2006

Self-determination in physical education: designing class environments to promote active lifestyles

Charity Leigh Bryan
Louisiana State University and Agricultural and Mechanical College

SELF-DETERMINATION IN PHYSICAL EDUCATION: DESIGNING CLASS ENVIRONMENTS TO PROMOTE ACTIVE LIFESTYLES

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Kinesiology

by
Charity Leigh Bryan
B.S., Samford University, 1997
M.A., University of Alabama at Birmingham, 1999
May 2006

ACKNOWLEDGEMENTS

I would first like to thank my committee who provided invaluable insight and assistance with this study. First, to my major professor, Dr. Melinda Solmon, thank you for everything over the last four years. I have truly learned what it takes to be a researcher and I could not have made it without you. We've even had some fun times along the way, like playing crab soccer at lunch during long days of data collection. Dr. Amelia Lee, your leadership in our department is a shining example to those of us who may one day be in your shoes, or in some other leadership role. I only wish we could have spent more time together over the last four years. Dr. Harrison, I have always enjoyed our chats in the lab and appreciate your guidance throughout this process as well. Dr. Kosma, thank you for all of your help with structural equation modeling. This is a stronger study thanks to your guidance. I also wish to thank Dr. Belanger, my outside committee member. You are truly a student advocate. Finally, I would be completely remiss if I did not extend heartfelt thanks to my fearless stats leader, Dr. Christine Distefano. CD, you are awesome and I only wish you were still at LSU so we could have great conversations. I appreciate your knowledge of the field, your statistical expertise, and your amazing sense of humor!

This study would not have been possible without my friends from pedagogy who routinely bailed me out by helping with data collection, crowd control, and a multitude of other issues. My thanks to Lisa Johnson, Delilah Moore, Janene Grodesky, and Ryan Green.

A big thank you and hug is also extended to my Varsity peeps, Jenni Peters, Jane Swift, and Kristen Manske. You guys always keep me in the best running shoes and apparel, and we have also had some kind of fun! You all kept me sane on a number of occasions and I cannot

thank you enough. Coach Peters, maybe my next life goal should be to run a mile in under 15 minutes! Thanks to all of you from Chastity, Harmony, and Black Bean.

To my dearest and best Baton Rouge friends, Ryan Green, Jill Spohrer, Devon/Bobo Dobrosielski, Meredith Dobrosielski, Lesli and Paul Cleveland (and, of course, baby human Riley and baby Graham), and Micki and Ken Collins. You guys are awesome and I have loved spending the last four years with each of you. I feel like we are a family and I can't say how much your friendship and our supper club means to me. Ryno, I am always here to help you with stats and SPSS, if you will always promise to serve as my 5:00 am wakeup call when needed. Oh, and as my personal "pace man" at the end of a long run. Thank you for being the brother I never had – I will sorely miss our daily conversations on sometimes random, and then not-so-random topics. Ryno, CB, and Bobo – the trifecta of Kinesiology!

Anyone who knows me has, at some point, had to endure some funny (or not so funny) story, tall tale, or other reminiscence of my times and adventures with "The Donna's." No one can really know how much these two individuals have meant to me since I was a 19 year old sophomore in college. Donna and Donna, I truly believe that there is a divine reason that our paths have crossed and I feel blessed that you are both in my life. So, I would like to extend my heartfelt thank you to Donna Dunaway and Donna Hester, my friends, my mentors, and sometimes, my second set of parents! Donna D., you have always inspired me to do great things in life, to be a great professional, and a great person. I know how much this profession means to you and I hope that I can make you proud as I begin my career, one that you have so greatly influenced.

Sweet Donna H., you have always known how to handle every situation in life with kindness, ease, and a warm smile. You have shown me the meaning of grace under pressure and

I am always amazed at how comfortable people feel in your presence. I hope that I can be the kind of individual who exudes a similar kind of sincerity. So, to the Donna's! We have organized conventions, hauled pine bark, scrubbed the docks, been lost in the ghetto, and I hope we have a lifetime of memories still to come. I hope you both have an inkling of how much you mean to me.

To the person who knows me best, K. C. White, I extend my thanks, deep admiration, love, and a giant hug! Wow, we have truly been through this together and you have been there every step of the way for me. I cannot tell you how much your unwavering support has meant in this "adventure." Words also cannot express how much you mean to me and I thank you for being a person who has made my life more abundant and full of fun, laughter, and love. What a journey, and it has only begun! At this time, I must of course, extend my love and gratitude to two very mischievous golden retrievers who remind me everyday of what is truly important in life. Murphy and Riley, I love you and thank you for your loyalty, unconditional love, and book/furniture chewing skills. You two are a reminder that all the schooling in the world does not necessarily mean you have learned anything! You are my precious babies!

It certainly appears that I have many people to thank in this dissertation endeavor. There is only one person, however, that has been here for me since day one in life - my mom, Patsy Bryan. Mom, thank you from the bottom of my heart, for *everything*! I promise, this is the last educational endeavor you will have to finance, and I extend my gratitude to the board of directors at the Bryan Bank Loan, Mortgage, and Trust Association, for their continued support. Mom, I have had the luxury of going through life knowing that you love me and believe in me, and that is all I have ever needed to know. You are my hero and the person I turn to and trust in life. Your lifetime of encouragement and love means more to me than you can imagine. I love

you! My thanks and love as well to BBLM&T Board Member Mike (Miguel) Donahoo. You have also been through this entire adventure, and I thank you for your constant stream of funny emails, and, of course, your tutoring and mentoring me in my higher level statistics classes. Just think, it will be my turn to pay your back, so start thinking of the assisted living facility of your dreams!

Finally, no acknowledgement of this endeavor would be complete without my expression of gratitude to my personal Lord and Savior, Jesus Christ who has had His hand on me always. "Trust in the Lord with all your heart and lean not on your own understanding; in all your ways acknowledge him, and he shall direct your paths" (Proverbs 3: 5-6). My prayer is that each of you in this acknowledgement would be richly blessed and always know the love of Christ.

FOREWARD

The data for this dissertation were collected using funds from the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) Research Consortium Established Investigator Grant program. Melinda Solmon, Ph.D. and I received $15,000 from the AAHPERD Research Consortium to investigate students' attitudes and motivation toward physical education with the goal of learning how to design class environments and activities that will promote the adoption of active lifestyles. I extend great appreciation to both Dr. Solmon for including me on this grant endeavor, and to the AAHPERD Research Consortium for the opportunity to conduct research of this magnitude.

TABLE OF CONTENTS

ABSTRACT

The purpose of this study was to investigate the relationships between self-determination, perceptions of the motivational climate, attitude, perceived ability, engagement in physical activity, and health-related fitness indicators. Two structural models related to engagement/intention to engage in physical activity and health-related fitness were tested. The premise of both models is that perceived competence predicts the outcome variables (engagement or health-related fitness), with self-determination, attitude, and motivational climate predicting perceived competence. Participants were 827 sixth, seventh, and eighth graders. Motivation, perceptions of the climate, attitude, perceived competence, and self-reported physical activity levels were assessed using surveys. Pedometers were used to record steps taken during physical education classes to obtain a quantifiable measure of physical activity. Body mass index and skinfold measures were used to assess body composition, and a measure of cardiovascular endurance was also collected. Perceptions of competence were related to both engagement and health indicators. Engagement and health indicators were also indirectly affected by the motivational climate, where the focus was on learning and mastery. This study suggests that providing a learning climate and structuring the environment so that students can be successful in their physical education endeavors fosters active engagement and is positively associated with health related components of fitness.

CHAPTER 1: INTRODUCTION

Regular participation in physical activity has been linked to improved health status in children and adults and is one way to fight obesity (Berkey, Rockett, Gillman, & Colditz, 2003). Current recommendations call for children ages five to twelve to be physically active 60 minutes each day, with bouts of continual activity lasting at least 15 minutes (Council for Physical Education for Children [COPEC], 2004).

Many researchers and professional organizations (American College of Sports Medicine [ACSM], 2000; Centers for Disease Control [CDC], 1997; McKenzie et al., 1995) identify physical education as a potentially important component in efforts to produce healthier children, and it is recommended that physical education be offered at every grade level every day. It is further suggested that children spend 50% of instructional time in physical education in moderate to vigorous physical activity (Burgeson, Wechsler, Brener, Young, & Spain, 2001). Physical education classes alone are not sufficient for meeting the recommended physical activity requirements for children of any age, therefore activity participation outside of the school setting must be promoted (McKenzie, 2003; McKenzie, Marshall, Sallis, & Conway, 2000). From this perspective, the importance of research studies that will guide efforts to design physical education class environments that will facilitate the adoption of physically active lifestyles in children is clear.

Being physically active is a lifestyle choice for most individuals and it is important for researchers to learn more about these choices under the broad umbrella of motivation. Roberts (2001) defines motivation as the "investigation of the energization, direction and regulation of behavior (p. 3)."

According to Roberts (2001), there are at least 32 distinct theories of motivation that have been identified. Although these theories have distinctive elements, there are several motivational constructs that consistently emerge across theories. Pintrich (2003) argued that it is unlikely that a single theory or construct alone is sufficient to explain the motivational choices that individuals make, and recommends that researchers begin to blend theoretical approaches to guide their work, and that is the approach taken in this investigation. The goal of this study is to explore the complex interrelationships between perceived competence (Harter, 1985), motivational climates (Ames & Archer, 1988), self-determination theory (Deci & Ryan, 1985), and attitudes (Silverman & Subramaniam, 1999).

Perceived Competence

Engagement behaviors of any kind are linked to the objective of displaying competence, or the antithesis, avoiding the display of incompetence (Nicholls, 1984). An individual's need to be perceived as one who is skilled or capable permeates almost every decision and action in one's life. The importance of the desire to show competence, therefore, cannot be underestimated. Fortunately, a competent performance includes a diverse range of acceptable outcomes, depending on the individual and his/her goals or ideals. If individuals are task involved, then they formulate their own criteria for success and evaluate their success based on personal improvement and increased skill. Exhibiting superior performance or requiring little or less effort than others to be successful is indicative of ego involvement (Duda & Whitehead, 1998).

Perceived competence pervades most facets related to student motivation (Harter, 1985). Moreover, when perceptions of competence change for the worse or better, students' motivation levels are affected linearly, that is, as perception of competence increase, levels of motivation

also increase (Vallerand, Gauvin, & Halliwell, 1986). Social comparison is one of the foremost ways individuals can receive information regarding their own levels of competence (Whitehead, 1995) while external feedback is a second source of information related to one's competence (Deci, 1971).

It is important that the role of perceived competence in physical education not only be recognized, but also understood so that physical education teachers can create environments that promote competence among physical education students. Students who feel competent are more likely to self-report engagement in moderate to vigorous physical activity (Kimiecik, Horn, & Shurin, 1996). Task enjoyment and perceived competence have been shown to predict attendance and adherence rates in physical activity classes (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Papaioannou (1994) reports that students with little or no prior experience with physical activity often find the physical education environment to be quite intimidating. Those who have previous experience with activity are likely to have greater perceptions of their own competence in physical education and enjoy their physical education classes more than the students with lower perceived competence (Ntoumanis, 2001).

It is widely recognized that perceived competence is a powerful predictor of engagement (Kimiecik, Horn, & Shurin, 1996), but the question remains, how do we foster competence and what predicts perceived competence? The basis of this work demonstrates that perceived competence is fostered by: (1) a motivational climate focused on learning and improvement, (2) higher levels of self-determination, and (3) a positive attitude where value, usefulness, and enjoyment are fundamental.

Perceptions of the Motivational Climate

Perceived climate is an important variable in the physical education class context. The

seminal work related to motivational climate was conducted by Ames and her colleagues (Ames, 1992; Ames & Archer, 1988). Competence can be defined in many ways, and the way in which a climate or environment is structured can have an enormous impact on motivation. A task or mastery-involved environment is one where students demonstrate their ability by mastering a task and comparisons are self-referenced. In this environment, students in physical education are more likely to be intrinsically motivated, believe that there are no gender disparities, and believe that success is the result of effort (Treasure, 1997). An ego-involved climate, on the other hand, implies that children demonstrate their ability by having a superior performance over another individual (Nicholls, 1984). In this ego or performance-oriented climate, levels of boredom increase while intrinsic motivation decreases, students attempt to win or succeed through deception or cheating, and ability, not effort, is emphasized (Treasure, 1997). Regardless of the student perceptions of the climate, competence alone is not sufficient for engagement. Recognizing the value of the task is also necessary in that individuals must find significance in the activity and believe they can be competent before they will willfully engage (Wigfield & Eccles, 2002).

Student engagement is cultivated when perceptions of a learning climate are salient. Further, there is evidence that a task or mastery climate contributes to student learning (Biddle, 2001). In physical education, Parish and Treasure (2003) reported that physical activity levels were positively correlated with perceptions of a mastery-oriented climate. In addition, Ferrer-Caja and Weiss (2000) found that students who perceived that learning and participation were promoted in their physical education classes were more likely to engage in the activities, exert effort, and focus on learning the task or activity. Ntoumanis (2002) points out that physical education teachers are often unsuccessful in constructing adaptive motivational climates in their

classes. Research (Parish & Treasure, 2003; Treasure & Roberts, 2001) demonstrates the necessity and importance of structuring mastery climates in physical education as a means of getting children in physical education to be as active as possible.

The powerful influence of children's perceptions of motivational climates has been demonstrated in recent studies that have focused on investigating ways to promote children's physical activity in physical education classes. Bryan, Johnson, and Solmon (2004) used interviews to investigate children's perceptions of fitness classes with elementary school students. Their results support the notion that children will retain positive messages that are consistently conveyed regarding health, physical activity, and fitness. Students clearly enjoyed participating in activities that they perceived to be fun and that provided a wide variety of opportunities to move and be active.

The importance of establishing a task-involved climate is clear (Biddle, 2001). Much of the work thus far that has investigated motivational climate has been based on the work of Ames (1992) and the use of Epstein's (1989) TARGET (Task, Authority, Recognition, Grouping, Evaluation, and Time) strategies to structure the climate to promote a focus on learning. Identifying a broader range of strategies that can be used to foster a task-involved climate has become an important area of study. Self-determination theory (Deci & Ryan, 1985) is a theoretical approach that has shown promise in that regard.

Self-Determination Theory

Self-determination theory is unique among social cognitive theories because it tries to make sense of why people do what they do (Ntoumanis, 2002) and provides a framework to understand individual choices about physical activity. Organismic in nature, the theory also takes into account that human beings regularly try to assimilate new ideas or interests into their

own sense of self (Ryan & Deci, 2000). When individuals feel as though they are acting out of their own volition, or have choices among several possible courses of action, they are more likely to engage in certain behaviors, such as choosing to be physically active on their own, or in physical education.

Self-determination theory postulates that all beings have basic psychological needs that they attempt to meet. Competence, autonomy, and relatedness are identified as the "nutriments" of self-determination theory. It is hypothesized that the nutriments are met by various social situations that can support motivated states and other positive results such as accomplishment (Standage & Treasure, 2002). Identifying the factors that foster human potential, growth, integration, and well-being is the goal of self-determination theory (Ryan & Deci, 2000) and enhanced motivational states are expected when individuals are able to meet their basic psychological needs through the nutriments (Ryan, 1995).

Competence is defined as the need to have an influence on our surroundings, which are noticeable in important outcomes in that environment (Deci & Ryan, 2000). For motivation of any kind to be present, individuals have to feel competent in the task at hand (Deci & Ryan, 2000). It is widely accepted that higher levels of perceived competence are associated with higher levels of self-determination and intrinsic motivation (Ferrer-Caja & Weiss, 2000; Goudas & Biddle, 1994; Harter & Connell, 1984; Li, Lee, & Solmon, 2005; Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2003). Due to the public nature of participation in physical education, the role of perceived competence should be thoroughly examined (Whitehead & Corbin, 1991). Additionally, current research indicates that students with higher levels of perceived competence are more active during their physical education class time (Parish & Treasure, 2003). Gender

differences related to perceived competence are also evident, with girls reporting lower levels of perceived competence than boys (Morgan et al., 2003).

Autonomy, defined as "a sense of feeling free from pressures and to have the possibility to make choices among several courses of action" (Guay, Vallerand, & Blanchard, 2000; p. 177-178), has a stronger effect on intrinsic motivation than perceived competence (Goudas & Biddle, 1995). The perception of experiencing autonomy support in physical education classes has been positively linked to higher levels of intrinsic motivation and identified regulation (Hagger, Chatzisarantis, Culverhouse & Biddle, 2003). In physical activity settings, when individuals have a low sense of autonomy, their levels of perceived competence become very important in relation to their intrinsic motivation (Markland, 1999). When perceived autonomy is inherently low, it is imperative that the environment fosters feelings of accomplishment and a sense of competence (Markland, 1999). Standage, Duda, and Ntoumanis (2003) found in their study of middle school students that when the physical education environment is perceived to be autonomy promoting and low in control, students report higher levels of competence, autonomy, and relatedness. Perhaps even more importantly, students in physical education who had increased levels of self-determination reported stronger intentions to participate in physical activity outside of their school time.

The third nutriment, relatedness, is exemplified by a condition of loving and caring for others, while love and care are also received by the individual (Deci & Ryan, 2000). Physical education research has established a weak, but positive, correlation between relatedness in physical education classes and higher levels of self-determination (Ntoumanis, 2001). Individuals in physical activity settings often report that social interaction is a primary reason for their participation (Ntoumanis, 2001).

Continuum of Self-Determination. Levels of motivation are conceptualized within self-determination theory on a continuum. This conception places intrinsic motivation at the highest level and amotivation at the lowest level. Varying levels of extrinsic motivation are delineated between the two end points of intrinsic and amotivation. The levels of extrinsic motivation are: external regulation, introjected regulation, identified regulation, and integrated regulation (Deci & Ryan, 2000). The progression through which an individual takes a novel behavior and makes it part of the self is referred to as internalization (Ryan & Deci, 2000). The degree to which the individual internalizes a new behavior is represented within the incremental levels of motivation within the continuum (Ryan & Deci, 2000).

Self-determination theory postulates that the highest level of self-determination is characterized by intrinsic motivation, where the individual chooses to participate solely for the sake of the activity as an end in itself (Deci & Ryan, 1985). The conclusion of much research in the area of physical activity is that involvement in physical activity is not inevitably intrinsically motivated (Ryan et al., 1997). Individuals may begin to participate in physical activity because they want to lose weight, or their doctors have recommended that they do so. In either case, these individuals are not participating for intrinsic reasons, though hopefully they will begin to understand the benefit of participation and move along the continuum toward a higher level of self-determination.

Intrinsic motivation is conceptualized as having three distinct components: knowing, accomplishing and experiencing stimulation (Vallerand et al., 1993). Knowing is represented by taking part in or doing something in order to discover, grow and increase in wisdom. Students in physical education, for example, may take pleasure in learning a new sport or discovering unique movement patterns. Accomplishment is represented by the affirmative feelings of endeavoring

in something exceptional or succeeding at a new pursuit. Accomplishment can be facilitated in physical education by affording students with occasions to be successful and have their accomplishments recognized. Encountering stimulation is best represented by participation for the purpose of experiencing happiness, enjoyment, excitement, and "aesthetic enjoyment" (Vallerand et al., 1993; p. 98). Examples of encountering stimulation are often associated with participation in physical activities such as rock climbing or white water rafting, which are innately thrilling and invigorating.

When individuals engage in an activity as a means to an end, rather than the activity as an end in itself, then the motivation to engage in the task is extrinsic, rather than intrinsic. Within self-determination theory, however, it is recognized that there are varying levels of internalization and self-determined forms of extrinsic motivation. Although the behavior is internalized, the motivation is extrinsic because it is associated with the outcome of the activity, such as exercising to maintain good health, rather than for enjoyment. Four levels of regulation are delineated, and integrated regulation represents the highest degree of self-determined regulations within extrinsic motivation (Deci & Ryan, 2000). The most important distinction regarding integrated regulation is that the behavior has been assimilated into the sense of self by the individual. The next level of regulation is identified, and there are subtle differences between integrated and identified regulation. When individuals believe an activity has significance to their goals they are said to be functioning at a level of identified regulation (Standage, Treasure, Duda, & Prusak, 2003). This stage of the continuum is often referred to as the "threshold of autonomy" (Whitehead, 1995) where an individual elects to be involved because they want to do so, not because they ought to (Biddle, 1999). Positive engagement patterns in physical activity

are expected when individuals choose to participate because they desire to do so, not because they feel as though they must (Chatzisarantis, Biddle, & Meek, 1997).

Introjected regulation is the next level of extrinsic motivation. Integrating the regulation into the sense of self has not yet occurred for individual at this level of the continuum. External controls such as burdens of guilt, shame or decreased self-worth are present for the individual who participates only out of a sense of compulsion, guilt or duress. Adherence is often inconsistent for individuals at this stage, though they are more likely to continue than those at the level of external regulation (Deci & Ryan, 2000).

The lowest form of extrinsic motivation is external regulation, which is adjacent to amotivation on the self-determination continuum. Participation to achieve a desired result, such as a reward, or to circumvent a negative outcome or some type of punishment are the reasons cited for participation at this level of motivation (Deci & Ryan, 2000). Individuals operating at this level are likely to withdraw from the task if the incentive or risk of punishment is eliminated (Deci & Ryan, 2000). Many individuals who initiate a physical activity or exercise regimen are frequently extrinsically motivated to do so (Ingledew, Markland, & Medley, 1998). However, if the individual stays with the program over time, it may be possible for them to move along the continuum and begin exercising for more self-determined reasons.

According to self-determination theory, individuals who quit or drop out are operating at lower levels of self-regulation. If environments could be structured in such a way as to cultivate higher levels of self-determination, individuals may be more likely to stay involved with the activity or behavior over time.

A lack of incentive, characterized by a conviction that success is not likely and that the activity is not worthwhile, is distinctive of amotivation (Standage et al., 2003). In this state, the

individual is not inspired to make an effort toward a certain end (Biddle, 1999) because of thoughts of ineptitude (Bandura, 1986) or simply because they do not value the activity (Ryan, 1995). A negative relationship emerges in physical education and physical activity settings between amotivation and involvement in or intention to be involved in physical activity (Standage, Duda, & Ntoumanis, 2003).

Attitude

Attitude is a factor that should be examined when investigating motivation levels because of its potential link to participation, or lack thereof, in physical activity. Often based on experiences and events in childhood, attitudes are formed early in childhood (Brustad, 1991). Fundamental beliefs that an individual holds are also significant in attitude formation (Ajzen, 1988, 1993). Essentially, individuals' beliefs influence their attitudes toward certain things. Perceptions and attitudes are important mediators between teacher actions and what students learn and do (Solmon, 2003).

Silverman and Subramaniam (1999) point out that an attitude continuum exists, from negative to positive. It is likely that affirmative experiences lead to a positive viewpoint, which can be critical for physical educators who are trying to reach students who display negative attitudes toward physical education. While it can be difficult to change an individual's attitude toward a specific object or situation, Silverman and Subramaniam argue that it is certainly possible to do so. In order to bring about this change, it is necessary first to understand the reason for the negative attitude, and then provide subsequent positive experiences, which could help bring about a change in the individual's way of thinking.

Used extensively throughout the literature, the term attitude is often banal and its definition, in psychometric terms, is often unclear. Frequently in attitude-related studies only

one component of attitude is examined. However, this construct includes more than just one single aspect (Subramaniam & Silverman, 2000). Silverman and Subramaniam (1999) conducted a review of measurement issues on student attitudes in physical education and physical activity. They concluded that the research up to that time had yielded mixed results, and recommended additional research be conducted to recognize the ways in which student attitudes affect participation in physical activity. Parish and Treasure (2003) also observed that young people's failure to meet current recommendations for moderate to vigorous physical activity may be partly related to lack of motivation.

One study to date has examined the relationships between perceptions of the motivational climate, attitude, and students' levels of self-determination. Bryan and Solmon (2005) examined the interrelationships between these variables in a correlational study of middle school students. The perception of the climate appeared to be a stronger influence on students' attitudes than on their levels of self-determination. This finding is unique, as other studies (Goudas & Biddle, 1994; Papaioannou, 1994; Parish and Treasure, 2003) have reported a link between a mastery-oriented climate and levels of self-determination, but have not considered how attitudes are related to the climate.

Research related to physical education, physical activity, and children can be conceptualized as a large puzzle. Studies using self-determination theory as a framework for investigation provide professionals with insights as to how children perceive the physical education environment and how the nutriments of self-determination theory can be fostered to enhance motivation. The most complete picture we have at this point is from several recent studies (Ferrer-Caja & Weiss, 2000; Ntoumanis, 2001; Parish & Treasure, 2003; Standage, Duda, & Ntoumanis, 2003) that examine multiple combinations of variables such as competence,

autonomy, relatedness, motivation levels, and perceptions of the environment. Some of these studies also examine more objective measures such as physical activity during physical education (pedometer counts), body mass index (BMI), and intention to engage in leisure activity. There has yet to be a comprehensive study which continues this line by examining the relationship between the subjective measures, such as survey data, with more objective measures such as percent body fat, cardiovascular fitness measures, BMI, and physical education pedometer counts. By providing a more complete picture through the use of additional objective measures, we can build on what is already known about creating class environments in physical education that will lead to the adoption of more physically active lifestyles.

Based on this literature, the purpose of this study is to investigate the complex network of relationships between engagement in physical activity, health-related fitness indicators, perceived ability, attitude, perceptions of the motivational climate, and levels of self-determination. Two structural models (see Figures 1 and 2) related to engagement and health-related fitness were tested. In both models, perceived competence predicts the outcome variables (engagement or health-related fitness), with self-determination, attitude, and motivational climate predicting perceived competence.

In order to promote healthy lifestyles and engagement in physical activity, it is essential that researchers understand the relationship between engagement and health. From the literature in this area, it is clear that perceived competence is, at this point, the most powerful influence on both of these outcomes, and as such, is conceptualized in the model as the mediator to both engagement and health indicators. Provided the relationship between perceived competence and these outcomes (engagement and health) is tenable, then it becomes important to consider what variables influence perceived competence. In both models, self-determination, motivational

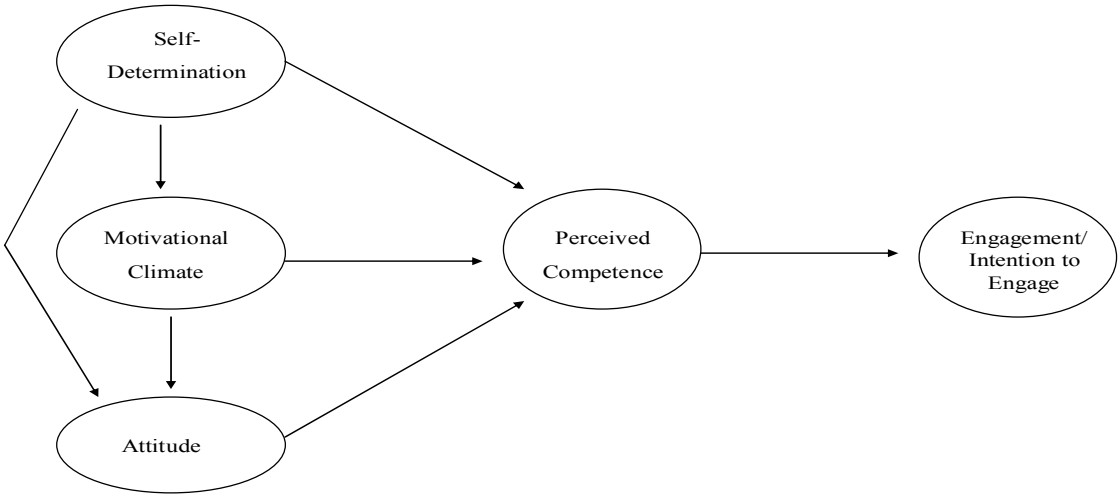

Figure 1. Engagement Model.

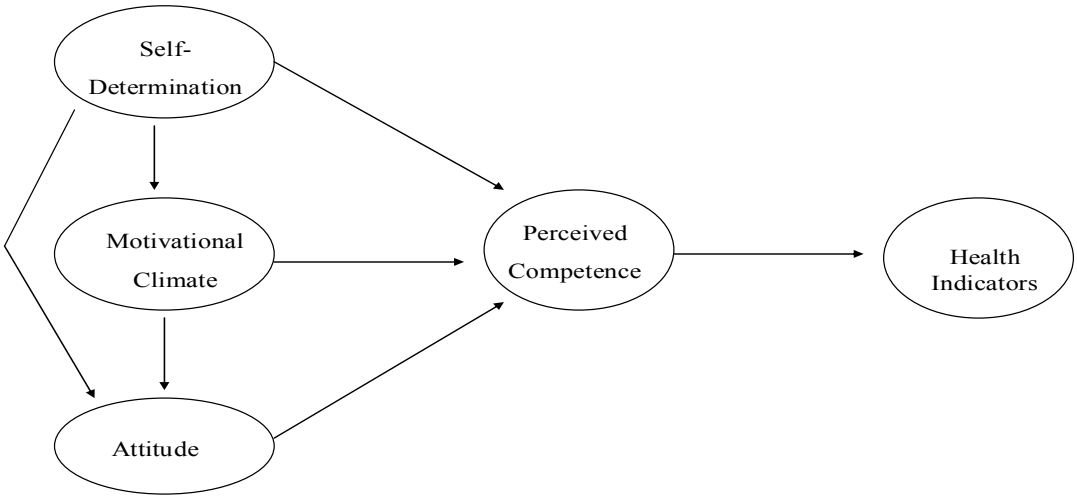

Figure 2. Health Indicators Model.

climate, and attitude are offered as factors that affect perceived competence, and ultimately engagement and health indicators.

The aim of this line of research is to determine how student attitudes and motivation affect participation in physical education and physical activity, with the overall goal of learning how to create class environments that promote the adoption of physically active lifestyles. Based on the literature reviewed, the following hypotheses to be tested are embedded in the models.

1. Higher levels of perceived competence directly predict both levels of engagement in physical education and intention to engage outside of school and health indicators.
2. Children who perceive the motivational climate as task-involved, rather than ego-involved, have greater levels of both engagement in physical education and intention to engage outside of school, and health indicators, as mediated through perceived competence.
3. Higher levels of self-determination indirectly predict both levels of engagement in physical education and intention to engage outside of school, and health indicators, as mediated through perceived competence.
4. Children who exhibit more positive attitudes have both higher levels of engagement in physical education and intention to engage outside of school, and health indicators, as mediated through perceived competence.

It was also hypothesized that children with higher levels of cardiovascular endurance and lower (healthier) levels of BMI and percent body fat would have higher levels of engagement in physical education and intention to engage in physical activity outside of school. This

hypothesis, though not embedded in the models, tests the link between the constructs representing the outcome variables in the two models.

CHAPTER 2: METHODOLOGY

Participants

Participants were 827 (males = 407; females = 420) sixth, seventh, and eighth grade students from two middle schools in the southeastern United States. Due to absenteeism, disciplinary problems, and scheduling issues, a total of 401 subjects were analyzed for the engagement model and 467 subjects were analyzed for the health indicators model. While this appears to be a rather poor retention rate, it is important to keep in mind that complete data sets were required to utilize LISREL analysis on the models, and students must have completed a total of four surveys, all health indicators (BMI, skinfold, and Hoosier Endurance Shuttle Run) and engagement activities (three pedometer days) to be used in the analysis. The two schools represent a diverse population of students in terms of geographic location and socioeconomic status. Permission was obtained through the Institutional Review Board, in addition to attaining parental consent and child assent from the participants.

The first middle school (n = 543; males = 262; females = 281) in the study offered daily physical education to all students in the school. The curricular approach at this school included fitness activities, used in a warm-up regimen, followed by a tactical games and activities focus for the lessons. Class periods were 50 minutes, with approximately 15 to 20 minutes allotted for dressing in and out and managerial issues (roll call, transition time to activity area, etc.). A total of twenty four classes (eight classes per grade level) participated in the study.

The second middle school (n = 284; males = 145; females = 139) also offered physical education to every student, and was on a rotating block schedule where students participated in extended 90 minute instructional periods three times a week. Team sports, organized games, and fitness activities were the curricular focus at this school. Instructional time was typically around

70 minutes with 20 minutes allotted for dressing in and out and managerial issues. This middle school had a total of 12 classes involved in this study (four classes per grade level).

Instrumentation

Five survey instruments and an information sheet were used in this study. The five instruments assessed self-reported levels of physical activity, children's perceptions of their ability levels, participants' attitudes toward physical education, perceived motivational climate within physical education, and motivation levels in physical education. In addition to these surveys, objective measures included body composition analysis, body mass index (BMI), a measure of cardiovascular fitness, and levels of physical activity engagement during the physical education class time. All instruments for this study can be found in Appendix B.

Self-Report of Physical Activity. The Physical Activity Questionnaire for Children (PAQ-C) was used as a means for students to self-report their own levels of physical activity over the past seven days. Students reported how many times in the previous week they participated in a wide range of physical activity behaviors such as recreational activities, sports, and other types of exercise (Crocker, Bailey, Faulkner, Kowalski & McGrath, 1997; Kowalski, Crocker & Faulkner, 1997). Other physical activity behaviors related to students' physical education class, free time, recess, extracurricular sports, weekend activities, and evening activities are also addressed within this instrument. Summed scores are calculated and then averaged across the different categories within the instrument. A final overall score is obtained as an indicator of activity level for the student. Convergent validity for this instrument was established through correlations with other measures of physical activity, specifically an aerobic step test and a questionnaire related to perceptions of athletic competence (Kowalski, Crocker & Faulkner, 1997).

Perceived Ability. The Children and Youth Physical Self-Perception Profile (CY-PSPP; Whitehead, 1995) was used to assess students' levels of perceived ability in physical education. Students choose between two contrasting statements as to which statement describes them the best. Once the student has selected the statement that best describes them, they are to then indicate whether the statement is "really true" for them or "sort of true" for them. Responses are scored from one to four on each item, with a score of four indicating the highest level of perceived ability. Four subscales of the CY-PSPP were used: condition/stamina, sport/athletics, children's perceived importance profile (C-PIP), and the physical self-worth (PSW) scale. Each of the subscales has a total of six items, except for the C-PIP which has eight items. Sample items are as follows: condition/stamina: "some kids feel uneasy when it comes to doing vigorous physical exercise BUT other kids feel confident when it comes to doing vigorous physical exercise;" sport/athletics: "some kids do very well at all kinds of sports, BUT other kids *don't* feel that they are very good when it comes to sports;" children's perceived importance profile (C-PIP): "some kids think it's important to be good at sports, BUT other kids *don't* think how good you are at sports is that important;" physical self-worth scale (PSW): "some kids are *proud* of themselves physically, BUT other kids don't have much to be proud of physically." This instrument has been used previously with middle school students and has established acceptable validity and reliability within this population (Eklund, Whitehead, & Welk, 1997; Welk, Corbin, Dowell, & Harris, 1997).

Attitude. An attitude scale developed and validated by Subramaniam and Silverman (2000) was used to assess student attitudes toward physical education. This instrument consists of 20 items related to attitude with a 5-point Likert scale ranging from strongly disagree to strongly agree. The instrument includes two subscales, one measuring enjoyment and the other

measuring usefulness. "I feel my PE teacher makes learning in my PE class fun for me" is a sample statement from the enjoyment scale. The usefulness subscale is assessed through statements such as: "I feel my PE teacher makes learning in my PE class valuable for me." Negative items were reverse coded prior to data analysis. Subramaniam and Silverman (2000) established construct validity for the attitude scale through confirmatory factor analysis, in addition to content validity which was .94 for attitude enjoyment and .99 for attitude usefulness.

Perceptions of the Motivational Climate. The Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ, Papaioannou, 1994) is a 27-item questionnaire that asks students to think about their physical education classes and respond using a 5-point Likert scale where a score of one indicates strong disagreement and five indicates strong agreement. The LAPOPECQ theoretically assumes the motivational climate to be one of either mastery or performance. The mastery factor, as assessed by the LAPOPECQ, examines two distinct areas: teacher-initiated learning and students' learning orientation. The performance factor examines three unique spheres: students' competitive orientation, students' worries about mistakes, and outcome orientation without effort. Satisfactory reliability and validity has been established in previous research using physical education classes (Ferrer-Caja & Weiss, 2000; Parish & Treasure, 2003). In addition, Papaioannou (1994) determined that the scales distinguish between perceptions of students in various physical education classes.

Sample items for each of the subscales, and the number of items per subscale, are as follows: (a) mastery-teacher-initiated learning: The PE teacher looks completely satisfied when students are improving after trying hard (6 items); (b) mastery-students' learning orientation: The way the lesson is taught helps me learn how to use PE to improve my health (7 items); (c) performance-students' competitive orientation: During the lesson, students try to outperform

each other (5 items); (d) performance-students' worries about mistakes: Students worry about performing skills that they are not particularly good at (5 items); (e) performance-outcome orientation without effort: It is very significant to win without trying hard (4 items).

Situational Motivation. The Situational Motivation Scale (SIMS) is a 16 item self-report inventory that measures four subscales: intrinsic motivation, identified regulation, external regulation and amotivation (Guay, Vallerand, & Blanchard, 2000). Each subscale is assessed through four items. Participants are asked, "Why are you currently engaged in this activity?" A 7-point Likert scale, ranging from strongly disagree to strongly agree, is used for all responses. Examples of items for the four subscales are as follows: (a) intrinsic motivation: Because I think that this activity is interesting; (b) identified regulation: Because I am doing it for my own good; (c) external regulation: Because I am supposed to do it; (d) amotivation: I do this activity but I am not sure if it is worth it. Standage and Treasure (2002) demonstrated the ability of the SIMS to distinguish between intrinsic motivation, identified regulation, external regulation and amotivation. Reliability and construct validity has been demonstrated consistently for the SIMS in previous research studies (Standage et al., 2003).

Intention to Engage in Exercise/Physical Activity. Three items were used to assess intention to engage in exercise/physical activity which were based on previous studies also measuring this construct (Standage et al., 2003). These items were presented at the end of three different surveys (PAQ-C, Attitude, LAPOPECQ) to determine the extent to which students intend to exercise or participate in physical activity at least three times per week over the next month. A six-point Likert scale, ranging from strongly disagree to strongly agree was used as the response scale for this item.

Body Composition. In addition to subjective survey data, students were also assessed using more objective measures related to functional level of health and participation in physical education. Skinfolds and body mass index (BMI) are two ways to ascertain information related to the amount of body fat an individual has (Safrit, 1995). Certain health risks are associated with overweight and obesity, therefore obtaining students' body composition provided insightful data. Body composition was determined individually by using Lange skinfold calipers. Measurements were taken at the tricep and calf with each site being measured three times. All skinfold measures were taken by researchers trained and experienced in conducting skinfolds. Researchers adhered to the established guidelines and procedures for taking skinfold measures on children. Tricep adipose tissue was separated away and measured at a point between the acromial process and elbow (Safrit & Wood, 1995). The same procedure was used at the calf, with the measurement taken "on the medial side of the right lower leg at the largest part of the calf girth" (Safrit & Wood, 1995, p. 471). The researchers took two measurements at each site. If the initial measurements were within one millimeter, a third measurement was not taken. However, if the initial measurements were not within a millimeter, a third skinfolfd measurement was taken at that site. Percent body fat was estimated from the prediction equation derived by Lohman (1992).

Students also had their heights and weights taken using portable stadiometers and digital scales. Research assistants were trained to use the stadiometers and digital scales. The stadiometer has a platform on which the student stands, while the researcher adjusts a horizontal lever to touch the student's head. From the head position, the researcher or research assistant read the height measurement, and recorded it in inches to the nearest half inch. The digital scale were calibrated prior to each class with a standardized weight. Students remained motionless

while the scale calculated the weight. Researchers or research assistants recorded the weight in pounds to the nearest pound, rounding when necessary. From these measurements, BMI was calculated (Baumgartner, Jackson, Mahar, & Rowe, 2003).

Cardiovascular Fitness. The Hoosier Endurance Shuttle Run (Safrit, 1995) was used to assess students' levels of cardiovascular fitness. Students have a partner for the test and are assigned a lane. One student is the "runner" while the partner is the "loader." Runners were positioned alongside a folding chair at the starting line with a tennis ball in hand. On the researcher's signal, the runner is to run or walk a distance of 60 feet, circle the chair at the other end, and drop a tennis ball into a basket placed on the chair. The runner returns to the starting line where the partner has placed one tennis ball on the chair. The runner picks up this tennis ball and repeats the process until nine minutes have elapsed. The goal is for the runner to get as many tennis balls into the laundry basket as possible, carrying only one ball at a time. The runner may walk or run, as long as he or she continues to move throughout the test time. It is the loader's responsibility to ensure that one tennis ball is always readily available for the runner. When nine minutes elapsed, the researchers counted and recorded the number of tennis balls in the basket. Figure 3 below provides an illustration of the test.

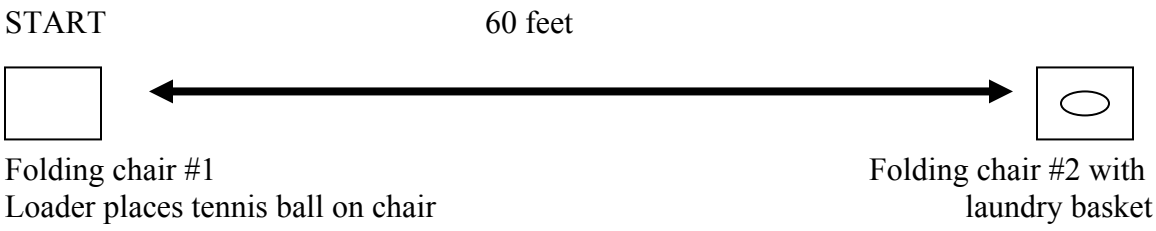

Figure 3. Hoosier Endurance Shuttle Run Diagram

The Hoosier Endurance Shuttle Run is an excellent test for middle school students for many reasons. First, it is practical and economical to administer, and requires minimal

equipment or set-up. In addition, students have the flexibility to go at their own paces and either walk or run, or utilize some combination of both, for the nine-minute testing time. Unlike the PACER test, students participating in the Hoosier run have virtually no way of knowing the score of another student, since everyone is going at their individual pace, and the number of tennis balls represents the score. The student and the researcher, or a research assistant, worked together to count and record the number of tennis balls, and all scores were kept private by the researcher. In the PACER test, students must "drop out" when they can no longer keep pace with the cadence of the run. Therefore, it is very obvious when a student is no longer able to continue in the test. As well, in the mile run, the least fit students are often the last to finish, which is very obvious to their peers. The Hoosier Endurance shuttle run correlates to the one mile run-walk test at least as well as the Pacer test from Fitnessgram, and acceptable test-retest reliability has been established (Mahar, Parker, & Rowe, 1997).

Physical Education Activity Levels. Levels of engagement during physical education class time were assessed using DigiWalker pedometers. The pedometers are attached to the waistband of the students' shorts and measure the number of steps a student takes. Vincent and Pangrazi (2002) concluded that three to four days of pedometer counts could predict habitual physical activity levels in children. Furthermore, other research (Bassett et al., 1996; Differding et al., 1998; Kilanowski, Consalvi, & Epstein, 1999; Rowlands, Eston, & Ingledew, 1997) has established the use of pedometers as valid and reliable in both child and adult populations. This research has also demonstrated a relationship between step counts and oxygen uptake, heart rate, and observations of behavior.

The intraclass reliability coefficient was calculated for the average number of steps per minute across the three pedometer days. The repeated measures ANOVA indicated that the

pedometer counts from day one were problematic, and the reliability coefficient was unacceptable. The first pedometer day was significantly different from the second and third days ($F_{2,511} = 5.80$, $p < .003$). According to Thomas, Nelson, and Silverman (2005), when one trial or observation is significantly different, producing an unacceptable reliability coefficient, it is recommended that trial be deleted. The second and third days of pedometer data were not significantly different ($F_{1,603} = .49$, $p = .49$), and the intraclass correlation using these two days was .65. Therefore, the average pedometer counts (steps per minute) for the second and third day of the pedometer data collection were used. It was, therefore, necessary to average the SIMS subscale scores since this instrument is day specific, and needed to correspond with the second and third day of the pedometer collection.

Procedures

Data were collected during regularly scheduled physical education classes. Both the researchers and trained research assistants worked together to collect all data for the study. The start date of data collection, and subsequent data collection days were left to the discretion of the physical education teachers. Every attempt was made to collect data in the least intrusive, most efficient format possible. Once parent permission was obtained, student assent was acquired. Researchers explained the goal of the study to students, which was to learn what students think about their physical education classes so that teachers can make improvements to the physical education classes.

A schedule of data collection was established so that time with the students was maximized for efficiency and to minimize interruptions to instructional time. Data were collected by class, with one or two researchers assigned to each class of 20 to 24 students. The research team informed students that their teachers would not know what their answers were and

that their survey responses were completely confidential. The researchers and research assistants also continually reminded the students that there were no right or wrong answers, but that we simply wanted to know what they honestly thought. Students were reminded throughout the completion of the surveys to read each question carefully and respond honestly.

Testing stations were set up to optimize both time and space allotments. A rotating schedule was established to help students complete the necessary tasks, without taking away from significant instructional time. Students completed no more than two surveys per session (class period). The per-class total for research activities was approximately 20 minutes, with a total of four class periods devoted to data collection. Students rotated through survey stations, height, weight, and skinfold stations. Each student was measured on an individual basis by a researcher or trained research assistant. These measures were not taken in front of peers under any circumstance, nor were the scores shared with anyone other than the researchers and the student. Once the surveys, height, weight, and skinfold portions of the study were completed, the Hoosier Endurance Shuttle run was administered by class. Students worked together in small groups of two or three to complete the shuttle run. A positive environment was established where students were encouraged to do their best, without an emphasis on social comparison of scores.

Once all survey and fitness data had been completed, the researchers scheduled, with the physical education teachers, three days to collect physical activity data during the physical education class period. The physical educators were made aware that the three physical activity data collection days should represent "typical" instructional days which are representative of the normal physical education class. Based on Vincent and Pangrazi's (2002) study that three to four days of pedometer counts are sufficient to predict habitual physical activity, the physical

education activity data were collected using pedometers over three physical education class periods. Since reliability coefficients indicated that the first day of pedometer data was problematic, days two and three were averaged into one pedometer score of steps taken per minute during physical education.

Once the students had dressed in and the teacher had the opportunity to take roll, pedometers were distributed to students. At this time, the researcher or research assistant placed the pedometer in the correct location on the waistband of the students' shorts. The researcher or research assistant ensured that the pedometer had been reset to zero. Students wore the pedometers during their physical education time, with the researcher or research assistant keeping track of the number of minutes that the class was engaged in instructional or activity time.

The research team was also on hand to ensure that students were not misusing the pedometers or that pedometers were not lost. In addition, any student with a malfunctioning pedometer was instructed to take the pedometer to a researcher immediately. The physical educators brought students back into the gym in sufficient time to complete the SIMS to assess their levels of motivation for the physical education class. The SIMS was completed at the end of the instructional time on each of the three physical activity pedometer days. The research team recorded the number of minutes for each physical education class, as well as the activity in which the class participated for that day. This information was used to assist in the understanding of the level of engagement for each class each day.

Data Analysis

Data were analyzed using several techniques. First, simple correlations were conducted for the variables of interest. In order test the two proposed models, where the outcomes were

intention to engage in physical activity based on subjective measures (students levels of self-determination, attitude, and perceived competence) and objective measures (cardiovascular fitness, BMI, percent body fat, and race) structural equation modeling using LISREL was employed.

For the final hypothesis, canonical correlations were used. Canonical correlations allow for the investigation of sets of variables through linear combinations in multidimensional space (Stevens, 2002). The amount of shared variance between the engagement variables (self-report of physical activity, intention, average pedometer steps per minute in physical education) and the health indicator variables (Hoosier cardiovascular endurance shuttle run, BMI, lean mass) is determined through the canonical correlations. Stevens (2002) proposes that .1 to .3 is a weak canonical correlation, while .7 to .9 is a strong canonical correlation.

CHAPTER 3: RESULTS

The models tested in this study are both exploratory in nature, with the primary dependent variables being engagement and health indicators. The results will first present descriptive statistics for all variables in the study. The relationships between constructs which predict perceived competence (self-determination, motivational climate, and attitude) will be presented, followed by the interrelationships between these latent variables and perceived competence. Next, the focus will be on the interrelationships between the outcome variables for engagement, followed by the health indicators. Finally, the fit of the two proposed models and the canonical correlations will be presented and explained.

Means, Standard Deviations, and Reliabilities for All Variables

Means, standard deviations and Cronbach's alphas for the variables of interest in this study are provided in Table 1. Prior to LISREL analysis, reliabilities were checked for the instruments used in the study.

The descriptive data in this study illustrate that female students, on average, were at the 88th percentile for weight and the 79th percentile for height according to the CDC growth charts. Boys were at the 91st percentile for weight and the 86th percentile for height. Students in this study had an average BMI of 22, which is considered to be in the healthy range for adults, but it is not appropriate to use adult standards for adolescents (Hammer, Kraemer, Wilson, Ritter, & Dornbusch, 1991; Pietrobelli, Faith, Allison, Gallagher, Chiumello, Heymsfield, 1998). The lean mass score is calculated by subtracting the estimated percent body fat from one. The mean estimated percent body fat for boys, 24.6%, is moderately high and barely within optimal limits for girls, as a mean percent body fat of 25.1% in girls is considered moderately high (Baumgartner, Jackson, Mahar, & Rowe, 2003). While there is no normative or criterion

Table 1. Descriptive statistics for all variables

Variable	N	Mean	Std. Deviation	Range	Cronbach's alpha
Height	827	61.72 inches	3.74	48-76 inches	n/a
Weight	827	120.55 pounds	37.02	58-282 pounds	n/a
BMI	827	21.99	5.53	13-46	n/a
Lean Mass	796	75.36%	9.22	29.17-93.12%	n/a
HOO	809	32.88 laps	5.63	11-49 laps	n/a
PAQ-C	827	3.35	.707	1-5	n/a
Intention	827	5.15	1.03	1-6	.754
SPATH	757	2.89	.617	1-4	.738
COND	757	2.96	.641	1-4	.813
C-PIP	757	2.94	.584	1-4	.778
PSW	756	3.05	.720	1-4	.859
ENJ	817	3.73	.818	1-5	.881
USE	817	3.62	.763	1-5	.844
T-Learn	770	3.63	.830	1-5	.798
S-Learn	761	3.68	.791	1-5	.820
Competitive	777	3.14	.798	1-5	.642
Worry	773	3.24	.783	1-5	.656
Outcome	788	2.83	.841	1-5	.551
IM	682	4.49	1.09	1-6	.838
IR	683	4.17	1.03	1-6	.746
ER	683	3.58	1.21	1-6	.807
AM	682	2.94	1.14	1-6	.792
STEPS	590	76.10	21.07	19.05-207.62	n/a

HOO: Hoosier Endurance Shuttle Run; SPATH: Sport/Athletics; COND: Condition/ Stamina; C-PIP: Children's Perceived Importance Profile; PSW: Physical Self Worth Scale; ENJ: Enjoyment; USE: Usefulness; T-Learn: Teacher initiated learning; S-Learn: Students learning orientation; Competitive: Students competitive orientation; Worry: Students worries about mistakes; Outcome: Outcome orientation without effort; IM: Intrinsic motivation; IR: Identified Regulation; ER: external regulation; Amot: amotivation; STEPS: Steps per minute in PE

referenced standard for the Hoosier Endurance Shuttle Run, students completed approximately 33 laps in the nine minute testing period. Based on the distance in the shuttle run, the average student walked/ran approximately 0.75 miles in nine minutes.

The PAQ-C instrument does not have norm or criterion referenced standards by which to make comparisons. However, the average score of 3.35 for the entire instrument indicates that,

in general, students are physically active in some form between three and four times per week. The average intention score, where students indicated their intention to engage in physical activity or exercise at least three times per week over the next month, indicated that students agreed with the statement. Students reported, on average, that the physical self worth scale was the most salient of the subscales in the perceived ability scale (CY-PSPP), however average scores for all four subscales were relatively similar. From the LAPOPECQ, students tended to perceive the physical education class climate as more learning than performance oriented. The self-determination instrument (SIMS) indicated that students tended to have higher intrinsic motivation scores, with identified regulation following as the second strongest response. Replies regarding the students attitude toward physical education class were also relatively positive.

Nunnally (1978) suggests an acceptable range of Cronbach's alpha scores to be between .70 and .90 for research purposes. The subscales of each instrument meet this criteria, except for the three performance oriented subscales of the motivational climate survey (LAPOPECQ). These subscales are: students learning orientation (.642), students competitive orientation (.656), and students worries about mistakes (.551). Papaioannou (1994) reports a hierarchical factor structure for this instrument, where the two learning subscales may be combined into a learning factor and the competitive, worry, and outcome subscales can be combined to represent a performance factor. While combining the subscales of the LAPOPECQ addresses the reliability issue by brining the learning and performance alpha levels into acceptable range, the combining of these factors creates a Heywood case in the LISREL analysis of the proposed models. Therefore, to address the issue of a Heywood case, the original five factors of motivational climate were analyzed in this study. Prior research (Bryan & Solmon, 2005) had similar Cronbach's alpha levels for this instrument when five factors were used.

Relationships Between Variables

To gain insight into the relationships among variables in the model, simple correlations were examined, and are presented here prior to testing the structural models. The directions of relationships were consistent with theoretical predictions, though the magnitude of many relationships, while statistically significant due to the large sample size, were not practically meaningful. Berg and Latin (1994) outline general cutoffs established for correlation coefficients as follows: above .76 is high, .51 to .75 is fair, .26 to .50 is moderate, and .25 and below are weak (Berg & Latin, 1994). First, the relationships between the hypothesized predictors of perceived competence are examined. Then, the correlations between those predictors and perceived competence are presented. Following that, the associations between the variables in the models and the engagement variables and the health indicators are reported.

Relationships Among Predictor Variables. Interrelationships between the predictor variables self-determination, motivational climate and attitude are presented in Table 2.

Table 2. Relationships among predictor variables

	IM	IR	ER	AM	T-Learn	S-Learn	Comp-etitive	Worry	Outcome	ENJ
IM	1									
IR	.76*	1								
ER	-.09	.00	1							
AM	-.44*	-.32*	.38*	1						
T-Learn	.32*	.32*	-.03	-.21*	1					
S-Learn	.40*	.41*	-.05	-.24*	.64*	1				
Competitive	.00	.07	.16*	.08	-.00	.02	1			
Worry	.13*	.20*	.14*	-.01	.17*	.14*	.39*	1		
Outcome	-.04	.02	.17*	.19*	.04	.01	.29*	.17*	1	
ENJ	.42*	.41*	-.13*	-.28*	.54*	.65*	-.04	.07	.00	1
USE	.40*	.41*	-.09*	-.27*	.52*	.63*	.01	.09	-.01	.84*

*p<.01

Consistent with theoretical predictions, intrinsic motivation and identified regulation were highly correlated while external regulation and amotivation were moderately correlated. Moderate

negative associations were also evident between intrinsic motivation and identified regulation and the amotivation subscale. The learning subscales of the climate instrument were fairly high in their association, while students competitive orientation (competitive) and students worries about mistakes (worry) and outcome orientation without effort (outcome) were moderately associated. The attitude subscales, enjoyment and usefulness, were highly correlated with each other.

Moderate relationships were evident for the intrinsic and identified subscales and the learning variables of the LAPOPECQ (teacher initiated learning [T-Learn] and students learning orientation [S-Learn]). Statistically significant and fairly strong relationships emerged between the SIMS subscales intrinsic motivation and identified regulation and the attitude subscales, enjoyment and usefulness. The learning variables of the LAPOPECQ were also highly correlated with both enjoyment and usefulness from the attitude survey. Many other relationships to the LAPOPECQ emerged as statistically significant, yet were not meaningful based on the weak magnitude of the relationships.

Perceived Competence and Predictor Variables. Correlation coefficients are reported in Table 3 for the interrelationships between perceived competence and the predictor variables (self-determination, motivational climate and attitude).

Among the four subscales of the perceived competence measures, there is a pattern of positive relationships. The relationships between perceived competence and the levels of motivation on the SIMS were generally weak, although statistically significant. Intrinsic motivation and identified regulation had weak positive associations with the perceived competence variables, while external regulation and amotivation had weak, negative relationships. As with the SIMS, the relationships between perceptions of competence and

Table 3. Relationships between Perceived Competence and Predictor Variables

	SPATH	COND	C-PIP	PSW
SPATH	1			
COND	.67*	1		
C-PIP	.45*	.48*	1	
PSW	.59*	.64*	.32*	1
IM	.18*	.21*	.20*	.21*
IR	.20*	.23*	.21*	.20*
ER	-.06	-.11*	-.02	-.07
AM	-.10	-.14*	-.11*	-.14*
T-Learn	.10*	.12*	.16*	.16*
S-Learn	.23*	.27*	.22*	.22*
Competitive	.04	.02	.16*	-.06
Worry	-.13*	-.11*	.06	-.20*
Outcome	-.06	-.08	-.03	-.04
ENJ	.19*	.20*	.21*	.19*
USE	.19*	.22*	.27*	.18*

*p<.01

attitude were in the predicted directions, but were generally weak. Higher levels of perceived competence were weakly associated with perceptions of a learning climate and positive attitudes.

Outcome Variables and Predictors. The outcome variables for this study were engagement (PAQ-C self report of physical activity, intention to exercise/be physically active, and average steps per minute taken during physical education) and health indicators (BMI, lean mass, Hoosier endurance shuttle run scores). The relationships between the engagement outcome variables to the mediating variable (perceived competence) and the predictor variables (self-determination, motivational climate, and attitude) are reported in Table 4. Self-reported physical activity was moderately correlated with intention to engage in physical activity. Weak, yet statistically significant, relationships emerged for the PAQ-C and the average steps per minute in physical education. Steps in class and intention to be active were unrelated. Self-reported physical activity was moderately associated with the four subscales of perceived competence, and had weak positive relationships with intrinsic motivation, identified regulation, perceptions of a learning climate, and attitude.

Table 4. Relationship of Engagement variables to mediator and predictor variables

	PAQ-C	Intention	STEPS
PAQ-C	1		
Intention	.478*	1	
STEPS	.119*	-.086	1
SPATH	.423*	.344*	.068
COND	.432*	.403*	.089
C-PIP	.349*	.341*	-.037
PSW	.320*	.246*	.069
IM	.142*	.262*	-.075
IR	.150*	.254*	-.031
ER	-.054	-.016	-.014
AM	.000	-.163*	-.002
T-Learn	.148*	.202*	-.040
S-Learn	.233*	.323*	-.012
Competitive	.035	.080	-.021
Worry	-.067	.055	-.064
Outcome	.046	-.053	-.048
ENJ	.193*	.316*	-.045
USE	.211*	.334*	-.061

*p<.01

The pattern of relationships was very similar for intention to engage. Intention to engage in exercise/physical activity was moderately correlated to the subscales of the perceived competence instrument, intrinsic motivation and identified regulation, and the learning variables of the motivational climate instrument. Moderate correlations emerged for the intention to engage in exercise/physical activity and the attitude subscales, enjoyment and usefulness. The average steps taken per minute during physical education were unrelated to any of the variables in this study.

The final set of outcome variables in this study was the assessment of health indicators, as measured by BMI, lean mass, and the Hoosier endurance shuttle run scores. The relationships for the health indicators outcome variable perceived competence, and the predictor variables of self-determination, motivational climate, and attitude are found in Table 5. BMI has a strong negative correlation with lean mass, which is rational given that the higher ones BMI, the

Table 5. Relationship of Health Indicator variables to mediator and predictor variables

	BMI	Lean Mass	HOO
BMI	1		
Lean Mass	-.783*	1	
HOO	-.593*	.625*	1
SPATH	-.195*	.240*	.389*
COND	-.307*	.338*	.470*
C-PIP	-.162*	.209*	.311*
PSW	-.341*	.366*	.413*
IM	-.090	.042	.126*
IR	-.039	.028	.106*
ER	.046	-.022	-.059
AM	.146*	-.050	-.194*
T-Learn	-.023	.022	.034
S-Learn	-.052	.040	.092
Competitive	.021	.019	.080
Worry	-.003	-.039	-.047
Outcome	.067	.001	-.104*
ENJ	-.056	.019	.066
USE	-.047	.019	.048

*p<.01

lower their amount of lean mass. Both of these indicators of body composition were moderately related to the Hoosier scores, which is also consistent since students who are leaner are more physically able to run a greater number of laps.

Generally, children with higher BMIs displayed a weak tendency to have lower levels of perceived competence. Moderate negative correlations exist between BMI and the condition/stamina and physical self worth scale of the perceived ability instrument. Weaker, yet statistically significant, correlations are evident for BMI and the subscales sport/athletics and perceived importance profile of the perceived ability instrument. Lean mass had a moderate, statistically significant, relationship with all four subscales of the perceived competence instrument. The Hoosier endurance shuttle run had fair and statistically significant associations with the four subscales of the perceived climate instrument.

The three health indicators had no relationship greater than .20 with any of the self-determination, motivational climate, or attitude variables. Though some relationships were statistically significant, the magnitude of these relationships was not meaningful.

Structural Models

Structural equation modeling (SEM) examines relationships between latent variables at the theoretical level, testing the nomological network of how constructs are related (Schumacker & Lomax, 2004). SEM has become popular in recent years due to its ability to test and confirm numerous observed variables and its capacity to account for measurement error (Schumacker & Lomax, 2004). As in other statistical analysis, independent and dependent variables are defined within SEM. Exogenous variables are those without any arrows pointing to them in the structural model, conceptualized as being "outside" the system of relationships. Exogenous variables are also known as latent independent variables. An endogenous variable is a latent dependent variable which has at least one arrow pointing to it and is considered to be inside the system of relationships of the model (Schumacker & Lomax, 2004).

Maximum likelihood, which is widely used in structural equation modeling (Hoyle & Panter, 1993), was used to estimate the model in this study. Maximum likelihood uses information from the relationships in the network to find parameters that maximize estimates or minimizes differences in the hypothesized (population) and observed (sample) models. It is used as the default method because it is unbiased in that it neither under nor over estimates true population values. Further, it is consistent and converges to population estimates the larger the sample gets. Maximum likelihood is also efficient in that the parameters obtained have the smallest amount of variability and are measured with the least amount of error (Bollen, 1989). To use maximum likelihood, the data must be continuous and multivariate normal. Data in this

study were treated as continuous, as the Likert values were "sum" scores considered to be measuring an underlying latent variable.

Multivariate normality was assured by checking skewness and kurtosis values, none of which exceeded acceptable limits and thus ensured a normal distribution of a linear combination of variables (Stevens, 2002). SEM also facilitates the investigation of indirect effects, where there is no direct link between two variables, but one variable affects or mediates another, which in turn affects a third variable (Schumacker & Lomax, 2004). In structural equation modeling studies, previous research suggests approximately five subjects per variable, with a minimum of 200 total subjects in the study (Gorsuch, 1983). The number of participants in the study exceeds this minimum criterion.

Model 1: Engagement/Intention to Engage in Physical Activity. The outcome variables for the engagement/intention to engage in physical activity model include the final score on the PAQ-C self-report of physical activity instrument, the average number of steps taken per minute in physical education class and the average score of the intention to exercise or engage in physical activity questions. The sample size for this model was 401. First I present the measurement model and coefficients. The paths are set to zero, free to be estimated, and a t-value greater than 1.96, which corresponds to an alpha level of .05, is considered significant (Schumacker & Lomax, 2004). Standardized loadings are on the same metric, with values ranging from zero to one (Schumacker & Lomax, 2004). Unlike simple correlations, there is no steadfast criteria for evaluating the strength of a relationship based on the standardized loadings.

Relationships between the observed variables and the latent variables on the endogenous side of the model were significant in most instances, as evidenced by a t-value greater than two. The mediator in this model, perceived competence, had significant paths from condition/stamina,

children's perceived importance profile (C-PIP), and the physical self worth scale (PSW) to the latent variable perceived competence. The first path in this step of the model, sport/athletics was used to set the metric of the endogenous variable perceived competence. The outcome variable, engagement/intention to engage in exercise or physical activity, had significant paths for the self-report of physical activity and the average number of steps taken per minute in physical education class. However, it is important to point out that the strength of the relationship between the average steps taken in physical education and the link to the endogenous variable engagement is barely significant. The first path in engagement, intention to engage in exercise/physical activity, was used to set the metric for the endogenous variable engagement.

The relationships between the observed and latent variables on the exogenous side of the model, were significant in all but a few cases. The paths from the four subscales of self-determination (intrinsic motivation, identified regulation, external regulation, and amotivation) to the latent variable self-determination were all significant, as were the paths from enjoyment and usefulness to the latent variable attitude. As expected, the relationships between external regulation and amotivation to the latent variable self-determination were both negative. Only three of the paths for motivational climate were significant: teacher initiated learning, students' learning orientation and students' worries about mistakes. The parameters in the model were free to be estimated. The paths in the engagement model are summarized in Figure 4.

All paths linking the exogenous variables on the x-side of the model were significant (self-determination to motivational climate, self-determination to attitude, and motivational climate to attitude). Relationships from the x-side exogenous and y-side endogenous variables (perceived competence and engagement) showed a significant path from the latent variable motivational climate to perceived competence. However, there was not a significant path from

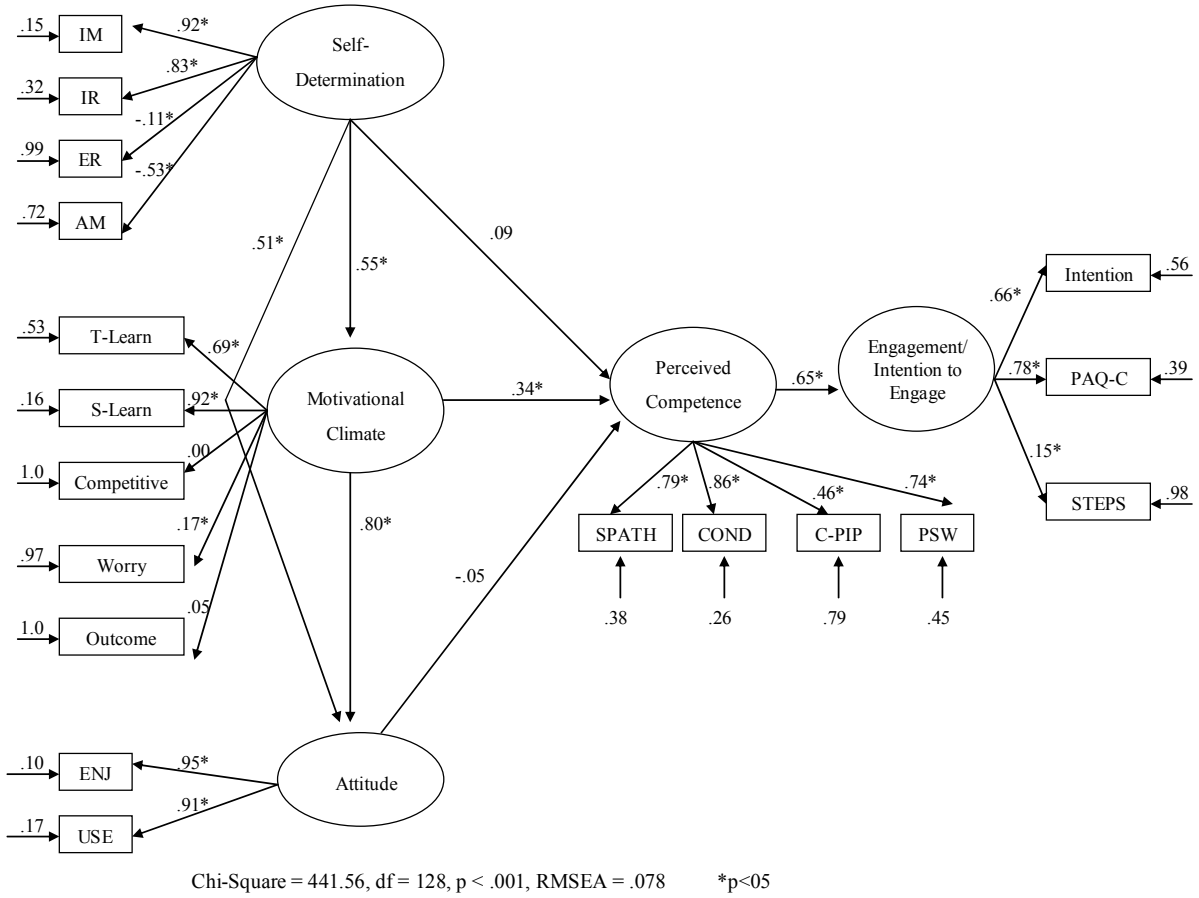

Figure 4. Engagement Model and Path Diagrams (standardized path coefficients)

self-determination to perceived competence or attitude to perceived competence. The latent variables on the y-side of the model had a significant path between perceived competence and engagement or intention to engage.

The squared multiple correlations are representative of R^2 values for each y-variable. In the engagement/intention to engage model, 13% of perceived competence is explained by the motivational climate, self-determination, and attitudes of students. Similarly, 42% of engagement or intention to engage in physical activity is explained by motivational climate, self-determination, attitude and perceived competence. The goodness of fit indices for this model, reported in Table 6, are approaching acceptable limits (Stevens, 2002).

Table 6. Fit indices for engagement/intention to engage in physical activity model.

Fit Index	Family	Value from LISREL	Interpretation
Goodness of Fit (GFI)	Model Fit	.89	Greater than .90 is considered acceptable fit
Adjusted GFI (AGFI)	Model Fit	.85	Greater than .90 is considered acceptable fit
Standardized Root Mean Square Residual (SRMR)	Model Fit	.078	Less than .05 is considered acceptable fit
Comparative Fit Index (CFI)	Model Comparison	.93	Greater than .90 is considered acceptable fit
Relative Fit Index (RFI)	Model Comparison	.88	Greater than .90 is considered acceptable fit
Normed Fit Index (NFI)	Model Comparison	.90	Greater than .90 is considered acceptable fit
Normed chi square	Model Parsimony	3.23	Ratio of less than 3 is considered acceptable fit
Root Mean Square Error of Approximation (RMSEA)	Alternative Fit	.078	Greater than .08 is considered poor fit

It is also important to examine any indirect effects which may occur in a structural model. In the case of the engagement/intention to engage in physical activity model, motivational climate has a significant indirect effect on engagement through the mediating variable perceived competence. No other significant indirect effects were detected in model 1. The standardized path coefficients for the indirect effects in model 1 are found in Table 7.

Table 7. Standardized path coefficients for indirect effects

Latent variable	Observed Variable Self-determination	Observed Variable Motivational Climate	Observed Variable Attitude
Engagement	.06	.22	-.03

The modification indices for this model suggest establishing a direct link between three observed variables (intention to engage in physical activity, PAQ-C self report of physical activity and the number of steps taken in one-minute during physical education) and the latent variable

perceived competence. However, allowing these observed variables to associate with perceived competence does not make theoretical or conceptual sense. Regarding the modification indices for this model, none of the suggested modifications match theory. In addition, the maximum modification index is found in the error matrix, however, freeing the error paths violates one assumption of structural equation modeling.

In the case of the engagement/intention to engage model, the overall fit of the data for this model is not outstanding, and could certainly be improved, however, the fit is also not poor. Given the fact that this is an initial effort to test a model that could help explain factors leading to engagement or the intention to engage in physical activity, it is certainly a good starting point.

While the fit of the engagement/intention to engage model is of paramount importance, it is also critical to examine the results of this model as they relate to the proposed hypotheses. The first hypothesis in this study, that higher levels of perceived competence would directly predict levels of engagement in physical education and intention to engage outside of school, was supported through the significant path from the latent variable perceived competence, to the latent variable engagement/intention to engage. Results relevant to the second hypothesis indicate that, although the relationship was relatively weak, yet statistically significant ($t = 2.75$), perceptions of the motivational climate, specifically task-involvement, were linked to perceived competence and were indirectly linked to levels of engagement in physical education and intention to engage outside of school. Self-determination did not have an effect on engagement in physical education and intention to engage outside of school, as mediated through perceived competence, as predicted in the third hypothesis. Finally, there was no indirect relationship between attitudes toward physical education and engagement/intention to engage in physical activity as hypothesized. Children who exhibited more positive attitudes did not necessarily

demonstrate higher levels of engagement in physical education and intention to engage outside of school, even when accounting for perceived competence as a mediator in this relationship.

Model 2: Health Indicators Model. In the second model, the same structure was used to predict health indicators as the outcome variable. The health indicators model has three observed variables, lean mass, Hoosier cardiovascular endurance run score, and body mass index linked to the latent outcome variable "health indicators." The sample size for this model was 467.

The relationships on the endogenous side of the model are represented by the links between the observed and latent variables. All subscales of the perceived competence latent variable are significantly linked to perceived competence, and the observed variables for the health indicators are also significant paths in the model. Again, as in model 1, sport/athletics (SPATH) was used to set the metric for the endogenous perceived competence variable. Similarly, lean mass was used to set the metric for the health indicator variables.

The relationships between the observed and latent variables on the exogenous side of the model are similar to those in model 1. Based on the standardized relationships reported, significant paths emerged in a similar fashion to the previous model. All observed variables were significantly linked to the latent variables self-determination and attitude. It is important to note that, compared to the other three observed variables, external regulation was barely significant with a t-score of -2.42. The direction of the signs for external regulation and amotivation are as expected and congruent with theory. Non-significant paths emerged for two observed variables linked to motivational climate: students' competitive orientation and outcome orientation without effort.

Paths in the health indicators model were also free to be estimated. Figure 5 indicates the paths for the health indicators model.

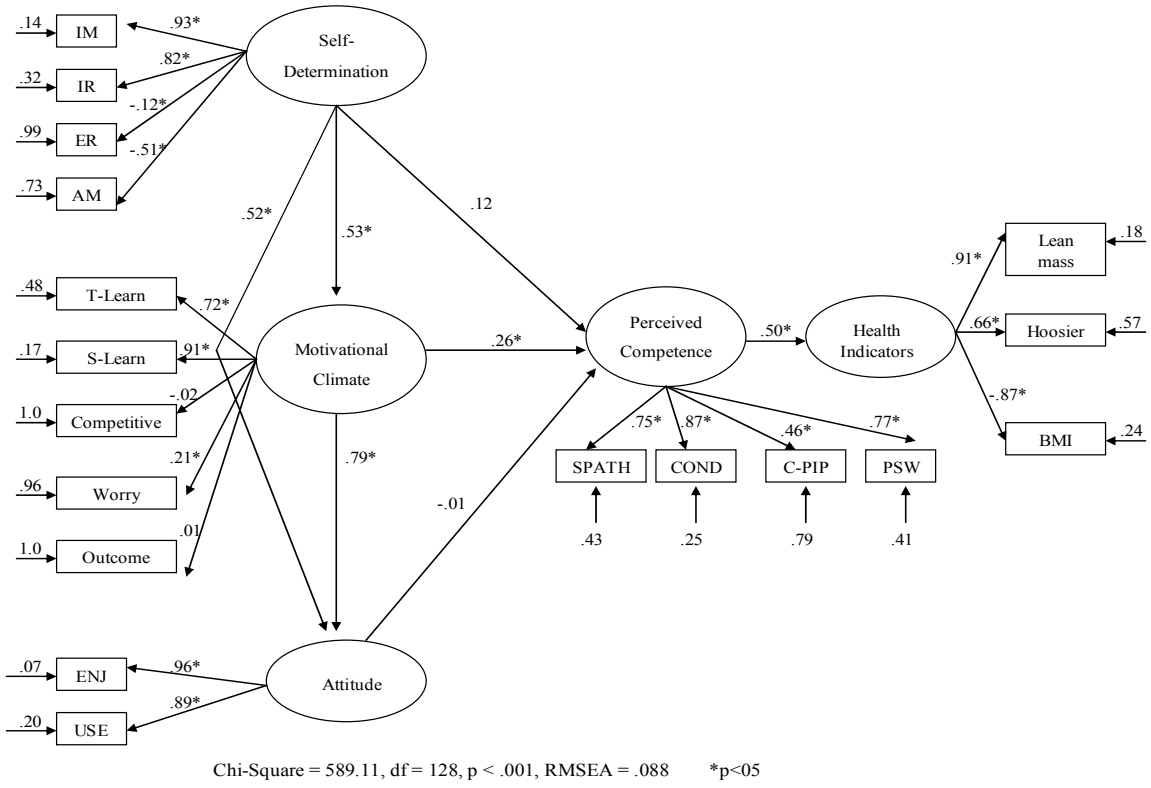

Figure 5. Health Indicators Model and Path Diagram (standardized path coefficients)

All paths linking the exogenous variables on the x-side of the model, were significant (self-determination to motivational climate, self-determination to attitude, and motivational climate to attitude). The only significant path linking the x-side exogenous and y-side endogenous variables was from motivational climate to perceived competence. Finally, there was a significant path between the latent variables perceived competence and engagement or intention to engage in physical activity on the y-side of the model.

The squared multiple correlations, or R^2 values, for model 2 indicate that perceived motivational climate, self determination, and the attitudes students have toward their physical

education classes account for 11% of their perceived competence. Further, 25% of student's health status is related to the motivational climate, self-determination, attitudes, and perceived competence. The goodness of fit indices for model 2 are provided in Table 8.

Table 8. Fit indices for the health indicators model.

Fit Index	Family	Value from LISREL	Interpretation
Goodness of Fit (GFI)	Model Fit	.88	Greater than .90 is considered acceptable fit
Adjusted GFI (AGFI)	Model Fit	.84	Greater than .90 is considered acceptable fit
Standardized Root Mean Square Residual (SRMR)	Model Fit	.080	Less than .05 is considered acceptable fit
Comparative Fit Index (CFI)	Model Comparison	.92	Greater than .90 is considered acceptable fit
Relative Fit Index (RFI)	Model Comparison	.88	Greater than .90 is considered acceptable fit
Normed Fit Index (NFI)	Model Comparison	.90	Greater than .90 is considered acceptable fit
Normed chi square	Model Parsimony	4.25	Ratio of less than 3 is considered acceptable fit
Root Mean Square Error of Approximation (RMSEA)	Alternative Fit	.088	Greater than .08 is considered poor fit

Overall, the data for the health indicators model do not fit as well as the engagement model. Again, this model is approaching an acceptable fit, and, in looking at the collective total of the fit indices, certainly this model could be improved. However, as with the engagement model, it is a solid start on structural models related to indicators of health.

As in model 1, there was only one significant indirect effect in the health indicators model. Motivational climate, working through perceived competence, has a significant indirect effect on the health indicators latent variable. Table 9 provides the standardized path coefficients for the indirect effects on the health indicator latent variable.

Table 9. Standardized path coefficients for indirect effects

Latent variable	Observed Variable Self-determination	Observed Variable Motivational Climate	Observed Variable Attitude
Health indicators	.06	.13	.00

The modification indices suggested for this model are either atheoretical, or violate the assumptions of structural equation modeling. For example, freeing the path from sport/athletics to associate with the latent variable health indicators does not make sense. In addition, the largest modification index would come from freeing the error terms associated with the variables in the model, however, this violates assumptions of structural equation modeling.

The first hypothesis related to the health indicators model was that higher levels of perceived competence will directly predict levels of health. The significant path that emerged from the latent variable perceived competence to the latent variable health indicators (as measured by lean mass, Hoosier endurance shuttle run score, and BMI) supports this hypothesis. The second hypothesis, that perceptions of the motivational climate are indirectly linked to levels of health, through the mediator perceived competence, is supported, though this relationship is quite weak ($t = 2.47$). Similar to the engagement model, the third hypothesis for the health indicators model is not supported. Self-determination did not have an indirect effect on the health indicators, as mediated through perceived competence. Finally, no indirect relationship existed between attitudes toward physical education and the health indicators, as hypothesized. Students who reported a more positive attitude were not necessarily healthier in terms of body mass and cardiovascular endurance, even when perceived competence was accounted for as a mediator.

Engagement and Health Indicators

The fifth and final hypothesis proposed in this study was that children with increased levels of cardiovascular endurance and lower (healthier) levels of BMI and percent body fat would have higher levels of engagement in physical education and intention to engage outside of school. This hypothesis was tested by determining the amount of shared variance between the three engagement variables (self-report of physical activity, intention, and average pedometer steps per minute in physical education) and the three health indicator variables (Hoosier cardiovascular endurance shuttle run, BMI, lean mass).

The first function of the canonical correlation analysis was significant, with an observed canonical correlation of .30, (Wilks's lambda = .89, F (9,1210) = 6.36, $p < .001$). The standardized canonical coefficients for the first function are presented in Table 10.

Table 10. Canonical correlation between engagement and health indicators

Variables	Standardized canonical coefficients
Engagement	
PAQ-C	.13
Steps	.51
Intention	.80
Health Indicators	
Lean mass	.25
Hoosier	1.02
BMI	.33

These coefficients indicate the relative contributions of the variables to the multivariate relationships between the linear combinations of the variable sets. According to Pedhauzer

(1982), coefficients greater than .30 are considered to be significant. The average steps taken during physical education and intention to engage were significant contributors to the canonical variate for engagement. The Hoosier was the most powerful influence among the health indicators, with BMI emerging as a significant contributor. A relatively small portion of the variance is shared between engagement and health indicators (adjusted $R^2 = 8.7\%$). While this is statistically significant, there remains a large portion of variance that is not accounted for in this model.

The second function of the canonical correlation analysis was also statistically significant, with an observed canonical correlation of .13 (Wilks's lambda = .97, F (4,996) = 6.36, $p < .03$). The second function is the linear combination of the variables sets that yields the next highest correlation coefficient, which is not correlated with the first pair of canonical variables. Although the second canonical variate is statistically significant, because the proportion of variance accounted for by this function (adjusted $R^2 = 1.7\%$) is negligible, it is not appropriate to interpret that function (Pedhauzer, 1982).

CHAPTER 4: DISCUSSION

The purpose of this study was to investigate the relationships between self-determination, class climate, attitude, perceived competence, engagement behaviors and health indicators. Other studies have examined various aspects of the models proposed, but not the entire complex network of relationships that influence children's physical activity choices. Self-determination theory was used as a framework to examine the five research hypotheses.

Engagement/Intention to Engage in Physical Activity

Issues related to the engagement or intention to engage in physical activity were one focus of this study. The results support the notion that perceived competence is a critical factor in students' decisions to engage and their intentions to engage in physical activity. Based on Cohen's (1988) coefficient criteria, which indicates a coefficient greater than .50 is large, the standardized relationship between perceived competence and engagement, in this study, is of considerable consequence. This finding is not unique, and is consistent with previous studies which have also linked perceived competence to engagement in physical activity (Ferrer-Caja & Weiss, 2000; Kimieck, Horn, & Shurin, 1996; Parish & Treasure, 2003; Wang, et al., 2002).

The absence of an indirect relationship between the levels of self-determination and engagement in physical education and intention to engage outside of school is not consistent with theoretical assertions or previous work. Prior research (Standage, Duda, & Ntoumanis, 2003) has established a link between levels of self determination and intention to engage in physical activity, though this link was direct and not mediated by perceived competence. A strong relationship between self-determination and a learning climate, where the focus is on mastery and improvement was evident in the engagement model. Parish and Treasure (2003) found similar results of strong associations among a task-involved climate and higher levels of self

determination. In addition, a strong relationship between self-determination and attitude was evident. These findings support the notion that higher levels of self-determined behavior are congruent with positive attitudes and perceptions of a task-involved climate. More research should be conducted, however, to better understand why the self-determination variables did not indirectly affect engagement.

The positive indirect relationship that emerged between perceptions of the motivational climate, specifically task-involvement, and engagement, provides further evidence for the importance of structuring physical education classes in such a way that the emphasis is on learning, improving and participating, rather than competing or outperforming others. Previous research also supports the idea that a focus on outperforming others, winning, and losing may send the wrong message and create an unintended ego-involved climate (Vallerand, Deci, & Ryan, 1987). Previous studies have also established that physical education environments should provide a choice of activities (Grolnick, et al., 2002; Li, et al., 2005; Ntoumanis, 2001) and allow for students to work at their own level of ability and challenge (Grolnick, et al., 2002). Competence can also be fostered by using personalized standards for success where students are evaluated based on their own progress (Ntoumanis, 2001) and the relationship between perceived climate and perceived competence is consistent with that premise.

The engagement model in this study did not reveal the indirect relationships between attitudes toward physical education and engagement/intention to engage in physical activity that were hypothesized. Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) found associations between enjoyment of physical activity, along with levels of perceived competence, and future attendance and adherence to an activity program. However, there has been little research to date on attitude constructs of usefulness and enjoyment and their relationships to engagement in

physical activity. Ntoumanis (2002) did assess enjoyment using a four-item inventory to assess the construct. The results of that study suggested that those who exhibited higher levels of self-determination also reported higher levels of enjoyment. While attitude was significantly related to the self-determination and motivational climate variables in this study, it is surprising that there was not a significant link between attitude and perceived competence. This seems to suggest that while students may feel competent in their physical education classes, they may not find it particularly enjoyable or useful.

One clear and important message from this study, as it relates to engagement/intention to engage in physical activity, is that students who perceived they were in a task-involved climate had higher levels of perceived competence and, therefore, were more engaged in their physical education classes and had stronger intentions to engage in physical activity outside of school. This has been evident in previous work and is further substantiated by this study. This study provides evidence that when these variables are fostered, we should see positive results in physical activity engagement patterns.

Health Indicators

A unique contribution of this study is the inclusion of objective measures of health related fitness. The proposed model that was tested to predict engagement was also evaluated with regard to these objective measures and many similarities between models were evident. Specifically, significant paths were consistent for both the engagement and health indicators model. However inspection of the fit indices indicates the engagement model appears to provide a slightly better fit to these data.

Similar to the engagement model, the results of this study indicate a significant link between perceived competence and health indicators. Certainly the salience of perceived

competence in a physical education class is critical, as fostering competence has been linked to increased physical activity during physical education (Parish & Treasure, 2003) and higher levels of self-determination (Losier & Vallerand, 1994). Previous literature has not addressed relationships between perceived competence and health indicators, and an important contribution of this study is to provide a foundational basis for the link between these constructs.

Relationships between self-determination, motivational climate, and attitude mirrored the engagement model. A critical finding from this work is related to the indirect effect from motivational climate to health indicators, similar to the indirect relationship found in the engagement model. In this study, students who perceived the motivational climate as a mastery climate had higher levels of perceived competence and better, healthier scores on the health indicators (BMI, lean mass, Hoosier endurance shuttle run). Cohen's (1988) criteria again indicate a large coefficient for the relationship. This finding further reiterates the importance of perceptions of a task-involved climate and perceived competence in physical education. As with the engagement model, there was no indirect effect for levels of self-determination or attitude on the health indicators in this study. There is a dearth of literature to support or challenge the findings as they relate to perceived competence or self-determination and health related components of fitness. Perceptions of the motivational climate were the only significant indirect effect on heath indicators. Like the other variables in this model, there is an absence of related literature to confirm or refute this finding since health related indicators have been used so infrequently in research.

It is worthy of note to examine patterns of relationships which did not emerge as expected. Specifically, attitude and self-determination were two latent constructs that were expected to be important contributors to these models. At this point, one may surmise that

attitude is either not important, or a negligible construct, based on the results of this study. The strong relationship between the observed variables enjoyment and usefulness is incontrovertible, and attitude was also moderately related to levels of self-determination, and the learning subscales of the motivational climate instrument. This study used a validated instrument (Subramaniam & Silverman, 2000) which had high reliability coefficients. In their review of the research on attitude, Silverman and Subramaniam (1999) concluded that the research at that time had produced inconsistent and disappointing findings. They suggested that one explanation for that was related to the use of invalid instrumentation to measure attitude. Attitude has sometimes been referred to as a nebulous construct, and although I used an instrument that had been validated for use with middle school students, little or no support for the influence of this construct was evident.

Self-determination is another variable which did not function as expected in the two models. One issue that stands out is that self-determination is not significantly related to perceived competence in either model, yet perceived competence is a nutriment of self-determination theory. Parish and Treasure (2003) found stronger relationships between intrinsic motivation and identified regulation and a mastery climate, though their study used only one higher order factor of mastery, not two (teacher initiated learning and students learning orientation). In addition, these authors found much stronger relationships between external regulation and amotivation and the higher order factor performance climate. Ferrer-Caja and Weiss (2000) also used self-determination in a study of high school students, yet they did not use the SIMS. The instrument they used to assess self-determination focused mainly on autonomy. Therefore, it is difficult to draw a direct comparison from their work to this study.

One possible explanation for these confounding results related to self-determination is that, though we collected data on multiple days across different classes to obtain reliable step counts, the SIMS is day specific in that it asks only about the activities in which a student participated on that day. Therefore, perhaps a more global measure of self-determination would be preferable to use with other more global constructs such as climate, perceived competence, and attitude.

Taken together, the interpretation of these models indicates that perceived competence is a powerful predictor for both engagement and health, as predicted in the first hypothesis. Motivational climate, mediated through perceived competence, also has an effect on engagement and health, thus providing support for the second hypothesis. It was also hypothesized that self-determination and attitude would effect engagement and health, however those hypotheses were not supported in this study.

Relationship Between Engagement and Health Indicators

The fifth hypothesis from this study examined the link between engagement and health indicators. Relationships between these two models are evident, though not powerful. It is certainly no surprise that the students who had a lower BMI scored higher, or completed more laps during the nine minute test period, on the Hoosier endurance shuttle run. Although Parish and Treasure (2003) used BMI and found students in their study to be within normal limits for BMI in adolescents, they used BMI only as a descriptive measure for the subjects in their study, and did not analyze relationships to other variables.

The findings of this study support the idea that students who scored better on the Hoosier have a higher intention to engage in physical activity and are more active in their physical education classes. Previous research has found that increasing the level of physical activity in

children has the potential to decrease their BMI (Berkey, et al., 2003) and reduce risk status. Further, many studies in public health have often relied on self-report data to calculate BMI. One of the strengths of this study is that both BMI and skinfold measures were taken by trained researchers and linked to engagement and motivational constructs. The accuracy of this information therefore should be greater than that of self-report alone.

One hypothesis proposed in this research study was that children with increased levels of cardiovascular endurance and lower (healthier) levels of BMI and percent body fat would have higher levels of engagement in physical education and intention to engage outside of school. The canonical correlations provided some support for that hypothesis, but the relationship was not large. On the surface, it may not appear that accounting for nine percent of the variance in engagement and health indicators is very significant, however, but closer examination of the meaningfulness of this finding suggests otherwise. In the context of the variability associated with weight, skinfold, and BMI, and the health risks associated with high levels of overweight, a nine percent change could bring a child or adolescent out of a high risk category and into less serious risk strata for a variety of health related problems. Again, as with the two proposed models, accounting for nine percent of the variance in engagement and health indicators is certainly a worthwhile start.

Limitations

While this study provides a more thorough picture of the complex network of relationships among attitude, motivation, climate, perceived competence, engagement, and health related variables, there are some limitations of this study that should be acknowledged. First, due to the structure of the physical education classes, and the desire on the part of the research team to get an accurate picture of a "typical" physical education class, the SIMS instrument was

given to students who had participated in a wide variety of activities. At one school, boys and girls participated in different activities, while at the second school, different classes, which had both genders, participated in different activities. The wording for the SIMS is very situation specific, and that level of specificity may not be appropriate when examining more global constructs. Second, the reliability coefficients for the subscales of the motivational climate were, in some cases, below acceptable limits. In future studies, it might be wise to consider other instruments to assess the climate.

Finally, a retention rate of more than 50% would provide more participants with viable data for analysis. Incomplete sets of data were collected on 827 participants, but approximately half of those had complete data sets which could be analyzed for the structural models. Certainly, data collection in field-based settings presents considerable challenges and hurdles. It would have been preferable, however, to have a higher percentage of the sample represented in the final analysis.

Conclusions and Implications

Given the current state of public health in the United States, and the obesity rates, determining ways to increase children's engagement in physical activity and improving their levels of functional health should be a high priority. Achieving that goal has the potential to have long term positive effects, given that active children are more likely to be active as adults. The intention of this study was to examine variables that mediate and contribute to both engagement in physical activity and health-related fitness indicators. One unique contribution of this study is the foundational work it provides regarding health related variables and the relationship to motivational constructs, which has previously been understudied. Based on the results, several implications are supported for future research and teaching practice.

Directions for Future Research. This study was exploratory in nature, and provides the basis to drive a series of studies investigating how to foster children's motivation to be physically active in physical education classes. The models proposed and tested in this study produced a marginally acceptable fit, however there is certainly room for improvement. Therefore, a first step in extending this line of research is to use the findings from this study to construct alternative models. The simple correlations in this study revealed weak relationships between perceived competence and self-determination, and perceived competence and attitude. This is not consistent with prior research (Losier & Vallerand, 2004; Ntoumanis, 2002). Relationships did, however, emerge between elements of a learning or mastery climate, higher levels of self-determination (intrinsic motivation and identified regulation), and attitude. These relationships are both reasonable and consistent with theory. Attitude and self-determination did not emerge as significant influences on engagement or health indicators, which did not support the theoretical predictions. In the conceptualization of subsequent models, I suggest the use of a more global measure of self-determination than the SIMS. Additionally, it seems wise to incorporate measures of the nutriments identified in Self-Determination Theory (autonomy, competence, and relatedness) as components of the latent variable. Evidence from the current study supports the continued use of perceived competence as a mediator for both engagement and health indicators, but an alternative model would be strengthened by eliminating the latent variable attitude from the model, and testing motivational climate and self-determination as predictors of perceived competence.

There is evidence that race (Morgan, et al., 2003) and gender (McKenzie, 2003) are influential variables in physical activity levels, and that males and Caucasians are more active than females and non-Caucasians. Those variables were not considered in this study, but

because it is clear that physical activity patterns vary by gender and race, future studies should explore how these variables function in these models. It is important to determine whether or not structural models that predict physical activity levels and health indicators are invariant across samples of males, females, and ethnically diverse samples. This analysis would also provide a more complete picture in terms of implications for teaching.

Ultimately, the goal in this line of research is to identify the correlates and predictors of engagement and health indicators in physical education with the intention of developing strategies to use in an intervention. When that has been accomplished, the next step in this progression is to design and test interventions to determine if strategies can be successfully integrated into instructional models that will promote engagement, as well as have a positive influence on health indicators. An intervention study could provide greater understanding as to the ways in which the physical education environment can be modified to reflect those variables that will produce measurable changes in both engagement patterns and health related components.

Finally, the use of survey data in this study is a limitation. The inclusion of objective measures of engagement and health indicators in the study design is a strength and supplements the survey data. In order to gain a clearer understanding of the meaning students attach to their physical education experiences, however, qualitative approaches are needed. Interview data have the potential to provide a deeper understanding and the motivational processes through the voices of the students. These data could also corroborate, or refute the current findings and provide more of a description into what students believe and do in their physical education classes.

Implications for Teaching. It is well documented that children should engage in physical activity on a regular basis as a way to improve their overall health (Berkey, et al., 2003; COPEC, 2004). Physical education programs have been recognized as one way to address physical activity concerns as they relate to children and adolescents (ACSM, 2000; CDC, 1997; McKenzie et al., 1995). One important goal of this study of children's engagement patterns and intention to engage is to provide research-based recommendations for physical educators and other practitioners concerning ways they can structure their classes to foster the adoption of physically activity lifestyles. The findings from this study, and others, provide evidence to support the following implications for teaching.

The results of this study indicate a clear relationship between perceptions of competence and engagement behaviors, and this link has also emerged in prior research (Kimiecik, Horn, & Shurin, 1996). Perceptions of competence are also associated with health indicators. Given that perceived competence mediates the engagement levels and health related status of children, it is critical that physical educators apply strategies to help foster students' perceived competence. Previous work in this area has supported the notion that experiences of success and failure have an impact on students' motivation to participate (Vallerand & Losier, 1999). Teaching methodologies that allow students to experience success as they participate in physical activity is one way to foster feelings of competence (Ntoumanis, 2001). In addition, focusing on the individual self-improvement of students rather than social comparison is another approach to fostering feelings of competence in physical education (Ntoumanis, 2001).

Harter (1978) advocates that individual's find activities in which they are competent, and pursue that activity where success is likely. Too often, traditional physical education curricula are constructed around a very narrow focus on sport (Ennis, 1999). This type of program does

not provide alternatives for students who either do not like or are not very successful at some of the more traditional sport skills. Providing a wide range of activities in a physical education curriculum is one way for students to find something that they enjoy and can develop the skills to participate successfully. Successful participation can, of course, mean different things for different students and it is up to the physical education teacher to help students understand that different criteria for success are acceptable. However, the point remains that if students have the opportunity to participate in an array of games or activities, they are more likely to find something they enjoy and in which they feel confident participating.

The role of competition as it relates to perceived competence is often misunderstood. Certainly, competition is motivating to some students and the opportunity to participate in competition is one way for students to make judgments regarding their own ability levels. However, a teaching approach that overemphasizes social comparison can be very demoralizing for students who are not as skilled or simply do not enjoy a particular activity or instructional unit. Perceived competence can be cultivated for students when they are in situations where the games and activities provide an appropriate level of challenge (Grolnick, et al., 2002) and competition is used only for informational purposes (Reeve & Deci, 1996) or for students who are motivated by this type of approach.

The results of this study also provide evidence that perceptions of the motivational climate have a significant link to engagement and heath indicators, as mediated by perceived competence. This finding is consistent with prior research (Ferrer-Caja & Weiss, 2000; Parish & Treasure, 2003) and it is clear that when students perceive that learning and improvement are the focus of their physical education program, they are more likely to participate in their class and give greater effort. An environment that promotes winning above all else is not one where

motivation to participate will be fostered (Reeve & Deci, 1996). This study provides evidence that when teachers create a mastery climate where the emphasis is on achieving goals and personal improvement, rather than on outperforming others, children are more likely to be physically active and healthier.

REFERENCES

Ajzen, I. (1988). *Attitudes, personality, and behavior.* Chicago: Dorsey Press.

Ajzen, I. (1993). Attitude theory and the attitude behavior relation. In D. Krebs & P. Schmidt (Eds.), *New directions in attitude measurement* (pp. 41-57). New York: de Gruyter.

American College of Sports Medicine. (2000). *ACSM's guidelines for exercise testing and prescription* (6th ed.). Philadelphia: Lippincott Williams & Wilkins.

Ames, C. (1992). Achievement goals, motivational climate, and motivational processes. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 161-176). Champaign, IL: Human Kinetics.

Ames, C. & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology, 80,* 260-267.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bassett, D. R., Ainsworth, B. E., Leggett, S. R., Mathien, C. A., Main, J. A., Hunter, D. C., & Duncan, G. C. (1996). Accuracy of five electronic pedometers for measuring distance walked. *Medicine & Science in Sports & Exercise, 28,* 1071-1077.

Baumgartner, T. A., Jackson, A. S., Mahar, M. T., & Rowe, D. A. (2003). *Measurement for evaluation in physical education and exercise science*. New York, NY: McGraw-Hill.

Berg, K. E. & Latin, R. W. (1994). *Essentials of modern research methods in health, physical education, and recreation.* Englewood Cliffs, NJ: Prentice-Hall.

Berkey, C. S., Rockett, H. R. H., Gillman, M. W., & Colditz, G. A. (2003). One-year changes in activity and in inactivity among 10 to 15 year old boys and girls: relationship to change in body mass index. *Pediatrics, 111*, 836-843.

Biddle, S.J.H. (1999). Motivation and perceptions of control: Tracing its development and plots its future in exercise and sport psychology. *Journal of Sport and Exercise Psychology, 21,* 1-23.

Biddle, S.J.H. (2001). Enhancing motivation in physical education. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 101-128). Champaign, IL: Human Kinetics.

Bollen, K. A. (1989). Structural Equations with Latent Variables. A volume in the Wiley Series in Probability and Mathematical Statistics: John Wiley & Sons, Inc.

Brustad, R.J. (1991). Children's perspectives on exercise and physical activity: measurement issues and concerns. *Journal of School Health*, 61, 228-230.

Bryan, C. L., Johnson, L. J., & Solmon, M. A. (2004, April). *Children's attitudes toward physical activity and their perceptions of fitness activities*. Paper accepted for presentation at the annual meeting of the American Educational Research Association, San Diego, CA.

Bryan, C. L. & Solmon, M. A. (2005, April). *Student Motivation in Physical Education and Engagement in Physical Activity.* Paper accepted for presentation at the annual meeting of the American Educational Research Association, Montreal, Canada.

Burgeson, C. R., Wechsler, H., Brener, N. D., Young, J. C., & Spain, C. G. (2001). Physical education and activity: Results for the school health policies and programs study 2000. *Journal of School Health, 71,* 279-293.

Centers for Disease Control and Prevention. (1997). Guidelines for school and community programs to promote lifelong physical activity among young people. *Morbidity and Mortality Weekly Report, 46,* 1-36.

Chatzisarantis, N. Biddle, S.J.H., & Meek, G. A. (1997). A self-determination theory approach to the study of intentions and the intention-behavior relationship in children's physical activity. *British Journal of Health Psychology, 2,* 342-360.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York: Academic Press.

Council for Physical Education for Children. (2004). *Physical activity for children: A statement of guidelines for children ages 5-12.* Reston, VA.

Crocker, P. R. E., Bailey, D. A., Faulkner, R. A., Kowalski, K. C., & McGrath, R. (1997). Measuring general levels of physical activity: Preliminary evidence for the Physical Activity Questionnaire for Older Children. *Medicine and Science in Sports and Exercise, 29,* 1344-1349.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18,* 105-115.

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

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

Differding, J., Welk, G. J., Hart, P., Abate, J., & Symington, S. (1998). The use of the Digi-Walker step counter to measure levels of physical activity. *Medicine & Science in Sports & Exercise, 30,* S11.

Duda, J. L., & Whitehead, J. (1998). Measurement of goal perspectives in the physical domain. In Duda, J. L. (Ed.) *Advances in sport and exercise psychology measurement* (pp. 21-48). Morgantown, WV: Fitness Information Technology.

Eklund, R. C., Whitehead, J. R., & Welk, G. J. (1997). Validity of the children and youth physical self-perception profile: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 68,* 249-256.

Ennis, C. D. (1999). Creating a culturally relevant curriculum for disengaged girls. *Sport, Education & Society, 4,* 31-49.

Epstein, J. (1989). Family structures and student motivation: A developmental perspective. In Ames, C. & Ames, R. (Eds.), *Research on motivation in education* (Vol. 3, pp. 259-295). New York: Academic.

Ferrer-Caja, E. & Weiss, M. R. (2000). Predictors of intrinsic motivation among adolescent students in physical education. *Research Quarterly for Exercise and Sport, 71,* 267-279.

Gorsuch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Goudas, M. & Biddle, S. J. H. (1994). Perceived motivational climate and intrinsic motivation in school physical education classes. *European Journal of Psychology of Education, 9,* 241-250.

Goudas, M. & Biddle, S. J. H. (1995). A prospective study of the relationships between motivational orientations and perceived competence with intrinsic motivation and achievement in a teacher education course. *Educational Psychology, 15,* 89-96.

Grolnick, W. S, Gurland, S. T., Jacob, K. F., & Decourcey, W. (2002). The development of self-determination in middle childhood and adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of Achievement motivation* (pp. 147-171). New York: Academic Press.

Guay, F., Vallerand, R. J., & Blanchard, C. (2000). On the assessment of situational intrinsic and extrinsic motivation: The situational motivation scale (SIMS). *Motivation and Emotion, 24,* 175-213.

Hagger, M. S., Chatzisarantis, N. L. D., Culverhouse, T., Biddle, S. J. H. (2003). The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behavior: A trans-contextual model. *Journal of Educational Psychology, 4,* 784-795.

Hammer, L. D., Kraemer, H. C., Wilson, D. M., Ritter, P. L., & Dornbusch, S. M. (1991). Standardized percentile curves of body-mass index for children and adolescents. *American Journal of Disease of Child, 145,* 259–263.

Harter, S. (1978). Pleasure derived from optimal challenge and the effects of extrinsic rewards on children's difficulty level choices. *Child Development, 49,* 788-799.

Harter, S. (1985). Competence as a dimension of self-evaluation: toward a comprehensive model of self-worth. In R. L. Leahy (Ed.), T*he development of the self* (pp. 55-121). Orlando, FL: Academic Press.

Harter, S. & Connell, J. P. (1984). A model of children's achievement and related self-perceptions of competence, control and motivational orientation. In: J. G. Nicholls (Ed.) *Advances in motivation and achievement, Vol. 3: the development of achievement motivation,* (pp. 219-250). Greenwich, CN: JAI Press.

Hoyle, R. H. & Panter, A. T. (1993). Writing about structural equation models. *Structural Equation Modeling,* , 158-176.

Ingledew, D. K., Markland, D., & Medley, A. R. (1998). Exercise motives and stages of change. *Journal of Health Psychology, 3,* 477-489.

Kilanowski, C., Consalvi, A., & Epstein, L. H. (1999). Validation of an electronic pedometer for measurement of physical activity in children. *Pediatric Exercise Science, 11,* 63-68.

Kimieck, J. C., Horn, T. S., & Shurin, C.S. (1996). Relationships among children's beliefs, perceptions of their parents' beliefs, and their moderate-to-vigorous physical activity. *Research Quarterly for Exercise and Sport, 67*, 324-336.

Kowalski, K. C., Crocker, P. R. E., & Faulkner, R. A. (1997). Validation of the Physical Activity Questionnaire for Older Children. *Pediatric Exercise Science, 9,* 174-186.

Li, W., Lee, A. M., & Solmon, M. A. (2005). Relationships among dispositional ability conceptions, intrinsic motivation, perceived competence, experience, persistence, and performance. *Journal of Teaching in Physical Education, 24,* 51-65.

Lohman, T. G. (1992). *Advances in body composition assessment.* Champaign, IL: Human Kinetics.

Losier, G. F. & Vallerand, R. J. (1994). The temporal relationship between perceived competence and self-determined motivation. *Journal of Social Psychology, 134,* 793-801.

Mahar, M.T., Parker, C. R., & Rowe, D. A. (1997). Agreement among three field tests of aerobic capacity. *Research Quarterly for Exercise and Sport, 68, Supplement 1,* A54.

Markland, D. (1999). Self-determination moderates the effects of perceived competence on intrinsic motivation in an exercise setting. *Journal of Sport & Exercise Psychology, 21,* 351-361.

McKenzie, T. L. (2003). Health-related physical education: Physical activity, fitness, and wellness. In Silverman, S. J., & Ennis, C. D. (Eds.) *Student learning in physical education* (2nd ed., pp. 207-226). Champaign, IL: Human Kinetics.

McKenzie, T. L., Feldman, H., Woods, S., Romero, K., Dahlstrom, V., Stone, E., Strikmiller, P., Williston, J., & Harsha, D. (1995). Student activity levels and lesson context during third grade physical education. *Research Quarterly for Exercise and Sport, 66,* 184-193.

McKenzie, T. L., Marshall, S. J., Sallis, J. F., & Conway, T. L. (2000). Student activity levels, lesson context, and teacher behavior during middle school physical education. *Research Quarterly for Exercise and Sport, 71,* 249-259.

Morgan, C. F., McKenzie, T. L., Sallis, J. F., Broyles, S. L., Zive, M. M., & Nader, P. R. (2003). Personal, social, and environmental correlates of physical activity in a bi-ethnic sample of adolescents. *Pediatric Exercise Science, 15,* 288-301.

National Association for Sport and Physical Education. (2004). *Moving into the future: National standards for physical education* (2nd ed.). Reston, VA: author.

Nicholls, J. G. (1984). Conceptions of ability and achievement motivation. In R. Ames & C. Ames (Eds.), *Research on motivation in education: volume 1. Student motivation* (pp. 39-73). New York: Academic Press.

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology, 71,* 225-242.

Ntoumanis, N. (2002). Motivational clusters in a sample of British physical education classes. *Psychology of Sport and Exercise, 3,* 177-194.

Ntoumanis, N. & Biddle, S. J. H. (1999). A review of motivational climate in physical activity. *Journal of Sport Sciences, 17,* 643-665.

Nunnally, J. C. (1978). *Psychometric Theory 2nd Edition*. New York: McGraw-Hill.

Papaioannou, A. (1994). Development of a questionnaire to measure achievement orientations in physical education. *Research Quarterly for Exercise and Sport, 65,* 11-20.

Parish, L.E., & Treasure, D.C. (2003). Physical activity and situational motivation in physical education: Influence of the motivational climate and perceived ability. *Research Quarterly for Exercise and Sport, 74,* 173-182.

Pate, R. R., Ross, R., Dowda, M., Trost, S. G., Sirard, J. R. (2003). Validation of a 3-day physical activity recall instrument in female youth. *Pediatric Exercise Science, 15,* 257-265.

Pedhauzer, E. J. (1982). *Multiple regression in behavioral research: Explanation and prediction* (2nd ed.). Fort Worth: Holt, Rinehart and Winston.

Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumello, G., & Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: A validation study. *Journal of Pediatrics*, *132*, 204–210.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 4,* 667-686.

Reeve, J. & Deci, E. L. (1996). Elements of the competitive situation that affect intrinsic motivation. *Personality and Social Psychology Bulletin, 22,* 24-33.

Roberts, G. C. (2001). Understanding the dynamics of motivation in physical activity: The influence of achievement goals on motivational processes. In Roberts, G. C. (Ed.) *Advances in motivation in sport and exercise* (pp. 1-50). Champaign, IL: Human Kinetics.

Rowlands, A. V., Eston, R. B., & Ingledew, D. K., (1997). Measurement of physical activity in children with particular reference to the use of heart rate and pedometry. *Sports Medicine, 24*, 258-272.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63,* 397-427.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68-78.

Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology, 28,* 335-354.

Safrit, M. J. (1995). *Complete guide to youth fitness testing*. Champaign, IL: Human Kinetics.

Safrit, M. J., & Wood, T. M. (1995). Introduction to measurement in physical education and exercise science. Boston, MA: WCB McGraw-Hill.

Schumacker, R. E. & Lomax, R. G. (2004). A beginner's guide to structural equation modeling. Mahwah, NJ: Lawrence Erlbaum Associates.

Silverman, S., & Subramaniam, P. R. (1999). Student attitude toward physical education and physical activity: A review of measurement issues and outcomes. *Journal of Teaching in Physical Education, 19,* 97-125.

Solmon, M. A. (2003). Student issues in physical education classes: Attitude, cognition, and motivation. In Silverman, S. J., & Ennis, C. D. (Eds) Student Learning in Physical Education (2nd ed., pp. 147-163). Champaign, IL: Human Kinetics.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology, 95,* 97-110.

Standage, M. & Treasure, D. C. (2002). Relationship among achievement goal orientations and multidimensional situational motivation in physical education. *British Journal of Educational Psychology, 72,* 87-103.

Standage, M., Treasure, D.C., Duda, J.L., & Prusak, K.A. (2003). Validity, reliability, and invariance of the situational motivation scale (SIMS) across diverse physical activity contexts. *Journal of Sport and Exercise Psychology, 25,* 19-43.

Stevens, J. P. (2002). Applied multivariate statistics for the social sciences. New Jersey: Lawrence Erlbaum Associates.

Subramaniam, P. R., & Silverman, S. (2000). Validation of scores from an instrument assessing student attitude toward physical education. *Measurement in Physical Education and Exercise Science, 4,* 29-43.

Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2005). *Research methods in physical activity* (5th ed.). Champaign, IL: Human Kinetics.

Treasure, D. C. (1997). Perceptions of the motivational climate and elementary school children's cognitive and affective response. *Journal of Sport and Exercise Psychology, 19,* 278-290.

Treasure, D. C. & Roberts, G. C. (2001). Students' perceptions of the motivational climate, achievement beliefs and satisfaction in physical education. *Research Quarterly for Exercise and Sport, 72,* 165-175.

U.S. Department of Health and Human Services. (1996). *Physical activity and health: A report ofthe Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention.

Vallerand, R. J., Deci, E. L., & Ryan, R. M. (1987). Intrinsic motivation in sport. In K. Pandolf (Ed.), *Exercise and sport sciences reviews: volume 16,* (pp. 389-425). New York: Macmillan.

Vallerand, R. J., Gauvin, L. I., & Halliwell, W. R. (1986). Effects of zero-sum competition on children's intrinsic motivation and perceived competence. *The Journal of Social Psychology, 126,* 465-472.

Vallerand, R. J. & Losier, G. F. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of applied Sport Psychology, 11,* 142-169.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senecal, C., & Vallieries, E. F. (1993). On the assessment of intrinsic, extrinsic, and amotivation in education: Evidence on the concurrent and construct validity of the Academic Motivation Scale. *Educational and Psychological Measurement, 53,* 159-172.

Vincent, S.D., & Pangrazi, R.P. (2002). An examination of the activity patterns of elementary school children. *Pediatric Exercise Science, 14*, 432-441.

Wang, C. K. J., Chatzisarantis, N. L. D., Spray, C. M., & Biddle, S. J. H. (2002). Achievement goal profiles in school physical education: Differences in self-determination, sport ability beliefs, and physical activity. *British Journal of Educational Psychology, 72,* 433-445.

Welk, G. J., Corbin, C. B., Dowell, M. N., & Harris, H. (1997). The validity and reliability of two different versions of the children and youth physical self-perception profile. *Measurement in Physical Education and Exercise Science, 1,* 163-177.

Whitehead, J. R. (1995). A study of children's physical self-perceptions using an adapted physical self-perception profile questionnaire. *Pediatric Exercise Science, 7,* 132-151.

Whitehead, J. R. & Corbin, C. B. (1991). Youth fitness testing: the effect of percentile-based evaluative feedback on intrinsic motivation. *Research Quarterly for Exercise and Sport, 62,* 225-231.

Wigfield, A., & Eccles, J. S. (2002). The development of competence beliefs, expectancies for success, and achievement values from childhood through adolescence. In A. Wigfield & J. S. Eccles (Eds.) *The Development of Achievement Motivation* (pp. 91-120). New York: Academic Press.

APPENDIX A: EXTENDED REVIEW OF LITERATURE

Self-determination in Physical Education:

Designing Class Environments to Promote Active Lifestyles

Physical inactivity is a widespread problem in the United States and children, in particular, are not as active as they should be (U.S. Department of Health and Human Services [USDHHS], 1996). Physical education programs have been identified as an important component in efforts to increase children's physical activity, but at present, there is very little research based evidence concerning how best to do that. The purpose of this paper, therefore, is to review the literature relevant to physical education and physical activity with the goal of identifying strategies to increase children's engagement in physical activity. The first section provides an overview of the current status of children's physical activity and health along with a review of the measurement aspects of physical activity and the problems associated with such measurements. Next, the mediating processes paradigm is presented as a framework to integrate theoretical constructs related to creating class climates that will foster engagement in physical education. The following sections examine critical motivational constructs. First, perceived competence is reviewed as an overarching concept related to motivation. A short summary of achievement goal theory, which has dominated research for the past decade, follows. Finally, self-determination theory is examined, with the goal of integrating the two constructs into a more comprehensive framework. Based on the literature reviewed, implications for practice and considerations for future research are presented.

Current Status of Children's Physical Activity and Health

The rise in Type II diabetes and increasing incidence of obesity has been reported at "epidemic" levels and has drawn a great deal of attention to the levels of physical activity of

children (Rocchini, 2002). Engaging in physical activity has been linked to improved health status in children and adults and is one way to fight obesity (Berkey, Rockett, Gillman, & Colditz, 2003). It is widely recognized that children should accrue between 30 and 60 minutes of moderate to vigorous physical activity each day, with bouts of continual activity lasting from 10 to 15 minutes each time (Council for Physical Education for Children [COPEC], 1998). Given that nearly half of American youths between the ages of 12 and 21 are not vigorously active on a regular basis and that females are less active than males, gender differences should be taken into account when addressing the problems associated with physical inactivity (National Association for Sport and Physical Education [NASPE], 2004; Pate, Ross, Dowda, Trost, & Sirard, 2003; USDHHS, 1996). While physical activity declines over time are typical, the decline in girls' activity levels is much sharper than that of boys (McKenzie, 2003). Girls are also less active than boys in structured settings such as school physical education (McKenzie, et al., 1995). In a study of fifth and seventh grade girls, those who were physically active on a regular basis reported that they were active for two main reasons: "to have fun" and "to stay in shape" (Kientzler, 1999). This finding was comparable to the reasons for physical activity participation given in a study by Ewing and Seefeldt (1988).

Boys typically report higher levels of time spent in both inactive pursuits (watching television, playing videogames, etc.) and physical activity while girls reported less time in inactive and active activities. In a study by Morgan et al., (2003), boys reported spending more time in activity as assessed through both self-report and accelerometer use. Subsequent increases in physical activity were associated with BMI decreases for girls and overweight boys (Berkey, et al., 2003). Gender differences are further exacerbated by the fact that body mass index (BMI) in female children appears to be more adversely affected by inactivity than in boys. Many of

these differences may be attributable to the perceived lack of opportunity for participation by girls and their diminished perceptions of their physical selves (Morgan, et al., 2003).

Recent research has also identified ethnic differences with European-Americans both reporting and participating in more activity that Mexican-Americans (Morgan, et al., 2003). Much like the gender differences that have been reported, Mexican-Americans reported more hindrances to activity and that they enjoyed physical activity less than their European-American counterparts. Lack of access to facilities and the need for a safe environment in which to participate in physical activity were cited as barriers to involvement (Morgan, et al., 2003). Ntoumanis and Biddle (1999) argue that motivational research must be extended to help explain how cultural differences emerge in different contexts.

A multitude of professionals and professional organizations (American College of Sports Medicine [ACSM], 2000; Centers for Disease Control [CDC], 1997; McKenzie, et al., 1995) recognize the potential contribution of physical education toward producing healthier children, and it is recommended that physical education be offered at every grade level every day. According to the School Health Policies and Programs Study (SHPPS), conducted in 2000, 78% of states require elementary physical education, and 86% and 82% of middle and high schools respectively teach physical education classes (Burgeson, Wechsler, Brener, Young, & Spain, 2001). Further, they advocate that children in physical education spend 50% of instructional time in moderate to vigorous physical activity. However, a cursory examination of the status of physical education in our country depicts a picture that is far from meeting the recommendations. Physical education is not mandated at a federal level, though most school systems require students to take physical education (Burgeson et al., 2001). Younger students, below the age of 13, report attending physical education classes on more occasions than their older counterparts

(Berkey, et al., 2003). Requirements for physical education at the elementary school level range from 30 to 150 minutes per week and from 80 to 275 minutes per week for middle school students (Burgeson et al., 2001). Further, it is apparent that few students choose to continue in physical education once they have met the high school graduation requisite (Chen, 2001).

Based on these wide-ranging requirements, it is clear that physical education programs in the United States lack consistency. Further, physical education classes alone are not sufficient for meeting the recommended physical activity requirements for children of any age, therefore activity participation outside of the school setting must be promoted (McKenzie, 2003; McKenzie, Marshall, Sallis, & Conway, 2000). ACSM (2000) goes beyond these minimal standards and supports eliminating substitutions or exemptions for physical education. According to the SHPPS study, almost 41% of elementary schools, and 53% and 60% of junior high and high schools respectively allow students to exempt physical education on the basis of religious reasons, participation in "other" school activities, community sports participation and numerous other reasons.

There is research evidence that participation in all types of physical activity declines significantly with age (Ewing & Seefeldt, 1988; USDHHS, 1996; Wigfield, Eccles, Mac Iver, Reuman, & Migdley, 1991), and active participation in physical education classes is not exempt from this decline. Over time, participation and interest in physical education decrease, though there is a lack of research to explain the gradual decline that is evident (Standage & Treasure, 2002). McKenzie et al. (1995) found in their study of third graders in 95 different schools that only 36% of the physical education time was spent in moderate to vigorous physical activity. This finding does not meet the recommendations of the ACSM (2000) or *Healthy People 2010* (USDHHS, 2000).

There are many possible reasons for the lack of engagement in physical activity by children and young adults. A great deal of research in this area has centered on motivational issues as they relate to participation in physical activity (Parish & Treasure, 2003). Roberts (2001) defines motivation as, "dispositions, social variables, and/or cognitions that come into play when a person undertakes a task at which he or she is evaluated, or enters into competition with others, or attempts to attain some standard of excellence" (p. 6). One important goal of physical education programs is to facilitate the adoption of physically active lifestyles, and in order to do that, it is necessary to examine the research literature to synthesize information that will direct efforts to accomplish that goal.

Measurement Issues and Challenges in Physical Activity

In order for researchers to investigate how physical education classes can promote physical activity, it is imperative that valid and reliable measures are used. Many methodological problems exist in attempting to assess levels of physical activity in children (Freedson, Sirard, & Debold, 1997; Janz, 1994) and the necessity of being able to accurately measure physical activity in young people is of paramount importance to the research community (USDHHS, 1996). Only when well-established, valid assessment measures are used can researchers truly begin to understand the frequency with which children participate in physical activity and the effectiveness of activity-based intervention programs (Pate, et al., 2003). Researchers continue to collect physical activity measures on children with some level of trepidation due to the validity and reliability concerns of these measures (Mamalakis, Kafatos, Manios, Anagnostopoulou, & Apostolaki, 2000; Trost, Kerr, Ward, & Pate, 2001) and there is a lack of agreement on one singular exemplary criterion for assessing all areas of physical activity (Wareham & Rennie, 1998). Mamalakis, et al. (2000) suggest that devices such as oxygen

consumption and electrocardiogram (ECG) are more objective and reliable than questionnaires in assessing physical activity in children, though it is not feasible to use these methods in field-based research.

Alternatives to the lab-based measures that are commonly used in field-based research include pedometers and accelerometers. In an attempt to help children and physical educators be more accountable for activity in physical education, pedometers have recently become popular instruments for measuring activity levels. Pedometers are relatively simple, inexpensive, and have exhibited less error when compared to accelerometers and heart rate monitors (Easton, Rowlands, & Ingledew, 1998; Morgan, Pangrazi & Beighle, 2003).

The National Association of Sport and Physical Education (NASPE) and other health professionals recommend that school age children take at least 10,000 steps every day. Although intuitively this seems to be an appropriate goal, some research has attempted to address the question of how many steps is sufficient for children to accrue on a daily basis. In a study of 711 elementary school children, female students averaged close to 11,000 steps while boys averaged 13,000 steps in a 24-hour period (Vincent & Pangrazi, 2002). Further, the President's Council on Physical Fitness and Sport requires 11,000 steps from both boys and girls in order for children to qualify for the Presidential Active Lifestyle Award (President's Council on Physical Fitness and Sports, 2001). It is important to know how many days of pedometer counts are needed for a physical educator to be reasonably certain that they have an accurate picture of the child's overall level of activity. Vincent and Pangrazi (2002) indicate that three to four days of pedometer counts are needed, but others (Trost, Pate, Freedson, Sallis & Taylor, 2000) suggest that two to three days are sufficient.

While pedometers appear to be a promising tool with which to collect physical activity data, they do have some limitations. First, the pedometer is not designed to calculate intensity or duration of activity. In this instance, a heart rate monitor is perhaps the most user-friendly device for analyzing intensity and time of activity, though compared to the pedometer, it is cumbersome due to the various parts required such as a transmitter, elastic strap and the watch (Beighle, Pangrazi & Vincent, 2001).

Accelerometers appear to also provide more accurate measures of physical activity than self-report measures (Pate, et al., 2002). Accelerometers have been used reliably during physical activity research on children, as Sallis, Buono, Roby, Carlson, and Nelson (1990) found that daily self-reports by children were significantly related to an accelerometer activity count. Moderate correlations between measured activity levels have been reported when using both accelerometers and pedometers and between accelerometers and the Activitygram self-report instrument developed by the Cooper Aerobic Institute (Treuth, et al., 2003).

An additional problem encountered in the study of children's level of physical activity is the uncertainty regarding terminology (Patterson, 2000; Sallis & Saelens, 2000). It is critical that definitions of physical activity, and other closely related constructs, are consistent and distinguishable. Terms such as "physically active" and "moderate to vigorous physical activity" can be difficult to interpret, especially for children responding to a self-report instrument (Sallis & Saelens, 2000). Though perhaps less objective than some other measures, self-report mechanisms are often employed because they are less expensive and easier to administer than other methodologies (Trost et al., 2001).

Self-report measures of physical activity are used frequently in research (Sallis & Saelens, 2000), though they may not provide as accurate an understanding of activity levels as

more objective measures (Pate et al., 2002). Unlike more objective measures, self-report instruments are open to recall bias (Trost et al., 2001) and have the potential for overrating physical activity levels (Sallis & Saelens, 2000). For children, especially under the age of 10, self-report measures requiring recollection over several days or weeks can be a cognitive challenge (Baranowski, 1988; Sallis, 1991; Sallis & Saelens, 2000). For example, the validity for a self-report measure was greatly improved after scores from children under the age of 10 were removed from the analysis for a sample of Portugese children (Mota, et al., 2002). One week recalls appear suitable for the childhood population partly because they do not require as much ability to remember, and levels of consistent physical activity appear to be detectable within a one week measure (Sallis, et al., 1993).

The advantages of self-report measures, however, are the relative ease with which they can be used, the economical practicality and the ability to investigate only those specific aspects in which the researcher is interested (Kriska, 1997). Self-report measures have been used successfully in research with children on their thoughts and cognitions, and can yield valid and reliable data, when the proper procedures are followed (Lee & Solmon, 1992). Much physical activity research has been designed to investigate the frequency, intensity, time and type of activity in which adults and children are engaged, and to make judgments regarding whether or not individuals are meeting the proposed minimum guidelines (Telford, Salmon, Jolley, & Crawford, 2004). However, questionnaires and other self-report instruments rarely provide information regarding all four of these facets (Sallis & Saelens, 2000).

Self-report measures are also frequently flawed due to respondents' attempts to produce socially desirable answers, which, in turn, overestimate the amounts of physical activity reported (Warnecke, et al., 1997). When interviews were conducted with fifth graders, researchers found

that the participants estimated their physical activity time to be approaching 29 minutes. However, when comparing these responses to self-report measures, the fifth graders self reported almost 48 minutes of physical activity (Sallis et al., 1996). Other researchers (Telford, et al., 2004) however, have found that children underestimate the number of minutes they spend in both moderate and vigorous physical activity.

Progress has been made over the past decade with regard to developing valid and reliable measures of physical activity. In order to effectively investigate ways to increase children's physical activity, it is necessary to identify an investigative framework from which to make these inquiries.

Mediating Processes Paradigm

A paradigm is an organizing framework from which investigations can be made (Patton, 2002) and a mediating factor intervenes or is indirectly related to other factors in a model or relationship (Guralnik, 1984). The mediating processes paradigm provides a lens for understanding and interpreting how motivational constructs mediate between teacher behaviors and student learning. This framework is a "response-oriented" approach that grew out of the unidirectional process-product paradigm of the 1960's (Doyle, p. 170, 1977). The process-product paradigm assumed a direct link between teacher behaviors, or the process, and student achievement, considered to be the product, but this approach is limited in scope. This linear approach does not take into account that individuals learn in different ways, are affected by situations differently, and that individuals come from many different backgrounds. The process-product paradigm is rooted in the underlying assumption that there is one right way to teach, and does not take the context of learning into account.

Mediating constructs, such as student interest, social background, prior knowledge and beliefs, and the classroom context, were identified which attempted to explain more of the "why," or in what context, learning occurs. Student learning characteristics and the instructional setting are the essential features of the mediating process paradigm. According to Doyle (1977), time was the first variable to be investigated as a mediating process, and increased time on task was related to student achievement. Doyle, however, cited the need to move beyond time as a mediator to investigate ways teachers could activate information processing responses during time on task. In the mediating processes paradigm, the role of the teacher is redefined. Rather than being a provider of information, the teacher is conceptualized as a facilitator who creates an environment and designs learning tasks so that the students make good choices regarding learning. The student is the most important factor in learning. Student interest, social background, prior knowledge and beliefs, and the classroom context are all mediators of the role of cognition in affecting student learning. Research questions in this paradigm shift to how the teacher actions and the educational resources impact the outcomes related to student learning, rather than simply how they bring about student learning.

The mediating processes paradigm provides a framework for the study of student learning, and recognizes that there are other intervening factors, besides teacher behaviors, that contribute to this process (Doyle, 1977). The role of the teacher is analogous to a conduit who is responsible for creating both the environment and designing learning tasks which influence students to make advantageous choices regarding learning (Lee & Solmon, 1992). Research designs involving the mediating processes paradigm are much more complex than other paradigms because of the number of mediating factors. Lee (1997, 2003) cites the need to move

beyond the simplistic unidirectional approach of the process-product paradigm and examine the process of learning using more dynamic methodologies.

Theoretical Perspectives

There are many theoretical perspectives employed in research related to physical activity and motivation. For the purposes of this paper, however, the scope will be narrowed to focus on perceived competence, achievement goal theory and self-determination theory as the cornerstone of this review. These constructs have been incorporated into past research and will likely continue to appear in future investigations.

Perceived Competence

Perceived competence is an overarching factor to be considered when examining student motivation (Harter, 1985). Any changes in feelings of competence, whether they are increased or decreased, are often directly linked to subsequent changes in intrinsic motivation (Vallerand, Gauvin, & Halliwell, 1986). Children and adults typically assess their levels of competence in a number of ways. First, an individual can socially compare their performances to that of a peer or they can use more self-referenced criteria in determining if they have mastered a skill or ability (Whitehead, 1995). A second way to receive information regarding levels of competence is through feedback (Deci, 1971).

Evidence to date suggests that perceived competence is an influential factor in activity patterns and fitness levels and is a powerful influence on decisions to engage in physical activity. Children's feelings of competence are positively related to their self reported levels of moderate to vigorous physical activity (Kimiecik, Horn, & Shurin, 1996). Those who perceive a higher level of physical competence also reported being more attracted to physical activity overall (Brustad, 1993). Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) reported that levels of

competence, along with enjoyment of the task, were predictors of adherence and attendance in physical activity. Students are also more likely to be engaged, perceive and rectify errors, and demonstrate higher levels of motivation when they have sufficient skill and are optimistic about their level of proficiency (Solmon & Lee, 1996). Physical education has the potential to be an extremely intimidating environment, especially for children who may have had little or no exposure to an array of physical activities (Papaioannou, 1994). Students who report higher levels of perceived competence in physical education are more likely to have had prior experience and indicate that they find physical education to be more appealing and enjoyable than their peers who report lower perceptions of competence (Ntoumanis, 2001b).

Achievement Goal Theory

Achievement goal theory has been used extensively in research studies investigating motivation levels in physical activity settings and represents the dominant theory in classroom and sport settings over the last few decades. The delineation between effort and ability is the principle upon which achievement goals have been examined (Biddle, 1999). Nicholls (1984) asserted that there are two dimensions of goals, task and ego, which help determine the motivation level of a student. In a task-involved state, students demonstrate their ability by mastering a task and utilize comparisons which are self-referenced (Nicholls, 1984). A task-oriented individual believes that ability can be enhanced through effort (Biddle, 1999). Individuals who are high in task orientation, regardless of whether or not their level of ego orientation is high or low, are likely to be positively motivated (Biddle, 2001; Standage & Treasure, 2002). Further, individuals who are high in task orientation are likely to be successful in almost any contextual environment, even those emphasizing ego climates (Newton & Duda,

1999). According to research, having a task-involved orientation is associated with adaptive motivational patterns (Duda, 1997; Standage & Treasure, 2002).

An ego-involved state, on the other hand, implies that individuals demonstrate their ability through a superior performance over another individual. In this case, social comparison is of the utmost importance (Nicholls, 1984). Ego-involvement has also been associated with an individual's attempt to maintain or improve his or her level of self-worth (Ryan, Koestner, & Deci, 1991) or acquire a certain level of social standing (Duda, 1989). An ego-involved person may choose not to exert much effort at a task, in an attempt to demonstrate that they can be successful without exerting effort (Biddle, 1999). Ego-involved individuals may be successful in any setting, whether it is task or ego, as long as they are proficient and can outperform others (Newton & Duda, 1999). A problem arises for those involved in an ego-oriented environment in that if they are unsuccessful in that, they may avoid or withdraw from the situation in the future.

Students can be identified as task or ego-involved as early as upper elementary school (Xiang & Lee, 1998), and it is important to note that the concepts of task and ego involvement are considered to be orthogonal, whereby a person can fluctuate in the extent to which he or she is task or ego-involved (Newton & Duda, 1999). Research is incongruent in terms of identifying those who are most at risk in terms of motivation. Some research identifies the low task/high ego group as being the most motivationally challenged (Standage & Treasure, 2002), while others have found the low task/low ego group to exhibit less self-determined kinds of motivation (Walling & Duda, 1995).

Perceptions of the Motivational Climate. Individuals bring certain dispositions, such as task or ego involvement, with them to any setting or situation that practitioners must consider. Duda (1989) and Nicholls (1984) began their work by investigating goal theory from

dispositional perspectives while Ames (1992) studied analogous dimensions of goals from a situational perspective by assessing students' perceptions of classroom climates. The mediating process paradigm provides a framework to understand how elements of the instructional climate can mediate these factors. Solmon (1996) conducted an investigation related to students' perceptions of the motivational climate, based on the physical education teacher using a task or ego-involved practice situation. In the study, students' perceptions of the climate accurately reflected the manipulations of the climate. The students persevered with tasks which were more difficult when they were in a task-involved climate. The results also indicated that students were at risk for maladaptive motivational patterns when they were not successful at a task in an ego-involved environment. This study was consistent with others, which revealed that students who are in an ego-involved setting acknowledge their achievement as related to ability, not effort (Treasure, 1997).

Achievement Goal Theory and Intrinsic Motivation. Achievement goal theory has dominated the research for the past decade. Clear evidence exists that a mastery climate fosters engagement in activity settings (Biddle, 2001; Treasure, 2001). Intrinsic motivation is defined as "the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn (Deci & Ryan, 2000; p. 70)." Nicholls (1989) argues that intrinsic motivation is enhanced for those who are task-involved, and diminished for those individuals who are ego-involved. Ego involvement suggests that participation motives are external for the individual, perhaps desiring to demonstrate superiority or achieve a level of success with less effort than their counterparts. Other research (Duda, Chi, Newton, Walling, & Catley, 1995) has suggested that task orientation, fulfillment and intrinsic motivation are positively linked in sport related contexts. Duda et al. (1995) demonstrated that participants

found their tennis class to be intrinsically motivating when they were in a task-involved environment. Students who were high in task orientation indicated that participation in the class was important and that they "worked hard while playing" (p. 56).

The importance of the link between a task-involved motivational climate and intrinsic motivation cannot be overemphasized, especially in settings such as physical education and physical activity where individuals are likely to continue participation if they are intrinsically motivated to do so. The conclusion from much of Duda's work, along with that of her colleagues, is that an environment that promotes working together and fosters self-improvement is an atmosphere that will enhance intrinsically motivated states (Newton & Duda, 1999). A highly task-involved environment should lead to positive engagement patterns regardless of the individual's personal orientation (task or ego) or level of perceived proficiency (Newton & Duda, 1999). When individuals are in a task-involved environment, perceptions of their own ability levels become immaterial because the focus is on the effort exerted in the process of the activity or task (Nicholls, 1989). Parish and Treasure (2003) also found that a mastery environment was a conclusive predictor of physical activity, even when perceived ability outcomes were taken into consideration. In the Solmon (1996) study, students who were in a task-involved climate were more persistent when practicing a challenging task than those who were assigned to an ego-involved climate.

The question becomes how to integrate motivational constructs to create a mastery climate. We know that a task climate is preferable in meeting the needs of a wide variety of learners. It is necessary, however, move beyond achievement goal theory to integrate other constructs to drive a research agenda informing researchers and practitioners about ways to

structure climates to promote task involvement and intrinsic motivation. Self-determination theory is one theoretical framework that has been explored as a means to do this.

Self-Determination Theory

Self-determination theory attempts to explain both the "what and why" of goal pursuits (Deci & Ryan, 2000; p. 228). Individuals are more likely to engage in behaviors when they are self-determined or acting out of their own volition. When individuals want to do something, rather than feeling as though they "have" to do it, they will be more likely to engage and will move to higher levels of self-determination. According to self-determination theory, individuals have shared psychological needs that must be met. These basic needs, competence, autonomy and relatedness, are referred to as nutriments in self-determination theory. Researchers suggest the nutriments are fulfilled by way of certain social circumstances which in turn promote other factors such as motivation and accomplishment (Standage & Treasure, 2002). Therefore, the social context is not directly related to motivation, though the influence of the social context on motivation is mediated by the nutriments. The goal of studies using self-determination theory is to gain an understanding of how to structure motivational climates to foster higher levels of self-determination. Self-determination theory has relevance to physical activity pursuits in that the behavioral regulation mechanism may influence the degree to which individuals are physically active.

The goal of self-determination theory is to identify those forces that cultivate human potential, development, integration and welfare (Ryan & Deci, 2000). Self-determination theory is one of the few theories related to behavior that attempts to understand why individuals do what they do (Ntoumanis, 2002), and it is considered organismic in nature due to the fact that human beings consistently attempt to integrate new views and interests within their identities of self

(Ryan & Deci, 2000). According to Ryan and Deci (2000), within self-determination theory, explanations are offered for the progression of extrinsically motivated behaviors to actions which are more self-determined. Further, self-determination theory examines the social factors that affect this progression. In the attempt to amalgamate new ideas and experiences, numerable social factors enter in to play which will either facilitate or hinder the integration process (Ntoumanis, 2001a). These social factors ultimately help to meet or undermine the nutriments of self-determination theory (Ntoumanis, 2001a; Ryan & Deci, 2000).

According to self-determination theory, competence, autonomy and relatedness are nutriments considered to be inherent psychological needs shared by all human beings (Deci & Ryan, 2000; Pintrich, 2003), though some research indicates the concept of autonomy is more valued in western cultures than in other cultures, such as Asia. The ability to better meet the basic needs of competence, autonomy and relatedness has been linked to improved motivational states (Ryan, 1995). Motivation can also be considered a social experience, in that attempts to meet the basic needs of competence, autonomy, and relatedness mediate the effect of social dynamics on the various kinds of motivation (Vallerand, 1997). These social factors which influence competence, autonomy and relatedness, cannot be underestimated. Further, social factors and situations are perceived differently by individuals, thus resulting in an array of potential outcomes. Positive outcomes related to motivation are thought to occur when relevant social factors enhance or sustain competence, autonomy and relatedness (Vallerand, 1999). However, experiences that diminish feelings of competence, autonomy and relatedness are expected decrease levels of motivation (Vallerand, 1999).

Continuum of Self-Determination. Within self-determination theory, a continuum of levels of motivation is conceptualized, with the highest level being intrinsic motivation and the

lowest level being amotivaiton. Between those two end points are levels of extrinsic motivation including: external regulation, introjected regulation, identified regulation, and integrated regulation (Deci & Ryan, 2000). The varying levels of motivation are representative of the extent to which the individual has internalized the behavior (Ryan & Deci, 2000). Internalization is the process by which the individual takes the new behavior and makes it part of the self (Ryan & Deci, 2000). Table 11 represents the continuum of self-determination with more internalized motivations at the far right of the continuum.

Table 11. The continuum of self-determination (Ryan & Deci, 2000).

Motivation	Amotivation	Extrinsic Motivation	Extrinsic Motivation	Extrinsic Motivation	Extrinsic Motivation	Intrinsic Motivation
Regulatory Styles	Non-regulation	External regulation	Introjected regulation	Identified regulation	Integrated regulation	Intrinsic regulation
Perceived locus of causality	Impersonal	External	Somewhat external	Somewhat internal	Internal	Internal
Relevant regulatory processes	Non-intentional, non-valuing, imcompetent and lack of control	Compliance, external rewards and punishment	Self-control, ego-involve-ment, internal rewards and punish-ments	Personal importance and conscious valuing	Congruence, awareness, synthesis with self	Interest, enjoyment, inherent satisfaction

It is important to note that the types of motivation, which are alongside one another, are hypothesized to be statistically more positively related than two types of motivation which are not located near each other on the continuum (Standage & Treasure, 2002). For example, external regulation would not be expected to positively relate to intrinsic motivation.

Amotivation. Amotivation is a state in which an individual is not stimulated to make an effort toward an activity or behavior (Biddle, 1999) attributed to feelings of incompetence

(Bandura, 1986) or failure to value the activity (Ryan, 1995). Amotivation is a lack of motivation, characterized by a belief that success is not possible and that the activity is not valuable (Standage, Treasure, Duda, & Prusak, 2003). Amotivation is linked to learned helplessness or other feelings of incompetence regarding aptitude, efforts and strategies (Vallerand, 1997). In physical activity and physical education contexts, there is a negative relationship between amotivation and participation or intention to participate in physical activity (Standage, Duda, & Ntoumanis, 2003). The notion that self-determination is represented by a continuum was supported by a meta-analysis study, which revealed that the continuum of self-determination is independent from its endpoint anchors, amotivation and intrinsic motivation (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003). Levels of external regulation that are progressive and lead to more autonomous motivation are delineated in self-determination theory (Standage, et al., 2003).

Extrinsic Motivation and Organismic Integration Theory. Organismic integration theory is a sub-theory of self-determination theory which attempts to explain the levels of extrinsic motivation and the situational factors that either encourage or obstruct the internalization and integration of the behavior (Ryan & Deci, 2000). External regulation is the lowest form of extrinsic motivation, placing it next to amotivation on the self-determination continuum. At this stage in the process of motivation, individuals participate in an activity or task merely to attain a desired outcome, such as a reward, or to avoid a negative consequence or some form of punishment (Deci & Ryan, 2000). When individuals participate only due to the threat of punishment or for a reward of some kind, they are engaging at lower levels of external regulation (Standage, et al., 2003). Once the reward system or risk of penalty is removed, the individual is likely to disengage from the activity or task (Deci & Ryan, 2000). It is well

documented that individuals who begin an exercise program or other healthful lifestyle changes often do so for extrinsically motivated reasons (Ingledew, Markland, & Medley, 1998) though the individual is likely to progress to exercising for more intrinsically motivated reasons if they stay with the program long enough.

The next level of extrinsic motivation is introjected regulation. Individuals functioning at a level of introjected regulation have yet to integrate the regulation into the sense of self. Often, these individuals continue to operate due to external constraints such as burdens of self-reproach, indignity or diminished self worth. Although operating at a level of extrinsic motivation, individuals at this stage of the motivation process are more likely to maintain the behavior over time, though adherence continues to be erratic at best (Deci & Ryan, 2000). Ryan and Deci (2000) point out that ego involvement is a standard type of introjection because individuals at this stage are motivated to participate in a behavior because of their need to maintain a sense of self worth, though the behavior is not yet viewed as congruent with the sense of self (Ryan & Deci, 2000). In addition, individuals at this stage of the continuum often participate out of a sense of obligation, guilt or coercion.

Identified regulation is where participants perceive the activity as having relevance to their goals and believe there is value in the activity, representing a higher form of external regulation (Standage, et al., 2003). Behaviors that are initiated at this stage are more likely to be sustained with the individual showing greater dedication to the behavior than at the lower stages (Deci & Ryan, 2000). The value component is essential in adopting the regulation and assimilating it as part of the concept of "self" (Deci & Ryan, 2000). Identified regulation is directly linked to physical activity outcomes and is to some extent correlated with future plans (Biddle, 1999). At this point on the continuum, the "threshold of autonomy" (Whitehead, 1995)

is achieved and the individual chooses to engage because they want to do so, not because they are supposed to (Biddle, 1999). Individuals who intend to engage in physical activity are more likely to do so if they participate because they want to and not because they have to (Chatzisarantis, Biddle, & Meek, 1997).

The highest level of extrinsic motivation is integrated regulation (Deci & Ryan, 2000). Though still categorized as extrinsic motivation, this level represents the greatest degree of self-determined regulations at this stage. The individual recognizes the significance and worth of the activity or regulation and assimilates the behavior with the sense of self (Deci & Ryan, 2000). From a measurement perspective, it is very difficult to differentiate integrated regulation from identified regulation. Half of all individuals who begin an exercise regimen are likely to quit within the first six months (Dishman, 1982). From this theoretical perspective, it is suggested that these individuals who drop out are most likely functioning at lower levels of self regulation. Based on self-determination theory, it is predicted that if individuals could be nurtured in such a way as to increase their levels of self-determination, that they would be less likely to withdraw from the activity.

Intrinsic Motivation. According to self-determination theory, the highest level of self-determination is represented by intrinsic motivation, where the individual participates for the sake of the activity itself (Deci & Ryan, 1985). Much research to date indicates that participation in physical activity is not necessarily intrinsically motivated (Ryan, et al., 1997).

The notion of intrinsic motivation is conceptualized as three components, related to knowing, accomplishing and experiencing stimulation (Vallerand, et al., 1993). The first type of intrinsic motivation, to know, is associated with the realm of participating in or doing something in order to learn, grow and expand in knowledge. In this situation, the individual senses

enjoyment and fulfillment by discovering and becoming aware of new things. In physical education, for example, students may take pleasure in learning a new activity or how certain cultures play or emphasize other sports and activities. The second type of intrinsic motivation is analogous to accomplishment or the positive feelings associated with venturing into something unconventional or succeeding at a new undertaking or activity. Physical educators can incorporate this area of intrinsic motivation by providing students with opportunities that enable students at all skill levels to be successful and recognize their individual accomplishments. The third iteration of intrinsic motivation comes in the form of encountering stimulation. This component of intrinsic motivation is best represented by participating for the purpose of experiencing joy, delight, thrill, and "aesthetic enjoyment" (Vallerand et al., 1993; p. 98). Most often, examples related to this component are seen in adult participation in physical activities such as skydiving or rock climbing, which are inherently exciting and stimulating.

Intrinsic motivation has been positively associated with the goal of being physically active once students have completed their schooling (Ntoumanis, 2001b). The challenge surrounding intrinsic motivation, and the responsibility for researchers, is to better understand how to foster those components in instructional settings that promote intrinsic motivation, while controlling or eliminating those factors which appear to weaken this construct (Ryan & Deci, 2000).

Cognitive Evaluation Theory and Intrinsic Motivation. Cognitive evaluation theory (CET) is the most widely studied component of self-determination theory (Markland, 1999). Intrinsic motivation, the highest level of self-determination, has been studied specifically through the perspective of cognitive evaluation theory (Deci & Ryan, 1985). It proposes that, for intrinsic motivation to occur, individuals must feel autonomous and competent (Deci & Ryan,

1985). CET is a sub-theory of self-determination theory and addresses social issues, such as use of rewards, communication, and feedback as they relate to intrinsic motivation (Ryan & Deci, 2000). Cognitive evaluation theory explains the role of autonomy and competence as mediators on an individual's choice of actions (Deci & Ryan, 1985). The importance of focusing on the process of a task, not necessarily the outcome, is also related to increases in intrinsic motivation (Ryan, 1982).

Self-Determination Theory and Gender. Gender related disparities have emerged in some self-determination research. Gender differences in intrinsic motivation have been reported in specific subject areas, such as girls taking pleasure in music and reading more than boys, who tended to value sports more than their female counterparts (Wigfield et al., 1997). It often appears as though girls, more so than boys, employ more adaptive strategies in school, often suggested by the teacher (Grolnick, Gurland, Jacob, & Decourcey, 2002). Girls may, for example, study more or get better grades because they want others to be satisfied with their performance, not because they are intrinsically interested in the topic. The inference from much of the gender related research on self-determination is that girls may not necessarily feel more self-determined, but they are in fact more interested in satisfying important others. Similarly, it appears that the nutriment relatedness is perhaps more salient to females than males (Wankel, 1993). Ultimately, individual differences are more likely to contribute to self-determination than gender related differences (Grolnick, et al., 2002).

Hierarchical View of Intrinsic and Extrinsic Motivation

Central to the hierarchical model of intrinsic and extrinsic motivation are the levels of motivation: amotivation, extrinsic motivation, and intrinsic motivation (Vallerand, 1997). These three adaptations of motivation are present at the global, contextual and situational level within

the hierarchy. Vallerand (1997) argues that it is unproductive to study motivation as a unidimensional concept. Instead, he suggests that researchers consider intrinsic, extrinsic and amotivation at the global, contextual and situational level, with each stratum constituting a unique stage within the hierarchy. The global level of motivation relates to the individual's own personality and characterizes the way in which individuals typically relate in their surroundings. The contextual level is represented by a more constant temperament espoused by the individual in relation to a specific context or circumstance. In school settings, for example, students may have differing levels of contextual motivation toward different subject areas. Since contextual motivation spans such broad areas, Vallerand (1997) postulates that contextual motivation is widely variable, depending on the area.

The situational level regards the current state or environment in which the individual finds him or herself (Vallerand, 1997) and the individual's motivation in that specific activity. A great deal of research has centered on "situational" motivation, as it relates to the individual's motivation in the midst of a task or activity (Guay, Vallerand, & Blanchard, 2000). Situational motivation is significant to the discussion of motivation, and self-determination theory, because of the various factors that can modify or change a motivational state while accomplishing a task or participating in an activity. Influences such as deadlines and contests can impact an individual's situational motivation (Guay, et al., 2000).

Social Factors and the Hierarchical View of Intrinsic and Extrinsic Motivation. Vallerand (1997) considers several determinants of motivation within the hierarchy. First, there are innumerable social factors at work in motivation and each stage or level of the hierarchy is influenced by a variety of social factors. Vallerand (1997) identifies the importance of these various social factors which either help individuals fulfill their need for competence, autonomy

and relatedness, or weaken the opportunity to meet these needs. Ntoumanis (2001b) also highlights the importance of social factors as they relate to levels of motivation. These social factors are thought to impact cognitive, emotional and behavioral outcomes with the nutriments of self-determination theory serving as mediators to varying motivation levels (Rousseau & Vallerand, 2000). Specifically, the social factors identified by Vallerand (1997) provide for a longitudinal relationship, beginning with psychological mediators, which lead to various kinds of motivation, which ultimately, in turn, bring forth certain consequences.

Ultimately, Vallerand's (1997) hierarchical model leads to psychological outcomes, which are the product of motivation. The psychological outcomes can be partitioned into distinct categories. First, the motivational impetus can result in cognitive, affective and behavioral outcomes. Cognitive consequences are related to recall, attentiveness and conceptual learning (Vallerand & Losier, 1999). Affective outcomes are represented by curiosity, fulfillment, disposition and worry or concern (Vallerand & Losier, 1999). Behavioral outcomes are symbolized by choice of difficulty, perseverance at an activity, or intensity (Vallerand & Losier, 1999). The second psychological outcome related to motivation is that positive results are linked to intrinsic motivation, and negative consequences are more related to extrinsic and amotivation (Vallerand, 1997). Ultimately, it is of critical importance that an individual be self-determined in their pursuit of goals or outcomes. The third psychological outcome is that consequences are evident at the global, contextual and situational levels (Vallerand, 1997). Motivation occurring at the global level will lead to end products at the global level. Similarly, motivations at the contextual and situational levels will lead to consequences at those respective levels (Vallerand, 1997).

Interestingly, Vallerand's (1997) proposed hierarchical model fits research data equally well, regardless of gender. There are some gender related differences, however, that emerge especially in terms of the physical education environment. Specifically, physical education activities that allow for interaction and social contact are more intrinsically motivating for female students (Ntoumanis, 2001b). On the other hand, this social interaction is not predictive of intrinsic motivation for boys in physical education classes.

Finally, the hierarchical nature of intrinsic motivation appears to have an inherent "top-down" and recursive effect, whereby each level of intrinsic motivation is related to the next level in the hierarchy. As an example, from the top-down, the contextual level may directly influence the situational level, though the situational level is less likely to be affected by motivation at the global level. The inverse is also true in that situational motivation can impact the contextual level, but is unlikely to influence the global level (Vallerand, 1997). For example, according to the hierarchy, it would be possible for a young person to have very little intrinsic motivation toward a particular physical activity at the situational level. It is likely that this lack of intrinsic motivation would carry over to the contextual level with the student possibly having a low level of intrinsic motivation for physical education. Thus, relationships in the hierarchy can proceed from the top down, or the bottom up. In addition to the top-down and recursive nature of the hierarchical relationships, there is also a certain interaction between variables at the contextual level, in that these variables can relate to each other (Vallerand, 1997). Vallerand (2000) articulates this relationship as the "interplay" between different contextual motivations.

The Hierarchical View of Motivation Related to Self-Determination Theory. To a great extent, self-determination theory parallels and supports Vallerand's (1997) hierarchical view of intrinsic and extrinsic motivation. There are, however, some distinctions between the

two theories where they begin to diverge. First, Vallerand (2000) maintains that an individual needs to maintain a certain level of global motivation. In an attempt to maintain that level, if an individual begins to lose motivation in a particular context, he or she may try to offset that loss by increasing motivation in another circumstance (Vallerand, 2000). For example, if individuals experience a decrease in their levels of motivation in sport participation, they may attempt to counteract that loss by increasing their motivation in academics or personal relationships. Vallerand goes on to suggest that ultimately, perhaps both the hierarchical view of intrinsic and extrinsic motivation and self-determination theory are correct in their suppositions. Vallerand posits that perhaps initially, if needs are not being met, the initial reaction is to attempt to augment motivation in some other area. If that course of action does not remedy the situation, then Vallerand theorizes that individuals may resort to lower levels of extrinsic motivation, which lead to less optimal outcomes, as implied by self-determination theory. Essentially, self-determination theory does not attempt to explain any potential for interaction between the various stages of motivation.

Links Between Achievement Goal Theory and Self-Determination Theory. While used as independent theories in research, achievement goal theory and self-determination theory are both social cognitive theories that center on the individual's interpretation of events and how they make meaning of those events (Ntoumanis, 2001a). Shared by both theories are the concepts of competence, levels of motivation, and achievement goals, though achievement goal theory and self-determination make distinctions regarding the significance and theoretical underpinnings. Ntoumanis (2001a) perhaps best summarized the relationship between achievement goal theory and self-determination theory by stating:

> Achievement goal theory examines how perceptions of task- and ego-promoting climates, created by significant others (e.g. parents, teachers, coaches), interact with dispositional goals to influence cognition, affect and behaviour in achievement contexts. In contrast, self-determination theory examines how social factors – that is, human and non-human factors in social environments (Vallerand, 1997) – impact on human motivation through the mediating variables of competence, autonomy and relatedness (p. 400).

Both achievement goal theory and self-determination theory share perceived competence as a critical underlying component, thus reiterating the established importance of this influential concept (Ntoumanis, 2001a).

Assessment of Motivation Levels

Historically, motivation has been measured in one of two ways. Researchers often used free-choice activities and devices such as a two-way mirror to observe participants in laboratory settings, in order to examine their participation in an uncontrolled environment (Deci, 1971). If not directly observing subjects and attempting to quantify levels of motivation, participants are often asked to self-report their level of motivation for a certain activity or task (Guay, et al., 2000). In their review, Guay et al., found only two self-report measures that were validated to assess intrinsic motivation. These scales, the Mayo Task Reaction Questionnaire (TRQ; Mayo, 1977), and the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989) had various psychometric issues, so the researchers developed the Situational Motivation Scale (SIMS) to "assess the constructs of intrinsic motivation, identified regulation, external regulation and amotivation" (Guay, et al., 2000; p. 175).

The SIMS was developed to assess levels of motivation in a five-part study (Guay, et al., 2000). The purpose of the first study was to develop the items used in the SIMS, assess

reliability, and investigate the construct validity of the instrument. This first phase of analysis revealed four factors within the structure of the SIMS. The second study validated the scales for both male and female samples. Third, the researchers ascertained that the SIMS could be used to assess motivation in various activities, and the fourth phase of the study was designed to give additional backing to the construct validity of the SIMS, which was achieved. Finally, the researchers provided additional support for construct validity with results which demonstrated the importance of task-focused activities over those activities which are linked to a reward.

Research Findings

In the next section, I present research findings using self-determination theory as a framework for studies in physical education. The research findings are organized around the nutriments of self-determination theory, competence, autonomy and relatedness. In addition, the link between research in achievement goal theory and self-determination theory is also explored.

Competence

Competence, or "effectance-focused motivation" (Deci & Ryan, 2000; p, 231) is based on the need to have an impact on our surroundings, which are manifest in significant results in that environment (Deci & Ryan, 2000). Competence motivation theory (Harter, 1978), as described earlier, relates to the concept of competence as a nutriment. Harter (1978) maintains that individuals either have competence in certain areas, or they do not. She suggests that if an individual is not competent in a certain area, he or she should find an alternative activity in which success is more likely. Harter does not encourage persisting in the activity or task where competence cannot be demonstrated. Self-determination theory, however, proposes that feelings of competence can be nurtured in any endeavor, for example, a task-involved environment, as proposed by achievement goal theory.

Competence, as conceptualized as a nutriment in self-determination theory, has a direct influence on intrinsic motivation. Feelings of competence can be enhanced or negated by episodes of feedback. If an individual experiences negative feedback from a source, intrinsic motivation will often decrease. On the other hand, when an individual feels responsible for proficiently executing a task or other undertaking, intrinsic motivation can be enhanced (Deci & Ryan, 2000). When positive results do occur, it is critical that the individual perceive that she or he had a direct impact on the desirable outcome. Interestingly, Deci and Ryan (2000) argue that individuals must feel a sense of competence for motivation of any kind to occur, whereas perceived autonomy is necessary for individuals to be intrinsically motivated.

In his early work, Deci (1975) suggested that activities that were intrinsically motivating were those that fulfilled the individual's inherent need to feel capable and autonomous. Individuals who are intrinsically motivated are more likely to be energized, intrigued, and self-assured in the activity they are pursuing, as opposed to those who are participating for more externally motivated reasons (Ryan & Deci, 2000). This holds true, even when controlling for perceptions of competence related to the endeavor at hand.

Multiple studies in physical activity settings generally support the notion that greater levels of perceived competence yield increases in self-determination and intrinsic motivation (Ferrer-Caja & Weiss, 2000; Goudas & Biddle, 1994; Harter & Connell, 1984; Li, Lee, & Solmon, 2005; Ntoumanis, 2001b; Standage, Duda, & Ntoumanis, 2003), though some indicate that the effect of perceived competence on intrinsic motivation is indirect (Goudas & Biddle, 1995). Accordingly, the influence of perceived competence, especially in an arena such as physical education where virtually all participation is within public view, cannot be underestimated (Whitehead & Corbin, 1991). Parish and Treasure (2003) found that students

who had higher levels of perceived ability were more physically active during their physical education classes. Wang, et al., (2002) studied middle school students and determined that those who were highly motivated were also more active, more self-determined and believed that their ability levels improve with effort. The lowly motivated group, on the other hand, was less active, less self-determined and believed their ability level to be fixed compared to the high motivation group. Perceived competence is important across other theoretical perspectives that have been used to frame investigation of motivation. There is clear evidence that beliefs about ability and competence have a powerful influence on individual choices.

The notion of competence is also central to levels of extrinsic motivation. Perceived competence, as viewed from the perspective of organismic integration theory, relates directly to internalization of behaviors that are extrinsically motivated (Ryan & Deci, 2000). If an individual feels that he or she can be successful at the endeavor, then internalization is more likely to occur with greater simplicity (Vallerand, 1997). While individuals may start an exercise or physical activity program for extrinsically motivated reasons, they may begin to take pleasure in the activity and move to a more intrinsically motivated state when feelings of competence are enhanced (Ryan, et al., 1997).

Past experiences can also influence perceived competence (Li, et al., 2005) which further illustrates the importance of children and young people being involved in physical education programs that promote individual success and positive experiences related to physical activity. A study by Losier and Vallerand (1994) provides some insight into how perceptions of competence affect motivation. They assessed participants' perceptions of competence and motivation two weeks into the hockey season and again at the end of the hockey season. In this repeated measures study, perceived competence measured two weeks into the season was

significantly related to levels of self-determination at the end of the season. However, levels of self-determination measured two weeks into the season were not related to perceived competence at the end of the hockey season.

Ntoumanis (2001b) found that students who felt their physical education teacher put emphasis on self-improvement were more likely to feel competent. Perceptions of competence are linked to the individual's likelihood to engage in an undertaking. In physical education, this becomes extremely important when considering the impact of perceived competence on participation patterns in physical activities. Girls demonstrate lower physical competence than boys, and this discrepancy must be addressed when attempting to move young females along the continuum toward intrinsic motivation as the reason for participation (Morgan, et al., 2003). If girls in coeducational classes feel incompetent because of comparisons to boys in the class, then they may be at risk to withdraw from the activity.

The effects of competitive environments or situations also have ramifications for perceived competence. Social comparison is a significant way in which children and adults judge their own levels of competence, and competitive situations provide an optimal environment for these comparisons. Situations that are defined as "zero-sum competition" (Vallerand, et al., 1986; p. 467) represent circumstances where there is essentially one person who is the winner and everyone else is the loser. In these environments, intrinsic motivation and perceived competence are decreased for those who are the losers in the competitive arena (Vallerand, et al., 1986). The tenets of cognitive evaluation theory (Deci & Ryan, 1985) also support this conclusion.

Early research (Deci, 1971) demonstrated that intrinsic motivation was diminished when financial rewards were introduced, thus leading to the conclusion that researchers must go

beyond simple reinforcements when attempting to understand human motivation. Reeve and Deci (1996) suggest that it is possible to perceive winning a competitive event as informational regarding the individual's performance, so long as the sole focus of the competition was not winning. They point out that cognitive evaluation theory and competition are linked in that cognitive evaluation theory "specifies that perceived competence and perceived self-determination are the processes through which elements of the competitive situation affect intrinsic motivation (p. 32)." A rational conclusion seems to be that competition in itself is not malevolent, however, it is the over emphasis on winning, and the nature of competition in our current society that frequently make competitive situations damaging to the esteem of young people.

Perceived competence is also relevant to the foundations of achievement goal theory. If, for example, success is defined in task-oriented terms, where the individual is using self-referenced criteria for their achievement, then success is possible. However, an ego-involved individual who is not successful or victorious in an activity or competition will no longer feel competent. Given that task-involved individuals use self-referenced standards for success, they are more likely to have greater perceived competence for the task at hand (Duda, et al., 1995).

Individuals who are essentially task oriented are likely to be resistant to the potential negative effects of low levels of perceived competence because they utilize self-referenced criteria for improvement and success (Nicholls, 1989). The research, however, is more ambiguous when it comes to ego-involved individuals and perceptions of competence. Some hypothesize that ego-involved individuals who have a high level of perceived competence will be more intrinsically motivated than ego-involved individuals with a low level of perceived competence (Cury, Biddle, Sarrazin, & Famose, 1997) though other researchers (Vlachopoulos

& Biddle, 1997) have not been found this interaction. It is generally agreed, however, that an ego-involved person who has a low perception of competence is less likely to approach a task when they do not feel they are likely to be successful (Kilpatrick, Bartholomew, & Riemer, 2003).

Autonomy

Autonomy is an essential nutriment in self-determination theory. Perhaps the most straightforward definition of autonomy, offered by Guay, et al. (2000) is, "a sense of feeling free from pressures and to have the possibility to make choices among several courses of action" (p. 177-178). Autonomy is tantamount to free will in the sense that individuals have the innate need for their actions and activities to parallel to their perceptions of self (Deci & Ryan, 2000). According to Deci and Ryan (2000), "autonomy concerns the experience of integration and freedom" (p. 231).

Incorporating new beliefs or ideology and adjusting behavior patterns are necessary in the integration process (Williams, Grow, Freedman, Ryan, & Deci, 1996). In their commentary on autonomy, Carver and Scheier (2000) question the conceptualization of autonomy proposed by Deci and Ryan (2000), who contend that autonomy is central to the experience of integration. They maintain that the word autonomy has different implications when used in self-determination literature from its use in ordinary language. They explore the question of whether individuals must truly feel autonomous in situations, or if they need only to perceive that they are autonomous.

The extent to which instigation and direction of action comes from within the self is central to the notion of autonomy (Grolnick, Ryan & Deci, 1991). Studies which introduced factors that challenged autonomy provide evidence concerning the powerful influence that

autonomy has on intrinsic motivation. Autonomy has proven to be a more powerful influence on intrinsic motivation than perceived competence (Goudas & Biddle, 1995). According to Goudas and Biddle (1995), even very high levels of perceived competence will not offset the fact that individuals are not intrinsically motivated when they are performing under some sort of external pressure. When individuals feel that their opinions are valued, their feelings are taken into account, and they have the opportunity to make choices and be self-managers, autonomy is enhanced (Ryan & Deci, 2000). Hagger, Chatzisarantis, Culverhouse and Biddle (2003) provide one of the few studies related to perceived autonomy support in physical education. Their results indicated a positive link between experiencing autonomy support in physical education classes and levels of intrinsic motivation and identified regulation.

External influences such as deadlines, supervision, and evaluation decrease levels of intrinsic motivation, ingenuity and problem solving (Deci & Ryan, 2000). Competition and rewards, frequently used in school settings, can also be detrimental to intrinsic motivation. In physical education, for example, teachers may use a system of rewards for students who are on task and behaving appropriately. Cognitive evaluation theory also attempts to address the manner in which external events such as rewards can increase or destabilize intrinsic motivation (Markland, 1999). Myriad studies indicate that the use of rewards is consistently detrimental to fostering a sense of intrinsic motivation (Ryan & Deci, 2000). Other external controls, such as time controls, intimidation, and stressful assessments of performance also decrease intrinsic motivation levels. School based research has provided evidence that intrinsic motivation flourishes when students perceive that they are in an autonomy supportive environment where they have some level of control (Ryan & Grolnick, 1986). Further, autonomous feelings have a greater likelihood of occurring for children who believe they have the competence necessary to

perform the task and when they have an understanding of "who or what is responsible" (p. 509) for exerting the control over the situation or task (Grolnick, et al., 1991). Engagement in physical activity, therefore, is expected when autonomous intentions are present for the individual (Biddle, 1999). When examining physical activity intentions and adherence issues, investigating the construct of autonomy is essential.

Teachers must make use of strategies that elicit desirable behaviors from students without being controlling in nature. Satisfying the basic psychological needs of competence, autonomy and relatedness may help bring forth more appropriate behaviors from students. Specifically, in physical education, if students are involved in a task that is appropriate to their levels of ability and is neither too challenging nor too easy, off-task behavior should be minimized. In addition, providing students with a level of choice regarding activity or equipment selection can also be a positive approach to achieving desirable behaviors in the classroom. In a study of middle school girls, situational motivation was increased and amotivation was decreased when students were allowed to make choices regarding the activity in which they wanted to participate (Prusak, Treasure, Darst, & Pangrazi, 2004).

It is also expedient in this discourse to have an understanding of what autonomy is not. Autonomy is not equivalent to independence or indifference, but rather it is the idea of being volitional or having the opportunity to make decisions in one's choices of actions (Ryan & Deci, 2000). From time to time researchers may fail to differentiate between the terms autonomy or self-determination and locus of control. There is, however, a distinct difference in the two terms and each connotes a very different meaning. Locus of control relates directly to the end result of a particular behavior or action (Grolnick, et al., 2002). Those who perceive the results of their efforts or actions are caused by their own actions or behaviors have an internal locus of control.

On the other hand, individuals who attribute outcomes to forces outside of their control, such as luck or destiny are said to have an external locus of control.

Self-determination theory is quite distinct from locus of control studies because self-determination is less related to the outcome of a particular behavior and is instead focused more on initiating and managing behaviors (Grolnick, et al., 2002). The principles behind self-determination and locus of control are inextricably linked by the fact that, "an internal locus of control is necessary but not sufficient for self-determination" (Grolnick, et al., 2002; p. 149). Locus of causality (Deci & Ryan, 1985) is more related to self-determination theory because it is related to perceptions of whether or not activating a new behavior is coming from within the self or from some other outside source. Behaviors emanating from within the self are thought to be more autonomous, while behaviors which result due to some outside influence are considered more controlling in nature (Deci & Ryan, 1985).

According to the tenets of self-determination theory, extrinsic motivation levels vary in their level or degree of autonomy (Ryan & Deci, 2000). Often, the focus of self-determination and autonomy is how they relate to intrinsically motivated behaviors, but it is also important to understand how autonomy affects the reasons individuals engage in behaviors that are extrinsically motivated. For example, exercising for the purpose of improving one's health status is considered to be extrinsically motivated, because the individual is not participating in exercise for the sake of the activity itself. The external force of improving health, however, is more autonomous than exercising simply because one is a scholarship athlete and needs the benefit of the scholarship money (Frederick & Ryan, 1995). Scholarship athletes, in particular, equate their sport to be more like employment and, therefore, are more likely to be extrinsically

motivated than their counterparts who are not on scholarship (Wagner, Lounsbury, & Fitzgerald, 1989).

In a study of aerobics participants, Markland (1999) found that when individuals had a low sense of autonomy, their perceived competence became very important in relation to intrinsic motivation. In situations where self-determination will, for whatever reason, be inherently low, it is critical to cultivate an atmosphere which promotes success and encourages a sense of competence (Markland, 1999). Intrinsic motivation will likely be diminished greatly if participants do not feel autonomous in the setting and perceive that they are not competent.

Cognitive evaluation theory identifies an additional component, feedback, as having an effect on intrinsic motivation (Deci & Ryan, 1985). Feedback can occur in numerous fashions, and individuals can interpret the feedback in a number of ways. Positive or negative verbal statements or a system of rewards all constitute different kinds of feedback. If the individual senses that the feedback is intended to be instructive and helpful, then the advice is likely to promote intrinsic motivation. If, on the other hand, the feedback is viewed as calculating, in an attempt to manipulate performance, then intrinsic motivation will decrease. At worst, the feedback may be amotivational in nature, promoting a sense of incompetence or helplessness (Deci & Ryan, 1985). Sport related research has shown considerable increases in intrinsic motivation for individuals who receive positive feedback and are in circumstances which allow them a level of autonomy by providing choice in situations (Thill & Mouanda, 1990).

Relatedness

Relatedness is characterized by a state of loving and caring for others, with the reciprocal being true, where love and care is also received by the individual (Deci & Ryan, 2000). Research (Ntoumanis, 2001b) has demonstrated a weak, but positive, relationship between

relatedness in physical education and more self-determined levels of motivation (intrinsic motivation, identified, and introjected regulation). It is not uncommon for individuals to report that a main reason they participate in physical activity is for the social interaction it provides (Ntoumanis, 2001b). It is logical to also conclude that physical education has the potential to offer a favorable environment for satisfying the need of relatedness. Compared to competence and autonomy, there is a dearth of research and literature on issues of relatedness (Kowal & Fortier, 2000).

Relatedness is thought to be of less consequence in intrinsic motivation than autonomy and competence though it certainly has a role in the continuation of intrinsic motivation (Deci & Ryan, 2000). Ultimately, social environments either enhance or diminish intrinsic motivation by fulfilling or failing to meet the psychological needs of competence, autonomy and relatedness (Ryan & Deci, 2000). Relatedness is also associated with extrinsic motivation. According to organismic integration theory, behaviors are more likely to be internalized, even if they are extrinsically motivated, when the individual feels a sense of relatedness.

Very young children exhibited diminished intrinsic motivation when an adult overlooked their efforts toward interaction while involved in an engaging activity (Anderson, Manoogian, & Reznick, 1976). School studies show that students who perceive they have a thoughtful and compassionate teacher exhibit greater levels of intrinsic motivation (Ryan & Grolnick, 1986). There are many pursuits that do not require interaction with others yet are still intrinsically motivating to the individual. For example, running or jogging is often an "individual" activity where there may be no contact with any other people. Many individuals, however, enjoy lone pursuits and are intrinsically motivated to participate in activities without the presence of others. Since it is quite possible for an individual to be intrinsically motivated to be involved in an

activity without connection to another person, relatedness is believed to provide less support for intrinsically motivated behavior than autonomy or competence (Deci & Ryan, 2000).

AGT and Self-Determination

As researchers have explored ways to extend or move beyond achievement goal theory to further our understanding of motivation, several studies have examined the links between key constructs within achievement goal theory and self-determination theory (Brunel, 1999; Goudas, Biddle, & Fox, 1994; Ntoumanis, 2001a; Standage, Duda, & Ntoumanis, 2003). This line of research specifically examined perceived competence and achievement standards in terms of estimating levels of self- determination. Theoretical predictions are that a task orientation will better help an individual to meet the needs for competence and autonomy as compared to an ego orientation. For task-oriented individuals, the inherent gratification one receives when mastering a new task or skill is not related to the outcome of that task, but rather to the process. Therefore, task oriented individuals are likely to be more self-determined. It is also hypothesized that, unlike ego orientation, task orientation will certainly not undermine the need for relatedness (Duda, 1992). Ultimately, it is only when autonomous conditions are present that individuals with a high perceived competence would be predicted to move toward more self-determined motivational states.

Ntoumanis (2001a) recently conducted a study investigating the empirical link between achievement goal theory and self-determination theory and found initial support for greater levels of self-determination in individuals who were high in task orientation. In their study of seventh and eighth graders, Goudas, et al. (1994) found that those who were task oriented and more self-determined reported higher levels of intrinsic interest in the physical education activity. Students in their study were less self-determined in the gymnastics unit than in the

football/netball unit. According to Standage and Treasure (2002), few studies have examined achievement goal orientations as they relate to varying levels of extrinsic motivation. They also examined middle school students and found that those who had a low task orientation, regardless of their ego orientation, had increased levels of external regulation when compared to those students who were high in their task orientation. Further, students who were low in both the task and ego orientation demonstrated lower levels of amotivation and higher levels of identified regulation than the students who were low in task and high in ego orientation.

By contrast, research evidence also supports the notion that individuals who are ego-involved are at the lower ends of extrinsic motivation (Brunel, 1999). Ego oriented individuals are expected to feel less autonomous because of their great concern for demonstrating an unrivaled level of competence (Ntoumanis, 2001a). Standage, Duda, and Ntoumanis (2003) conducted a study using the constructs of both self-determination theory and achievement goal theory for the purpose of understanding motivation specifically within physical education classes. Their study of boys and girls, ages 12-14, tested a proposed model merging the constructs of motivation and achievement goal theory. Consistent with theoretical predictions, students who perceived the environment to be autonomy promoting and low in control, reported feeling more competent, autonomous, and related in their physical education classes. Further, students who exhibited higher levels of self-determination in their physical education classes also reported higher levels of intention to engage in physical activity outside of school. Interestingly, in this study, a more self-determined level of motivation was predicted by competence and relatedness, but not necessarily autonomy. In statistical terms, autonomy was indeed linked to self-determination, though the path coefficient in the analysis was relatively weak. The overall conclusion from this study was that physical education teachers should provide autonomy-

support with an emphasis on mastery or task involving climates. Consistent with this conclusion, Parish and Treasure (2003) found strong relationships between perceptions of a task-involved physical education climate and increased levels of self-determination.

One suggestion for future research in the area of achievement goals is to identify a continuum, much like in self-determination theory, between task and ego involvement (Pintrich, 2003). While little in the world is a concrete "black and white" issue, the development of levels between task and ego may help further delineate various goals by including several perspectives.

Applying Research to Practice

Research evidence indicates that students are motivated for many reasons and it is critical that physical educators understand how to integrate the research and apply implications for practice. There is clear evidence that an autonomy supportive environment is preferable (Hagger, et al., 2003; Markland, 1999). There remain, however, important questions for research and practice in terms of identifying strategies to create those environments.

The research findings support the following practices in physical education. First, it is critical that physical educators recognize that traditional sport skilled-based programs do not meet the needs of the less active, less fit children in their classes (Bryan, Johnson, & Solmon, 2004; Ennis, 1999; Santina, Solmon, Cothran, Loftus, & Stockin-Davidson, 1998). This traditional curriculum is fine for children who are skilled, successful and enjoy this approach, however it has failed to meet the needs of many children. In competitive situations, many students, especially females, may participate at less vigorous levels which does not help them meet physical activity recommendations (Scruggs, Beveridge, & Watson, 2003).

In addition, physical educators must understand the ways in which children's intrinsic motivation can be fostered. Children need to be in an environment that stimulates them and

allows them the opportunity to work at a level of optimal challenge (Grolnick, et al., 2002). Further, individuals should be provided with many different activities in which they can participate (Li, et al., 2005). Social and cultural issues make providing choice important, since children from different cultures will likely have diverse interests (Grolnick, et al., 2002). Providing choice in the physical education class is critical for motivation. Offering choice, whether in terms of activity selection, difficulty of task, or other alternatives, supports autonomy and decreases the sense of working or learning in a controlling environment (Ntoumanis, 2001b). Physical education provides a tremendous opportunity for children and adolescents to participate in many different kinds of physical activities, which may carry over into their free time (Pate, et al., 1995).

The importance of success and failure in physical education, as it relates to motivation, cannot be taken too lightly (Vallerand & Losier, 1999). Physical activity and sport related research has found that when individuals are successful, they experience greater intrinsic motivation just as they feel less intrinsic motivation upon failing at a task (Bandura & Schunk, 1981). Specifically, teachers should be encouraged to use individualized criteria for success, where the student is evaluated in terms of their own improvement (Ntoumanis, 2001b). Using this personal reference of success will foster children's perceptions of competence and increase levels of motivation (Ntoumanis, 2001b).

An additional implication for practitioners is that physical educators may unintentionally create ego-involved climates where students are far more concerned with the outcome of the game and demonstrating superiority (Vallerand, Deci, & Ryan, 1987). It is important to recognize that competition itself does not automatically create ego-involved individuals who participate in activity for the wrong reasons. Research has shown that when competition is used

in an informational context, intrinsic motivation is increased. It is only when the competitive conditions foster a "win at all costs" atmosphere that intrinsic motivation is quelled (Reeve & Deci, 1996).

Several key points repeatedly emerge in the literature that lend themselves to the practitioner in physical education. First, students are more likely to feel competent in physical education when their teacher emphasizes self-improvement. Physical educators should also keep in mind that females consistently demonstrate lower physical competence than boys. Activities should be provided where all students, regardless of gender, are successful and improving in terms relative to the individual. Second, competition does not need to be eliminated in physical education classes. However, the teacher is responsible for the environment in which students are placed and an over-emphasis on winning is detrimental to those with less skill. Third, task oriented students are likely to succeed in almost any environment. The same, however, cannot be said for ego-involved individuals, as the research is more uncertain in this area. Promotion of task-involved states is advantageous in general. Fourth, students must perceive that their physical education class provides some form of autonomy. Providing choices in physical education is relatively easy to do and choices should be fixed such that the options are acceptable to the teacher and always safe for students. Finally, teachers should keep in mind that students who feel their teachers are considerate and compassionate are more intrinsically motivated.

Future Research

As Pintrich (2003) points out, there is not one particular best practice or situation when it comes to designing educational environments to facilitate motivation. Quite the opposite is true in terms of structuring and organizing motivational climates within schools. It is necessary at this point to investigate ways to implement practices, which have been identified as successful in

enhancing motivation by examining the kinds of teachers, students, and schools where these practices work best. Pintrich (2003) goes on to argue that we should not have the mentality of competing theories or interventions whereby we assert in the end that one is better than another. Rather, we should seek commonalities and parallels between theoretical approaches to better understand what practices are most likely to be effective in specific settings and contexts.

Further research is needed to investigate the ways different types of motivation either work together to promote a behavior or to obstruct the initiation of a new behavior (Vallerand, 1997). By employing the continuum of self-determination, Vallerand and Losier (1999) theorize that individuals who have high levels of intrinsic motivation and identified regulation, at one end of the continuum, and negligible levels of external regulation or amotivation will likely be the individuals who engage in more positive behaviors. Ntoumanis (2002) suggests that in continuing this line of research, investigations should include assessment of the motivational climate, in addition to measuring the motivational state of the individual. Grolnick, et al., (2002) argue that more research is needed to determine how gender differences exist in self-determination in terms of subject matter and ascription for achievement and failure.

In addition, future research should examine specific subgroups such as race, gender, and those who are of a low socioeconomic status to determine their attitudes and motivation toward physical activity and physical education. Moreover, relatedness is an important nutriment in self-determination theory, but there is little information on how to foster this nutriment or what role it plays in fostering self-determination. Although there exists an instrument for measuring the three basic psychological needs (competence, autonomy, and relatedness), there are possible measurement issues related to this construct. Further, there is little information on interventions that use self-determination theory as a framework. The

constructs within self-determination theory appear to be an excellent foundation for structuring an intervention to increase physical activity, but few studies have established an association between the tenets of self-determination theory and an actual intervention. To date, studies in physical education classes have generally been correlational in nature. We know that individuals who are intrinsically motivated are more self-determined and more active, but we do not know if changes in the physical education climate can increase self-determination and subsequently increase levels of physical activity.

While a great deal of research has been conducted in this realm, there is a need for further understanding. It is necessary to better understand how children's motivation, perceptions of the motivational climate, and perceived competence affect their levels of fitness and participation in physical activity. By extending this line of research, our field can gain a greater understanding of these constructs through actual interaction and dialogue with children in physical education settings, using self-determination theory as the theoretical framework.

ADDITIONAL REFERENCES

Anderson, R., Manoogian, S. T., & Reznick, J. S. (1976). The undermining and enhancing of intrinsic motivation in preschool children. *Journal of Personality and Social Psychology, 34,* 915-922.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41,* 586-598.

Baranowski, T. (1988). Validity and reliability on self-report measures of physical activity: An information processing perspective. *Research Quarterly for Exercise and Sport, 59*, 314-327.

Beighle, A., Pangrazi, R.P. & Vincent, S.D. (2001). Pedometers, physical activity, and accountability. *Journal of Physical Education, Recreation and Dance, 72,* 16-19.

Brunel, P. (1999). Relationship between achievement goal orientations and perceived motivational climate on intrinsic motivation. *Scandinavian Journal of Medicine and Science in Sports, 9,* 365-374.

Brustad, R.J. (1993). Who will go out and play? Parental and psychological influences on children's attraction to physical activity. *Pediatric Exercise Science, 5*, 210-223.

Carver, C. S., & Scheier, M. F. (2000). Autonomy and self-regulation. *Psychological Inquiry, 11,* 284-291.

Chatzisarantis, N., Hagger, M. S., Biddle, S. J. H., Smith, B. & Wang, J. C. K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal of Sport & Exercise Psychology, 25,* 284-306.

Chen, A. (2001). A theoretical conceptualization for motivation research in physical education: An integrated perspective. *Quest, 53, 35*-58.

Council for Physical Education for Children. (1998). *Physical activity guidelines for children: A statement of guidelines.* Reston, VA.

Cury, F., Biddle, S. J. H., Sarrazin, P., & Famose, J. P. (1997). Achievement goals and perceived ability predict investment in learning a sport task. *British Journal of Educational Psychology, 67,* 292-309.

Deci, E. L. (1975). *Intrinsic Motivation.* New York: Plenum.

Dishman, R. K. (1982). Health psychology and exercise adherence. *Quest, 32,* 116-180.

Doyle, W. (1977). Paradigms for research on teacher effectiveness. In L. S. Shulman (Ed.), *Review of research in education* (Vol. *5,* pp. 163-198). Itasca, IL: Peacock.

Duda, J. L. (1989). Relationship between task and ego orientation and the perceived purpose of sport among high school athletes. *Journal of Sport and Exercise Psychology, 11,* 318-335.

Duda, J. L. (1992). Motivation in sport settings: A goal perspective approach. In Roberts, G. C. (Ed.) *Motivation in Sport and Exercise* (pp. 57-91). Champaign, IL: Human Kinetics.

Duda, J. L. (1997). Perpetuating myths: A response to Hardy's 1996 Coleman Griffith address. *Journal of Applied Sport Psychology, 9,* 307-313.

Duda, J. L., Chi, L., Newton, M. L., Walling, M. D., & Catley, D. (1995). Task and ego orientation and intrinsic motivation in sport. *International Journal of Sport Psychology, 26,* 40-63.

Eston, R.G., Rowlands, A.V., & Ingledew, D.K. (1998). Validity of heart rate, pedometry, and accelerometry for predicting the energy cost of children's activities. *Journal of Applied Physiology, 84,* 362-371.

Ewing, M. E., & Seefeldt, V. (1988). *American youth and sports participation*. North Palm Beach, FL: American Footwear Association.

Frederick, C. M., & Ryan, R. M. (1995). Self-determination in sport: A review using cognitive evaluation theory. *International Journal of Sport Psychology, 26,* 5-23.

Freedson, P. S., Sirard, J., & Debold, N. (1997). Validity of two physical activity monitors in children and adolescents. In Armstrong, N., Kirby, B., & Welsman, J. (Eds.) *Children and Exercise XIX*, (pp. 127-131). London: E & FN Spon.

Goudas, M., Biddle, S. J. H., & Fox, K. R. (1994). Achievement goal orientations and intrinsic motivation in physical testing with children. *Pediatric Exercise Science, 6,* 159-167.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 83,* 508-517.

Guralnik, D. B. (Ed.). (1984). *Webster's new world dictionary of the American language (2nd ed.)*. New York: Simon & Schuster, Inc.

Janz, K. F. (1994). Validation of the CSA accelerometer for assessing children's physical activity. *Medicine and Science in Sports and Exercise, 26,* 369-375.

Kientzler, A. L. (1999). Fifth- and seventh- grade girls' decisions about participation in physical activity. *The Elementary School Journal, 99,* 391-414.

Kilpatrick, M., Bartholomew, J., & Riemer, H. (2003). The measurement of goal orientations in exercise. *Journal of Sport Behavior, 26,* 121-136.

Kowal, J., & Fortier, M.S. (2000). Testing the relationships from the hierarchical model of intrinsic and extrinsic motivation using flow as a motivational consequence. *Research Quarterly for Exercise and Sport, 71,* 171-181.

Kriska, A. M. (1997). Introduction to a collection of physical activity questionnaires. *Medicine and Science in Sports and Exercise, 29,* S5-S9.

Lee, A. M. (1997). Contributions of research on student thinking in physical education. *Journal of Teaching in Physical Education, 16,* 262-277.

Lee, A. M. (2003). How the field evolved. In Silverman, S. J., & Ennis, C. D. (Eds.) *Student learning in physical education* (2nd ed., pp. 9-25). Champaign, IL: Human Kinetics.

Lee, A. M., & Solmon, M. A. (1992). Cognitive conceptions of teaching and learning motor skills. *Quest, 44,* 57-71.

Mamalakis, G., Kafatos, A., Manios, Y., Anagnostopoulou, T., & Apostolaki, I. (2000). Obesity indices in a cohort of primary school children in Crete: A six year prospective study. *International Journal of Obesity, 24*, 765-771.

Mayo, R. J. (1977). The development and construct validation of a measure of intrinsic motivation (Unpublished doctoral dissertation, Purdue University, 1976). *Dissertation Abstracts International, 37,* 5417b. University Microfilms No. 77-7491.

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the intrinsic motivation inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 60,* 48-58.

Morgan, C.F., Pangrazi, R.P. & Beighle, A. (2003). Using pedometers to promote physical activity in physical education. *Journal of Physical Education, Recreation and Dance, 74,* 33-38.

Mota, J., Santos, P., Guerra, S., Ribeiro, J. C., Duarte, J. A., Sallis, J. F. (2002). Validation of a physical activity self-report questionnaire in a Portuguese pediatric population. *Pediatric Exercise Science, 14*, 269-276.

Newton, M. & Duda, J. L. (1999). The interaction of motivational climate, dispositional goal orientations, and perceived ability in predicting indices of motivation. *Internal Journal of Sport Psychology, 30,* 63-82.

Nicholls, J. G. (1984). Conceptions of ability and achievement motivation. In R. Ames & C. Ames (Eds.), *Research on motivation in education: volume 1. Student motivation* (pp. 39-73). New York: Academic Press.

Nicholls, J. G. (1989). *The competitive ethos and democratic education.* Cambridge, MA: Harvard University Press.

Ntoumanis, N. (2001a). Empirical links between achievement goal theory and self-determination theory in sport. *Journal of Sport Sciences, 19,* 397-409.

Ntoumanis, N. (2001b). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology, 71,* 225-242.

Pate, R. R. Freedson, P.S., Sallis, J. F., Taylor, W. C., Sirard, J., Trost, S. G., & Dowda, M. (2002). Compliance with physical activity guidelines: Prevalence in a population of children and youth. *Annals of Epidemiology, 12,* 303-308.

Pate, R. R., Small, M. L., Ross, J. G., Young, J. C., Flint, K. H., & Warren, C. W. (1995). School physical education. *Journal of School Health, 65,* 312-318.

Patterson, P. (2000). Reliability, validity, and methodological response to the assessment of physical activity via self-report. *Research Quarterly for Exercise and Sport, 71,* 15-20.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods.* Thousand Oaks, CA: Sage.

President's Council on Physical Fitness and Sports. (2001). *The President's Challenge: Physical activity and fitness awards program.* Bloomington, IN: Author.

Prusak, K. A., Treasure, D. C., Darst, P. W., & Pangrazi, R. P. (2004). The effects of choice on the motivation of adolescent girls in physical education. *Journal of Teaching in Physical Education, 23,* 19-29.

Rocchini, A. P. (2002). Childhood obesity and a diabetes epidemic. *New England Journal of Medicine, 346,* 854-855.

Rousseau, F. L. & Vallerand, R. J. (2000). Does motivation mediate influence of social factors on educational consequences? *Psychological Reports, 87,* 812-814.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43,* 450-461.

Ryan, R. M. & Grolnick, W. S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perceptions. *Journal of Personality and Social Psychology, 50,* 550-558.

Ryan, R. M., Koestner, R., & Deci, E. L. (1991). Ego-involved persistence: When free-choice behavior is not intrinsically motivated. *Motivation and Emotion, 15,* 185-205.

Sallis, J. F. (1991). Self-report measures of children's physical activity. *Journal of School Health, 61,* 215-219.

Sallis, J. F., Buono, M. J., Roby, J. J., Carlson, D., & Nelson, J. A. (1990). The Caltrac accelerometer as a physical activity monitor for school-age children. *Medicine and Science in Sports and Exercise, 22,* 698-703.

Sallis, J. F., Condon, S. A., Goggin, K. J., Roby, J. J., Kolody, B., & Alcaraz, J. E. (1993). The development of self-administered physical activity surveys for the 4th grade students. *Research Quarterly for Exercise and Sport, 64,* 25-31.

Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: Status, limitation and future directions. *Research Quarterly for Exercise and Sport, 71*, S1-S14.

Sallis, J. F., Strikmiller, P. K., Harsha, D. W., Feldman, H. A., Ehlinger, S., Stone, E. J., Williston, B. J., & Woods, S. (1996). Validation of interviewer- and self-administered physical activity checklists for fifth grade students. *Medicine and Science in Sports and Exercise, 28,* 840-851.

Santina, B., Solmon, M. A., Cothran, D. J., Loftus, S. J., & Stockin-Davidson, K. (1998). Patriarchal consciousness: Middle school students' and teachers' perspectives of motivational practices. *Sport, Education & Society, 3,* 181-200.

Scruggs, P. W., Beveridge, S. K., & Watson, D. L. (2003). Increasing children's school time physical activity using structured fitness breaks. *Pediatric Exercise Science, 15,* 156-169.

Solmon, M. A. (1996). Impact of motivation climate on students' behaviors and perceptions in a physical education setting. *Journal of Educational Psychology, 88,* 731-738.

Solmon, M. A., & Lee, A. M. (1996). Entry characteristics, practice variables, and cognition: Student mediation of instruction. *Journal of Teaching in Physical Education, 15,* 136-150.

Telford, A., Salmon, J., Jolley, D., & Crawford, D. (2004). Reliability and validity of physical activity questionnaires for children: the children's leisure activities study survey (CLASS). *Pediatric Exercise Science, 16,* 64-78.

Thill, E., & Mouanda, J. (1990). Autonomy or control in the sports context: Validity of the cognitive evaluation theory. *International Journal of Sport Psychology, 21,* 1-20.

Treasure, D. C. (2001). Enhancing young people's motivation youth sport: An achievement goal approach. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 79-100). Champaign, IL: Human Kinetics.

Treuth, M. S., Sherwood, N. E., Butte, N. F., McClanahan, B., Obarzanek, E., Zhou, A., Ayers, C., Adolph, A., Jordan, J., Jacobs, D. R., & Rochon, J. (2003). Validity and reliability of activity measures in African-American girls for GEMS. *Medicine and Science in Sports and Exercise, 35*, 532-539.

Trost, S. G., Kerr, L. M., Ward, D. S. & Pate, R. R. (2001). Physical activity and determinants of physical activity in obese and non-obese children. *International Journal of Obesity, 25*, 822-829.

Trost, S.G., Pate, R., Freedson, P.S., Sallis, J.F., & Taylor, W.C. (2000). Using objective physical activity measures with youth: How many days of monitoring are needed? *Medicine and Science in Sports and Exercise, 32,* 426-431.

U.S. Department of Health and Human Services. (2000). *Healthy people 2010* (Conference edition, in Two Volumes). Washington, DC: U.S. Government Printing Office.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M.P. Zanna (Ed.), *Advances in experimental social psychology, 29,* 271-360. New York: Academic Press.

Vallerand, R. J. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of Applied Sport Psychology, 11,* 142-169.

Vallerand, R. J. (2000). Deci and Ryan's self-determination theory: A view from the hierarchical model of intrinsic and extrinsic motivation. *Psychological Inquiry, 11,* 312-318.

Vlachopoulos, S., & Biddle, S. J. H. (1997). Modeling the relation of goal orientations to achievement-related affect in physical education: Does perceived ability matter? *Journal of Sport & Exercise Psychology, 19,* 169-187.

Wagner, S. L., Lounsbury, J. W., & Fitzgerald, L. G. (1989). Attribute factors associated with work/leisure perception. *Journal of Leisure Research, 21,* 155-166.

Walling, M. D. & Duda, J. L. (1995). Goals and their associations with beliefs about success in, and perceptions of the purposes of physical education. *Journal of Teaching in Physical Education, 14,* 140-156.

Wankel, L. M. (1993). The importance of enjoyment to adherence and psychological benefits from physical activity. *International Journal of Sport Psychology, 24,* 151-169.

Wareham, N. J., & Rennie, K. L. (1998). The assessment of physical activity in individuals and populations: why try to be more precise about how physical activity is assessed? *International Journal of Obesity, 22 (Suppl):* 30-38.

Warnecke, R. B., Johnson, T. P., Chavez, N., Sudman, S., O'Rourke, D. P., Lacey, L., & Horm, J. (1997). Improving question working in surveys of culturally diverse populations. *Annals of Epidemiology, 7,* 334-342.

Wigfield, A., Eccles, J. S, Mac Iver, D., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27*, 552-565.

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A. J. A., Freedman-Doan, C., Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology, 89,* 451-469.

Williams, G. C., Grow, V. M., Freedman, Z., Ryan, R. M. & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70,* 115-126.

Xiang, P. & Lee, A. M. (1998). The development of self-perceptions of ability and achievement goals and their relations in physical education. *Research Quarterly for Exercise and Sport, 69,* 231-241.

APPENDIX B: INSTRUMENTATION

PAQ-C (PHYSICAL ACTIVITY QUESTIONNAIRE FOR CHILDREN)

Name: _____

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

Physical activity in your spare time. Have you done any of the following activities **in the past 7 days (last week)?** If yes, how many times? **MARK ONLY ONE ANSWER!**

	A = None	B = 1-2 times	C = 3-4 times	D = 5-6 times	E = 7 times or more
Skipping/Jumping Rope	⬭	⬭	⬭	⬭	⬭
Roller Blading					
Active Games (tag)					
Walking for exercise					
Bicycling					
Jogging or Running					
Swimming laps					
Baseball, softball					
Dance (social, recreational)					
Football					
Racket sports (badminton, tennis, racquetball)					
Skateboarding					
Soccer					
Volleyball					
Hockey (roller, ice, street)					
Basketball					
Ice Skating					
Martial Arts (karate, judo)					
Gymnastics					
Other					

Which one of the following describes you best for the last 7 days? Read all five statements before deciding on the one answer that describes you.

- ⬭ **All or most of my free time was spent doing things involving little physical effort.**
- ⬭ **I sometimes (1-2 times last week) did physical things in my free time.**
- ⬭ **I often (3-4 times last week) did physical things in my free time.**
- ⬭ **I quite often (5-6 times last week) did physical things in my free time.**
- ⬭ **I very often (7 times last week) did physical things in my free time.**

In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)?

I don't do PE Hardly Ever Sometimes Quite Often Always

⬭ ⬭ ⬭ ⬭ ⬭

In the last 7 days, on how many days right after school, did you do sports, or play games in which you were very active?

A. None **B.** 1 time **C.** 2-3 times **D.** 4 times **E.** 5 times

In the last 7 days, on how many evenings did you play sports, dance or play games in which you were very active?

A. None **B.** 1 time **C.** 2-3 times **D.** 4 times **E.** 5 times

This past weekend, how many times did you play sports, dance, or play games in which you were very active?

A. None **B.** 1 time **C.** 2-3 times **D.** 4 times **E.** 5 times

In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

- ⬭ Sat down (talking, reading, doing schoolwork)
- ⬭ Stood around or walked around
- ⬭ Ran or played a little bit
- ⬭ Ran around and played quite a bit
- ⬭ Ran and played hard most of the time

Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

A. None B. Little Bit C. Medium D. Often E. Very Often

Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

Were you sick last week, or did anything prevent you from doing your normal physical activities?

A. Yes
B. No

If Yes, what prevented you? _____

Using the scale below, please respond to the following question:

1	2	3	4	5	6
strongly disagree	disagree	somewhat disagree	mostly agree	agree	strongly agree

I am determined to exercise/play sport at least 3 times a week during the next month.

CY-PSPP (The Children and Youth Physical Self-Perception Profile)

Name: _____

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

Below are several pairs of statements. Choose the statement that describes you the best, and then check whether it is really true for your or sort of true.

How I See Myself

Really true for me	Sort of true for me			Sort of true for me	Really true for me
☐	☐	Some kids do very well at all kinds of sports	BUT	Other kids don't feel that they are very good when it comes to sports	☐ ☐

1. Some kids *don't* think doing well at athletics is that important to how they feel about themselves as a person, BUT
   Other kids feel that doing well at athletics is important.
2. Some kids feel *uneasy* when it comes to doing vigorous physical exercise, BUT
   Other kids feel c*onfident* when it comes to doing vigorous physical exercise.
3. Some kids feel that having the ability to do a lot of running and exercising is *very* important to how they feel about themselves as a person, BUT
   Other kids *don't* feel that it's all that important to have the ability to do a lot of running and exercising.
4. Some kids wish they could be a lot better at sports, BUT
   Other kids feel that they are good enough at sports.
5. Some kids think it's important to be good at sports, BUT
   Other kids *don't* think how good you are at sports is that important.
6. Some kids are *proud* of themselves physically, BUT
   Other kids don't' have much to be proud of physically.
7. Some kids have a lot of stamina for vigorous physical exercise, BUT
   Other kids soon get out of breath and have to slow down or quit.
8. Some kids *don't* think that having a lot of stamina for energetic exercises is very important to how they feel about themselves, BUT
   Other kids think that having a lot of stamina for vigorous exercise is *very* important
9. Some kids are *happy* with how they are and what they can do physically, BUT
   Other kids are *unhappy* with how they are and what they can do physically.

10. Some kids think they could do well at just about any new sports activity they haven't tried before, BUT
    Other kids are afraid they might *not* do well at sports they haven't ever tried.
11. Some kids *don't* have much stamina and fitness, BUT
    Other kids have *lots* of stamina and fitness.
12. Some kids think it's *very* important to have a good-looking (fit-looking) body in order to feel good about themselves as a person, BUT
    Other kids *don't* think that having a good –looking body is important at all.
13. Some kids *don't* feel very confident about themselves physically, BUT
    Other kids feel really good about themselves physically.
14. In games and sports some kids usually *watch* instead of play, BUT
    Other kids usually *play* rather than watch.
15. Some kids try to take part in energetic physical exercise whenever they can, BUT
    Other kids try to *avoid* doing energetic exercise if they can.
16. Some kids think that being physically strong is *not* all that important to how they feel about themselves as a person, BUT
    Other kids feel that it's *very* important to be physically strong.
17. Some kids have a positive feeling about themselves physically, BUT
    Other kids feel somewhat negative about themselves physically.
18. Some kid feel that they are *better* than others their age at sports, BUT
    Other kids usually *don't* feel they can play as well.
19. Some kids soon have to quit running and exercising because they get tired, BUT
    Other kids can run and do exercises for a long time without getting tired.
20. Some kids *don't* think that having a body that looks in good physical shape is important to how they feel about themselves, BUT
    Other kids feel that it's *very* important to have a body that looks in good physical shape.
21. Some kids wish that they could feel better about themselves physically, BUT
    Other kids *always* seem to feel good about themselves physically.
22. Some kids *don't* do well at new outdoor games, BUT
    Other kids are *good* at new games right away.
23. When it comes to activities like running, some kids are able to keep on going, BUT
    Other kids soon have to quit to take a rest.
24. Some kids think that having strong muscles is *very* important to how they feel about themselves, BUT
    Other kids feel that it's *not* at all important to have strong muscles.
25. Some kids are very *satisfied* with themselves physically, BUT
    Other kids are often *dissatisfied* with themselves physically.

ATTITUDE SCALE

Name: _____

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

Directions: Read each item carefully. Using the scale below, provide the answer that best describes how you feel.

A. Strongly disagree B. Disagree C. Neutral D. Agree E. Strongly agree

1. The games I learn in my PE class make my PE class interesting for me.
2. The games I learn in my PE class make learning unpleasant for me.
3. The games I learn in my PE class get me excited about PE.
4. My PE teacher makes my PE class seem unimportant to me.
5. I feel the games I learn in PE make my PE class boring for me.
6. I feel the games I learn in my PE class are useless to me.
7. The games I learn in my PE class seem important to me.
8. My PE teacher makes my PE class seem important to me.
9. My PE teacher makes my PE class interesting for me.
10. The games I learn in my PE class are useful to me.
11. I feel my PE teacher makes learning in my PE class fun for me.
12. I feel my PE teacher makes my PE class boring for me.
13. I feel the games I learn in my PE class are valuable to me.
14. The games I learn in my PE class seem unimportant to me.
15. My PE teacher makes learning in my PE class unpleasant for me.
16. My PE teacher makes my PE class useful for me.
17. I feel my PE teacher makes learning in my PE class valuable for me.
18. I feel my PE teacher makes learning in my PE class useless for me.
19. My PE teacher gets me excited about PE.
20. I feel the games I learn in my PE class make learning fun for me.

Using the scale below, please respond to the following question:

1	2	3	4	5	6
strongly disagree	disagree	somewhat disagree	mostly agree	agree	strongly agree

I intend to exercise, play sport at least 3 times a week during the next month

LAPOPECQ (Learning and Performance Orientations in PE Classes Questionnaire)

Name: _____

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

Directions: Read each item carefully. Using the scale below, provide the answer that best describes how you feel.

A. Strongly disagree B. Disagree C. Neutral D. Agree
E. Strongly agree

1. Students feel most satisfied when they win with little effort.
2. Successful students are thought to be those who perform skills better than their classmates.
3. The PE teacher pays special attention to whether my skills are improving.
4. I feel very satisfied when I learn new skills and games.
5. The PE teacher looks completely satisfied when students are improving after trying hard.
6. Students worry about failure in performing skills because it would lead to the disapproval of others.
7. Successful students are thought to be those who score the most points with little effort.
8. The PE teacher looks completely satisfied with those students who manage to win with little effort.
9. Students feel very badly when they can't perform a skill as well as others.
10. Students worry about performing skills that they are not particularly good at.
11. The PE teacher is most satisfied when every student learns something new.
12. Students try to gain rewards by outperforming others.
13. The PE teacher is completely satisfied when every student's skills are improving.
14. The way the lesson is taught helps me learn how to use PE to improve my health.
15. Students feel very badly when they make mistakes while performing skills or playing games.
16. I feel very satisfied when I learn something new.
17. The PE teacher makes sure that I understand how to perform each new skill before the class moves on to learning other skills.
18. I learn something enjoyable.
19. The PE teacher insists that students' mistakes are part of learning.
20. During the lesson students try to outperform each other.
21. The way the lesson is taught helps me learn how to exercise by myself.
22. The most important thing is for a student to demonstrate that he or she is better in sports than others.
23. It is very significant to win without trying hard.
24. I enjoy trying my best to learn a skill.
25. Students feel most satisfied when they manage to outperform others.
26. What I learn makes me want to practice more.
27. Students worry about failure in performing skills because they would not look good in the eyes of the PE teacher.

Using the scale below, please respond to the following question:

1	2	3	4	5	6
strongly disagree	disagree	somewhat disagree	mostly agree	agree	strongly agree

I plan to exercise/play sport at least 3 times a week during the next month

SIMS (Situational Motivation Scale)

Name: _____

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

Directions: Read each item carefully. Using the scale below, please indicate the answer that best describes the reason why you are currently engaged in this activity. Answer each item according to the following scale:

1	2	3	4	5	6
Strongly Disagree	**Disagree**	**Somewhat Disagree**	**Somewhat Agree**	**Agree**	**Strongly Agree**

1. Because I think that this activity is interesting.
2. Because I am doing it for my own good.
3. Because I am supposed to do it.
4. There may be good reasons to do this activity, but personally I don't see any.
5. Because I think that this activity is pleasant.
6. Because I think this activity is good for me.
7. Because it is something that I have to do.
8. I do this activity but I am not sure if it is worth it.
9. Because this activity is fun.
10. By personal decision.
11. Because I don't have any choice.
12. I don't know; I don't see what the activity brings me.
13. Because I feel good when doing this activity.
14. Because I believe this activity is important for me.
15. Because I feel that I have to do it.
16. I do this activity, but I am not sure it is a good thing to pursue it.

PE PEDOMETER STEPS

0 0 0 0
……
……..
9 9 9 9

DAY
1 ⬭
2 ⬭
3 ⬭

INFORMATION SHEET

Name: _____ Gender: ☐ male ☐ female

First Initial a . . . .z
Last Initial a ….z
Birthday month 1..…12
Day of birth 1….31
Birthday year 1989……1996

School: 0 . … . .9

Class:		Height in inches		Weight in pounds		
0	0	0	0	0	0	0
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
9	9	9	9	9	9	9

Race:

American Indian or Alaska Native
Asian
Black or African American
Native Hawaiian or Other Pacific Islander
White
Hispanic or Latino
Some other race

SF Tricep 1	SF Tricep 2	SF Tricep 3
☐☐☐☐	☐☐☐☐	☐☐☐☐
0 0 . 0	0 0 . 0	0 0 0
……	……..	……
……	……..	……
……	……..	……
9 9 . 9	9 9 . 9	9 9.99

SF Bicep 1 | | | | |

0 0 . 0
……
……
……
9 9 . 9

SF Bicep 2 | | | | |

0 0 . 0
……..
……..
……..
9 9 . 9

SF Bicep 3 | | | | |

0 0.0
……
……
……
9 9 .9

Hoosier Endurance Shuttle Run: Number of objects retrieved:

0 0
. .
. .
. .
. .
9 9

Father's Occupation: _____

Mother's level of education:

Some high school
Completed high school
Some college
Completed college
Graduate school

APPENDIX C : PILOT STUDY #1

Children's Attitudes Toward Physical Activity and Their Perceptions of Fitness Activities

Paper presented at AERA 2004

Physical inactivity is a widespread problem in our nation today. Trends such as the rise in Type II diabetes and increasing incidence of obesity have created scrutiny regarding the physical activity levels of children. Engaging in physical activity has been linked to improved health status in children and adults (Berkey, Rockett, Gillman, & Colditz, 2003). Myriad activities compete for the attention of children in today's technologically driven society and often children opt to participate in sedentary activities rather than being physically active. One important goal of physical education programs is to facilitate the adoption of physically active lifestyles, and in order to do that, it is necessary to examine children's attitudes and perceptions regarding their participation in physical activity (American College of Sports Medicine, [ACSM], 2000).

ACSM (2000) recommends physical education be offered at every grade level every day. Further, they advocate that children in physical education spend 50% of instructional time in moderate to vigorous physical activity. ACSM also advocates eliminating substitutions or exemptions for physical education. There is research evidence that participation in all types of physical activity declines significantly with age (Ewing & Seefeldt, 1988; U.S. Department of Health and Human Services [USDHHS], 1996; Wigfield, Eccles, Mac Iver, Reuman & Migdley, 1991). Active participation in physical education classes is not exempt from this decline. Over time, participation and interest in physical education decrease, though there is a lack of research to explain the gradual decline that is evident (Standage & Treasure, 2002). Though activity levels decline over the years, self esteem and body image are diminished for children and

adolescents who are obese (Trost, Kerr, Ward & Pate, 2001). The need for quality, daily physical education, therefore, is evident.

Almost half of American youths ages 12 to 21 are not vigorously active on a regular basis. Females are less active than males, so we must also take gender differences into account when addressing the problems associated with physical inactivity (USDHHS, 1996). However, knowledge about physical activity and a positive attitude toward this construct does not guarantee that young children will participate in the recommended amounts of physical activity (Brustad, 1991).

Because children often make decisions about whether or not they choose to be active, it is important to examine children's attitudes and perceptions regarding their participation in physical activity. Attitudes are formed early in childhood and are often based on experiences children have (Brustad, 1991). The word attitude has been used broadly in the literature, and is likely over used and ill-defined. Attitudes are formed based on central beliefs that an individual holds (Ajzen, 1988, 1993). In essence, what we believe determines our attitudes toward certain things. When asked about their own physical activity patterns, children report that the reason they play sports and engage in physical activity is to "have a good time" (Ewing & Seefeldt, 1988).

Perceptions and attitudes are also important mediators between teacher actions and what students learn and do. Positive attitudes are associated with adaptive motivational behaviors such as exerting effort, while negative attitudes are expected to result in a reluctance to engage in activities (Solmon, 2003). Parish and Treasure (2003) argue that motivation levels may be partly to blame for the low levels of moderate to vigorous physical activity in young people today. In addition, motivational issues must be asddressed in regard to physical fitness and

fitness testing. A study by Hopple and Graham (1995) found motivational issues to be a barrier in students participating in the mile run. Many students reported feeling like they had to take the test and they had a "just get it over with" attitude (p. 414).

In their review of measurement issues on student attitudes in physical education and physical activity, Silverman and Subramaniam (1999) indicated the research thus far has produced mixed results. They concluded that more investigation is needed to understand how student attitudes affect physical activity. Researchers must keep in mind that attempts to measure attitudes and perspectives of children have only begun in earnest in the last fifteen years (Brustad, 1991). The research produced in this short amount of time however, has yielded mixed results (Solmon, 2003).

In addition to the difficulty in assessing attitudes, there are innumerable methodological problems when attempting to assess levels of physical activity in children (Freedson, Sirard, & Debold, 1997; Janz, 1994). Researchers continue to collect physical activity measures on children with some level of trepidation due to the validity and reliability concerns of these measures (Mamalakis, Kafatos, Manios, Anagnostopoulou, & Apostolaki, 2000, Trost et al, 2001). Mamalakis, et al (2000) suggest that devices such as oxygen consumption and ECG are more objective and reliable than questionnaires in assessing physical activity in children. Though perhaps less objective, self-report measures are often employed because they are less of a financial burden and easier to administer (Trost et al, 2001).

Self-report measures of physical activity are used commonly, though they may not measure activity levels as accurately as more objective measures (Pate, et al., 2002). Unlike more objective measures, self-report instruments are also subject to recall bias (Trost et al, 2001). For children, especially under the age of 10, self-report measures requiring recall over

several days or weeks can be a cognitive challenge (Baranowski, 1988; Sallis, 1991; Sallis & Saelens, 2000). A study of Portuguese children found that validity for a self-report instrument was greatly improved after scores from children under the age of 10 were removed from the analysis (Mota, et al., 2002). One week recalls appear suitable for the childhood population in that they do not require as much ability to remember, and levels of consistent physical activity appear to be detectable within a one week measure (Sallis, et al., 1993).

The cognitive mediational paradigm provides a framework for the study of student attitudes and perceptions (Solmon, 2003). Students are recognized as active and controlling agents in the learning process. They enter instructional settings with varying backgrounds, knowledge and experiences that serve as filters through which they interpret instruction and make meaning of classroom experiences. Based on their prior experiences, they form attitudes that are theorized to be powerful influences on decisions they make about engaging in activity.

The purpose of this study was to employ the mediating processes paradigm as a framework to study students' attitudes toward physical activity and their perceptions of fitness activities with the goal of learning how to design class environments and activities that will promote the adoption of active lifestyles. Specifically, we examined the relationships between self-reported levels of physical activity, attitudes toward physical activity, and a health-related fitness assessment and used qualitative techniques to investigate student perceptions of physical fitness and fitness activities.

Methods

Participants

Participants were 105 (50 male and 55 female) fourth and fifth grade children enrolled in a suburban public school in the southeastern United States. Prior to data collection, parents

provided informed consent and children completed child assent forms. IRB approval was also obtained from the institution. The children in this study participated in daily physical education classes taught by a physical education specialist. The physical education program curriculum focused on skill development throughout the school year.

Instruments and Procedures

Data sources for this study included a health-related fitness assessment, self-reported levels of physical activity, an assessment of children's attitudes toward physical activity, open-ended surveys concerning their perceptions of fitness activities, and individual interviews of high and low fit students. Prior to the instructional intervention, researchers and research assistants were trained to administer the assessments and collect the data.

The Fitnessgram was used as the health-related fitness assessment. Variables analyzed from the Fitnessgram were the PACER test as a measure of aerobic fitness. In the PACER test, students are instructed to run from the starting line to another line 20 meters away. Students may not return to the starting line until they hear the "beep" sound from the tape recorder. The cadence is intended to help students pace themselves throughout the test, though the test becomes more difficult as time elapses.

Percent body fat was also obtained using skinfold calipers to provide a measure of body composition. This test was conducted in a private area where children were paired with a trained research assistant who measured the calf and tricep areas. ACSM (2000) indicates that skinfold measures obtained with calipers are highly correlated to hydrostatic weighing, which is an illogical field based test.

The Physical Activity Questionnaire for Children (PAQ-C), used as the measure of self-reported levels of activity, asks respondents to indicate how many times in the previous week

they participated in a wide range of physical activity behaviors across a variety of settings (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997). The first page of the questionnaire lists several activities such as swimming, bicycling, running, active games and basketball. Respondents are to indicate, by placing a check in the appropriate box, the number of times in the past week they engaged in that particular activity. The remainder of the questionnaire asks about other physical activity behaviors, from the last seven days, in other settings. These questions are related to physical education free time, recess, extracurricular sports, weekend activities, and evening activities (Crocker, et al., 1997).

The Children's Attitudes Toward Physical Activity (CATPA) survey was used to assess children's attitudes related to activity (Schutz, Smoll, Carre, & Mosher, 1985). Specifically, the CATPA analyzes the following subdomains: social growth, social continuation, health and fitness (value), health and fitness (enjoyment), vertigo, aesthetic, catharsis, and ascetic values.

Instructional Intervention, Surveys and Interviews

Every Friday over a three-month period, a fitness based activity program, "Fit Friday," was conducted with the fourth and fifth grade classes at a suburban public school in the southeastern United States. The Fit Friday activities included non-competitive games and activities designed to maintain an elevated heart rate for most of the physical education time. In addition, students had some type of cognitive endeavor to go along with the activities each week. For example, during one of the Fit Friday's which employed a station format, students rotated through each station twice. They tracked the number of points, sit ups, etc. on the first and second rotations through the activities. The completed worksheets were discussed at the end of the Fit Friday session.

During Fit Friday, students worked individually, in pairs, and in small groups, depending on the activity. Most activities were set up in a station format with children rotating on a designated signal. During the Fit Friday sessions, students wore a DigiWalker pedometer and selected students wore Caltrac accelerometers to track caloric expenditure and activity counts.

At the end of the instructional Fit Friday sessions, open-ended questionnaires were given to each child to gather information concerning their perceptions of the fitness activities and their understanding of the concepts presented in the sessions. In addition, 10 high fit students (5 boys and 5 girls) and 10 low fit students (5 boys and 5 girls) were purposively selected for individual interviews. Interview questions focused on how children defined fitness, why they thought they were fit or unfit, if their families participated in physical activity, how much the students valued physical activity and how and why they were physically active. An additional question asked how the children perceived their physical education classes were different from the Fit Friday classes, and what they learned from using the accelerometer and pedometer.

Data Analyses

Data were analyzed using a series of three multiple regression analyses to determine if attitudes as measured by the CATPA were related to aerobic fitness, body composition, and physical activity levels. The predictor variables in these analyses were the domains of the CATPA, and the dependent variables were the PACER, percent body fat, and scores from the PAQ-C. The constant comparative method was used to analyze the Fit Friday questionnaires and interview data. Using this method, interview data were both unitized and categorized to see what themes emerged. The unitizing involved breaking the data up into discrete parts, which yielded distinct units of information. The categorizing step involved going through the units of

information and applying a categorical name and definition. From this, final themes emerged from the data (Lincoln & Guba, 1985).

Results and Discussion

Multiple Regressions

The CATPA did not account for a significant portion of the variation in any of the multiple regression analyses, suggesting that attitudes toward physical activity as measured by the CATPA are not related to fitness measures or self-reported levels of physical activity. These results are not consistent with theoretical predictions, nor are they similar to other findings reported in recent literature. A possible explanation for the confounding CATPA findings is offered by Brustad (1991) who explains that the subdomains from the instrument are patterned after Kenyon's model, which was never intended for children.

Although the CATPA follows closely the original ATPA for adults, necessary changes were made to the instrument to account for the reading levels of children (Schutz, Smoll, Carre & Mosher, 1985). Based on a pilot study with 10 to 12 year old children, some of the dichotomous word pairs were eliminated because the respondents could not understand them. After the pilot test, the revised CATPA was developed using five word pairs with a 5-point scale for each pair of adjectives (Schutz, Smoll, Carre & Mosher, 1985). Though plagued by significant psychometric problems, the CATPA is still the most widely used assessment for studying children's attitudes toward physical activity (Brustad, 1991).

While the CATPA is widely used, Brustad questions its validity, reporting a relatively weak test-retest reliability (r =.60). Pennington, Pennington, and Hager (2003) reported no relationship between the beliefs of children and their participation in physical activity. Schutz, et al (1985) also report a six week test-retest reliability of .60 and goes on to suggest that children's

attitudes toward physical activity may not be a stable enough construct to test. Ultimately, they suggest the CATPA is useful for making decisions regarding group changes toward physical activity, but should not be used on an individual level (Schutz, et al., 1985).

Kimiecik, Horn, and Shurin (1996), however, found a significant relationship between children's feelings of competence and their self reported levels of moderate to vigorous physical activity. The evidence to date suggests that perceived competence, rather than attitude, may be a more influential factor in activity patterns and fitness levels. At this point, it seems prudent to conduct further research using attitude inventories and self-report measures of physical activity. If it is important to study young children's attitudes about physical activity, it is essential that valid and reliable age-appropriate measures be developed.

Students' Perceptions of Fitness Activities

Analysis of the qualitative data concerning children's perceptions of physical fitness and fitness activities yielded three major themes: (a) We can learn about health and fitness through activities; (b) Variety and physical activity is challenging and fun; and (c) Everyone can be active and successful if they try on Fit Friday. Data supporting the themes were evident in both the questionnaires and the interviews.

Relevant to the first theme, virtually every child in the study was able to correctly identify health and fitness concepts emphasized during the Fit Friday activities. They reported that being physically fit meant you were "in good shape," "healthy," "strong and active" or a "regular size" (physique). Other students reported having greater energy levels due to their level of physical fitness and being able to do the activities their friends do. This finding is unlike the results of some other studies in which students were not aware of the specific fitness concepts in fitness testing situations (Hopple & Graham, 1995). The children in the Hopple and Graham

study did not understand why the fitness testing was conducted, nor did they comprehed the concepts tested with the various assessments (1995).

Some students were able to provide greater detail regarding the benefits of physical activity and physical fitness. For example, one student indicated that it is "real important to be fit because you could have a heart attack or something when you grow up." Another student stated that being fit is important in order to "keep your heart healthy." These ideas are similar to ones reported in a similar study where student were able to, in general, speak to the importance of being healthy and exercising (Placek, Griffin, Dodds, Raymond, Tremino, & James, 2001)

By inquiring about the nature of physical fitness, several students answered the question in terms of what physical fitness is *not*. These students reported that being unfit is associated with "fat" and "lazy" people. Another student said he wants to stay fit so he does not look "ugly and fat." Even in children as young as 10 or 11, physical appearance and the stigma surrounding those who are overweight or obese are prevailing thoughts. The emphasis on physique and body size is consistent with previous studies (Placek et al., 2001).

Student responses also indicated an awareness that they need to move more and do activity more frequently. Some respondents indicated that they learned "how to be healthy" and "take care of my body." One student reported thinking that it is very important to stay fit, but she admits to "sitting down on the couch and just watching TV a lot and not moving a whole bunch." Interestingly, this student said she thinks she is "pretty active." Students also made references that they learned how many steps they were taking by using the pedometers and with the accelerometers, they learned how many calories they burned. One student said that she liked the pedometers and accelerometers very much and thinks "wearing them all the time would help me be more active."

With regard to the second theme, the attitudes expressed both on the questionnaires and in the interviews were overwhelmingly positive toward the Fit Friday activities. When comparing Fit Friday to their regular physical education classes, 39% of the respondents said that Fit Friday was more fun. In addition, 24% of the students reported that Fit Friday taught them to take care of their body, while 22% said they learned how to be fit or stay in shape.

Children consistently described the Fit Friday activities as fun, but challenging. They enjoyed the variety and constant activity, and the challenge of learning new activities. The physical education curriculum in their school was strongly rooted in traditional sport skill-based units. Class sizes were relatively large, usually over 30 children, and space and equipment were sometimes limited, resulting in fewer opportunities for children to engage in the learning activities presented. The Fit Friday activities were different from the sport-based lessons not only in their focus, but also in the structure of class. One student indicated that the regular physical education class was "boring because it's the same thing over and over again." However, this student liked Fit Friday because of the different activities and the fact that it "took up the whole hour."

Research assistants supervised activity stations with small groups of children, allowing for extensive individual attention and ample space and equipment for each child. It became clear that the small group and individualized setting with new and different activities was enjoyable for the students. One student reported that "Fit Friday made me more tired than PE because we did a lot more stuff." Another emphasized the challenging nature of the activities and said Fit Friday was "hard work and everybody sweats bad."

The third theme centered on the message that individualized fitness activities provided a setting where all children could experience success. It was clear from the student responses,

particularly those who were scored in the unhealthy range on the Fitnessgram, that they perceived these activities to provide them with the opportunity to engage successfully in enjoyable activities.

When asking children how they thought they performed on the Fitnessgram assessments, there was great disparity in their perception of their performance on the test and their actual score. One 4th grade student reported that he "thinks I did good on the Fitnessgram" while, in reality, his body composition is 56.5% body fat and he received a "needs improvement" recommendation on both his aerobic and body composition based on his Fitnessgram test scores. Another 5th grade student thought he did "somewhat good" on the fitness testing, but weighed in at 185 pounds and also needed to improve his aerobic and body composition scores. A 5th grade student, self-described as "not that fit," weighed 258 pounds and was 47.8% body fat. She indicated a desire to become more fit, in order to participate in gymnastics. She also considers herself to be "kind of active" and reported that she was the most active person in her family.

Given the focus on sport skills, coupled with large classes and limited resources, the students categorized as high fit, who were also skillful, were often able to dominate games and activities in the daily lessons. The individualized, non-competitive activities, while including a focus on learning and skill development, provided an environment that students enjoyed and in which they could experience success.

This theme was especially evident in the interview data, where all low fit children preferred Fit Friday to their regular classes. Only boys who were high fit and very skillful indicated a preference for playing competitive games in physical education classes. Some students, however, continue to prefer the traditional curriculum to more innovative approaches. To illustrate this point, one student reported a certain level of disappointment because his

favorite game, "bombardment," was not one of the Fit Friday activities. When asked to describe the game, he stated, " it's where they have two balls in the middle, and you run and you get a ball and you throw it at the other person and try to tag them out."

In explaining the differences between Fit Friday and regular physical education, one student stated, "I like PE better because I can play baseball and sometimes we'll go out there and play baseball with some little whiffle things, or we'll play kickball and we'll play football." Another skillful male in the fifth grade said, "We play basketball and volleyball and stuff like that, kickball, in our PE class. We do made up games in Fit Friday." He went on to explain that he would rather play "stuff that I actually know the rules to." These comments continue to point out that skillful students who are successful in a traditional sport skill-based curriculum enjoy this approach to physical education.

In the review of student issues in physical education, Solmon (2003) highlights the importance of the physical education curriculum and its relationship to positive student attitudes. Students who have more positive attitudes perceive that the curriculum is both useful to them and enjoyable at the same time (Solmon, 2003). Further, when activities are structured in a flexible manner, students have more positive attitudes toward those activities (Martin, 2000; Solmon & Carter, 1995).

Trost et al. (2001) indicate that interventions to increase physical activity for children should possess several characteristics. First, they should allow opportunities for success by providing developmentally appropriate activities. Positive verbal support and the participation of influential others should also be encouraged in intervention programs. Finally, the authors suggest that competitive situations be drastically limited, or eliminated all together. The attempt

in Fit Friday was to provide developmentally appropriate activities that were fun and provided variety, in an effort to help everyone enjoy the physical activity experience.

In traditional physical education programs where competition abounds, attitudes and motivation levels toward activity can decrease. In an autonomous supportive environment, where children are provided with some element of choice or control, students often perform better and achieve more because they are more intrinsically motivated.

According to self-determination theory, the highest level of self-determination is represented by intrinsic motivation where the individual participates for the sake of the activity itself (Standage, Treasure, Duda & Prusak, 2003). Levels of external regulation that are progressive and lead to more autonomous motivation are delineated in self-determination theory. Identified regulation, where participants see the activity as having relevance to their goals and see value in the activity, is higher form of external regulation. When individuals participate only due to the threat of punishment or for a reward of some kind, they are engaging at lower levels of external regulation. Amotivation is at the lowest level or a lack of motivation, is characterized by a belief that success is not possible and that the activity is not valuable (Standage, Treasure, Duda & Prusak, 2003).

In a study by Parish and Treasure (2003), activity levels were positively correlated with the perceptions of a mastery-oriented climate, which are characterized by situational motivation which is more self-determined. In particular, intrinsic motivation and identified regulation are central to self-determined levels of motivation. The Hopple and Graham (1995) study of fourth and fifth graders provided a classical example of the motivation continuum which illustrates the core concepts of self-determination theory. In their study, students felt they had no choice in the mile run assessment. They had to do it and reported that it was not a fun experience. This is a

characteristic representation of external regulation where engagement in an activity occurs only because one "has to." Placek and colleagues (2001) also suggest that there are motivational issues surrounding fitness activities and that many students simply do not enjoy fitness related endeavors.

Achievement goal theory has attempted to explain motivation levels in physical education. Nicholls (1984) asserted that there are two states of involvement, task and ego, which help determine the level of motivation of a student. A task-involved environment is one where students demonstrate their ability by mastering a task and all comparisons are self-referenced. An ego-involved climate, on the other hand, implies that children demonstrate their ability by having a superior performance over another individual. In this case, social comparison is of the utmost importance (Nicholls, 1984). A problem arises for those involved in an ego-oriented environment in that if they are unsuccessful, they may attempt to avoid or withdraw from the situation in the future. In a physical activity setting, professionals should attempt to intervene when avoidance or withdrawal behaviors are evident.

During Fit Friday, students always utilized a cognitive task, such as a worksheet, to track their progress throughout the stations. On some days, they were encouraged to do as well as they could as a team, and at other times, they were encouraged to try and exceed their own performance from the first time through the activities. By attempting to provide a task involved environment where mastery and improvement were emphasized, we strived to increase motivation and activity levels of the students. The qualitative data support the notion that the theoretically based intervention was perceived positively by children, especially those who were at risk according to health-related fitness measures.

Educational Significance

The results of this study suggest that children's attitudes toward physical activity as measured by the CATPA do not accurately predict levels of health-related fitness or self-reported physical activity. In light of these findings, more research is necessary to develop an understanding of how children's attitudes about physical activity affect their levels of physical activity and physical fitness. Consistent with recent studies, our findings call into question the validity of the CATPA as a reliable measure of children's attitudes.

Development of more precise measures of children's attitudes about physical activity is needed if we are to clarify the relationships between attitude, physical activity, and physical fitness. Subramaniam and Silverman (2000) developed and validated an instrument to assess student attitude toward physical education for students in middle school. It was not used in this study because our participants were fourth and fifth graders, and we were interested in assessing attitudes toward physical activity rather than physical education. In future studies, it appears that careful consideration needs to be given to the instrumentation used with young children, and that a simplification of the Subramaniam and Silverman survey validated with younger children might yield more informative results. Further, validity and reliability studies should continue to be conducted on instruments designed to assess the attitudes of children toward physical activity.

The qualitative results of this study provided insight into children's perceptions of fitness activities. These data support the notion that children will retain positive messages that are consistently conveyed regarding health, physical activity, and fitness. Students clearly enjoyed participating in activities that they perceived to be fun and that provided a wide variety of opportunities to move and be active. When interviewed, children in the Hopple and Graham (1996) study did not find the mile run fitness assessment to be fun. They expressed a desire for

the activity to be more "like a game" (p. 416) and that if it were more fun, they might be more willing to engage. The authors also advocate for more student choice, providing alternatives and the use of partners to make situations more developmentally appropriate.

Consistent with Solmon et al. (2001), the students recognized that individualized activities focused on personal improvement are more beneficial for children of varying abilities than activities that recognize and privilege superior performers. This study contributes to a growing body of evidence which indicates a curriculum focusing on individualized activities that promote active engagement in movement activities is needed to increase activity levels for children who are less active and less fit. It also provides valuable insight concerning how best to approach the task of designing programs to accomplish that goal.

Moderate to vigorous physical activity is significantly related to children's perceptions of fitness (Kimiecik, Horn and Shurin, 1996). Those who report engaging in a health enhancing level of physical activity, therefore, believe that they are capable in their physical fitness abilities. In addition, Brustad (1993) found that those who perceived a greater level of physical competence also reported being more attracted to physical activity overall. The cognitive mediational paradigm suggests that students with positive attitudes will pay more attention to instruction and exert more effort compared to those with negative attitudes (Solmon, 2003).

A worthy question at this point is, "what is the take home message?" The professional implications resulting from this study are two-fold. First, students want to be in a fun and stimulating learning environment where a variety of different physical activity opportunities are offered. Second, it is critical that physical educators recognize that traditional sport skilled based programs do not meet the needs of the less active, less fit children in their classes. This traditional curriculum is fine for children who are skilled, successful and enjoy this approach,

however it leaves many students out of a quality physical education class and does not promote activity for everyone. Further, if we want for our students to have a more concrete understanding of the importance of fitness and the link between fitness testing and health related components of fitness, teachers must make a conscious decision for the curriculum to reflect these ideas (Placek, et al., 2001).

Although the findings of this study seem quite compelling, there are some limitations. First, the CATPA has significant psychometric issues and should not be used with children. In addition, future research in this area should include instruments which are more related to children, as long as validity and reliability studies are conducted. Indeed, this is a promising area of research, but much work remains to be done.

ADDITIONAL REFERENCES

Hopple, C. & Graham, G. (1995). What children think, feel, and know about physical fitness testing. *Journal of Teaching in Physical Education, 14,* 408-417.

Lincoln, Y.S. & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills: Sage Publications, Inc.

Martin, L. T. (2000, April). *Perceptions of high, average, and low performance second graders about physical education and physical education teachers.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

Pennington, C., Pennington, T., & Hager, R. (2003). Children's beliefs as a determinant of physical activity. *Research Quarterly for Exercise and Sport, 74*, A-72-A-74.

Placek, J. H., Griffin, L. L., Dodds, P., Raymond, C., Tremino, F., & James, A. (2001). Chapter 3: Middle School Students' Conceptions of Fitness: The Long Road to a Healthy Lifestyle. *Journal of Teaching in Physical Education, 20,* 314-323.

Schutz, R. W., Smoll, F. L., Carre, F. A., & Mosher, R. E. (1985). Inventories and norms for children's attitudes toward physical activity. *Research Quarterly for Exercise and Sport, 56*, 256-265.

Solmon, M. A., & Carter, J. A. (1995). Kindergarten and first-grade students' perceptions of physical education in one teacher's classes. *Elementary School Journal, 95,* 355-365.

Solmon, M. A., Lee, A. M., Rukavina, P., Landry, J., Harrison, L., & Li, W. (2001, April). *Children's critiques of teaching practices in physical education.* Paper presented at the meeting of the American Educational Research Association, Seattle, WA.

APPENDIX D: PILOT STUDY #2

Student Motivation in Physical Education and Engagement in Physical Activity

Paper presented at AERA 2005

Leading causes for global and national health concerns are related to the current status of overweight and obesity. Physical activity levels are at an all time low and developments such as increasing levels of Type II diabetes and rising obesity rates have focused increasing attention on the physical activity levels of children and adults in our nation. Participating in regular physical activity is recommended and has been associated with enhanced health for children and adults (Berkey, Rockett, Gillman, & Colditz, 2003). Approximately half of our nation's young people ages 12 to 21 are not regularly active at a vigorous level. Further, females are less active than males, making it necessary to take gender differences into consideration when focusing on the ills related to physical inactivity. The fact that involvement in physical activity of all kinds decreases considerably as we grow older is well established in physical activity research (Ewing & Seefeldt, 1988; U.S. Department of Health and Human Services [USDHHS], 1996). There is, however, a lack of research evidence that attempts to explain why involvement and interest in physical education also diminishes across time (Standage & Treasure, 2002).

In today's technology focused society, children are bombarded with opportunities to engage in physically inactive pastimes. All too often, children decide to participate in sedentary activities instead of those behaviors that are active and more health enhancing. School physical education programs have the potential to increase children's physical activity levels and attitudes toward activity, and one important goal of physical education programs is to facilitate the adoption of physically active lifestyles (American College of Sports Medicine [ACSM], 2000).

In an attempt to help children and physical educators be more accountable for activity in physical education, pedometers have recently become popular instruments for measuring activity levels. Pedometers are relatively simple, inexpensive, and have exhibited less error when compared to accelerometers and heart rate monitors (Eston, Rowlands, & Ingledew, 1998; Morgan, Pangrazi & Beighle, 2003). The National Association of Sport and Physical Education (NASPE) and other health professionals recommend that school age children take at least 10,000 steps every day, though other professionals (Tudor-Locke & Bassett, 2004) indicate this level is not adequate for children. Children's activity levels are often studied in the context of motivation levels in an attempt to reveal ways to encourage young people to increase their amount of physical activity.

Self-determination theory (Deci & Ryan, 1985) provides a theoretical framework to study student motivation. Motivation is conceptualized as a continuum ranging from amotivation, or a lack of motivation to intrinsic motivation, defined as engaging in an activity as an end in itself. In between amotivation and intrinsic motivation, varying levels of extrinsic motivation reflect increasing levels of self-determination. When individuals take part only due to the threat of punishment or for a reward of some kind, they are at a level of external regulation (Standage, Treasure, Duda, & Prusak, 2003). Introjected regulation is characterized by recognizing some level of value in an activity, but feeling as though one "ought" to participate out of guilt or obligation. Identified regulation is the level at which participants see the outcome as beneficial and they begin to participate because they want to. Integrated regulation represents a level where the activity is part of the individual's identity and is relevant to higher goals, though it may still be somewhat extrinsically motivated (Biddle, 1999). Higher levels of self-determination and autonomy are more likely to elicit long-term motivated behavior

Attitude is another factor that must be considered when examining motivation levels. Most attitude related studies use only one component of attitude, yet this construct contains more than just this dimension (Subramaniam & Silverman, 2000). In a review of measurement issues on student attitudes in physical education and physical activity, Silverman and Subramaniam (1999) concluded that the research thus far has produced mixed results. They suggested more investigation is needed to understand how student attitudes affect physical activity. In addition, Parish and Treasure (2003) note that motivation levels may be partly to blame for the lack of moderate to vigorous physical activity in young people today.

Research related to student attitudes and perceptions (Solmon, 2003) is well framed within the cognitive mediational paradigm, as a way to better understand how self-determination can be enhanced. In this organizing framework, students are characterized as being an active part of the learning process, in which they control much of their own learning. Attitudes, which mediate decisions made regarding participating in physical activity, are often formed on the basis of prior life experiences. These experiences and encounters, along with their viewpoints on certain issues, intercede between teacher actions and student learning and performance. Student actions, such as putting forth effort, are considered adaptive motivational behaviors reflective of a positive attitude. On the other hand, students who choose not to participate in activities are thought to demonstrate negative attitudes (Solmon, 2003).

Perceptions of a learning climate are important to fostering student engagement and there is evidence that a task or mastery climate is conducive to learning (Biddle, 2003). Parish and Treasure (2003) reported activity levels were positively correlated with the perceptions of a mastery-oriented climate, which is characterized by situational motivation which is more self-determined.

One goal of physical education is to promote physical activity and it is important to explore ways to accomplish that goal. The relationships between levels of motivation, attitudes, and perceptions of the learning climate, and how these factors relate to engagement in physical activity, have not been thoroughly investigated. By employing the mediating processes paradigm, it is possible to investigate student motivation in physical education classes by examining relationships between these variables. Using self-determination theory as a framework, the purpose of this study was to investigative relationships between levels of self-determination, attitudes, perceptions of the learning climate, and engagement in physical activity in order to determine the role each plays in student motivation toward physical education. Specific research questions addressed were (a) How do students' perceptions of the motivational climate relate to student attitudes and levels of self-determination? (b) How do measures of student attitude, self-determination, and perception of the climate relate to student levels of activity as measured by pedometer counts? (c) How do students' motivation and activity levels vary by gender?

Methods

Participants

Participants in this study were 114 sixth (n = 30; 16 boys, 14 girls), seventh (n = 30; 18 boys, 12 girls), and eighth (n = 54; 23 boys, 31 girls) graders enrolled in a suburban public school. Students participated in 90-minute physical education classes every other day on a block schedule. They received instruction from certified physical education specialists. The middle school physical education curriculum focused on team sports, organized games, and fitness activities. One class of sixth graders, one class of seventh graders and two classes of eighth graders participated in the study. Prior to data collection, child assent and parental permission

forms were completed. Institutional review board (IRB) approval was also obtained from the institution prior to data collection.

Instrumentation

Four surveys were used in this study. The Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ) is a 27-item questionnaire used to measure perceptions of classroom goal structure in physical education (Papaioannou, 1994). Participants are to think about their physical education class and respond to a 5-point likert scale with one being strong disagreement and five being strong agreement. The LAPOPECQ assesses perceptions of a learning and performance climate and contains five factors: (a) teacher-initiated learning orientation; (b) students' learning orientation; (c) students' competitive orientation; (d) students' worries about mistakes; and (e) outcome orientation without effort. These factors load on two higher order factors: learning and performance. Papaioannou (1994) established construct validity for the LAPOPECQ through a confirmatory factor analysis.

The learning orientation subscale addresses perceptions of the teachers' behaviors and the students' satisfaction with learning. A sample item from the teacher-initiated learning orientation is: " The PE teacher is completely satisfied when every student's skills are improving." The student's learning orientation is assessed through questions such as, "I feel very satisfied when I learn new skills and games." Perceptions of a performance climate were assessed using questions regarding performance compared to peers, ability levels (performance with little effort), and how much the student is concerned with making mistakes in physical education class. The students' competitive orientation, was measured by response to statements such as: "Successful students are thought to be those who perform skills better than their classmates." Students' worries about mistakes, also part of the performance orientation subscale,

are represented by questions such as, "Students worry about failure in performing skills because it would lead to the disapproval of others." The third performance-oriented factor is outcome orientation without effort, which is measured by questions such as, "The PE teacher looks completely satisfied with those students who manage to win with little effort." Construct validity for the LAPOPECQ questionnaire was also established by Papaioannou (1994). In this study, data were analyzed using the two higher order factors, learning and performance climates.

Levels of self-determined motivation were assessed using the Situational Motivation Scale (SIMS), a 16-item self-report inventory that assesses intrinsic motivation, identified regulation, external regulation and amotivation (Guay, Vallerand, & Blanchard, 2000). The authors established construct validity of the SIMS through a multiple analysis of variance (MANOVA) (Guay, Vallerand, & Blanchard, 2000). Participants are asked to use the scale and indicate the answer that best describes the reason why they are currently engaged in an activity. A seven-point likert scale is used for all responses. A score of one does not correspond at all and a score of seven corresponds exactly (Standage, et al., 2003). Sample statements from the SIMS representing each of the subscales are: "Because I think that this activity is interesting"(intrinsic motivation); "Because I think this activity is good for me" (identified regulation); "Because I feel like I have to do it (external regulation); and "There may be good reasons to do this activity, but personally I don't see any" (amotivation).

The SIMS has demonstrated internal consistency using Cronbach's alpha levels which are widely deemed as acceptable in the research world (Guay, et al., 2000). Further, the SIMS is able to discern motivational constructs adequately between the genders and across a wide variety of activities. Previous research (Standage & Treasure, 2002) has also demonstrated the ability of the SIMS to delineate between intrinsic motivation, identified regulation, external regulation and

amotivation (Deci & Ryan, 1985). The SIMS has consistently demonstrated both reliability and construct validity in previous research studies (Standage, et al., 2003).

A scale developed by Subramaniam and Silverman (2000) was used to assess student attitudes toward physical education. The instrument consists of 20 items with a 5-point likert scale used for scoring. A score of one indicates strong disagreement while a score of five indicates strong agreement. The attitude scale measures two components of attitude: enjoyment and usefulness as it relates to the current physical education program and the physical education teacher. Students respond to 10 items related to enjoyment, such as the following: "The games I learn in my physical education class get me excited about physical education." The remaining 10 items represent the usefulness factor, assessed through items like, "I feel my physical education teacher makes learning in my physical education class valuable for me." Content validity for the attitude instrument was ascertained through a panel of experts. The content validity for attitude enjoyment was .94 and attitude usefulness was .99. Subramaniam and Silverman (2000) also established construct validity through confirmatory factor analysis. Negative items are included in the scale and were reverse coded prior to data analysis.

The Physical Activity Questionnaire for Children (PAQ-C) was used as a measure of self reported levels of physical activity. Designed for students in grades four and above, the PAQ-C measures levels of moderate to vigorous physical activity across different settings (Kowalski, et al., 1997). Students report how many times in the previous week they participated in a wide range of physical activity behaviors (Crocker, Bailey, Faulkner, Kowalski & McGrath, 1997; Kowalski, et al., 1997). Other physical activity bouts related to physical education, free time, recess, extracurricular sports, weekend activities, and evening activities are also addressed within this instrument. The PAQ-C for example, asks, "In the last 7 days, on how many days right after

school, did you do sports, or play games in which you were very active?" Another question asks, "This past weekend, how many times did you play sports, dance or play games in which you were very active?" The PAQ-C has many advantages, such as its ease of use, the expedient manner in which it is explained and administered, and the fact that the instrument is of minimal cost. Kowalski et al. (1997), in their validation study on children in grades four through eight, reported a one-week test-retest reliability of .75 for boys and .82 for girls. They established convergent validity of the PAQ-C by assessing other measures of physical activity, specifically an aerobic step test and a questionnaire related to perceptions of athletic competence.

Pedometers were used as an objective measure of physical activity on three physical education days and once for a 24-hour count. Pedometers are a widely acceptable tool for measuring student levels of physical activity (Beighle, et al., 2001; Scruggs et al., 2003), and Vincent and Pangrazi (2002) established that three to four days of pedometer counts could predict habitual physical activity levels. In order to meet the Surgeon General's recommendation of 30 minutes of activity a day, individuals would need approximately 3,200 to 4,000 steps to meet this goal (Le Masurier, 2004). Pedometers provide an instantaneous response in a quantifiable way regarding the activity, which can be quite encouraging for individuals (Le Masurier, 2004). A disadvantage of pedometer use is that they are unable to quantify the intensity, frequency or duration of activity (Beighle, et al., 2001), however, in field research and in physical education classes, they are an extremely straightforward and efficient mechanism for assessing activity levels. Students in this study were accustomed to the use of pedometers in physical education, which greatly facilitated the management aspect of this research. For the purposes of this study, during physical education, students participated in a variety of activities such as bowling, walking, capture the flag, and fitness testing. Students were monitored

throughout the activity time to ensure that pedometers were not manipulated or lost during movement. At the end of each physical education class, pedometers were removed and the researchers recorded the pedometer count. Reliability for the Digi-Walker pedometer was established through correlations of step counts, energy expenditure, and engagement time in physical activity (Welk et al., 2000).

Procedures

Data were collected over five consecutive physical education days. Due to the time constraints of block scheduling, researchers met with two classes (sixth and eighth grade) on one day and seventh graders on the following day. On the first day of data collection, classes completed the PAQ-C and the first physical education pedometer count. The second day of data collection included the completion of the attitude scale and a second pedometer count. Day three involved completion of the LAPOPECQ and a final physical education pedometer count. On day four, participants completed the SIMS and any necessary "make ups" were completed. The fifth data collection day was reserved for giving participants a pedometer to wear during the 24-hour time period, which was returned at the same time the following day.

Data Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS). Relationships among variables were evaluated using simple correlations. To ensure the reliability of the SIMS, the attitude scale, and the LAPOPECQ, Cronbach's alphas were computed for all questionnaire items. Group differences between males and females were assessed using independent *t*-tests.

Results

Means, standard deviations, and Cronbach's alphas for the variables in the study are reported in Table 12.

Table 12. Means, Standard Deviations and Cronbach's Alpha Coefficients by Gender

Variable	Boys		Girls		Total		Cronbach Alpha
	Mean	SD	Mean	SD	Mean	SD	
LAPOPECQ							
Learning climate	2.29	.69	2.34	.69	2.32	.68	.87
Performance climate	1.94	.51	2.08	.52	2.01	.51	.72
Attitude							
Enjoyment	2.53	.78	2.20	.92	2.36	.86	.91
Usefulness	2.44	.66	2.16	.86	2.30	.78	.87
SIMS							
Intrinsic Motivation	4.18	1.34	4.20	1.43	3.20	1.37	.81
Identified Regulation	4.19	1.43	3.94	1.22	3.06	1.31	.75
External Regulation	3.83	1.28	4.05	1.43	2.93	1.35	.76
Amotivation	3.12	1.30	3.39	1.17	2.27	1.24	.72
Physical Activity							
PE pedometer	3282.12	836.76	2756.81	813.19	3005.93	885.77	
24-hour pedometer	11,988.30	4735.60	10,095.48	4106.74	11,050.90	4515.27	
PAQ-C composite	1.20	.46	1.11	.46	1.14	.46	

From the descriptive data, the physical education class climate tended to be perceived as learning as opposed to performance. Analogous to the climate scores, attitudes regarding the physical education classes were also relatively positive. Inspection of the means suggests that intrinsic motivation and identified regulation are more influential in terms of self-regulation than external regulation and amotivation. Relationships between variables were assessed using Pearson's correlation coefficients. The correlation matrix for all variables is reported in Table 13.

Table 13. Correlations

Variable	1	2	3	4	5	6	7	8	9	10
LAPOPEC										
1. Learning	1									
2. Performance	.10	1								
Attitude										
3. Enjoyment	.48*	-.10	1							
4. Usefulness	.52*	-.14	.80*	1						
SIMS										
5. Intrinsic Motivation	.27*	.03	.37*	.30*	1					
6. Identified Regulation	.25*	-.01	.21*	.22*	.66*	1				
7. External Regulation	.14	.14	.01	-.05	-.07	-.06	1			
8. Amotivation	-.23*	.09	-.29*	-.33*	-.40*	-.33*	.45*	1		
Physical Activity										
9. PE count	.07	.10	.18*	.07	.13	.01	-.19*	.01	1	
10. 24-hour count	.03	.05	-.03	-.03	.13	.15	-.01	-.01	.28	1
11. PAQ-C	.04	.10	.01	.09	.16	.14	.00	-.09	.15	.16

* $p < .05$

Perceptions of the Climate and Motivational Variables

Three sets of relationships were of interest in the analysis of the data: perceptions of the motivational climate, levels of self-determination, and attitude. Examination of the interrelationships between these constructs provides a background for interpretation of the relationships between them. Perceptions of a learning climate, with a focus on learning and improvement, were unrelated to perceptions of a performance climate, with a focus on outperforming others. The lack of a relationship between these two variables suggests that students did not necessarily perceive one type of climate in physical education over the other. Within the levels of self-determination, intrinsic motivation, and identified regulation were positively related, while amotivation was negatively related to both intrinsic motivation and identified regulation. In addition, amotivation was positively associated with external regulation. These relationships are consistent with the theoretical assumptions of self-determination theory (Deci & Ryan, 1985). There was also a strong positive correlation between enjoyment and usefulness, the two components of attitude.

How perceptions of the motivational climate relate to levels of self-determination and attitudes was a primary research question for this study. Perceptions of a learning climate were related to the components of self-determination and attitude. Intrinsic motivation and identified regulation were positively associated with perceptions of a learning climate, while amotivation was negatively related to perceptions of a learning climate. Though statistically significant, the strength of these relationships was relatively weak. Perceptions of a learning climate were also positively related to both the enjoyment and usefulness constructs of attitude, and these relationships were of moderate strength. Perceptions of a performance climate were not related to levels of self-determination or attitude.

The examination of the relationships between self-determination and attitude were also of interest. Intrinsic motivation and identified regulation were both positively correlated with attitude enjoyment and usefulness, while amotivation was negatively related to both attitude constructs. Though statistically significant, the strength of these relationships was relatively weak.

Activity Levels and Motivational Variables

Perceptions of the motivational climate, levels of self-determination, and attitudes were generally not related to the measures of physical activity. Specifically, attitude enjoyment had a weak, but statistically significant positive association with the pedometer count in physical education classes, while external regulation had a weak, negative relationship with that measure. No other significant relationships emerged. The data also revealed a positive weak correlation between the physical education pedometer count and the 24-hour pedometer count. However, neither of the pedometer counts were related to the self reported levels of physical activity, assessed by the PAQ-C.

Gender Differences

Males and females did not differ with regard to perceptions of the motivational climate or levels of self-determination. Males had significantly higher scores for attitude enjoyment [t (112) = -1.954, p = .05] and usefulness [t (111) = -2.0297, p = .04]. During the physical education class time, girls took an average of 2701 steps while boys averaged 3310 steps. Over the 24-hour period, girls and boys took 10,095 and 11,988 steps respectively. The t-tests indicated that males took significantly more steps in both the physical education class [t (112) = -3.897, p < .001] and during the 24-hour period [t (103) = -2.186, p = .03). The results of the self-report physical activity levels were not different for males and females in this study.

Discussion

The focus of this study was to explore relationships between climate, self-determination, and attitude, and investigate how those factors interrelated to affect student engagement in physical activity. The first research question focused on how students' perceptions of the motivational climate related to their attitudes and levels of self-determination. Perceptions of a learning (task-oriented) climate were related to positive attitudes regarding both the usefulness and enjoyment of physical education and higher levels of self determined motivation. This suggests that positive attitudes about engaging in activity in physical education classes are fostered when a task-involved environment is salient. When opportunities for students to progress at their own rate are provided, student attitudes and motivation toward physical education may improve. Parish and Treasure (2003) found that a mastery environment was a significant predictor of physical activity, even when perceived ability outcomes were taken into consideration. Solmon (1996) also found that students who sense a mastery climate more often select to engage in tasks that are more complex and continue to engage in the challenging task.

One important finding in this study is that the perception of the climate appeared to be a stronger influence on students' attitudes than on their levels of self-determination. This finding is unique, as other studies (Goudas & Biddle, 1994; Papaioannou, 1994; Parish and Treasure, 2003) have reported a link between a mastery-oriented climate and levels of self-determination, but have not considered how attitudes are related to the climate. There has been limited use of the Subramaniam and Silverman (2000) attitude scale, so it is difficult to make comparisons related to findings across other studies. The findings of this study support the continued use of this instrument as a way to assess student attitudes toward physical education.

The second research question examined how measures of student attitude, self-determination, and perception of the climate related to student levels of activity as measured by pedometer counts. It is unclear why stronger relationships did not emerge for the physical education and 24-hour pedometer counts in regard to the attitude, climate and self-determination variables. Earlier studies have reported positive associations between pedometer counts and motivational variables (Parish & Treasure, 2003). Additional research with these variables could provide valuable information in this regard.

An intriguing finding is that the pedometer counts have no relationship to the self-report measure of physical activity. This poses an interesting scenario and may lead one to question whether or not the pedometer is a good measure of physical activity both in and outside of physical education time. Parish and Treasure (2003) indicated that pedometers offer a legitimate measurement of student activity levels in physical education. It is important to keep in mind that pedometer counts in this study were compared across classes and activities. In addition, there is a much greater opportunity for personal choice regarding the level of participation in a unit such as soccer compared to bowling. One logical conclusion is that pedometer counts need to be obtained in a similar environment for successful comparisons to be made.

Tudor-Locke, et al. (2002) compared self-reported physical activity data to pedometer counts. They found positive relationships between pedometer counts and the information provided in several different self-report questionnaires which spanned the previous seven days. The PAQ-C, however, was not one of the self-report measures examined by Tudor-Locke and her colleagues. There have been validity studies conducted on the PAQ-C (Kowalski, Crocker, & Faulkner, 1997), and responses were significantly related to scores on an aerobic step test and accelerometer counts. Further, the validity investigation of the PAQ-C included one question

which required the respondent to compare him/herself to other children of their same age and sex and indicate how much physical activity they get compared to other children. This one-question assessment, which used a five-point rating scale, was related to the PAQ-C scores in the validity study (Kowalski, Crocker, & Faulkner, 1997). A previous study including 4th and 5th graders (Bryan, Johnson, & Solmon, 2004) also found no relationship between self-reported physical activity in the PAQ-C and physical education pedometer counts.

The final research question was related to the ways in which students' motivation and activity levels vary by gender. From the attitude scale, we know that males enjoy physical education significantly more and find it significantly more useful than females. There are two potential explanations for this finding. First, it is well documented (USDHHS, 1996) that activity levels decline faster and at an earlier age for females than males and this finding is consistent with that conceptualization. Second, it is possible that many of the physical education activities at the middle school were stereotypically "male" oriented activities. Soccer and capture the flag (using a football) may have piqued the interest of males more so than females. It is important for physical educators to be mindful of their activity selection and the potential impact that stereotypical activities may have on the attitudes of their students. Parish and Treasure (2003) cautioned against potential gender stereotyping in their study which utilized ultimate football for collecting pedometer counts. Perhaps offering a choice of activities would help girls find the physical education experience more useful and enjoyable.

In terms of physical activity and pedometer counts, boys in this study were significantly more active than girls. This finding is consistent with other studies that have used pedometers to measure physical activity levels in children (Vincent & Pangrazi, 2002; USDHHS, 1996). Previous research using the PAQ-C (Kowalski, Crocker, & Faulkner, 1997; study one) also

found boys to be more active than girls using the self-report measure. Overall, engagement as measured by the pedometer counts in this study was not compelling. It is also problematic to attempt to explain the absence of relationships between the motivational variables and the self-report measures of physical activity. It would seem logical that students who are more motivated in physical education would report greater levels of physical activity. However, this relationship did not emerge in this study and other studies using the PAQ-C do not include assessment of motivational constructs. Perhaps the PAQ-C should be reexamined as a legitimate means of collecting self-report data on physical activity engagement.

Taken together, the results of this study provide greater insight into the relationships between levels of self-determination, attitudes, perceptions of the learning climate and engagement in physical activity. The professional implications resulting from this study are two-fold. First, students who feel and/or perceive that they are involved in a task-oriented learning environment where the needs of all children are addressed are more likely to have more positive attitudes about physical education and physical activity. The importance of the link between a climate that fosters task involvement and intrinsic motivation cannot be overemphasized, especially in settings such as physical education and physical activity where individuals are likely to continue participation if they are intrinsically motivated to do so. The conclusion from much of Duda's work, along with that of her colleagues, is that an environment that is highly task-involved will lead to positive engagement patterns regardless of the individual's personal orientation (task or ego) or their level of perceived proficiency (Newton & Duda, 1999).

Second, it is critical that physical educators offer activities which are appealing to both genders or, provide a choice of activities to perhaps increase the likelihood of all students being more active during physical education time. Providing choice in the physical education class,

whether in terms of activity selection, difficulty of task, or other alternatives, fosters a sense of autonomy, one of the critical components of self-determination, and decreases the sense of working or learning in a controlled environment (Ntoumanis, 2001). Since intrinsic motivation is inherent, children need to be in an environment which stimulates them and allows them the opportunity to work at a level of "optimal challenge" (Grolnick, Gurland, Jacob, & Decourcey, 2002; p. 155). Children report that the activities they find to be most enjoyable are those which are slightly above their present skill level (Harter, 1978). Another implication regarding environments that are intrinsically motivating is that children be provided with many different activities in which they can participate. Physical education provides a tremendous opportunity for children and adolescents to participate in many different kinds of physical activities, which may carry over into their free time (Pate, Small, Ross, Young, Flint, & Warren, 1995).

One strength of this study was the inclusion of the attitude assessment along with a perceptions of climate questionnaire, and measures of self-determination. These results suggest that climate has a stronger relationship to attitude as compared to levels of self-determination, which merits further study. Theoretical predictions would be that more positive attitudes should lead to higher levels of self-determination, but the interaction of these variables is complex. Future research in this area should include perceptions of ability which may increase the percent variance accounted for in the relationships between physical activity and attitude/motivation measures. Individual goal orientations could also be examined in the future to assess the impact it may have on the relationships examined in the current research. Indeed, this is a promising area of research, but much work remains to be done.

ADDITIONAL REFERENCES

Biddle, S.J.H. (2003). Enhancing motivation in physical education. In Silverman, S. J., & Ennis, C. D. (Eds) Student Learning in Physical Education (2nd ed., pp. 101-127). Champaign, IL: Human Kinetics.

Le Masurier, G. C. (2004). Walk which way? *ACSM's Health & Fitness Journal, 8,* 7-10.

Tudor-Locke, C. & Bassett, D. R., Jr. (2004). How many steps/day are enough? *Sports Medicine, 34,* 1-8.

Tudor-Locke, C., Williams, J. E., Reis, J. P., & Pluto, D. (2002). Utility of pedometers for assessing physical activity: Convergent validity. *Sports Medicine, 32,* 795-808.

Welk, G. J., Differding, J. A., Thompson, R. W., Blair, S. N., Dziura, J., & Hart, P. (2000). The utility of the Digi-Walker step counter to assess daily physical activity patterns. *Medicine and Science in Sports and Exercise, 32,* S481-488.

VITA

Charity Bryan received her Bachelor of Science from Samford University in Birmingham, Alabama. She then attended the University of Alabama at Birmingham where she completed her Master of Arts in Education degree. From 1999-2002, Charity worked as an Instructor and Wellness Coordinator at Samford University, and, in the spring of 2002, she was admitted to the doctoral program at Louisiana State University in the Department of Kinesiology. While at Louisiana State University, Charity was the recipient of the Louisiana Board of Regents Fellowship. Charity is an active member of her professional organizations, including the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD), and Southern District AAHPERD. At the national level, Charity has received the AAHPERD Past President's Scholarship, and at the district level, the Southern District President's Award and the Southern District Student Leadership Award. In addition, she has served on the board of directors for the Southern District AAHPERD and the Alabama State Association for Health, Physical Education, Recreation, and Dance (ASAHPERD). Charity has a published abstract in *Research Quarterly for Exercise and Sport* and currently has several manuscripts in review. The focus of Charity's research is child and adolescent physical activity in physical education, perceived competence, and motivation toward physical activity and physical education. Charity has presented her research at national meetings such as AAHPERD and the American Educational Research Association (AERA) and the state and district levels as well.