to reduce or nullify effects of SA.

The results strongly support the conclusion that PPC is a significant predictor of LTPA. The evidence for SA as a predictor of LTPA is weaker. This study was based on the idea that the effects of SA on physical activity behavior is domain-specific, hence the use of a SA measurement scale that was designed with physical activity in mind rather than a global scale of SA. It is possible that SA is even more dependent on context than

originally thought, and that it only shows up as a predictor of LTPA in specific situations, environments, or types of physical activity not analyzed in this study. For example, in this sample SA was negatively correlated with participation in team sports but was not associated with participation in fitness classes. Therefore, the social environment facilitated by fitness classes may be different than the social environment facilitated in team sports, and in turn have different effects on SA. As suggested earlier and based on the relationships shown in this study, it is also possible SA is dependent on PPC. In other words, higher PPC may result in both higher levels of LTPA and lower levels of SA, thus explaining the generally negative correlation between SA and LTPA.

Comparisons between Groups

Comparisons between gender resulted in some clear differences regarding LTPA, PPC, and SA. The higher aerobic activity levels in males found in this study were consistent with the findings in similar studies (Douglas et al., 1997; Huang et al., 2003). However, in regards to muscle-strengthening activities, the percentages of males and females who met recommendations were almost identical. This is in contrast to research by Lowry et al. (2000) which found that male college students were more likely to participate in muscle-strengthening activities than females. The results from this sample show that there were no significant differences in muscle-strengthening frequency between males and females. The relationship between gender and muscle-strengthening time approached significance with a clear trend towards higher levels in males. However, recommendations for muscle-strengthening activity only take into account frequency (two or more times per week). Therefore, even a significant difference in muscle-

strengthening time would not have had an effect on the findings for those who met national guidelines for muscle-strengthening activity.

It is important to note that there was a significant difference in the means of likelihood of participating in weight training, with males being more likely than females. In combination with the fact that there were no significant differences in frequency or time spent in muscle-strengthening activities, this suggests that females prefer other forms of muscle-strengthening activities as opposed to traditional weight training. When examining physical activity preferences among college students, Keating et al. (2005) found that females were less likely to prefer weight training as a form of exercise. Other examples of muscle-strengthening activities that were given in the instrument for this study included body weight exercises, yoga, and Pilates, all of which are commonly offered in fitness classes. Females in this sample were more likely to say they would participate in fitness classes than males, which may account for the similarities in adherence to muscle-strengthening guidelines. These findings suggest that different strategies should be applied for males and females in order to increase participation in muscle-strengthening activities for both groups. Activities such as fitness classes may be an appropriate avenue for attracting females to muscle-strengthening activity, whereas males may be more interested in traditional weight training. This demonstrates the importance of universities offering a variety of programming to meet the physical activity preferences of both male and female students.

There were significant differences in scores of both PPC and SA between males and females. Males were significantly more likely to have higher PPC scores, which is

consistent with previous studies that have examined PPC (Mullan, Albinson, & Markland, 1997; Ridgers et al., 2007). More information is needed as to why males are typically measured as having higher PPC. In contrast, males in this study had significantly lower scores of SA than females. This is also consistent with studies that have examined SA in college students (Norton, Burns, Hope, & Bauer, 2000) and children (Ridgers at al., 2007). This study was unique in that it demonstrated these relationships while also providing evidence that they contribute to participation in LTPA. In other words, PPC and SA help to at least partially explain the higher levels of physical activity commonly seen in males. It can therefore be suggested that more emphasis needs to be placed on increasing PPC and/or decreasing SA in females in order to promote more participation in LTPA. Considering the social aspect of physical activities like fitness classes appears to be an important factor for females, support groups, clubs, and event committees that implement physical activity may be a way to achieve this. This may be especially important in female college students who are developing lifelong behaviors that may affect their health in the future.

Body mass index (BMI) exhibited a significant weak negative correlation with PPC and a significant weak positive correlation with SA, but does not appear to be strongly associated with any measurement of LTPA. Furthermore, the regression model that used PPC and SA to predict BMI accounted for a very negligible amount of variance. Comparisons of PPC, SA, and LTPA across BMI groups also proved to be largely insignificant. Additionally, BMI group classification did not have any relationship with the likelihood of meeting aerobic, muscle-strengthening, or overall recommendations for

physical activity. These findings suggest that BMI does not play a major role in determining participation in LTPA, which contradicts some studies that have found an inverse relationship between physical activity and BMI (Brock et al., 2009; Hartmann et al., 2010). It is possible that BMI is more dependent on dietary factors than physical activity, as previous research has suggested that both appropriate diet and physical activity are necessary to maintain and to lose weight (U.S. Department of Health and Human Services, 2008).

CHAPTER VII

CONCLUSION

This study provided some of the first steps taken to examine how intrapersonal variables such as perceived physical competence (PPC) and social anxiety (SA) may affect the participation in leisure time physical activity (LTPA) among college students. As shown in the results, it appears that PPC acts as a strong predictor to the participation in LTPA. While the results for SA were not as conclusive, there was enough evidence to suggest that SA was associated with participation in LTPA and that further and more specific examination of the effects of SA on LTPA participation is warranted. Additionally, results showed that there was a clear and strong relationship between PPC and SA. An interaction effect between these two variables was not present in this sample, suggesting that PPC and SA do not moderate the effects of one another on participation in LTPA.

Additionally, this study provided some insight into the gap of information about participation in LTPA among college students. Specifically, it examined both aerobic and muscle-strengthening activity levels; something that has been missing from most studies in this population. The drop in percentage of those who met national guidelines for activity when including muscle-strengthening activities is noteworthy. If this drop is consistent in other populations, it may be even more important to study in those who have less access and social support to participate in both types of activity. If muscle-

strengthening activities are considered important enough to include in national guidelines, there should be more emphasis on getting people to participate in these activities in addition to aerobic physical activity. In the context of this study, universities and colleges should make sure to provide programming that allows for both aerobic and muscle-strengthening physical activity. Physical education programs like LEAP (Lifestyle Education for Activity Program) have been shown to be effective at increasing participation in physical activity (Pate et al., 2005; Ward et al., 2006), but information on programs implemented at the post-secondary level is more scarce. The numerous differences across universities in physical activity, physical education, and health education curricula make it difficult to provide suggestions that would work universally. However, implementing a requirement for all students to take one or more physical education classes may be a proper place to start. In order to reduce problems with low PPC and/or high SA, it would be necessary for universities to offer a variety of courses to provide students with environments and activities in which they feel comfortable and competent. For example, as shown in this study, walking is an activity that is often preferred by those with lower PPC and higher SA. Offering a walking course that meets requirements for academic credits would be one way of providing these particular students with an opportunity to be more physically active. In contrast, courses in traditional team sports may be more appropriate for those students with higher PPC and lower SA. Another strategy could include requiring students to take a course emphasizing aerobic activity and a course emphasizing muscle-strengthening activity, but the logistics and constraints present in student schedules and the resources available to the university

to offer the courses must also be considered. Therefore, it may be more appropriate to design classes that incorporate both aerobic and muscle-strengthening activity into the same course. As an example, "Boot Camp" style classes that mix running and endurance activities with body weight exercises like push-ups and squats in a social environment may be effective at addressing both types of activity.

The study also supported current evidence that there are differences in PPC and SA between males and females. To this point this has been one of the only studies to examine these differences in the college population. Further work needs to be done to determine why these differences exist and what can be done to decrease the number of females who exhibit low PPC and/or high SA. It seems more conceivable for universities and colleges to design and provide programming that is targeted towards mitigating these barriers using some of the examples already discussed rather than attempting to change the psychological qualities of the individuals. This is a prime example of using an ecological approach to behavior change. In other words, it is an attempt to address intrapersonal factors (PPC and SA) through the use of interpersonal, environmental, and policy factors like offering physical education classes that promote social support for students. It is important to study intrapersonal factors such as PPC and SA, but may be just as important to address those barriers through multidimensional approaches.

Additional strengths of this study include the diverse sample and the use of several measures of LTPA. Almost a quarter of the students who participated were black/African American, and 9.7% considered themselves multiracial. Additionally, though the results slightly favored upperclassmen, the sample represented students across

all undergraduate years, which was an important goal of the study. Although there was about a 3:1 ratio of females to males, this was likely attributable to both the higher enrollment of females at the University of North Carolina at Greensboro (UNCG) as well as within the Department of Community and Therapeutic Recreation (CTR).

Limitations

There were several limitations to this study. First, the study used a convenience sample that consisted entirely of undergraduate students taking classes within a single academic department, with the majority of those students' major being housed within that department. This limits the generalizability of the findings. Results may prove to be different in other populations including non-students or even students enrolled within other departments. Additionally, because the respondents were students enrolled in courses within the CTR department, it would not be unreasonable to suggest that this sample was more likely to view physical activity as a priority compared to students in other disciplines. While it is possible that this may have contributed to higher levels of physical activity, it is not likely to have had an effect on the relationships between LTPA, PPC, and SA. Similar studies using students from different disciplines will help to confirm whether or not these results are consistent across all college students.

A second limitation was the use of self-report data to determine levels of LTPA and height and weight measurements. A systematic review by Prince et al. (2008) found that correlations between self-reported and direct measures of physical activity were typically low to moderate and that over- and under-reporting of activity levels differed based on the instrument used. The current study did not have the resources to include an

objective measure of physical activity to validate the instrument used, however the instrument was modified from existing validated measures of LTPA (Craig et al., 2003; Godin & Shepard, 1985).

Lastly, the data used for this study was strictly cross-sectional, and thus causal relationships between the variables tested cannot be assumed. The correlational and regression analyses used only tested how closely these variables were associated with each other. In this study it was predicted the PPC and SA acted as predictors of LTPA. However, it is possible that the relationships found were working in the opposite direction. For example, rather than high levels of PPC causing higher levels of LTPA participation, it may be that individuals who participate in more LTPA develop higher levels of PPC as a result. Though there is no research to support this claim regarding PPC specifically, there is evidence to suggest that participation in physical activity can increase self-efficacy (McAuley, Courneya, & Lettunich, 1991; Rudolph & Butki, 1998) as well as reduce levels of anxiety (Petruzzello et al., 1991). It is most likely that the relationships work bilaterally, with psychological variables such as PPC and SA acting as both determinants and outcomes of LTPA.

Recommendations for Future Research

There are several directions that future research should take based on the results of this study. First, while the relationships between PPC and different measures of LTPA are strong, more information is needed about SA and where it fits into the puzzle of intrapersonal barriers to physical activity. Studies focusing on SA within specific contexts and environments are needed. For example, Humbert et al. (2003) found that

women experienced feelings of intimidation in environments in which they felt surrounded by people who were more physically talented. In a qualitative study that examined factors affecting physical activity among youth, children experienced similar feelings in settings where they did not feel they had the skills to participate (Humbert et al., 2006). Evidence such as this suggests that SA may differ based on social environments, and that it could be a direct result of low PPC in the form of inadequate skill sets. Therefore, future research may examine how SA differs based on physical and social environments, number of people present, type of people present, or other similar factors.

Second, to the author's knowledge this is one of the first studies to examine adherence to all physical activity guidelines (according to the U.S. Department of Health and Human Services) in college students. The inclusion of muscle-strengthening activity guidelines in large-scale population studies should be considered, as the percentage of those who meet full guidelines is likely lower than what is currently reported for aerobic guidelines alone. Considering the independent health benefits of muscle-strengthening activity, it is logical to include some measurement of this variable in future studies.

Third, future research could include more thorough analysis of the variables found in this study. This includes an objective measure of participation in LTPA through the use of accelerometers, pedometers, and/or heart rate monitors. Direct observation of activities is another possible method of measuring participation in LTPA. Furthermore, qualitative analysis of both PPC and SA could be useful in determining what causes these feelings and how they affect participation in LTPA. The current study has shown that

there were clear relationships between these variables, but qualitative practices such as personal interviews or focus groups may provide insight into why these relationships exist.

Finally, ecological models should continue to be used to address PPC, SA, and related intrapersonal concepts such as self-efficacy, self-consciousness, and intimidation to further examine relationships and interactions among such variables. Practitioners and professionals should attempt to implement programming and make environmental and policy changes that affect intrapersonal barriers to LTPA. This means addressing PPC and SA directly (e.g., classes to build skills and/or competence), as well as indirectly through environmental changes (e.g., offering physical activities that provide supportive social environments) and policy changes (e.g., implementing requirements for participating in physical activity through physical education classes). Addressing barriers from each domain of the Social Ecological Model of Active Living (SEMAL) is the most effective way to contribute to behavior change. Considering this, the SEMAL should continue to be used to discover and implement multidimensional approaches to promote physical activity with the intention of resulting in healthier individuals and communities.

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APPENDIX A

QUESTIONNAIRE

Questionnaire on Leisure Time Physical Activity Among College Students

This questionnaire involves questions that deal with **leisure time physical activity.** Leisure time physical activity is defined as *physical activity that is not required for essential activities of daily living and is performed at the discretion of the person.* These activities may include sports participation (including intercollegiate, club, intramural, and recreational), exercise conditioning or training, and other forms of active recreational activities. Leisure time physical activity **does not** include any physical activity performed for household duties or for occupational or transportation purposes.

Part I. Please tell us about your leisure time physical activity.

1) During a typical month, do you participate in any leisure time physical activity?

☐ Yes

☐ No

The following questions are about **moderate aerobic physical activity.**

Moderate aerobic physical activity is physical activity that requires a moderate amount of effort and quickens your breathing but does not leave you out of breath (e.g., brisk walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing).

2) During a typical 7-day period (one week), how many times do you participate in moderate aerobic physical activity during your leisure time?

_____ times per week

3) During a typical 7-day period (one week), how many total minutes do you spend participating in moderate aerobic physical activity during your leisure time?

For example, if you walk briskly 3 times a week for 45 minutes each time, your time spent participating in moderate aerobic physical activity would be 135 total minutes per week.

_____ total minutes per week

The following questions are about **vigorous aerobic physical activity.**

Vigorous aerobic physical activity is physical activity that requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling).

4) During a typical 7-day period (one week), how many times do you participate in vigorous aerobic physical activity during your leisure time?

_____ times per week

5) During a typical 7-day period (one week), how many total minutes do you spend participating in vigorous aerobic physical activity during your leisure time?

For example, if you go running 3 times a week for 45 minutes each time, your time spent participating in vigorous aerobic physical activity would be 135 total minutes per week.

_____ total minutes per week

The following questions are about **muscle-strengthening physical activity.**

Muscle-strengthening physical activity is physical activity that is non-aerobic, works the major muscle groups (legs, hips, back, chest, abdomen, shoulders, and arms), and is intended to strengthen or tone muscle (e.g., lifting weights, resistance band work, body weight exercises (i.e., push-ups, sit-ups, squats), yoga, Pilates).

6) During a typical 7-day period (one week), how many times do you participate in muscle-strengthening physical activity during your leisure time?

_____ times per week

7) During a typical 7-day period (one week), how many total minutes do you spend participating in muscle-strengthening physical activity during your leisure time?

For example, if you lift weights 3 times a week for 45 minutes each time, your time spent participating in muscle-strengthening physical activity would be 135 total minutes per week.

_____ total minutes per week

Part II. Please tell us about your physical activity preferences.

8) If available and feasible (i.e., the activity is offered in your area, you can afford it, you have time to do it, etc.), how likely would you be to participate in the following types of physical activity from *not at all likely* (1) to *very much likely* (5)? (Please circle only one number per statement)

	Not at all likely				Very much likely
a. Competitive Team Sports (basketball, volleyball, soccer, etc.)	1	2	3	4	5
b. Competitive Individual Sports (tennis, swimming, wrestling, etc.)	1	2	3	4	5
c. Walking for physical activity	1	2	3	4	5
d. Group exercise/fitness classes (zumba, pilates, cycle, kickboxing, etc.)	1	2	3	4	5
e. Weight training (free weights, weight machines, etc.)	1	2	3	4	5
f. Races (5k, marathon, mud run/adventure race, etc)	1	2	3	4	5

Part III. Please tell us a little bit about yourself.

9) How descriptive of yourself would you rate the following statements from *not at all descriptive of me (1)* to *very descriptive of me (5)*? (Please circle only one number per statement)

	Not at all descriptive of me				Very descriptive of me
a. I could participate in several types of leisure time physical activity if I wanted to.	1	2	3	4	5
b. I simply don't have much ability when it comes to being physically active.	1	2	3	4	5
c. In most physical activities, I feel I can become skilled with sufficient effort and practice.	1	2	3	4	5
d. I'm not very good at physical activities.	1	2	3	4	5
e. I'm confident in my athletic skills.	1	2	3	4	5

10) **How descriptive of yourself would you rate the following statements from *not at all descriptive of me (1)* to *very descriptive of me (5)?*** (Please circle only one number per statement)

	Not at all descriptive of me				Very descriptive of me
a. I worry about what people will think of me when I am physically active.	1	2	3	4	5
b. I feel that I will humiliate myself when I am physically active.	1	2	3	4	5
c. I rarely worry about what kind of impression I am making on someone when I am physically active.	1	2	3	4	5
d. I am usually worried about what kind of impression I make when I am physically active.	1	2	3	4	5
e. I am afraid that people will find fault with my performance when I am physically active.	1	2	3	4	5
f. Sometimes I think I am too concerned with what other people think about my performance when I am physically active.	1	2	3	4	5
g. I feel nervous if other people are watching me when I am physically active.	1	2	3	4	5
h. I usually get nervous when I am physically active in front of even a few people who are watching.	1	2	3	4	5
i. Other people's opinions of how well I can perform physically do not bother me.	1	2	3	4	5
j. I feel self-conscious when I am physically active.	1	2	3	4	5
k. I do not care if an audience is watching me when I am physically active.	1	2	3	4	5
l. I avoid social gatherings if I think they will involve an athletic activity.	1	2	3	4	5
m. I avoid being physically active where others can see me.	1	2	3	4	5

11) **How descriptive of yourself would you rate the following statements from *not at all descriptive of me (1)* to *very descriptive of me (5)*?** (Please circle only one number per statement)

	Not at all descriptive of me				Very descriptive of me
a. I feel like I lack the skill to participate in certain types of physical activities.	1	2	3	4	5
b. I am uncomfortable being physically active without proper training.	1	2	3	4	5
c. I am afraid to try new activities because I don't know how to do them.	1	2	3	4	5
d. When I am physically active, I fear that I am not doing things correctly.	1	2	3	4	5
e. There are certain types of physical activities in which I don't participate because I don't know how to use the equipment/gear associated with them.	1	2	3	4	5
f. I feel uncomfortable being physically active around people who are more experienced in the activity than I am.	1	2	3	4	5
g. I feel uncomfortable being physically active around people who are more fit than I am.	1	2	3	4	5
h. I feel uncomfortable being physically active around members of the opposite sex.	1	2	3	4	5
i. I fear that I look unattractive when I am physically active.	1	2	3	4	5
j. I fear that being physically active will be too difficult.	1	2	3	4	5
k. I fear that I don't have enough discipline to be physically active on a regular basis.	1	2	3	4	5
l. I don't feel safe in the areas that are available for me to be physically active.	1	2	3	4	5

Part IV. Demographics

12) Please identify your gender:

- ☐ Male
- ☐ Female
- ☐ Transgender
- ☐ Other

13) Please record your age:

_____ years

14) Please identify your year in school:

- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Graduate Student

15) Please specify the race(s) and/or ethnicity with which you most identify (check all that apply):

- ☐ Black or African-American
- ☐ East Asian or Asian American
- ☐ Hawaiian or Pacific Islander
- ☐ Hispanic or Latino
- ☐ Middle Eastern or Arab American
- ☐ Native American or Alaskan Native
- ☐ South Asian or Indian American
- ☐ White or Caucasian
- ☐ Multiracial
- ☐ Other (Please specify):_____

16) Please record your height:

_____ feet _____ inches

17) Please record your current weight:

_____ lbs

Thank you for your participation! If you have any additional comments regarding this questionnaire and/or its content, please write them below:

_____

_____

_____

_____

APPENDIX B

COVER LETTER

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The Relationships between Social Anxiety, Perceived Competence, and the Participation in Leisure Time Physical Activity

Principal Investigator and Faculty Advisor (if applicable): Lee Parfitt
Dr. Nancy Gladwell

What is the study about?
This is a research project. Your participation is voluntary. The purpose of this study is to examine the relationships between social anxiety, perceived competence, and participation in leisure time physical activity.

Why are you asking me?
You have been selected for this study as an undergraduate student taking a class offered by the Department of Community and Therapeutic Recreation. You must 18 years or older in order to participate in this study.

What will you ask me to do if I agree to be in the study?
This study consists of a questionnaire (attached) that you will be asked to compete during class time. The questionnaire should take 10-15 minutes to complete. If you are uncomfortable with any particular question on the instrument, you are not required to answer. However, please complete the questionnaire honestly and to the best of your ability.

Is there any audio/video recording?
There is no audio or video recording to be used for this study.

What are the risks to me?
The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. This study includes questions that deal with social anxiety. If you suffer from anxiety and seek assistance, please contact the UNCG student health center counseling services at (336)-334-5874.

If you have questions, want more information or have suggestions, please contact Lee Parfitt or Dr. Nancy Gladwell who may be reached at (336)-334-3261.

If you have any concerns about your rights, how you are being treated, concerns or complaints about this project or benefits or risks associated with being in this study please contact the Office of Research Integrity at UNCG toll-free at (855)-251-2351.

Are there any benefits to society as a result of me taking part in this research?
This study will attempt to examine certain barriers that inhibit the participation in leisure time physical activity among college students. By participating in this study, you are providing data that may eventually help to identify these barriers and result in higher levels of physical activity among your peers.

Are there any benefits to *me* for taking part in this research study?
There are no direct benefits to participants in this study.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study.

How will you keep my information confidential?
All questionnaires and data collected in this study will remain entirely confidential. Please do not write your name or any identifying information on the questionnaire. Collected questionnaires will be stored in a locked filing cabinet in a locked office on campus. Only the principal investigator and faculty advisors associated with the project will have direct access to the questionnaires. Data that is gathered from the study will be stored on a password protected computer and will not be accompanied by any identifying information. All information obtained in this study is strictly confidential unless disclosure is required by law.

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. Whether or not you decide to participate in this study will not in any way affect any part of your grade in this class. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state.

What about new information/changes in the study?
If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By completing this survey (used for an IRB-approved waiver of signature) you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. By completing this survey, you are agreeing that you are 18 years of age or older and are agreeing to participate.

APPENDIX C

TABLES

Table 1. Participant Demographics and Descriptions

	Total	
	n	%
Gender		
Male	44	23.7
Female	142	76.3
Race and Ethnicity		
Black or African American	44	23.7
East Asian or Asian American	1	0.5
Hawaiian or Pacific Islander	1	0.5
Hispanic or Latino	3	1.6
Middle Eastern or Arab American	2	1.1
White or Caucasian	115	61.8
Multiracial	18	9.7
Other	2	1.1
Academic Year		
Freshman	27	14.6
Sophomore	40	21.6
Junior	60	32.4
Senior	58	31.4
Body Mass Index (BMI)		
Underweight	4	2.3
Normal Weight	101	58.7
Overweight	35	20.3
Obese	32	18.6

Table 2. Means, Standard Deviations, and T-Test Results for PPC, SA, and All Measures of LTPA

	Total		Male		Female		
	M	SD	M	SD	M	SD	t
PPC	3.99	0.79	4.47	0.52	3.84	0.81	6.07**
SA	31.03	12.53	26.32	10.79	32.52	12.71	-2.92**
Total Aerobic Frequency	5.44	3.33	6.60	3.70	5.09	3.13	2.66**
Total Aerobic Time	336.81	317.05	500.61	447.41	288.15	248.49	2.91**
Moderate Aerobic Frequency	3.44	2.02	3.94	2.01	3.29	2.00	1.90
Moderate Aerobic Time	145.81	117.19	202.21	162.61	128.36	93.10	2.84**
Vigorous Aerobic Frequency	2.02	1.90	2.69	1.94	1.81	1.84	2.74**
Vigorous Aerobic Time	96.82	121.75	148.78	161.31	81.38	103.02	2.53*
Muscle-Strengthening Frequency	2.33	2.31	2.65	2.33	2.23	2.31	1.05
Muscle-Strengthening Time	88.12	112.16	135.98	175.26	73.89	80.54	2.20*
Team Sports	3.15	1.59	3.98	1.44	2.89	1.55	4.14**
Individual Sports	2.46	1.38	2.64	1.51	2.41	1.34	0.96
Walking	3.78	1.25	2.93	1.40	4.04	1.08	-4.73**
Fitness Classes	3.77	1.24	2.75	1.18	4.09	1.08	-7.05**
Weight Training	3.44	1.39	3.93	1.26	3.28	1.40	2.75**
Races	2.56	1.37	2.29	1.21	2.64	1.41	-1.46
BMI	24.94	4.99	26.03	4.83	24.58	5.01	1.66

Notes: * indicates significance at .05, ** indicates significance at .01

Table 3. Frequencies for Levels of LTPA

	Total	
	n	%
Do you participate in any LTPA?	173	93.5
Total Aerobic Activity Level		
Inactive	9	5.0
Low	37	20.7
Medium	60	33.5
High	73	40.8
Moderate Aerobic Frequency		
0 times per week	13	7.0
1 - 2 times per week	52	27.9
3 - 4 times per week	71	38.2
≥ 5 times per week	50	26.8
Vigorous Aerobic Frequency		
0 times per week	50	27.3
1 - 2 times per week	76	41.5
3 - 4 times per week	37	20.3
≥ 5 times per week	20	10.9
Muscle-Strengthening Frequency		
0 times per week	49	26.6
1 - 2 times per week	58	31.5
3 - 4 times per week	52	28.2
≥ 5 times per week	25	13.5
Aerobic Recommendations Met	134	74.4
Muscle-Strengthening Recommendations Met	118	64.5
All Recommendations Met	99	55.3

Table 4. Multiple Regression Analyses Predicting LTPA through PPC and SA

Outcome Variable	Predictor Variables				Model Summary	
	PPC		SA			
	B	t	B	t	R^2	F
Total Aerobic Frequency	1.76	4.97**	-0.01	-0.30	.195	21.37**
Total Aerobic Time	132.59	3.84**	-2.83	-1.30	.173	18.12**
Moderate Aerobic Frequency	0.87	3.81**	0.02	1.13	.085	8.41**
Moderate Aerobic Time	36.69	2.68**	-0.37	-0.43	.074	7.05**
Vigorous Aerobic Frequency	0.90	4.61**	-0.02	-1.86	.242	28.31**
Vigorous Aerobic Time	48.73	3.72**	-1.21	-1.46	.174	18.17**
Muscle-Strengthening Frequency	1.14	4.39**	0.02	1.24	.113	11.34**
Muscle-Strengthening Time	53.39	4.26**	0.07	0.09	.141	14.19**
Team Sports	0.97	6.02**	-0.01	-0.45	.262	31.93**
Individual Sports	0.66	4.38**	0.00	0.33	.135	14.07**
Walking	-0.40	-2.92**	0.01	1.64	.134	13.68**
Fitness Classes	-0.23	-1.57	-0.00	-0.23	.018	1.67
Weight Training	0.63	4.09**	-0.00	-0.07	.132	13.72**
Races	0.36	2.24*	0.00	0.17	.039	3.67*

Notes: * indicates significance at .05, ** indicates significance at .01

B = Beta value, R^2 represents the amount of variance accounted for by each model

Table 5. All Correlations between PPC, SA, LTPA, and BMI

	PPC	SA
PPC	N/A	-.614**
SA	-.614**	N/A
Total Aerobic Frequency	.436**	-.287**
Total Aerobic Time	.442**	-.320**
Moderate Aerobic Frequency	.280**	-.109
Moderate Aerobic Time	.270**	-.191*
Vigorous Aerobic Frequency	.466**	-.389**
Vigorous Aerobic Time	.386**	-.328**
Muscle-Strengthening Frequency	.317**	-.130
Muscle-Strengthening Time	.368**	-.225**
Team Sports	.515**	-.336**
Individual Sports	.356**	-.207**
Walking	-.347**	.304**
Fitness Classes	-.141	.069
Weight Training	.362**	-.227**
Races	.204**	-.111
BMI	-.235**	.221**

Notes: * indicates significance at .05, ** indicates significance at .01

APPENDIX D

DESCRIPTIONS OF VARIABLES

Label	Description
Total Aerobic Frequency	Number of times per week spent in any aerobic activity
Total Aerobic Time	Total time spent in all aerobic activity (minutes/week)
Moderate Aerobic Frequency	Number of times per week spent in moderate aerobic activity
Moderate Aerobic Time	Total time spent in moderate aerobic activity (minutes/week)
Vigorous Aerobic Frequency	Number of times per week spent in vigorous aerobic activity
Vigorous Aerobic Time	Total time spent in vigorous aerobic activity (minutes/week)
Muscle-Strengthening Frequency	Number of times per week spent in muscle-strengthening activity
Muscle-Strengthening Time	Total time spent in muscle-strengthening activity (minutes/week)
Team Sports	Likelihood of participating in competitive team sports
Individual Sports	Likelihood of participating in competitive individual sports
Walking	Likelihood of participating in walking for physical activity
Fitness Classes	Likelihood of participating in group exercise/fitness classes
Weight Training	Likelihood of participating in weight training
Races	Likelihood of participating in recreational races