Exploring Student Perceptions to Explain the Relationship Between Physical Activity and Academic Achievement in Adolescents: A Mixed Methods Study

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EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS:
A MIXED METHODS STUDY

by

Megan J. Hylok

A DISserTATION

Presented to the Faculty of The Graduate College at the University of Nebraska In Partial Fulfillment of Requirements For the Degree of Doctor of Philosophy

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EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS: A MIXED METHODS STUDY

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University of Nebraska, 2011

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A nationwide survey conducted by the Center for Disease Control in 2007 reported 65% of high school students did not meet the recommendation that youth participate in at least 60 minutes of physical activity most days of the week (CDC, 2008). While research has focused its attention primarily on bodily health, growing evidence supports the benefits of physical activity on brain health (Ratey & Hagerman, 2008). Physical activity is important and many adolescents are not meeting the recommendation, therefore, it is important to explore the adolescent perceptions to understand which factors influence physical activity participation. The significance of this study is to gain a better understanding of adolescent perceptions to explain the role physical activity plays on academic achievement. The intent is to provide additional insight into improving educational and community programs and policies to increase physical activity among adolescents.

A two-phase explanatory mixed methods design was used. In the first quantitative phase, descriptive statistics, correlations, and two-way ANOVAs were conducted. Results from the study of 208 secondary adolescents from a Midwestern setting indicated that physical activity does not have a significant relationship with academic achievement.
However, two-way ANOVA results did provide support for the existence of differences in ecological factors influencing physical activity and academic achievement.

In the second qualitative phase, extreme case sampling was used to select participants for focus group interviews. Analysis of the third research question did reveal substantive differences in perceptions of physical activity and academic achievement between each of the four extreme groups. Themes included: enjoyment, motivation, self-efficacy, perceived feelings, health, social influences, support, environment, academics, and barriers.

A connection of the quantitative and qualitative results found social influences, self-efficacy, support, environment, academics, and motivation the greatest influences statistically and substantively on physical activity influences. The fourth analysis suggested more students feel there is a relationship between physical activity and academic achievement. The fifth analysis provides suggestions for adolescents, parents, schools and the community how to increase physical activity participation among adolescents.
Acknowledgements

I have been looking forward to writing this section for a long time. I am so grateful of the love, support, and encouragement that all of you have provided me along this journey.

First of all, today is the fifth best day in my life. My first was marrying my husband Dan, and the next three were having my three boys; Peyton, Parker, and Porter. My husband has been so giving, understanding, and patient; I cannot possibly thank him enough for supporting me, thank you, I love you.

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Thank you to Houston Lester for your time, generosity, and patience helping me understand the meaning behind the madness. Thank you to Holly Sexton for working your wordsmith magic. Thank you to my school district for providing scholarships, support, and the participants for this research study. Thank you to my sisters Misty Schwartz and Mendy Hayes for providing words of encouragement and prayer during difficult times and for helping me find the balance between family, professional, and academic life. Thank you to my parents, Larry and Marty Barnett, for instilling the firecracker in me I needed to get this PhD. You truly are my inspiration. I love you!
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Chapter 1

Introduction

Statement of the Problem

According to the United States Department of Health and Human Services (2008), Center for Disease Control (2010), and the National Association for Sports and Physical Education (2009) it is recommended youth participate in at least 60 minutes of moderate to vigorous physical activity most days of the week. Participation in physical activity is decreasing as children age with the activity level dropping sharply between the ages of 9 and 15, when most youth are failing to reach the daily recommended activity level (National Institute of Health [NIH], 2008). "Consequently, there is need for program and policy action as early as possible at the family, community, school, health care, and governmental levels to address the problem of decreasing physical activity with increasing age” (NIH, 2008, para. 1). Furthermore, it is becoming increasingly difficult to incorporate physical activity into the school day as the No Child Left Behind Act pressures schools to improve academic performance (United States Department of Education, 2008). Research suggests the decline in physical activity can be contributed to schools reducing the amount of time spent at recess (Robert Wood Johnson Foundation, 2010), eliminating physical education programs, and increasing academic classes in an overall effort to improve academic achievement (Pate et al., 2006; Siegel, 2007).

It is recommended youth participate in at least 60 minutes per day of physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities (Strong et al., 2005). Research suggests 60 minutes of physical activity a day can easily be accumulated in school during physical education class, recess, intramural sports, and
before or after-school extracurricular activities (Strong et al., 2005). A nationwide survey conducted by the Center for Disease Control (CDC) in 2007 found that 65% of high school students did not meet the recommended levels of 60 minutes of physical activity most days and only 30% attended physical education class daily (CDC, 2008). Another study by the CDC (2003) reported that during nonschool hours 62% of children aged 9 to 13 years did not participate in any organized physical activity, and 23% did not engage in any free-time physical activity.

According to the CDC (2010) insufficient physical activity can lead to an increase in obesity and other poor health outcomes such as diabetes, hypertension and stroke, cardiovascular disease, some cancers, depression and anxiety, sleep disorders, weak muscles and bones, and early death. While research has focused much of its attention on the overall effects of physical activity on bodily health, growing evidence supports the benefits of physical activity for brain health (Ratey & Hagerman, 2008). Physical activity has been shown to improve mental health indicators such as anxiety, depression, and self-concept (Strong et al., 2005), improve learning and cognitive function (Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Tomporowski, Davis, Miller, & Naglieri, 2008; Trudeau & Shephard, 2008), and increase academic achievement (Ploughman, 2008; Ratey & Hagerman, 2008).

Although physical activity is important for body and brain health, many adolescents are not meeting the recommended guidelines. Therefore, it is important to explore the perceptions of adolescents to better understand which factors influence physical activity so an effort can be made to increase the number of adolescents meeting the physical activity recommendations. Physical activity in adolescents is a highly
variable behavior determined by a number of factors (Park & Kim, 2008). Factors involving biological, psychological, and environmental influences have been defined in an ecological model for physical activity promotion (Spence & Lee, 2003). Humbert et al (2006) discussed an ecological model of influences on physical activity, adopted from Sallis and Owen’s (1997) ecological model of health behavior, which suggests physical activity is influenced by three domains: intrapersonal, social, and environmental influences.

While the consequences of physical activity on health are well-known, the outcomes on academic achievement are not yet fully understood. It has been shown physical activity has a positive relationship with academic achievement (Trost, 2009). However, few studies have examined the perceptions of adolescents to explain the relationship. Most studies on physical activity and academic achievement have been quantitative in nature and have not incorporated the perceptions of students. Research on adolescent perceptions on physical activity has also been largely quantitative, with a few studies reporting qualitative findings (Allender, Cowburn, & Foster, 2006; Dagkas & Stathi, 2007; Humbert et al., 2006; Tergerson & King, 2002).

**Purpose of the Study**

The purpose of this study was to explain the relationship between physical activity and academic achievement in adolescents by exploring student perceptions. A two-phase explanatory mixed methods design was used. It involved collecting qualitative data after a quantitative phase to explain the quantitative data in depth. In the first quantitative phase of the study, survey data was collected from eleventh and twelfth grade students at a large public suburban high school. The data was used to determine if
there was a relationship between physical activity and academic achievement, and to select participants for the follow-up qualitative phase. The second qualitative phase of the study was conducted because student perceptions on physical activity needed to be explored further. In the exploratory follow-up, participants were selected from the survey based on physical activity levels and GPA, then invited to participate in small focus groups to discuss their perceptions on physical activity and academic achievement. Focus groups were chosen to provide for more interaction with the students, where a personal interview might have seemed more intimidating to an adolescent. The reason for the exploratory qualitative follow-up was to help explain and build upon the initial quantitative results of the survey (Creswell & Plano Clark, 2007).

Based on the information discussed in the statement of the problem, the following research questions and hypotheses were generated (Tables 1.1 & 1.2).
Research Questions

Table 1.1
Quantitative Research Questions

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Hypothesis</th>
<th>Rationale</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R1) Is there a significant relationship between physical activity and academic achievement in adolescents?</td>
<td>Physical activity would be positively associated with academic achievement</td>
<td>Physically active and fit children tend to have better academic achievement (Trost, 2009).</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td>(R2) Do adolescents with different levels of physical activity and academic achievement have different factors influencing their participation in physical activity?</td>
<td>There will be significant differences in factors that influence physical activity participation among adolescents with different levels of physical activity and academic achievement.</td>
<td>Ecological model of influences of physical activity suggests physical activity is influenced by three domains: intrapersonal, social, and environmental influences (Humbert et al., 2006; Sallis &amp; Owen, 1997)</td>
<td>Two-way ANOVA</td>
</tr>
</tbody>
</table>

Table 1.2
Qualitative and Mixed Method Research Questions

<table>
<thead>
<tr>
<th>Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R3) What are the perceptions of physical activity and grades for adolescents with varying levels of physical activity and academic achievement? (Qualitative)</td>
</tr>
<tr>
<td>(R4) How do adolescent’s perceptions on physical activity and grades help us to explain the relationship between physical activity and academic achievement? (Mixed Methods)</td>
</tr>
<tr>
<td>(R5) For adolescents with different physical activity and academic achievement levels, what recommendations are offered for increasing physical activity? (Mixed Methods)</td>
</tr>
</tbody>
</table>
Definition of Terms

**Academic achievement** is the overall excellence in all academic disciplines; represented in this study as cumulative grade point average (GPA).

**Academics** refer to student dispositions on school and grades and can be influenced by adult expectations.

**Adolescent** is an individual usually between the ages of 13 and 19, also known as the stage of development between childhood and adulthood. This study will focus on adolescents between 16 and 19 years of age.

**Belates** is a teacher-designed method for learning math using steps, gestures, and words completed in unison (Oberthur, 2008).

**Block schedule** is also called a 4x4 schedule. Each student attends four-periods a day with 90 minute classes for 4 semesters. This allows students the potential to take eight classes during the first half of the year (four classes in each of 2 semesters), and eight classes the second half of the year. It is important to note that some core classes are two semesters long.

**Brain derived neurotrophic factor (BDNF)** is a protein found in the brain to support the survival and encourage the growth of neurons. It is important for learning and memory (Ratey & Hagerman, 2008).

**Ecological factor** is a biological, psychological, or environmental cause or influence on an individual to perform an outcome.

**Enjoyment** is the act of doing something beneficial or pleasurable.

**Environment** can be the upbringing, conditions or circumstances that surroundings someone.
**Exercise** is a type of physical activity with repetitive actions for the purpose of increasing performance in an effort to improve or maintain physical fitness (Evans & Burghardt, 2008).

**Extracurricular activities** are voluntary activities performed by students under faculty sponsorship outside the standard school curriculum.

**FITNESSGRAM®** is a variety of health-related physical fitness tests used in physical education programs to assess aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition. Scores from these tests are compared to healthy fitness standards to determine students' overall physical fitness.

**Focus groups** are a form of qualitative research in which a group of individuals are interviewed about their perceptions, opinions, beliefs and attitudes about a particular subject. Focus group interviews for children might be used in education to gain insight into the reactions of children or generate new program ideas from children based on their wants, needs, and desires (Archer, 1993).

**Mixed methods research** focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. This “mixing” of data is believed to provide a better understanding of the research problem than either approach alone (Creswell & Plano Clark, 2007).

**Moderate to vigorous physical activity** causes an increase in breathing and heart rate. The energy expenditure is usually at the level of three metabolic equivalents (METS) (Center for Disease Control, 2010).
**Motivation** is the effort put forward to participate in physical activity. It can be influenced by internal and/or external factors that stimulate the desire and energy to be interested and committed.

**Neurogenesis** is the process by which new neurons are generated.

**Neurotransmitters** are chemicals which relay signals between neurons.

**No Child Left Behind Act (NCLB)** supports setting high standards and establishing measurable goals to improve student learning. The Act requires states to develop standardized assessments to administer to all students in certain grades, if those states want federal funding for their schools.

**Non-organized physical activity** is described as any physical activity NOT structured by a supervising adult, containing no practices or training sessions and not involving competitions. This may include activities such as skateboarding, riding a bike, walking to and from school, and playing pick-up games with friends.

**Organized activity** is defined as any physical activity in which students have training sessions with a coach, teacher, or supervisor and/or compete. This may include, but is not limited to, activities such as playing school sports, dance classes, athletic clubs or intramurals, gym classes, or working out in a fitness center.

**Physical activity** is an action requiring muscle contractions in your body (Evans & Burghardt, 2008).

**Physical education** is a school-based program that provides students with opportunities to be physically active and to acquire the skills and knowledge needed to establish and sustain an active lifestyle (National Association for Sport and Physical Education, 2006).
**Physical fitness** is described as a set of attributes, either health-related or skill-related, usually measured with a specific set of tests (Caspersen, Powell, & Christenson, 1985).

**Plasticity** is a term used to explain the brain's unique ability to continually change, grow, and reorganize itself due to the ability of the connections to change between neurons.

**Self-efficacy** is a person’s belief in his or her ability to succeed in a particular situation (Cherry, 2011).

**Sequential explanatory design** is a type of mixed method research where the researcher uses qualitative data from participants to further explain quantitative findings (Creswell & Plano Clark, 2007).

**Social influences** can be thoughts or actions that affect someone to do or not to do something. This can include friends, peers, family, teachers, and community members.

**Socioeconomic status (SES)** is a synonym for social class representing groupings in society based on family income, education, and housing (Humbert et al., 2006).

**Support** is the assistance or encouragement someone receives; as in social support.

**Assumptions**

1. Participants who completed the study were truthful in their responses.

2. Participants contributed willingly with no ulterior motives and without coercion.

3. Perceptions of participants were reflective of adolescents across the United States.
Delimitations

1. The population was limited to eleventh and twelfth grade students.
2. All participants were from the same large, public, suburban high school.
3. There could be other factors used to define physical activity influences.
4. Participant’s responses were reflections of their experiences with physical activity and academic achievement.
5. Not all participants were invited to participate in the follow-up focus groups.

Limitations

1. Convenience and purposeful sampling were used. Therefore, the sample may not be representative of the population (Creswell, 2002).
2. The population sample lacked variation in SES and race/ethnicity which may cause lack of generalizability.
3. It is often difficult to obtain valid and reliable measures of physical activity since the term can have different meanings.
4. Students may have reported inaccurately about their physical activity.
5. Correlation studies do not determine causality.
6. Qualitative research is subjective.
7. The researcher worked in the building where the study was conducted.

Significance of the Study

This study will contribute to the content literature on the relationship between physical activity and academic achievement. The main significance of this study is the connection of student’s perceptions to the relationship between physical activity and academic achievement in adolescents. It is believed no studies have used student
perceptions to explore this relationship before. Understanding student’s perceptions on the role physical activity has on academic achievement may provide additional insight into developing educational and community programs and policies to increase physical activity among adolescents.

Additionally, this study will provide valuable outcomes as a result of the mixed method research design. The use of qualitative data to help explain quantitative data will provide a better understanding of the relationship between physical activity and academic achievement in adolescents. The integration of both types of data will provide a deeper insight into the problem of the decline of physical activity, first, by identifying the relationship between physical activity and academic achievement, then by exploring the student’s views on physical activity and academic achievement in depth.

Methodologically, this study will add to the mixed methods literature by utilizing the sequential explanatory design in which the purpose is for the qualitative data to help explain or build upon the initial quantitative results (Creswell & Plano Clark, 2007).
Chapter 2

Review of Related Literature

Introduction

Humans were born to move. From the beginning humankind, it was innate for us to hunt and search for food. Physical activity was a part of daily life and using the brain was a way of survival. In 2011, however, exercise is viewed as a way to stay in shape or get fit. It is viewed as leisure time rather than a means of survival, and it is viewed entirely separate from intellect. Ratey and Hagerman (2008) state “the relationship between food, physical activity, and learning is hardwired into the brain’s circuitry” (p. 3). What individuals fail to realize is that physical activity is needed for survival now more than ever. Sedentary lifestyles are creating a health crisis, not only for the body, but for the brain.

According to the Center for Disease Control (CDC; 2009), “American society has become 'obesogenic,' characterized by environments that promote increased food intake, non-healthful foods, and physical inactivity” (para. 1). The National Health and Nutrition Examination Survey (NHANES) results show an increased prevalence in adolescent obesity from 5% in 1980 to 17.6% in 2006, with 67% of adults classified as overweight or obese (CDC, 2009). Along with obesity, the National Institute of Mental Health (2008) has described mental disorders as the leading cause of disability in the United States and Canada for ages 15 to 44, with one in 10 children severe enough to cause some level of impairment. Ratey and Hagerman (2008) describe exercise “like taking a little bit of Prozac and a little bit of Ritalin” (p. 38) because exercise is known to balance the neurotransmitters serotonin, norepinephrine, and epinephrine involved with mood,
attention, and arousal. Along with improving mood, motivation, focus, and attention, Ratey also discusses how exercise reduces stress, anxiety, depression, and addiction. Exercise is known to improve cardiovascular health and weight, but documentation recently has shown the positive effects on the brain. This chapter is a review of the effects of physical activity on adolescent body and brain health, a review of literature supporting the role of physical activity in Kindergarten through high school, student’s perceptions on physical activity, and recommendations for improving adolescent body and brain health.

**Effects of Physical Activity on Adolescent Health**

According to the U.S Department of Health and Human Services, (USDHHS; 2008), physical activity in children and adolescents reduces the likelihood that as adults these individuals will develop chronic diseases such as heart disease, hypertension, type-2 diabetes, and osteoporosis. Regular physical activity in children and adolescents has been shown to improve cardio-respiratory fitness, strengthen muscles, support bone growth, promote healthy body weight, build self-esteem, and reduce anxiety and stress (USDHHS). Several studies also discuss the impact of physical activity on academic achievement. One particular study states “children who are more physically active are more likely to achieve better academically” (Government of Western Australia Department of Sport and Recreation, 2008, p. 1). Based on these findings, it should be the role of society to provide many opportunities for children and adolescents to incorporate physical activity into their daily life and thereby help lay the foundation for a life-long, healthy lifestyle.
Effects of Physical Activity on Adolescent Brain Health

While it is known physical activity is important for improving cardiovascular health, emerging research focuses on the benefits of exercise on brain health. Tomporowski et al. (2008) discussed how exercise may be the most simple and significant method for improving the aspects of children’s mental performance central to cognitive development. Four important points on how exercise impacts the brain and improves cognitive processes involved in learning and memory are: (a) enhancing circulation so individual neurons can get more oxygen and nutrients, (b) stimulating the production of the mood enhancing neurotransmitters and nerve growth factors such as brain-derived neurotrophic factor (BDNF), (c) creating new brain cells in a process called neurogenesis, and (d) improving plasticity (Jensen, 2008).

Oxygen circulation. The brain needs a continuous supply of oxygen and glucose as its source of fuel. While glucose comes from foods eaten, the oxygen supply comes from physical activity. As individuals perform physical activity, this increases the number of capillaries in the brain which allows for the transport of oxygen in the blood. The amount of oxygen in the blood has an impact on the cognitive abilities of an individual. The more oxygen available to the brain, the better a student will perform cognitive tasks. Sousa (2006) states “armed with the knowledge that movement is connected to cognitive learning, teachers and administrators need to encourage more movement in all classrooms at all grade levels” (p. 233). As a result, it would be ideal for teachers to incorporate physical activity into every lesson in order to oxygenate the brain and facilitate attentiveness in students.
Production of neurotransmitters and neurotrophins. Along with oxygenating the brain, Winter et al. (2007) found intense physical exercise improves cognitive function by increasing levels of neurotransmitters and neurotrophins responsible for relating mood and short-and long-term learning success. The research shows “exercise accelerates learning and improves long-term retention of learned material” (p. 607). While the neurotransmitters are involved in emotion, learning, and memory, brain-derived neurotrophic factor is involved in the survival and growth of neurons.

Researchers have found that as exercise increases, BDNF levels increase in an area in the brain called the hippocampus, which is related to memory and learning. This BDNF molecule has a direct impact on cognitive function, neurogenesis, and plasticity (Cotman & Berchtold, 2002; Rasmussen et al., 2009). Cotman and Berchtold (2002) showed how exercise produces BDNF and how this molecule has a direct impact on cognitive function. This study gave researchers the evidence they needed to support the notion that exercise improves learning, mental performance, and long-term memory retention.

Ratey and Hagerman (2008) describes BDNF as “miracle grow for the brain” (p. 40). He discusses the importance of this molecule for regulating neurotransmitters such as serotonin involved in mood regulation, for encouraging new growth of neurons in a process called neurogenesis, and for enhancing, strengthening, and protecting connections between neurons known as plasticity. BDNF for the brain is like water for the body, essential. They both require much praise, because without them the body and brain would die.
Neurogenesis. One of the most profound advances in neuroscience and education is neurogenesis, or growth of new neurons (van Praag, Christie, Sejnowski, & Gage, 1999). While it was once believed neurons could not be replaced once they died, new research is showing how exercise has the ability to promote the birth of new brain cells. This process of neurogenesis occurs in the hippocampus.

According to van Praag et al. (1999), exercise stimulates the growth of new brain cells in a process called neurogenesis. This study showed “physical activity can regulate hippocampal neurogenesis, synaptic plasticity, and learning” (p. 13427). Neurogenesis has become monumental in neuroscience because it refutes the old theory that dead brain cells can never be replaced. It was not until Cotman and Berchtold (2002) that the connection was made suggesting exercise results in the production of BDNF which elevates the production of new neurons (neurogenesis), thereby enhancing learning.

Plasticity. A final outcome of exercise on improved learning is through a process called plasticity. Everything individuals do, think, and feel, is regulated by how the brain cells are connected to one another (Ratey & Hagerman, 2008). It is through the repetitive firing of these neurons that connections are strengthened which plays a role in how learning occurs. Cotman and Berchtold (2002) point out that exercise is a simple way to support and maintain brain plasticity by inducing BDNF and neurogenesis in the hippocampus.

Physical Activity in Schools

If exercise is considered “brain food” and physical activity truly plays a role in increased cognitive function and improves academic performance (Ploughman, 2008), then the implications for education today must be discussed. There are three areas during
the day where educators can incorporate exercise into a student’s day in order to enhance cognition and improve academic performance. These areas include (a) movement of students in the classroom, (b) physical education participation, and (c) extra-curricular activities.

Before discussing the literature on physical activity in school settings, it is important to define the difference between physical activity, physical fitness, and exercise. While these terms are sometimes used interchangeably, they are clearly different terms needing further clarification when discussing studies relating physical activity to overall brain health.

Evans and Burghardt (2008) describe physical activity as “an action that requires muscle contraction in your body…this includes walking, chores, playing Wii sports, and in some cases even sitting” (p. 94). Physical fitness is described as a set of attributes either health-related (cardiorespiratory endurance, muscular strength, flexibility, and body composition) or skill-related (balance, agility, power, reaction time, speed, and coordination) and these attributes are usually measured with a specific set of tests completed during physical education class (Caspersen et al., 1985). Exercise, is a type of physical activity, “a dedicated time for repetitive actions with the purpose of increasing performance or physical capacity” (Evans & Burghardt, 2008, p. 94), such as conditioning for many athletic activities, in an effort to improve or maintain physical fitness. It is important to note “although all exercise is physical activity, not all physical activity is exercise” (USDHHS, 2008, Chapter 2, p. 7).

**Movement in the classroom.** Jensen (2008) discusses the importance of physical movement in the classroom to stimulate the brain and boost learning. He suggests
incorporating energizers every 20 minutes, facilitating physical movement and providing manipulatives. He states, “An active body enhances an active mind” (p. 41).

Sousa (2006) states:

Although moving around in class is common in the primary grades, it drops dramatically at the secondary level…teachers are understandably concerned about having adequate time to cover the enormous amount of material in the curriculum…trading a few minutes of teacher talk for a movement activity can actually increase the amount of learning retained, it could be a very worthwhile investment of time. (p. 240)

Sousa also discusses several strategies for how teachers can incorporate movement into daily lessons, making physical activity fun for the students, while at the same time improving learning. Such activities include: energizers, acting out key concepts and words like charades, role-playing, and verbal tug-of-war, all of which allow students an opportunity to get up out of their seats and use their body in a physical way to learn.

Oberthur (2008) discusses how teachers have become creative in incorporating exercise in their classrooms. She describes how various teachers are integrating activities like yoga during the day, allowing brain breaks for students to get their wiggles out, and teaching a system called “belates.” Belates is a method for learning math using steps, gestures, and words completed in unison. Individuals have described this as being similar to martial arts. Another teacher instructs with her students perched on exercise balls. She believes this movement provides several benefits such as improved attention, concentration, and focus. Along with the teacher, students believe the balls “improve
their ability to pay attention, concentrate, take notes, engage in classroom discussions and take exams” (Wyatt, 2009).

In an article published by the Robert Wood Johnson Foundation (2010), a Gallup poll of almost 2,000 elementary school principals nationwide suggests the most unexpected opportunity to boost learning may be occurring outside the classroom on the playground at recess. Key findings from this survey include: students listen better after recess and are more focused in class, there is a positive impact on academic achievement, and recess has a positive impact on children’s social development and general well-being.

While allowing student’s opportunities for movement in the classroom and during recess seems logical in theory, incorporating the movement into lessons becomes a challenge for teachers due to a lack of time in the day and an increased pressure to cover the curriculum and prepare students for standardized testing (Evenson, Ballard, Lee, & Ammerman, 2009).

**Physical education.** The demands of standardized testing in schools have greatly increased since the No Child Left Behind Act of 2002. This Act is designed to assess schools each year to determine if students are improving academically on their annual goals. This pressure for student improvement creates a great deal of stress for school districts to find a way to increase instructional time. The instructional time strain has caused some schools to reduce or eliminate physical education classes in order to increase student’s academic performance. However, no current research exists supporting the reduction of non-academic programs to improve academic performance. A study conducted by Sallis and Owen (1999) suggested “spending more time in physical education did not have harmful effects on standardized academic achievement test scores
in elementary school children” (p. 132). This study also showed “evidence that a two-year health-related physical education program has several significant favorable effects on academic achievement” (p. 232).

Coe et al. (2006) completed a study of 214 sixth grade students comparing engagement in moderate to vigorous activity in physical education class to core academic grades and Terra Nova percentiles. This study hypothesized students engaged in physical education class would improve academic achievement more than students not engaged in physical education class. The results of this study showed physical education class enrollment did not influence academic achievement. The hypothesis may not have been accepted, but the results of the study did show students who performed vigorous physical activity (according to the Healthy People 2010 guidelines of 20 minutes or more, 3 or more days a week), did have significantly higher grades than those who did not meet the guidelines. This study suggests an increase in academic performance is associated with vigorous physical activity and not with moderate physical activity. Perhaps the standards for physical education should be raised to meet the needs of a more vigorous physical education curriculum.

Carlson et al. (2008) tracked the reading and math scores on standardized tests of more than 5,000 students in Kindergarten through fifth grade and found those who received the highest levels of physical education, 70 to 300 minutes a week, scored consistently higher on their tests than those students who spent less than 35 minutes a week in physical education class. Their study concluded that increasing physical education and reducing academic time does not appear to have negative effects on academic achievement. Carlson et al. believe physical education impacts students
academic achievement physiologically (increase in blood flow to the brain), psychologically (raising self-esteem and reducing stress and anxiety), and behaviorally (better participation and concentration), resulting in improved learning. Jensen (2005) believes if schools do not put into action a concrete physical education program they are truly creating a disadvantage for student intellect and the potential for improved academic performance.

The results of studies analyzed by Trudeau and Shephard (2008) showed adding an hour of physical education to the school curriculum, thereby taking time away from other subjects, does not impede student academic achievement. The study also supported positive influences on classroom behavior, concentration, memory, and cognitive function.

One of the most inspiring physical education programs today comes out of Naperville Illinois, one of the fittest and smartest high schools in the nation. This program first begin in 2004, when students identified as low performing in literacy and math were offered a “learning readiness” physical education class, similar to zero-hour PE, followed by an appropriate support class. After one semester, students who took part in both the physical education and support classes improved more than those students who were only in the support class. Ratey and Hagerman (2008) mention it is not likely most physical education classes will produce these benefits unless students are completely engaged in vigorous exercise and wearing heart rate monitors to maximize their heart rate. In this class, students are graded on how much time they spend in their target heart rate zones during an activity, rather than on the mastery of certain skills. Since Naperville offers such a wide range of interests (18 different activities), everyone
can find something they enjoy. The real meaning of physical education at Naperville is about personal progress and teaching students a lifestyle, not increasing sports skills.

Based on the current research, clearly the quality of physical education is most important for academic achievement. While physical activity predicts higher academic performance, physical education with insufficient duration and intensity levels of activity does not. Therefore, physical education programs need to “increase activity levels, improve physical fitness, help control weight, and enhance academic performance – and it should be an integral component of our educational systems” (Sattelmair & Ratey, 2009, p. 370).

**Physical fitness.** Physical fitness is best described as a generalized state of well being or an ability to perform certain sports related tasks. In this paper physical fitness is measured by multiple tests performed usually during physical education class to estimate aerobic fitness, muscular strength, flexibility, and body composition. Castelli, Hillman, Buck, and Erwin (2007) looked at the relationship between physical fitness and academic performance in 259 third and fifth graders and found aerobic exercise was positively associated to academic achievement on standardized tests, grades, and other measures of cognitive performance, while body mass index (BMI) was inversely related.

A cross-sectional study by Chomitz et al. (2009) analyzing 1,841 Massachusetts middle school students from 2004-2005 concluded there is a “statistically significant relationship between fitness and academic achievement, though the direction of causation is not known…promoting fitness by increasing opportunities for physical activity during PE, recess, and out of school time may support academic achievement” (p. 30).
Grissom (2005) was one of the first researchers to analyze a sample size of 884,715 California middle school children, comparing FITNESSGRAM® test results with Stanford Achievement Test, a standardized norm-referenced achievement test. His results indicate a positive relationship between overall student fitness and academic achievement. As the overall fitness scores improved, the mean achievement scores also improved. Grissom states “when administrators need to make decisions about where to focus resources in a climate of academic accountability, a proven relationship between physical fitness and academic achievement could be used as an argument to support, retain, and perhaps even improve physical education programs” (p. 12).

Similar research has also been found in California; students with higher levels of fitness were associated with higher academic achievement. The California Department of Education (2001) compared 954,000 fifth, seventh, and ninth graders’ FITNESSGRAM® scores to their Stanford Achievement Test and found a positive relationship. Another study conducted by Singh and McMahan (2006) analyzed scores in 253 elementary schools and found a positive correlation between academic achievement (California Standards Test) and physical fitness scores. Singh and McMahan also emphasize that it is the responsibility of schools to promote physical activity and a life-long behavior change since “schools are the only institutions which have structured and continuous contact with nearly all children” (p. 212).

One of the largest studies included more than 2.4 million Texas students. Welk and Meredith (2009) found several correlations between physical fitness and academic achievement. The study reports students who are physically fit, measured by FITNESSGRAM® test results, are more likely to do well on the state’s standardized
tests, have better school attendance, and are less likely to have disciplinary referrals involving truancy, drugs, alcohol, and violence.

**Extra-curricular activities.** It would be ideal for students to participate in physical education classes for at least one hour every day, but this is not always practical. Therefore, extra-curricular physical activities opportunities must be provided before and after school.

While Coe et al. (2006) found physical education during the day reduces boredom and improves attention in the classroom, they also found physical education alone does not improve grades. The study found students who were involved in more vigorous physical activities, such as organized sports, did approximately 10% better in core classes than students not involved in vigorous activity. In this case, the difference between physical education class and vigorous physical activity is that during physical education class most students are not getting their heart rates up enough to be classified as vigorous activity.

While Broh (2002) states “early analysis of the effect of participation in sports on academic achievement produced inconsistent evidence” (p. 60), several studies have shown participation does in fact, improve academic achievement. From the research conducted by Fujita (2006), support is found for the idea that students who participate in certain extracurricular activities, such as sports, improve their academic achievement by raising their grades and test scores. Stephens and Schaben (2002) support this idea. They conducted a study to see if the number of sports students played had an effect on overall academic performance. They found students who participated in at least one sport during an academic year performed better in their overall grade point average and class rank.
Silliker and Quirk (1997) not only found a relationship between participation and performance, but reported participants had significantly higher grade point averages during in-season competition.

Fredricks and Eccles (2006) and Trudeau and Shephard (2008) included differences in background such as race and income in their research. Both studies showed a positive correlation between student participation in school sports and academic achievement, regardless of race. These studies also discussed the importance of school sports for psychological benefits. Another study showing psychosocial benefits was conducted by Field, Diego, and Sanders (2001) and compared suburban high school seniors. Their study found those who had a higher level of exercise reported higher grade point averages, better relationships with parents, were less depressed, used drugs less frequently, and spent more time engaged in sports.

In a study conducted by Fox, Barr-Anderson, Neumark-Sztainer, and Wall (2010), researchers tried to clarify whether greater academic achievement was associated with physical activity in general or specifically sports team participation. The study found for high school girls physical activity in general and school sports are associated with higher grade point averages. For boys, only sports participation was associated with a higher grade point average. This suggests boys must participate in school sports, not just any other physical activity, in order to see the improvements in academic achievement. Regardless of the gender outcome, academic success was related to overall physical activity in sports, other physical activities, or a combination of both.

Ratey and Hagerman (2008) mention that while exercise alone will not make students smarter it puts the brain in the optimal situation for learning to occur. Davis et al.
(2007) discovered “exercise may be a simple, important method of enhancing children’s cognitive and academic development” and “these results may persuade educators to implement vigorous physical activity curricula during a childhood obesity epidemic” (p. 510).

It is understood exercise is important for learning, but how much is necessary for academic improvement is still a debate among scientists. According to Hobson (2008), Castelli noted a single 10 minute bout of physical activity is enough to boost attention and problem solving skills. Davis et al. (2007) claims mental and physical health benefits were observed after 20 minutes of physical activity, and Tomporowski (2003) suggests 30 minutes a day for improving cognition and social development. For optimal overall body and brain health, the CDC (2010) recommends “adolescents should do 60 minutes (1 hour) or more of physical activity each day” (para. 1). All of the times have been shown to be effective in improving cognition and social development. Another study suggests students who engage in vigorous physical activity perform better overall in school than students with moderate or no physical activity (Coe et al., 2006). What this suggests is students who perform any physical activity are more likely to perform better academically than students with no physical activity.

Factors Influencing Physical Activity Participation

Considerable effort has been dedicated to quantitative studies investigating physical activity correlates in adolescents (Loucaides, Plotnikoff, & Bercovitz, 2007; Sallis, Prochaska, & Taylor, 2000). Many of these studies have identified these correlates using an Ecological Model of Physical Activity Behavior (Spence & Lee, 2003). This model suggests physical activity behavior is influenced by biological, psychological, and
environmental factors. However, a study conducted by Humbert et al. (2006) combined this model and the Ecological Model of Health Behavior (Sallis & Owen, 1997) to provide a framework in which to explore factors that influence physical activity among adolescents. This study used qualitative methods to explore three different categories: intrapersonal (biological, psychological, and behavioral influences), social (family, peer, and adult support), and environmental factors (facilities, communities, accessibility) believed to be influences on physical activity participation.

**Intrapersonal influences.** Research supports the intrapersonal influences as the greatest area of influence on adolescent participation in physical activity. One factor frequently studied is the area of self-efficacy (Loucaides et al., 2007) or self-esteem. Several studies mention self-esteem as an important aspect of mental health; developed early in life, it plays a significant role in lifestyle (Daley, 2002; Kirk, 2005; Shephard, 1983). Other research discusses factors such as weight management and enjoyment (Allender et al., 2006) and fun and motivation (Dagkas & Stathi, 2007; Humbert et al., 2006; Tergerson & King, 2002) as important influences on physical activity participation.

Research shows that as female adolescent’s age, they are more likely than males to stop engaging in physical activities because they are not fun, are too competitive, and demand too much time (Strong, 1990). Other barriers included lack of time and motivation (Humbert et al., 2006; Tergerson & King, 2002). Ammouri, Kaur, Neuberger, Gajewski, and Choi (2007) found adolescent males generally cite competition and females more often mention weight management as reasons for participating in physical activity.
Other studies discuss how positive perceptions of physical activity are developed during early learning experiences (Kirk, 2005) and during quality physical education classes (Trudeau & Shephard, 2005). Humbert et al. (2006) found the most important factors for adolescents participating in physical activities were if the activities were fun and if friends were involved. These two factors made adolescents more likely to participate.

**Social influences.** Significant research also shows social influences as a major impact on adolescent participation in physical activity. Ries, Voorhees, Gittelsohn, Roche, and Astone (2008) discussed the importance of support and encouragement from parents, peers, and other community members as very important to adolescents. Research shows adolescents with siblings, parents, and peers who support and/or engage in physical activity are more likely to participate in physical activity than those lacking support (Ammouri et al., 2007; Dagkas & Stathi, 2007; Loucaides et al., 2007; Ries et al., 2008; Sallis et al., 2000; Voorhees et al., 2005).

**Environmental influences.** Other studies have examined environmental influences affecting adolescent’s participation in physical activity. These findings showed environmental factors such as cost, facilities, and proximity are the greatest barriers for physical activity in low socioeconomic (SES) adolescents (Dagkas & Stathi, 2007; Humbert et al., 2006). The study conducted by Humbert et al. (2006) used a qualitative approach to analyze adolescent perspectives to explain the relationship between socioeconomic status (SES) and physical activity.

Gordon-Larsen, McMurray, and Popkin (2000) found that environmental factors such as daily participation in physical education class and the availability of a community
recreation center were related with physical activity. Giles-Corti and Donovan (2002) found recreational facilities located near the home were used more than facilities located farther away from an individual’s living space. They also found the most frequently used facilities were not within a defined space, but in informal areas such as streets, open public space, and beaches. This study, along with several others, found environmental influences to be secondary to individual and social influences.

**Recommendations for Improving Physical Activity in Adolescents**

Adolescents spend at least one third of their day in school. Therefore, if young people are going to engage in adequate amounts of physical activity, it is essential that schools systematically and effectively provide and promote participation in physical activity. Most schools already have programs that provide students with some physical activity, but population trends for obesity suggest that American children and youth need more physical activity than their current levels. Although parents, community agencies, and healthcare providers share the responsibility for ensuring that young people are physically active, schools are uniquely positioned to address this critical public health concern.

A goal of the research is to inform parents, schools, and communities of the role professionals have in guiding students in the process of being physically active for life. In order to help students maintain or improve body and brain health, this section includes a list of recommendations (CDC, 1997; Pate et al., 2006) on ways parents and professionals can promote more physical activity among youth.

1. Establish policies that promote enjoyable, lifelong physical activity among adolescents.
2. Require adolescents to participate in a minimum of 60 minutes of moderate to vigorous physical activity during the day; this includes recess, physical education classes, and extra-curricular activities.

3. Implement standards-based physical education curriculum that emphasizes enjoyable and moderate to vigorous physical activity participation and helps students adopt and maintain physically active lifestyles.

4. States should hold schools districts accountable for delivering physical education programs that meet national standards for quality and quantity of 225 minutes per week for grades 9 to 12 of physical activity.

5. Provide safe and enjoyable environments that encourage physical activity.

6. Provide extracurricular physical activity programs that meet the needs and interests of all students.

7. Include parents and guardians in physical activity instruction, extracurricular and community physical activity programs.

8. Provide training for educators, coaches, and other community personnel to promote enjoyable, lifelong physical activity among youth.

9. Provide a range of developmentally appropriate community sports and recreation programs that are attractive to all young people.

10. Make facilities available to community based organizations during after-school, weekend, and summer periods.

11. Schools should collaborate with community organizations in promoting physical activity programs to students and their parents.
Summary

There is national attention on the issue of childhood obesity and improving adolescent health. At the same time, there is similar pressure in the educational system to meet the academic standards of the No Child Left Behind Act. With this tug of war between whether or not to add more physical activity or more academics, the physical education curriculum is the first to get cut. However, the consequence of decreasing physical activity is far greater than expected. When physical education is decreased and physical activity becomes limited, this impacts youth health and academic achievement.

Research shows exercise enhances certain aspects of the brain responsible for learning and memory. It increases efficiency between communicating neurons, enhancing plasticity; it enhances neurotransmitters which improve mood and focus; it boosts BDNF or “miracle grow” for brain cells; and it is responsible for neurogenesis or the birth of new neurons.

Trudeau and Shephard (2008) states “the literature strongly suggests that the academic achievement, physical fitness, and health of our children will not be improved by limiting the time allocated to PE instruction, school physical activity, and sports programs” (p. 9). Research has shown it is possible to increase physical activity within the student’s academic day and not diminish academic achievement, rather in many cases improve it. Physical education class and extra-curricular activities are for some students their only means of physical activity and provide the best opportunity to meet the recommended 60 minutes of physical activity most days of the week.

While the relationship between physical activity and academic achievement is promising, opportunities are not always available and participation is not always
welcomed by the adolescent. Therefore, it is important to understand adolescent perceptions on physical activity so parents, educators, and the community can provide the best opportunities for increasing student engagement.

No studies have explored student perceptions on physical activity to explain the relationship between physical activity and academic achievement. The proposed study aims to fill this gap in understanding to help execute future programs and policies to support physical activity. This study will contribute to the literature on physical activity by offering suggestions to parents, educators, and community leaders on how to increase adolescent physical activity in order to improve overall health and academic achievement.
Chapter 3
Methodology and Procedure

Introduction

This chapter describes the quantitative and qualitative sampling, instrumentation, data collection, and data analysis methods. This study used a sequential explanatory mixed methods design (Creswell, Plano Clark, Gutmann, & Hanson, 2003) involving qualitative data collection and analysis to help explain the quantitative data. The purpose of this mixed method study was to investigate the relationship between physical activity and academic achievement using quantitative data collection and analysis, then to examine student perceptions of physical activity and academics using qualitative data collection and analysis. This integration involved using student perceptions to help explain the relationship between physical activity and academic achievement by connecting both methods for an overall complete understanding.

Tashakkori and Teddlie (1998) describe mixed methods studies as a combination of quantitative and qualitative approaches in research methodology involving a single or multi-phase study. Mixed methods research is a research design with philosophical assumptions that guide the data collection and analysis and the mixing of both quantitative and qualitative approaches to provide a better understanding of the research questions (Creswell & Plano Clark, 2007).

As stated in Creswell and Plano Clark (2007), one stance related to mixed methods is that “There is one ‘best’ paradigm or worldview that fits mixed methods research” (p. 26). Therefore, the appropriate worldview in this study is pragmatism which provides the best foundation for a mixed methods approach (Tashakkori & Teddlie,
and focuses on collecting, analyzing, and mixing quantitative and qualitative data. This paradigm works best to address the research questions which are of primary importance (Creswell & Plano Clark, 2007). The ontological perspective is that research should be practical, informative, and provide an opportunity for societal improvement.

Creswell and Plano Clark (2007) discuss four key mixed methods research designs: Triangulation, Embedded, Explanatory, and Exploratory. In this study the sequential explanatory design was used.

According to Creswell and Plano Clark:

In this model, the researcher identifies specific quantitative findings that need additional explanation, such as statistical differences among groups, individuals who scored at extreme levels, or unexpected results. The researcher then collects qualitative data from participants who can best help explain these findings. In this model, the primary emphasis is usually on the quantitative aspects. (p. 72)

Therefore, gathering qualitative data to explain the quantitative results provides the best method for answering the research questions. Other researchers who have found this model successful in designing their studies include Ivankova (2002), Mountain (2009), Tarver (2006), Thøgersen-Ntoumani and Fox (2005), and Way, Stauber, Nakkula, and London (1994).

**Research Design**

Before beginning the study, appropriate approval and permission from the institutional review board (Appendix A), school district (Appendix B), parents (Appendix C), and participants (Appendix D) was obtained (Creswell, 2002).
This study’s methodological approach included a mixed methods design and data collection on the same phenomenon, separately in two phases, quantitative then qualitative. This was a single study involving both quantitative and qualitative approaches in the process of collecting, analyzing, and interpreting data. The type of mixed method research strategy implemented was the sequential explanatory design consisting of two distinct phases: quantitative followed by qualitative, in order to select participants and follow-up on quantitative results.

The initial phase and question was best answered quantitatively with a correlation to determine if there was a relationship between physical activity and academic achievement. Exploring student perceptions on physical activity and academic achievement worked best for the second phase and qualitative questions. The research emphasis contained equal weight on the quantitative and qualitative data collection and analysis methods (QUAN → QUAL). This method focused on in-depth explanations of the quantitative data by exploring four extreme variation samples (Ivankova, 2004). During the interpretation phase of the design, qualitative data in phase two was connected to the quantitative data in phase one in order to follow-up with the quantitative results and explain the overall findings.

The rationale of this mixed method approach was to create a better understanding of physical activity and academic achievement among adolescents. The use of this design allowed the qualitative results to connect and expand on the quantitative findings in order to strengthen the research questions. A visual diagram of the procedures for this sequential explanatory mixed methods design is presented in Figure 3.1.
Figure 3.1 Visual Model for Sequential Explanatory Mixed Methods Design

<table>
<thead>
<tr>
<th>Phase</th>
<th>Procedure</th>
<th>Product</th>
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| QUAN data collection | • Convenience sample of 11th – 12th grade students  
• Online survey measuring physical activity and academic achievement | • Suburban Sample (N = 208)  
• Demographic data, GPAs  
• Type & amount of physical activity  
• Likert scale scores |
| QUAN data analysis | • Descriptive statistics  
• Correlation  
• Two-way ANOVAs  
• Analysis of extreme cases | • Means and standard deviations  
• Linear relationship  
• Extreme case comparisons with Likert-scales |
| QUAN results | • Identify and describe four extreme cases from measured variables | • Summary tables  
• Figures  
• Description of results |
| Select participants from QUAN | • Purposeful sample of members of each of the four extreme cases | • Sample from each extreme case (n = 4-6) |
| QUAL data collection | • Four focus groups representing each extreme case  
• Semi-structured questions  
• Open ended survey questions | • Focus group voice recordings and documents |
| QUAL data analysis | • Coding & thematic content analysis | • Thematic similarities and differences among four focus groups |
| QUAL results | • Describe themes with sample quotes | • Narratives of focus groups  
• Description of themes  
• Tables |
| Interpretation QUAN → QUAL results | • Synthesize quantitative and qualitative findings in one discussion section  
• Report QUAN and QUAL results by extreme cases | • Discussion of how qualitative results explain quantitative findings  
  o Typology development  
  o Extreme case analysis  
  o Data merging  
• Implications  
• Future research |
Creswell and Plano Clark (2007) discuss several strengths and weakness involved in using the sequential explanatory design when conducting research. Advantages in using this design include:

1. It involves a single study.
2. Two-phases make easier implementation since one set of data is collected at a time.
3. The final report is written as two phases making it easier to write and read.
4. This design allows quantitative results to be explored in-depth.

Challenges in using this design include:

1. Adequate time is necessary for the completion of this study.
2. Results of the first quantitative phase may not turn out as expected, therefore effecting the participant selection for the second qualitative phase.
3. It may become difficult to obtain internal review board approval because the researcher needs to analyze the quantitative data before deciding on participant selection.

**Research Permission and Ethical Considerations**

At each phase of the study the researcher respected the rights, needs, values, and desires of the participants (Creswell, 2003). Ethical consideration for each phase of the research was in full compliance with the University of Nebraska Institutional Review Board (IRB). Permission was obtained from the IRB at the University of Nebraska, school district, school site, parents and participants. The anonymity of individuals was protected by assigning participants identification numbers for the survey. The identity of individuals remained confidential and student names were not shared with other
participants or individuals outside the research project. All data was kept password protected on a school district issued laptop computer with a tracking device. Any hard copies were safely secured in a locked file cabinet in the researcher’s office. Individuals who chose not to participate were respected for their choice and not penalized.

**Target Population**

The population in this study was 208 eleventh and twelfth grade students from a large, public, suburban high school during the 2010-2011 academic calendar year. The school district included 25 elementary schools, six middle schools, and four high schools. The total student population in the school district was 22,000 students. The school used in the study housed 2,166 students, grades 9-12, and 125 teachers, giving this school a student to teacher ratio of 17.3. The population of students in the school included 595 ninth-graders, 553 tenth-graders, 513 eleventh-graders, and 505 twelfth-graders. The racial breakdown of students in the school was 92.14% Caucasian, 2.98 Hispanic, 2.84% Asian, 1.75% black, and 0.28% Native American. Of the 2,166 students, 3.41% received free/reduced lunch.

**Variables in the Study**

Variables in this study included physical activity levels and academic achievement. Physical activity questions included types of physical activity participation (organized vs. non-organized), season(s) participated, weekly frequency, and daily duration. For the dependent variable, academic achievement, student’s cumulative grade point averages were used.

Several factors which influence student’s participation in physical activity were also measured. These factors are defined as intrapersonal (enjoyment, self-efficacy,
motivation), social (family, peer, and adult support), and environmental factors (facilities, communities, accessibility) (Humbert et al., 2006; Sallis & Owen, 1999). These factors were identified from the literature for the purpose of designing the survey used in Phase I of the research. The intention of using these factors was for the anticipation of finding an overlap in the data between the quantitative and qualitative phases.

**Phase I Quantitative**

**Participant selection.** In the first quantitative phase of the study a non-probability sampling method selected participants because they were available, convenient, and represented some characteristics the researcher was seeking to study (Creswell, 2002). The convenience sample of the population was selected for accessibility of the school, diversity of academic ability and physical activity, and age of the student. The sample included students in the eleventh and twelfth grade from the following classes: civics, environmental science, lifetime fitness, and zoology classes. During semesters one and two of the school year, both the parents and students in the sample classes received an invitation to participate in the study on a volunteer basis. A letter containing a description of the study and a consent form was sent home to the parents/guardians of each student prior to the study. Students who returned the signed parental consent forms were invited to participate in the study. These students were asked to sign a participant assent form before beginning the study.

**Quantitative instrument.** In the first phase of the study, an online survey developed in SurveyGizmo™ was given to participants. Participating eleventh and twelfth grade students completed the online survey during their class time using the participant online survey directions (Appendix E). Survey directions included purpose of
study, time allotted to complete the survey, explanation of possible follow up, the website address to access the online survey, and an identification number to activate the survey. No names were used. Each participant was assigned a random identification number assigned by the researcher. The online survey format included four sections: (a) participation in organized sports/physical activities, (b) participation in non-organized sports/physical activities, (c) demographic and attitudinal questions, and (d) open ended questions (Appendix F). The attitudinal and open ended questions were designed to reflect factors that have been found in the research to influence student’s participation in physical activity (intrapersonal, social, and environmental). This survey was developed as a method to measure context and types of physical activity, frequency, duration, influences, and attitudes of physical activity participation and academic achievement. The survey took approximately 20 minutes to complete.

Sections A and B of the survey established the amount of time participants spent in organized and non-organized sports and activities. Students were asked to choose all the physical activities (organized and non-organized) they participated in during each of the four seasons (fall, winter, spring and summer) before, during, and after school. They also indicated how many times in a normal week they participated in each activity (frequency) and the amount of participation time (duration) for each of the activities.

Section C of the survey involved demographic and attitudinal factors that influence physical activity. There are 54 questions in this section divided into 11 categories. The first category, questions 1 and 2, included demographic information on gender and ethnicity. The second through tenth categories, questions 3 through 47, were set up as a 5-point Likert scale. The scale ranged from 1 (Strongly disagree) to 5
(Strongly agree). The second category, questions 3 through 7, asked students to reflect on their attitude about physical education class. The third through fifth categories, questions 8 through 12, 13 through 17 and 18 through 22, involved intrapersonal influences on physical activity (enjoyment, self-efficacy, and motivation). The sixth and seventh categories, questions 23 through 27 and 28 through 32, asked participants to reflect on social influences and whether they received support in their physical activity (parents, peers, teachers/coaches). The eighth category, questions 33 through 37, asked participants to reflect on their environmental influences (family exercises, opportunities, facilities, financial). Categories nine and ten, questions 38 through 42 and 43 through 47, asked participants about academic expectations and performance as it relates to physical activity. The eleventh and final category, questions 48 through 54, asked participants to compare themselves to their peers based on a 5-point Likert scale from 1 = Near the bottom to 5 Near the top.

Section D of the survey included a short answer response section, which will be discussed in the qualitative section of the paper.

Reliability. Gliem and Gliem (2003) discuss the importance of calculating and reporting Cronbach’s alpha coefficient for internal consistency reliability on any Likert-type scales or subscales designed by the researcher. The normal range of Cronbach’s alpha reliably coefficient is between 0 and 1. The closer the coefficient is to 1, the greater the internal consistency of the scale items. George and Mallery (2003) discuss the significance of the coefficients “ > .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable” (p. 231). Therefore, all
Likert-type items on the survey instrument were accepted as reliable, with the range from .76 to .96.

According to Table 3.1, there were three scales where the Cronbach’s alpha reliability coefficient for internal consistency would be higher if an item was removed from the scale. However, all alphas were above .7 so the scales were kept with the complete set of items originally as intended.

Table 3.1

Cronbach’s Alpha Reliability Statistics on Survey Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Alpha</th>
<th>N of Items</th>
<th>Alpha if Item Deleted*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Education</td>
<td>.79</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Intrapersonal</td>
<td>.91</td>
<td>15</td>
<td>.91</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>.84</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>.86</td>
<td>5</td>
<td>.87</td>
</tr>
<tr>
<td>Motivation</td>
<td>.80</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>.85</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>.77</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>.81</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>.76</td>
<td>5</td>
<td>.79</td>
</tr>
<tr>
<td>Academics</td>
<td>.82</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Relationship</td>
<td>.96</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Self Reflection</td>
<td>.78</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

*Alpha if item deleted represents Cronbach’s alpha reliability coefficient for internal consistency if the individual item is removed from the scale.

Quantitative data collection. Data from the survey was exported from SurveyGizmo™ and downloaded directly into an Excel spreadsheet. Data from sections
A and B of the survey were analyzed and expressed as physical activity participation in minutes per year in organized, non-organized, and combined total physical activity. Participants were ranked according to the total number of minutes per year spent in physical activity participation. Physical activity was defined as any bodily movement produced by muscles and required energy.

The school registrar supplied the cumulative grade point averages (GPA), based on a 4-point weighted scale, for each of the participants. The cumulative GPA was used to define academic success. The participant’s grade point averages were recorded on the excel spreadsheet as academic achievement.

Using an interval scale on total amount of physical activity in organized and non-organized activities and participant cumulative grade point average, a Pearson product-moment correlation coefficient was run to determine the relationship between physical activity and academic achievement. The results of this test are presented in Chapter 4. The second purpose for performing the correlation was to select participants from the scatterplot for Phase II of the research.

**Physical activity analysis.** According to the scatterplot data (Figure 3.2) participants were organized into four extreme groups: (a) high physical activity and high academic achievement \(n = 31\), (b) high physical activity and low academic achievement \(n = 22\), (c) low physical activity and high academic achievement \(n = 20\), and (d) low physical activity and low academic achievement \(n = 21\). Groups were defined according to low GPA < 2.8, and high GPA > 3.6. For physical activity, low physical activity < 45 minutes per day, and high physical activity > 90 minutes per day.
Once the participants were divided into the extreme groups, a second analysis was performed, a series of two factor Analysis of Variance (ANOVA) tests to determine if mean differences existed between high/low physical activity (PA) and high/low academic achievement (AA) for each of the Likert scale items on physical activity influences (i.e., enjoyment, motivation, self-efficacy, social, support, environmental, and academics). Results of these tests are presented in Chapter 4.
The third analysis of the data involved examining mean scores, standard deviations, and partial eta squared for each of the extreme groups. This analysis was performed in order to determine which Likert scale items had the greatest influences on physical activity participation. Results of this analysis are presented in Chapter 4.

**Phase II Qualitative**

**Participant selection.** For the second qualitative phase of the study a purposeful sampling method was used to select participants so they could help the researcher understand the phenomenon being studied (Creswell, 2002). Extreme case sampling, a type of purposeful sampling, was used to study the extreme variations in physical activity and academic achievement. According to the sequential explanatory participant selection model, participants for the second phase were selected for a follow-up, in-depth, qualitative phase after analyzing the quantitative data in the first phase of the study (Creswell & Plano Clark, 2007). In the participant selection model the emphasis is on the second, qualitative phase of the study to gain a better understanding of student’s perceptions to explain the relationship between physical activity and academic achievement in adolescents.

During this phase, four to six participants from each of the extreme groups were randomly selected using the correlation scatterplot. The identification number from the data was then matched with the student’s name. Parents and participants were sent an invitation through email to participate in a follow-up focus group interview on a volunteer basis. If parents consented (Appendix G) and adolescents agreed to participate (Appendix H), a convenient time was arranged for all group members to participate. All
focus group interviews were held in a conference room at the school to minimize interruptions.

**Qualitative focus groups.** According to Kreuger (1988) a focus group is defined as a "carefully planned discussion designed to obtain perceptions in a defined area of interest in a permissive, non-threatening environment" (p.18). An advantage to using focus groups is to provide for more interaction with the students, where a personal interview might seem more intimidating to an adolescent. A disadvantage of using focus groups is that it may be difficult to find a consensus among the students (Creswell, 2002). For this study, follow-up focus group interviews with four to six participants in each of the extreme cases was thought to provide the best insight about why participants might have diverged from the quantitative survey sample (Creswell, 2003).

The focus group protocol (Appendix I) consisted of seven statements informing the participant of (a) the purpose of the research study and focus group, (b) confidentiality, (c) rights as a participant, (d) consent to participate in the study, (e) permission for the interview to be recorded, (f) the possibility of follow up after data interpretation, and (g) thanking them for their participation. The focus group interview questions consisted of 13 semi-structured questions asking students to reflect on physical activity as a child, physical activity influences, academic motivation, if they think there is a relationship between physical activity and academic achievement, and suggestions for improving physical activity in adolescents.

Audio recordings of all focus group interviews were completed using Audacity®, free software for recording and editing sounds, on the researcher’s password protected computer. After all focus group interviews were conducted, the audio recordings were
played back and hand typed by the researcher. The control of the audio playback allowed for accurate transcriptions of the interviews. If there was any question about what a participant was saying, the researcher contacted the participant and asked for clarification.

**Qualitative survey responses.** A second form of qualitative data involved the open ended responses from the online survey. In Section D of the survey, students were asked to briefly respond to six short answer questions. These questions asked participants to describe how they felt about physical activity and grades, what influences them to participate in physical activity or do well in school, and to discuss their thoughts about a relationship between physical activity and grades in school. Results are discussed in Chapter 4.

**Coding and theme identification.** The process of qualitative analysis involved six steps (Creswell, 2003). The first step involved transcribing the focus group interviews. Recorded interviews were played back and typed out by the researcher. The second step was to read the data line-by-line and make sure it made sense. The third step began the coding process, writing codes in the paper margin, then organizing the codes into categories in an excel spreadsheet using terms from the actual language of the participants. The focus group interviews and open ended survey responses were coded separately to see if any differences emerged. Step four used codes to develop larger themes, which became the major headings in the qualitative results section of the study. In step five, the researcher decided how the themes would be represented in the qualitative section of the results. This study used narrative passages and quotes, as evidence to the themes, to represent the findings. The sixth step involved the
interpretation of the data. During this step the meaning from the qualitative data was connected to the literature on factors that influence physical activity among adolescents.

**Establishing credibility.** Reliability was established by checking for consistency between the focus group interviews and open ended survey responses. To validate the findings four methods were used to determine if the information was accurate: (a) member checking with participants on accuracy of codes and themes; (b) providing rich, thick descriptions to convey the findings; (c) converging the data using the literature, quantitative, and qualitative data; and (d) reporting discrepant information that countered the themes discussed in the literature (Creswell, 2003).

Creswell and Plano Clark (2007) discuss mixed methods validity as the “ability of the researcher to draw meaningful and accurate conclusions from all of the data in the study” (p. 146). Specifically in the explanatory design, the qualitative second phase builds on significant predictors in the quantitative phase, to provide more meaningful information.

Potential threats to the validity of the mixed methods Sequential Explanatory Design can be minimized by:

1. Selecting the same individuals for the quantitative and qualitative phases.
2. Using a large sample for the quantitative phase \( n = 208 \) and a small sample for the qualitative phase (four focus groups with 4 to 6 students each).
3. Using rigorous procedures for developing and validating the researcher designed survey.
4. Choosing significant results to follow up on.
5. Addressing both quantitative and qualitative validity.
The Role of the Researcher

In the quantitative phase of the study, the researcher designed and administered online surveys to participants using SurveyGizmo™. The researcher was also responsible for exporting the data from SurveyGizmo™ and downloading it into an Excel spreadsheet for analysis. The researcher then organized the data and met with the NEAR Center to perform appropriate statistical analysis procedures. The results were then interpreted based on the established measurements for statistical significance.

In the qualitative phase of the study, the researcher conducted the focus group interviews. An advantage of the researcher leading the interview was for “better control over the types of information received since specific questions can be asked to elicit this information” (Creswell, 2002, p. 205).

The researcher is a teacher and coach in the same school as the participants. She has been a teacher and coach in the building for the past 13 years. There is the possibility the researcher may have known some of the participants in the study. The experiences with the school, students, and athletes have formed the perceptions she has today. Due to the previous experiences with the school, there are biases the researcher brings to the study. Every effort has been made to ensure objectivity.

While the researcher is a teacher and coach in the building, it is important to point out the data collection did not occur within the researcher’s classroom. Although it has been advised not to conduct “backyard” research (Creswell, 2003) the school was selected for this study based on convenience.
Chapter 4

Results

Reporting the Findings

This chapter presents Phase I quantitative results first, using simple statistics (measures of central tendency), measures of the relationship between physical activity and academic achievement (correlation), and inferential methods (ANOVA) on factors that influence physical activity, to allow readers an understanding of the constructs of interest (Tashakkori & Teddlie, 1998). Next, Phase II qualitative focus group interviews and open ended response questions from the online survey are presented. These qualitative results represent adolescent perceptions on physical activity and academic achievement.

Phase I Quantitative

Descriptive statistics and preliminary analyses. Participants in the study included 208 students, 60.1% eleventh graders ($n = 125$) and 39.9% twelfth graders ($n = 83$). Of the 208 participants, there were 47.1% males ($n = 98$) and 52.9% females ($n = 110$). The racial breakdown of participants was 86.5% Caucasian, 5.3% Hispanic, 2.4% Asian, 2.4% Multi-racial, and 1.5% Native American. The remaining 1.9% of participants declined to respond. Students receiving special education services were invited to participate in the study. Of the 27 special education students invited to participate, 14 students (51.9%) agreed to take part in the study.

Strong et al. (2005) recommended youth participate in at least 60 minutes per day of physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities. The study proposed the 60 minutes of physical activity could easily be
attained during physical education class, recess, intramural sports, and before or after-school during extracurricular activities. A nationwide survey conducted by the CDC found that 65% of high school students did not meet the daily recommendation of 60 minutes of physical activity and only 30% of the students attended physical education class daily (CDC, 2008). Another study by the CDC (2003) reported during nonschool hours 62% of children did not participate in any organized physical activity and 23% did not engage in any free-time physical activity.

In this study, 38.5% of students did not meet the daily recommendation of 60 minutes most days of the week and only 4.8% of students attended physical education class daily. Therefore, students must be participating in physical activity before or after school since so few are participating in physical education class. This study found 98.1% of students were participating in some form and amount of physical activity, with 10.1% of students reporting they are not participating in any organized physical activity, and 5.8% not engaged in any non-organized physical activity.

As a result, students exceeded the CDC statistics, except in the area of physical education. This can be explained by block scheduling. Instead of the traditional eight classes, 50 minutes for 90 days, students take four classes, 90 minutes for 45 days. Therefore, students of block schedule have fewer physical education class days than the traditional schedule. The percentage of students participating in organized, non-organized, and total physical activity during the different seasons of the year is presented in Table 4.1.
The data indicate more students are engaged in organized and/or non-organized physical activity during the fall (93.8%) and summer (93.3%) than during the winter (85.6%). Organized physical activity shows the greatest amount of student participation in the fall (80.8%), with fewer students participating in the summer (59.6%). Non-organized physical activity shows the greatest amount of student participation during the summer (88.5%) with fewer students participating in the winter (74.0%).

Table 4.2 shows the percentage of students and the daily amount of time spent involved in organized, non-organized, and total physical activity. The data shows 61.5% of students participate in organized and/or non-organized physical activity at least 60 minutes a day. More students (43.0%) participate in 15 – 29 minutes of organized physical activity each day, while more students (38.7%) engage in 60 or more minutes of non-organized physical activity each day.

According to Figure 4.1, physical education was the type of organized physical activity most students participate in. According to Figure 4.2, walking was the type of non-organized physical activity most students participate in.

<table>
<thead>
<tr>
<th>Participation</th>
<th>Fall (%)</th>
<th>Winter (%)</th>
<th>Spring (%)</th>
<th>Summer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized</td>
<td>80.8</td>
<td>63.9</td>
<td>72.1</td>
<td>59.6</td>
</tr>
<tr>
<td>Non-Organized</td>
<td>85.6</td>
<td>74.0</td>
<td>81.3</td>
<td>88.5</td>
</tr>
<tr>
<td>Total</td>
<td>93.8</td>
<td>85.6</td>
<td>90.9</td>
<td>93.3</td>
</tr>
</tbody>
</table>

Note. Data is represented as a percentage of students participating in physical activity. Total = organized and/or non-organized physical activity.
Figure 4.1 represents the types of organized physical activities students participate in during different seasons. Physical education has the highest number of year round student participation. The other category also had high student participation. The activities included show choir, weightlifting, lacrosse, and martial arts. Dance was also found to be a consistent year round type of organized physical activity with high participation. Winter (63.9%) and summer (59.6%) seasons have the lowest amounts of physical activity participation. Suggestions for increasing organized physical activity participation are presented in the discussion.

Table 4.2
Percentage of Students and the Daily Amount Physical Activity Participation

<table>
<thead>
<tr>
<th>Time (min - day)</th>
<th>Physical Activity Participation (n = 208)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Organized (%)</td>
</tr>
<tr>
<td>0 - 14</td>
<td>10.1</td>
</tr>
<tr>
<td>15 - 29</td>
<td>43.0</td>
</tr>
<tr>
<td>30 - 44</td>
<td>10.6</td>
</tr>
<tr>
<td>45 - 59</td>
<td>12.1</td>
</tr>
<tr>
<td>60 +</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Note. Physical activity participation data is expressed as percentage of student participation. The unit for time is represented as total numbers of minutes per day students spend participating in physical activity.
Figure 4.2 represents the types of non-organized physical activities students participate in during different seasons. Walking, running, and weightlifting are the highest for student participation during all seasons. Swimming and biking are high in the summer months. Summer (88.5%) was found to have the greatest amount of non-organized physical activity participation. Winter (74.0%) and spring (81.3%) have the lowest amounts of physical activity participation. Suggestions for increasing non-organized physical activity participation are presented in the discussion.
Research question 1 analysis. The first analysis involved a Pearson product-moment correlation coefficient to determine the relationship between physical activity and academic achievement in adolescents. The question stated: Is there a significant relationship between physical activity and academic achievement in adolescents? The hypothesis was physical activity would be positively associated with academic achievement in adolescents in a large public suburban high school.

Results in Table 4.3 indicate no significant relationship between the amount of organized or non-organized physical activity participation in adolescents and the
cumulative grade point averages (GPA). The cumulative weighted grade point average (GPA) was used as a measurement of academic achievement. However, there was a moderately positive relationship between organized and non-organized physical activity measures. Correlation output on total amount of physical activity and gender showed no significant relationship.

Table 4.3
Pearson Correlation Between Organized and Non-organized Physical Activity and Academic Achievement

<table>
<thead>
<tr>
<th>Measure</th>
<th>GPA</th>
<th>Organized</th>
<th>Non-organized</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized</td>
<td>.11</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Non-Organized</td>
<td>.01</td>
<td>.39*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. *p < .05

Results from research question 1 reject the hypothesis that physical activity would be positively associated with academic achievement. Results for research question 2 are presented in the following section.

**Research question 2 analysis.** The second analyses performed were two factor Analysis of Variance (ANOVA) models. Data was collected to answer research question 2: Do adolescents with different levels of physical activity and academic achievement have different ecological factors influencing their participation in physical activity? The hypothesis stated *there would be significant differences in ecological factors that influence physical activity participation among adolescents with different levels of physical activity and academic achievement.*
Results indicate there was a significant difference in ecological factors (Likert scale items) due to physical activity (Table 4.4) and academic achievement (Table 4.5). Data was further analyzed (Table 4.6) in order to compare the ecological factor mean scores between the extreme groups. One factor, motivation, showed a statistically significant interaction at the $p = .02$ level between physical activity and academic achievement (Figure 4.4). There were also significant differences in views between groups on the relationship between physical activity and academic achievement $F(3, 87) = 2.90, p = .04, \eta_p^2 = .08$. This will be discussed further in the qualitative section. There were no significant differences on physical education attitudes for physical activity ($F = 1.45, p = .23$) or academic achievement ($F = .15, p = .70$).

Therefore, results from research question 2 fail to reject the hypothesis that there would be significant differences in ecological factors that influence physical activity participation among adolescents with different levels of physical activity and academic achievement.

Results in Table 4.4 indicate motivation ($p = .0001$), environment ($p = .0002$), and support ($p = .0021$), had the greatest significant differences due to the physical activity group. Environment also showed significance at the $p = .008$ level for academic achievement. Partial eta squared results showed medium to large variance with ecological factors. Enjoyment ($\eta_p^2 = .11$) and motivation ($\eta_p^2 = .17$) had the greatest amounts of variation between subjects. The R-squared value (0.24) for motivation suggests that 24% of student’s physical activity is explained by motivation.
Results in Table 4.5 indicate academics ($p = .0001$) has the greatest significance difference between group means due to the academic achievement group. Low academic mean was 3.87 and high academic mean was 4.53, while low physical activity mean was 4.13 and high physical activity mean was 4.26. Partial eta squared results show academics ($\eta_p^2 = .23$) having the greatest amount of variation between subjects for the academic achievement group. The R-squared value (0.25) for academics suggests that 25% of student’s academic achievement is explained by academic dispositions.

Table 4.4

Significance of Ecological Factors Due to Physical Activity

<table>
<thead>
<tr>
<th>Ecological Factors</th>
<th>R-Squared</th>
<th>F</th>
<th>p</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Activity Enjoyment</td>
<td>0.13</td>
<td>4.32</td>
<td>.01**</td>
<td>.11</td>
</tr>
<tr>
<td>Self Efficacy</td>
<td>0.09</td>
<td>2.96</td>
<td>.04*</td>
<td>.08</td>
</tr>
<tr>
<td>Motivation</td>
<td>0.24</td>
<td>9.06</td>
<td>.0001**</td>
<td>.17</td>
</tr>
<tr>
<td>Support</td>
<td>0.15</td>
<td>5.30</td>
<td>.0021**</td>
<td>.08</td>
</tr>
<tr>
<td>Environment</td>
<td>0.20</td>
<td>7.20</td>
<td>.0002**</td>
<td>.09</td>
</tr>
</tbody>
</table>

*Note. Discussion of Ecological Factors as they relate to Likert scale items
Physical activity enjoyment: fun, with friends, feels good, less depression and stress
Self-efficacy: goals, positive self-esteem and body image, measures success
Motivation: staying fit, doing well in school, staying out of trouble, enjoys competition
Support: support from parents, siblings, friends, teachers, coaches, and community
Environment: parents/siblings/friends exercise, opportunities provided, facility access, finances
df = 3, error = 87
$\eta_p^2$ = partial eta squared interpretation: .01 = small, .06 = medium, .14 = large
*p < .05
**p < .01
Mean scores were analyzed to determine which ecological factors (Likert scale items) were associated with physical activity participation among adolescents (Table 4.6). All of the groups had social influences as a high mean score. This was the highest mean score for the low physical activity/low academic achievement group (M = 4.16) and the second highest for the low physical activity/high academic group. Social survey questions asked students about participating with friends, meeting new friends, being part of a team, being a leader, and getting involved in the community. Both high physical activity/high academic (M = 4.62) and low physical activity/high academic (M = 4.44) reported academics as the greatest ecological factor mean score. This suggests academics were the greatest influence on physical activity participation for the high academic groups and social influences were the greatest influences on the low physical activity groups. Both high physically active groups rated environmental influences as the second highest influence.

Table 4.5
Significance of Ecological Factors Due to Academic Achievement

<table>
<thead>
<tr>
<th>Ecological Factors</th>
<th>R-Squared</th>
<th>F</th>
<th>p</th>
<th>( \eta_p^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>.10</td>
<td>3.20</td>
<td>.03*</td>
<td>.05</td>
</tr>
<tr>
<td>Academics</td>
<td>.25</td>
<td>9.68</td>
<td>.0001**</td>
<td>.23</td>
</tr>
</tbody>
</table>

*Note.* Discussion of Ecological Factors as they relate to Likert scale items

Social: being with friends, meeting new friends, teammates, being involved, leadership
Academics: enjoy school, do their best, parents/teachers/coaches high expectations, success

df = 3, error = 87
\[ \eta_p^2 \] = partial eta squared interpretation: .01 = small, .06 = medium, .14 = large
*p < .05
**p < .01
The high physical activity/low academic achievement group ($M = 4.20$) and low physically active/low academics ($M = 3.90$) show self-efficacy as the highest and second highest influences on physical activity participation. Self-efficacy Likert scale items

<table>
<thead>
<tr>
<th>Likert scale Ecological Factors</th>
<th>Extreme Groups $M (SD)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High PA High AA</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>4.26 (.63)</td>
</tr>
<tr>
<td>Motivation</td>
<td>4.16 (.64)</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>4.37 (.48)</td>
</tr>
<tr>
<td>Social</td>
<td>4.49 (.47)</td>
</tr>
<tr>
<td>Support</td>
<td>4.50 (.57)</td>
</tr>
<tr>
<td>Environment</td>
<td>4.55 (.41)</td>
</tr>
<tr>
<td>Academics</td>
<td>4.62 (.40)</td>
</tr>
</tbody>
</table>

*Note: $M =$ mean; $SD =$ standard deviation
PA = Physical Activity and AA = Academic Achievement

Discussion of Ecological Factors as they relate to Likert scale items:
Enjoyment as it pertains to PA: fun, with friends, feels good, less depression and stress
Motivation: staying fit, doing well in school, staying out of trouble, enjoys competition
Self-efficacy: goals, positive self-esteem and body image, measures success
Social: being with friends, meeting new friends, teammates, being involved, leadership
Support: support from parents, siblings, friends, teachers, coaches, and community
Environment: family/friends exercise, opportunities provided, facilities accessible, finances
Academics: enjoy school, do their best, parents/teachers/coaches high expectations, success
included questions on setting goals, self-esteem, heath, body image, and success. Both high physically active/high academic ($M = 4.55$) and high physical activity/low academic ($M = 4.01$) groups had environmental influences as one of the highest mean scores. These Likert scale questions ask students if parents, siblings, and friends exercise, if opportunities for physical activity are provided, if students have access to facilities, and if finances are available for the students to participate.

Figure 4.3 shows a graphical representation of the ecological factors that influence physical activity participation between the low physical activity/low academic group and the high physical activity/high academic group.

Data shows the high physical activity/high academic group is higher in all ecological factors. The low group overall has greater variance in the scale score means, while the high group has less of a range. Ecological factors showing the greatest mean scores for the low group include social influences, self-efficacy, and support. Ecological factors showing the greatest influences for the high group include academics, environment, support, and social influences. Both groups have enjoyment and motivation as the lowest mean scores.

The ecological factors academics, environment, and motivation show the greatest increase from the low to the high group, and all three show the greatest significant differences in mean scale scores (Tables 4.4 and 4.5). Data shows less of an increase from the low to the high group for social influences and self-efficacy. Although the data shows significance, there is less difference between the mean scores for the two groups than there is for all other ecological factors.
Table 4.7 shows a correlation matrix for the Likert scale ecological factors. Factors showing moderate correlations include: enjoyment and motivation $r(206) = .612, p < .01$; enjoyment and self-efficacy $r(206) = .615, p < .01$; and motivation and self-efficacy $r(206) = .570, p < .01$. 

Figure 4.3 Comparison of Ecological Factor Mean Scale Scores Between the Low Physical Activity-Low Academic Group and the High Physical Activity-High Academic Group.

Lo-Lo – Low physical activity and low academic achievement.
Hi-Hi – High physical activity and high academic achievement.

Aca = Academics, Env = Environmental influences, Sup = Support, Soc = Social influences, SE = Self-efficacy, Enj = Physical activity enjoyment, Mot = Motivation.
Table 4.7
Correlation Matrix Between Likert Scale Ecological Factors

<table>
<thead>
<tr>
<th>Measure</th>
<th>Enj</th>
<th>SE</th>
<th>Mot</th>
<th>Soc</th>
<th>Sup</th>
<th>Env</th>
<th>Aca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enj</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>.62*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mot</td>
<td>.61*</td>
<td>.57*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soc</td>
<td>.47*</td>
<td>.54*</td>
<td>.54*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sup</td>
<td>.38*</td>
<td>.53*</td>
<td>.51*</td>
<td>.55*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env</td>
<td>.37*</td>
<td>.36*</td>
<td>.41*</td>
<td>.38*</td>
<td>.37*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Aca</td>
<td>.37*</td>
<td>.54*</td>
<td>.37*</td>
<td>.44*</td>
<td>.50*</td>
<td>.40*</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. *p < .05
Partial eta squared for all ecological factors ranged between .95 to .98
Enj = physical activity enjoyment, SE = Self-efficacy, Mot = Motivation, 
Soc = Social influences, Sup = Support, Env = Environmental influences, Aca = Academics.

Figure 4.4 represents the interaction for the ecological factor motivation. This graph represents a significant interaction between physical activity participation (PA) and academic achievement (AA). This interaction suggests there is a relationship between physical activity and motivation. The difference is in the level of academic achievement. The low academic achievement group shows lower motivation, while the high academic group shows greater motivation. Therefore, the data illustrates a small difference in motivation scores between the low physical activity groups, and a substantial difference between the high physically active groups. The figure also illustrates how the low physically active/high academic achievement group is actually less motivated than the low physically active, low academic achievement group. A concern with this interaction is with the low physically active/high academic group and how this group can be so
successful academically, but have such low motivation. This suggests there must be something besides motivation influencing their academic achievement.

Likert scale items where the participants compared themselves to their peers showed statistically significant differences in mean scores due to physical activity and academic achievement. Likert scales showing significance due to physical activity included athletic, competitive, and hardworking. Likert scales showing significance due to academic achievement included academics, disciplined, and successful. The only scale item not showing a significant difference between mean scores was motivation. This suggests participants do not rate themselves as being more motivated when they compared themselves to their peers.
Summary

In summary, participants included 208 eleventh and twelfth grade students. A series of descriptive statistics, correlations, and two-way ANOVAs were conducted to analyze two research questions.

Descriptive statistics revealed 98.1% of students are participating in some form and amount of physical activity each day. Data indicates more students are engaged in physical activity during the fall and summer months than during the winter months. Organized physical activity showed the greatest amount of student participation in the fall, with fewer students participating in the summer. Non-organized physical activity showed the greatest amount of student participation during the summer, with fewer students participating in the winter.

The data showed 61.5% of students participated in some form (organized and/or non-organized) physical activity at least 60 minutes a day. Most students participated in organized physical activity for 15 to 29 minutes each day, while most students participated in 60 or more minutes a day in non-organized physical activity. Physical education was the type of organized physical activity most students participated in, with only 4.8% of students attending physical education class daily. Walking was found to be the highest non-organized physical activity for student participation.

Analysis for the first research question did not provide support for the hypothesis that the amount of physical activity would have a significant influence on academic achievement (GPA). The researcher observed a non-significant relationship between these two variables.
For the second research question, a series of two-way ANOVA results showed support. There were significant differences in ecological factors that influence physical activity participation among adolescents with different levels of physical activity and academic achievement. Factors that showed significance due to physical activity included enjoyment, motivation, support, and environmental influences. Partial eta squared results showed a medium to large variance with the ecological factors enjoyment and motivation. Data also suggested 24% of a student’s physical activity was explained by motivation. This group also reported they were more athletic, competitive, and hardworking than their peers.

Factors that showed significance due to academic achievement included academics, social, and environmental influences. Results indicated academic dispositions had the greatest significant difference between group means due to the academic group. Partial eta squared results showed academics had the greatest amount of variation between academic achievement subjects. Of the student’s academic achievement, 25% can be explained by academic dispositions. These participants also reported greater mean scores compared to their peers in academics, being disciplined, and feeling more successful.

Mean scores were analyzed to determine which ecological factors were associated with physical activity participation among adolescents. The greatest differences in mean scores between the groups were motivation and enjoyment. The lowest differences in mean scores between groups were social influences and self-efficacy. There were no significant differences on physical education attitudes for physical activity or academic achievement.
High physically active groups reported environment as one of the greatest influences on physical activity participation, while the low physically active groups reported social pressures as a top influences. For the high academic groups, both reported academics as a high influence, while the low academic groups reported self-efficacy and social pressures as the highest influences on physical activity participation. Social influence was a significant similarity among all groups. Differences in influences were found in the areas of academics, environment, support, and self efficacy.

Results were analyzed for each extreme group to determine which ecological factors had the greatest influence on physical activity participation. Results showed the high physical activity/high academic group had the highest mean scores for all ecological factors. The high physically active/high academic group reported academics and environment as the top influences. The high physically active/low academic group reported self-efficacy, environment, and social influences as the greatest influences. The low physically active/high academic group reported academics and social pressures as the highest influences. The low physically active/low academic group showed social influences and self-efficacy as the greatest influences on physical activity participation.

Comparison of the low physically active/low academic group and the high physically active/high academic group revealed the low group had social influences, self-efficacy, and support as the greatest influences on physical activity participation. Ecological factors that showed the greatest influences on the high group included academics, environment, support, and social influences. For both groups, enjoyment and motivation were the lowest mean scores. Correlations between ecological factors
revealed moderate correlations for enjoyment and motivation, enjoyment and self-efficacy, and motivation and self-efficacy.

Other statistical analyses showed motivation as a statistically significant interaction between physical activity and academic achievement. The low academic achievement group showed lower motivation, while the high academic group showed greater motivation. Data found the low physically active/high academic achievement group reported they were less motivated than the low physically active, low academic achievement group.

Results indicated significant differences in views between the physical activity and academic achievement groups on the relationship between physical activity and academic achievement. Reasons for these differences are discussed further in the qualitative section.

**Phase II Qualitative**

The second qualitative phase of the study used extreme case sampling, a type of purposeful sampling, to study extreme variations in physical activity and academic achievement. According to this sequential explanatory participant selection model, the qualitative phase of the study is important for selecting participants and explaining the quantitative findings. Therefore, student’s perceptions on physical activity and academics were necessary to gain a better understanding of the relationship between physical activity and academic achievement in adolescents. During this phase, four to six participants from each of the four extreme groups were randomly selected to participate in focus group interviews.
In the following section, qualitative data is summarized to answer the third research question: What are the perceptions of physical activity and academics for adolescents with varying levels of physical activity and academic achievement? Analysis of data is presented in the form of narratives, summaries (Table 4.8), and themes (Table 4.9) to capture each extreme group’s perceptions on physical activity and academic achievement.

**Research question 3 analysis.** In the third analysis, focus group interviews and open ended survey responses were explored. Data was organized into extreme group summaries to answer the third research question: What are the perceptions of physical activity and academics for adolescents with varying levels of physical activity and academic achievement? According to Creswell (2002) narrative discussion is “the primary form for representing and reporting findings” (p.274). The following paragraphs present narrative summaries of each of the four extreme groups.

**(a) High physical activity and high academic achievement.** Each of the participants emphasized they were physically active when they were younger and continue to be physically active today. They described their memories of physical activity as social, “playing in the backyard with neighbor kids” and “playing with all my friends.” All participants agreed the reasons they continue to be physically active was because it is “fun” and their parents expect them to “do something after school instead of just sitting around.” Students shared environmental factors that continue to influence their participation today. They described “it was our lifestyle growing up” and “my mom owns a gym.” Students felt physical activity overall has had a positive impact on their learning. They discussed feeling “more awake after I do physical activity,” “more focused,” “better
concentration,” and “happy.” However, one participant felt physical education classes “don’t count as physical activity because I think they try to make us do more like, elementary school stuff.” Students agreed that if they were “really active outside of school” they should not be required to take physical education classes. Students felt they could use this time to take more rigorous academic classes. All participants felt physical activity improved health, stating it “keeps me in shape,” “improves my body,” and “makes me feel good.”

When asked about grades, participants shared their favorite classes were math, science, and English. They described how parents created “a lot of pressure to get good grades.” It was clear good grades were “expected” of them. One participant shared, “I get grounded, and so I’m kind of like forced by my parents to get straight A’s.”

Overall, participants felt there was a relationship between physical activity and grades. Participants showed a strong sense of self-efficacy. They discussed the importance of setting goals for academics and physical activity. One student stated, “it’s kind of like school; you have to like, achieve certain things to get farther.” Another student shared, “on my ACT I got my highest score because John Baylor told us to do some sprints before we went to take it, and I think that it helped.” Another student affirmed, “I remember last year I had gym class second block, and third block I just did way better because I felt like I was awake.”

(b) **High physical activity and low academic achievement.** All participants emphasized they were physically active when they were younger and continue to be physically active today. The reasons for continuing to be physically active were, “it’s fun; I like that it’s competitive” and “I like being part of a team, and just like having that trust
in other people.” One student described “feeling confident that I can actually do something.” Another student stressed the importance of physical activity in his life, “my goal is to go to the Olympics.” This student also shared an environmental influence on his participation, “I grew up in a gymnastics gym because my grandparents own it.” Students felt physical activity has a positive impact on their learning in the next class after completing physical education, “I feel more awake” and “motivated and pumped up.” Students criticized that when they participate in too much physical activity it can leave them exhausted for class, “it’s like an energy drink, gets you hyped up, then you crash.” Some participants also felt finding the time to do homework was difficult, “sports just like cuts into our lives and our school work too.” All participants recognized physical activity improved health, stating it “keeps me fit,” and “in better shape.” Participants discussed how physical activity should be “fun, where you get to be with your friends” and “you don’t feel the stress of your parents.” They suggested the school should offer more intramurals for students which are “not as competitive,” less stress from parents and pressure from coaches, and allows them to “laugh and have fun with their friends.”

When asked about grades, participants shared their favorite classes were “easy A classes like speech and pottery” and “common sense” classes. They described how they felt grades were important, but they “create a lot of stress.” Students described a lack of motivation to do well academically until a parent “gets mad” or “tells me to raise it.” Generally participants understood the importance of grades; they felt “you are more likely to get into a good college” and “they build my future.” Students also stated they “just want to graduate,” “wished they didn’t matter,” and “let them slip sometimes.”
Overall, participants felt there was a relationship between physical activity and grades. They discussed first a negative connection, “if you work out real hard and then you don’t get much sleep because of the adrenaline, you could be tired while you’re taking a test.” They also discussed the positive relationship “it gets my blood flowing so I can think better” and “it keeps me more awake and focused for class.”

(c) Low physical activity and high academic achievement. All of the participants emphasized they were physically active when they were younger, but participate in little to no physical activity today. They shared reasons for discontinuing activities, “I’m just really bad at sports” and “I just wanted to focus on school and get good grades.” All the students agreed school work was a priority and finding time to be physically active was difficult. They discussed studying “just kind of takes over your life and you don’t really have time for anything else.” Other students described how they didn’t have time to be physically active because homework and making money were more important. Students agreed that if they had workout equipment in the home it would help them to be more physically active, “cause then you wouldn’t have to go down to the gym to work out, it’s just like, right there.” Students felt physical activity has a positive and negative impact on their learning, “it keeps you more awake and aware,” “allows me to sleep better,” and “sometimes makes me tired.” Students described how physical activity makes them more focused, “sweaty, but focused.”

All participants agreed physical activity improved health, stating it “keeps me in shape,” and “burns the excess fats that are in foods I love to eat.” Participants discussed ways of improving physical activity, “start it when kids are young and keep them being physically active.” They described homework as the greatest influences on their lack of
participation, “the more schoolwork you have, the less time you have to do physical activity.”

When asked about grades, participants shared their favorite classes were math, science, and art. All of the students shared they were taking at least one Advanced Placement (AP) course. Students described how classes were tough, but felt “you got to take the challenging classes to stay competitive” for college. Students described the biggest motivators for doing well academically were, “my parents expect me to get straight A’s” and “I need scholarships to pay for college.”

Participants were divided in their thoughts on the relationship between physical activity and grades. One student shared “the healthier I am, the better I feel in the morning and the better I do at school.” Another student stated, “I wouldn’t say the lack of physical activity might hurt your grades, because there’s people out there that don’t do any physical activity and they get really good grades.” Several students also shared there was “no real connection.”

(d) Low physical activity and low academic achievement. Each of the participants emphasized they were physically active when they were younger, but most were currently not participating in any type of physical activity. They described memories of physical activity as “fun” and something to do “whenever you were bored.” Several of the participants agreed the reasons they have withdrawn from being physically active are jobs, “gotta make the paper, I don’t really do that school stuff right now,” medical reasons, “I have asthma” and “too many surgeries,” and personal choices, “I’m lazy,” “peer pressure,” and “smokin’ bud.” The reference of drug use came up multiple times during the interview from several different students. One student described his lack
of participation, “cause of my smoking [marijuana] I can’t even jog down the street anymore.” A few students blamed family as an influence on their physical activity participation, “what your family does affects a lot; like my dad, he sits on the couch and drinks a twelve pack of beer every day.” Another student commented on “both my parents don’t do anything, so I don’t.” Another student suggested, “it’s not always your family or peer pressure, sometimes it’s personal choices and how you feel.”

When asked how they felt about physical activity, students were quick to say “I don’t like it”, but acknowledged it was important for “health and body” and “necessary for health.” Comments included “I know it’s important, but I just can’t, I have asthma,” “I feel it’s a hassle, but it is necessary,” and “if I cared about my health, then I wouldn’t smoke cigarettes.” Several of the students reported it was “boring,” but “fun when you do it with friends.”

Some students felt physical activity has a positive impact on their learning. They described “feeling good,” having “more energy” and “confidence so I can work and pay attention.” However, some participants felt physical activity has negative effects on their learning. One student said physical education class made him “exhausted, like I crash in my classes.” Another student said they felt “tired after gym.”

When asked about school, participants shared their favorite classes were science, English, and industrial technology. All of the students agreed they liked these classes because of the teachers, “they give us permission to play games” and are “funny.” Another student explained, “if I don’t respect a teacher, then I won’t do anything in class.” When the discussion turned to grades, students agreed grades were important, “my car insurance goes down,” “I get good grades to be successful,” and “good grades get you
into college.” However, some students still felt, “it’s just a number” and “I got so many things going on in my life, grades are like the bottom.” Students described parent expectations as “way too much pressure” and “way too high.” Several students mentioned having some type of attention deficit, “distracted easily,” “ADHD,” “ADD,” and “anxiety.” Students agreed that if physical activity improved concentration they would participate more.

Overall, participants felt there was a relationship between physical activity and grades. Some students described a positive relationship, “physical activity helps you stay focused and you get good grades if you stay focused,” while other students expressed a negative relationship, “if you’re super worn out you can’t focus on your work.” At the end of the interview, one student summed up his thoughts, “I think it’s all about being motivated, if you don’t have motivation in your life, then you’re obviously not going to do anything but just sit around.”

**Synthesis of Physical Activity and Academic Achievement Perceptions**

The perceptions from each of the extreme groups on physical activity and academic achievement are summarized in Table 4.8. All students recognized physical activity was important for health and grades were important for college. The high physical activity groups stated physical activity was fun and a part of their lifestyle, while low physically active groups reported they do not like to participate and it was not a priority. Reasons low physically active students do not participate in physical activity included lack of time due to jobs, homework, and family influences.

On the academic side, high academic groups described grades as a priority in life. Students take Advanced Placement classes (AP) classes which are important for
determining the future and success. Students described how parents had high academic expectations. The low academic groups described grades as important, but there was no motivation to do well academically. Students felt grades created added stress in life because parents set expectations too high. The low academic group described time as a barrier for not doing well academically. Lack of motivation and time were barriers also discussed by Humber et al. (2006). Reasons for lack of time included sports, social life, and jobs.

Table 4.8

Adolescent Perceptions of Physical Activity and Academic Achievement Associated with Each Extreme Group

<table>
<thead>
<tr>
<th>Extreme Groups</th>
<th>Physical Activity</th>
<th>Academic Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>High PA High AA</td>
<td>Necessary for good health</td>
<td>Determine college / future success</td>
</tr>
<tr>
<td></td>
<td>Lifestyle, Parent expectation</td>
<td>Grades priority in life</td>
</tr>
<tr>
<td></td>
<td>Fun, Set goals</td>
<td>High parent expectations</td>
</tr>
<tr>
<td>High PA Low AA</td>
<td>Important for health</td>
<td>Lack of graduation and college</td>
</tr>
<tr>
<td></td>
<td>Fun, Family lifestyle, Set goals</td>
<td>Lack of motivation, sometimes slip</td>
</tr>
<tr>
<td></td>
<td>Enjoy teammates and Competition</td>
<td>Lack of time/creates stress</td>
</tr>
<tr>
<td>Low PA High AA</td>
<td>Necessary for health</td>
<td>Important for college and success</td>
</tr>
<tr>
<td></td>
<td>Not a priority</td>
<td>Priority in life, taking AP classes</td>
</tr>
<tr>
<td></td>
<td>Lack of time due to homework</td>
<td>High parent expectations</td>
</tr>
<tr>
<td>Low PA Low AA</td>
<td>Necessary for health, but don’t care</td>
<td>Important to get into college</td>
</tr>
<tr>
<td></td>
<td>Family: alcoholism, lack of PA</td>
<td>Lack of motivation</td>
</tr>
<tr>
<td></td>
<td>Do not like to participate, boring</td>
<td>Parent expectations too high</td>
</tr>
</tbody>
</table>

*Note: PA = Physical Activity; AA = Academic Achievement*
Discussion of Themes

A chart of themes (Table 4.9) was designed to compare and contrast the four extreme groups. Themes which emerged from this research are similar to the research by Humbert et al. (2006) suggesting physical activity was influenced by three ecological factors: intrapersonal, social, and environmental influences. However, data analysis revealed themes were strong enough to stand alone rather than be grouped into one of three major themes.

The themes from the qualitative analyses included: physical activity enjoyment, motivation, self-efficacy, perceived feelings, health, social influences, adult support, environment, academics, and barriers. Based on the thick, rich descriptions from students, it was felt barriers should be represented as a separate theme rather than integrated into other themes. Barriers are discussed further in Chapter 5 when quantitative and qualitative data are merged to discuss the relationship between physical activity and academic achievement.

Similar perceptions were held among groups for health and perceived feelings. Students stated physical activity was important for health; it helps them feel better, and was necessary for getting fit and staying in shape. Another similar theme among the groups was social influences. Students described how friends played a major role in physical activity participation. Students explained they were more likely to participate in physical activity if friends were involved, making it more fun (Humbert et al., 2006). A common barrier among the groups was time. Students discussed it was difficult to find time to engage in physical activity every day.
### Table 4.9
Analysis of Themes Derived from Qualitative Instruments Associated with Each Extreme Group

<table>
<thead>
<tr>
<th>Themes</th>
<th>Extreme Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High PA</td>
</tr>
<tr>
<td></td>
<td>High AA</td>
</tr>
<tr>
<td></td>
<td>Low PA</td>
</tr>
<tr>
<td></td>
<td>Low AA</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>It’s fun</td>
</tr>
<tr>
<td></td>
<td>I enjoy it</td>
</tr>
<tr>
<td></td>
<td>Like it</td>
</tr>
<tr>
<td></td>
<td>Fun with friends</td>
</tr>
<tr>
<td></td>
<td>Like -Don’t like</td>
</tr>
<tr>
<td></td>
<td>Ok with friends</td>
</tr>
<tr>
<td></td>
<td>Not fun –</td>
</tr>
<tr>
<td></td>
<td>Fun with friends</td>
</tr>
<tr>
<td>Motivation</td>
<td>College athlete</td>
</tr>
<tr>
<td></td>
<td>Parent rewards</td>
</tr>
<tr>
<td></td>
<td>Competition</td>
</tr>
<tr>
<td></td>
<td>Fun</td>
</tr>
<tr>
<td></td>
<td>Parents</td>
</tr>
<tr>
<td></td>
<td>Competition</td>
</tr>
<tr>
<td></td>
<td>Good grades</td>
</tr>
<tr>
<td></td>
<td>Scholarships</td>
</tr>
<tr>
<td></td>
<td>“lazy”</td>
</tr>
<tr>
<td></td>
<td>Recognition</td>
</tr>
<tr>
<td>*Self-Efficacy</td>
<td>Set goals</td>
</tr>
<tr>
<td></td>
<td>Confidence</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
</tr>
<tr>
<td></td>
<td>Set goals</td>
</tr>
<tr>
<td></td>
<td>Confidence</td>
</tr>
<tr>
<td></td>
<td>Push myself</td>
</tr>
<tr>
<td>Perceived</td>
<td>Feel better</td>
</tr>
<tr>
<td>Feelings</td>
<td>Feel better</td>
</tr>
<tr>
<td></td>
<td>Feel good</td>
</tr>
<tr>
<td></td>
<td>Pumped up</td>
</tr>
<tr>
<td></td>
<td>Tired</td>
</tr>
<tr>
<td></td>
<td>Feel better</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
</tr>
<tr>
<td></td>
<td>Feel good</td>
</tr>
<tr>
<td></td>
<td>Exhausted</td>
</tr>
<tr>
<td>Health</td>
<td>Focus</td>
</tr>
<tr>
<td></td>
<td>Feel good</td>
</tr>
<tr>
<td></td>
<td>Learn better</td>
</tr>
<tr>
<td></td>
<td>In shape</td>
</tr>
<tr>
<td></td>
<td>Better body</td>
</tr>
<tr>
<td></td>
<td>PA Important</td>
</tr>
<tr>
<td></td>
<td>Better about self</td>
</tr>
<tr>
<td></td>
<td>Relieves stress</td>
</tr>
<tr>
<td></td>
<td>Better shape</td>
</tr>
<tr>
<td></td>
<td>Burn excess fat</td>
</tr>
<tr>
<td></td>
<td>Fit and healthy</td>
</tr>
<tr>
<td></td>
<td>Staying fit</td>
</tr>
<tr>
<td></td>
<td>Not overweight</td>
</tr>
<tr>
<td></td>
<td>Look good</td>
</tr>
<tr>
<td>Social</td>
<td>New friends</td>
</tr>
<tr>
<td></td>
<td>Friends</td>
</tr>
<tr>
<td></td>
<td>Friends</td>
</tr>
<tr>
<td></td>
<td>Friends</td>
</tr>
<tr>
<td></td>
<td>Only if friends</td>
</tr>
<tr>
<td></td>
<td>participate</td>
</tr>
<tr>
<td></td>
<td>Friends don’t participate</td>
</tr>
<tr>
<td></td>
<td>Peer pressures</td>
</tr>
<tr>
<td>Adult support</td>
<td>Parents</td>
</tr>
<tr>
<td></td>
<td>Parents</td>
</tr>
<tr>
<td></td>
<td>Parents</td>
</tr>
<tr>
<td></td>
<td>Lack of Parents</td>
</tr>
<tr>
<td></td>
<td>participation</td>
</tr>
<tr>
<td>Environment</td>
<td>Mom owns gym</td>
</tr>
<tr>
<td></td>
<td>Lifestyle</td>
</tr>
<tr>
<td></td>
<td>Family owns gym</td>
</tr>
<tr>
<td></td>
<td>Lack of equipment</td>
</tr>
<tr>
<td></td>
<td>Marijuana</td>
</tr>
<tr>
<td></td>
<td>Parent alcoholic</td>
</tr>
<tr>
<td>Academics</td>
<td>College</td>
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<td>College</td>
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<td>College</td>
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<td>College</td>
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<td>Lack of motivation</td>
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<td>Lack of motivation</td>
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<tr>
<td>Barriers</td>
<td>Time</td>
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<td></td>
<td>Time, Jobs</td>
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<td></td>
<td>Schoolwork</td>
</tr>
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<td></td>
<td>Time, jobs</td>
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</tbody>
</table>

*Note.* Analysis represents data from open ended survey and focus group interviews.  
*Self-efficacy questions on the survey include health and body image.*
Differences in perceptions among the groups were revealed within the themes of enjoyment, motivation, self-efficacy, adult support, environment, and academic influences. Data shows students high in physical activity enjoy participating more in exercise, show greater motivation to participate, set goals for themselves, and have higher self-confidence. Students high in academic achievement show greater motivation to do well academically, set high academic goals, describe positive adult support, and accomplish high parental expectations. Adolescents high in physical activity or academic achievement tend to have greater parental support than students who are low in physical activity and academic achievement. The theme of support might help explain the theme of environmental influences. High physically active participants described families as physically active, while those low in physical activity mentioned parents were not physically active. The low physically active students described environments with little to no physical activity, alcoholic parents, peer pressure, and the involvement of risky behaviors such as drug and alcohol use.

Differences in these themes were found to be greatest between the extremes of high and low physical activity and high and low academic achievement. However, when the data was viewed as the four extreme variations combined (Hi-Hi, Hi-Lo, Lo-Hi, Lo-Lo) the groups began to have different overall perceptions on physical activity and academics. Next, a summary is provided on these similarities and differences between the four extreme groups.

Summary

Analysis of focus group interviews and open ended survey responses revealed substantive differences in perceptions of physical activity and academics between each of
the four extreme groups. However, data does reveal similarities in perceptions among the high physically active, low physically active, high academic, and low academic groups.

Overall, themes that emerged from this section included: physical activity enjoyment, motivation, self-efficacy, perceived feelings, health, social influences, adult support, environment, and barriers. All students’ recognized physical activity was important for good health, helps them to feel better, and is necessary for staying in shape. Participants also acknowledged grades were important for graduating high school and getting into college. Student’s described social life as a major influence on physical activity participation, suggesting they were more likely to participate if friends were involved. Time was a barrier for all groups.

Major differences in this section included enjoyment, motivation, self-efficacy, adult support, environmental influences, and academics Data showed students high in physical activity enjoyed participating in exercise, had greater motivation, higher self-confidence, and set goals. The high physical activity groups described physical activity as fun and a way of life, while low physically active groups stated it was boring and not a priority in their life. Students high in physical activity were more motivated to participate in physical activity than the low physical activity group and had friends and family influencing their participation. Data suggests adolescents high in physical activity and/or academic achievement have greater parental support than students low in physical activity and academic achievement. In addition, environment plays a role in differences between high and low physically active groups. High physical activity participants have active families, while low physically active participants have low participation among their families.
As for academic achievement, high academic groups described grades as being a priority in their life. Students described grades were important for determining success and parents set high expectations. The low academic groups described grades as important, but they had no motivation to do well academically. These differences in themes are discussed further in the next chapter when the qualitative data is connected to the quantitative findings.
Chapter 5

Discussion

The organization of this study was informed by previous studies on physical activity and academic achievement and on theoretical models of physical activity influences. The quantitative instrument was designed to reflect self-reported physical activity measures and attitudinal beliefs, while the qualitative strategy was chosen to examine previous research on physical activity influences. This explanatory mixed methods model was designed with the idea that the qualitative data would be used to build on the quantitative findings. Therefore, the following sections provide qualitative evidence to support and explain the quantitative findings.

Interpretation of Quantitative and Qualitative Results

Upon analysis of both quantitative and qualitative data, interpretations of the final research questions were answered by connecting the data. The qualitative follow-up, focus group interviews, and survey open ended questions were used to explain the quantitative survey data.

Analytical strategies for the integration of quantitative and qualitative data included: typology development, extreme case analysis, and data merging (Caracelli & Green, 1993). For the typology development, the design and analysis of the quantitative instrument was used as a framework to examine the qualitative results. In the extreme case analysis, the extreme cases were selected from the quantitative data and then interviewed in focus groups, with the intent of testing the initial explanation for the extreme cases. The final strategy, data merging, involved making data tables to show the connection between the two types of data and for explaining the final two questions.
Figure 5.1 shows a visual summary of the mixed methods approach used for this study with the interpretation of results being the focus of this chapter.

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
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<tbody>
<tr>
<td>QUAN →</td>
<td>Participant selection → QUAL</td>
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<tr>
<td>Survey</td>
<td>Focus Group &amp; Open Ended</td>
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<tr>
<td></td>
<td>Extreme cases</td>
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<td></td>
<td>Survey</td>
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<td>Responses</td>
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<td>Typology development</td>
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<td></td>
<td>Extreme case analysis</td>
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<td></td>
<td>Data merging</td>
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</table>

Figure 5.1 Visual Summary for Sequential Explanatory Mixed Methods Design

Table 5.1 provides an illustration of the merged quantitative and qualitative data, in an effort to provide a better, more concrete understanding of ecological factors that influence physical activity participation among adolescents.

Social influence (range $M = 4.01 - 4.49$) were found to be a common ecological factor shared by all four extreme groups. Qualitative data suggested when friends are involved in physical activity adolescents are more likely to participate, as found by Humbert et al. (2006). Self-efficacy (range $M = 3.90 - 4.20$) was a strong factor among three of the four groups in the quantitative data. Survey questions asked students about the importance of physical activity for improved health, body, and self-esteem. All four groups stated they recognized physical activity was important for health. Three of the four groups showed support (range $M = 3.89 - 4.50$) as a strong quantitative factor and qualitative theme. High physically active and high academic groups all described support by family, friends, school, and community. The low physically active/low academic
group reported support as a high influence; however, qualitative data does not show positive support. This group described adult pressures as negative unlike positive support from peers, parents, and teachers.

Table 5.1
Connection of Quantitative and Qualitative Data to Explain which Ecological Factors Influence Physical Activity Participation Among Adolescents

<table>
<thead>
<tr>
<th>Extreme Groups</th>
<th>Influence on Physical Activity Participation</th>
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<tbody>
<tr>
<td></td>
<td>Quantitative Ecological Factors (M)</td>
</tr>
<tr>
<td>High PA</td>
<td>Academics (4.62)</td>
</tr>
<tr>
<td></td>
<td>Environment (4.55)</td>
</tr>
<tr>
<td>High AA</td>
<td>Support (4.50)</td>
</tr>
<tr>
<td></td>
<td>Social (4.49)</td>
</tr>
<tr>
<td></td>
<td>*Self-efficacy (4.20)</td>
</tr>
<tr>
<td>High PA</td>
<td>Environment (4.01)</td>
</tr>
<tr>
<td>Low AA</td>
<td>Social (4.01)</td>
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<tr>
<td></td>
<td>Support (4.01)</td>
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<tr>
<td></td>
<td>Academics (4.44)</td>
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<tr>
<td></td>
<td>Social (4.20)</td>
</tr>
<tr>
<td>Low PA</td>
<td>Environment (3.97)</td>
</tr>
<tr>
<td>High AA</td>
<td>*Self-efficacy (3.90)</td>
</tr>
<tr>
<td></td>
<td>Social (4.16)</td>
</tr>
<tr>
<td></td>
<td>Support (3.89)</td>
</tr>
<tr>
<td></td>
<td>*Self-efficacy (3.90)</td>
</tr>
</tbody>
</table>

Note: PA = Physical Activity; AA = Academic Achievement
M = mean scale scores; Motivation (p = .0001), Environment (p = .0002), and Support (p = .0021) had the greatest significance difference between physical activity and academic group means.

Discussion of Ecological Factors as they relate to Likert scale items:
Academics: enjoy, do their best, parents/teachers/coaches high expectations, success
Environment: family/friends exercise, opportunities provided, facility access, finances
Support: support from parents, siblings, friends, teachers, coaches, and community
Social: being with friends, meeting new friends, teammates, being involved, leadership
Self-efficacy: goals, PA improves self-esteem, health and body image, feel successful
Environment (range $M = 3.97 - 4.55$) was a strong ecological factor shared among three of the four groups. High physically active groups described how physical activity was a lifestyle. Students discussed being surrounded by family and friends who are physically active. The low physical activity/low academic group did not report environment as a high factor influencing participation. Instead, students described negative environmental influences such as risky behavior and lack of parent participation as reasons for not participating. The final ecological factor, academics (range $M = 4.44 - 4.62$) was found only among the high academic groups. These groups described how parents have very high academic expectations.

One ecological factor not presented in the table that warrants further discussion is motivation. The mean range for this physical activity influence among all four groups was $3.00 - 4.16$. All four groups rated motivation in the survey as a low ecological factor. Motivation ($p = .0001$) showed the greatest amount of variation between subjects ($\eta_p^2 = .17$), with 24% of student’s physical activity participation attributed to motivation. Mean difference between groups and an explanation for not ranking higher among the ecological factors can be explained by the survey questions. Some of the survey questions asked students about playing sports in college and enjoying competition. While some students may enjoy physical activity, they may not necessarily plan on playing in college or enjoy competing. Qualitative analysis revealed high physically active and high academic groups were motivated to participate in physical activity and academics. The high physically active/low academic group described motivation for physical activity but a lack of motivation academically until a parent “gets mad.” The low physically active/high academic group described how studying “just takes over your life, and you
don’t really have time for anything else.” Students described motivation for doing well, “my parents expect me to get straight A’s” and “I need scholarships to pay for college.” The low physically active/low academic group described a lack of motivation physically and academically. One student shared, “I think it’s all about being motivated, if you don’t have motivation in your life, then you’re obviously not going to do anything but just sit around.”

The next section will quantify the qualitative data to explain student responses on the relationship between physical activity and academic achievement.

**Research question 4 analysis.** The fourth analysis examined the qualitative data to answer the question: How do adolescent’s perceptions on physical activity and academics help explain the relationship between physical activity and academic achievement? Quantitative data revealed a significant difference in views between groups on the relationship between physical activity and academic achievement. Analyses of qualitative findings differ in views. Overall, a greater number of adolescents stated there is a relationship between physical activity and academic achievement. Due to ecological factors such as motivation, environment, enjoyment, and social influences, some adolescents are still not convinced a relationship exists.

(a) **High physical activity and high academic achievement.** According to the qualitative responses, 71% of students believe there is a positive relationship between physical activity and academic achievement, while 12.9% believe there is no relationship.

- “Without physical activity I would always be tired in school and would not have any motivation to complete my school work.”
“I definitely believe physical activity helps the brain function. I'm most alert after gym class, and I got my best ACT score after doing exercise to warm up.”

Another 9.7% of students believe that physical activity helps grades, but too much exercise can negatively affect grades.

“Sometimes my physical activity causes me to not do as well in school because I am more focused on my sports.”

The remaining 6.4% of students were unsure if there was a relationship between physical activity and academic achievement.

\[ (b) \text{ High physical activity and low academic achievement.} \]

According to the qualitative responses, 54.5% of students believe there is a positive relationship between physical activity and academic achievement, while 4.5% believe there is a negative relationship.

“The more active I am the better grades I get.”

“I think physical activity helps. It keeps me more awake and focused for class.”

Another 27.3% of students believe there is no relationship between physical activity and academic achievement.

“I don’t think it helps grades. You have to want to make your grades and yourself improve. I don’t think physical activity influences that.”

The remaining 13.7% of students were unsure if there was a relationship between physical activity and academics.
(c) Low physical activity and high academic achievement. According to the qualitative responses, 40% of students believe there is a positive relationship between physical activity and academic achievement, while 5% believe there is a negative influence. Another 5% of students believe that physical activity helps grades, but too much can negatively affect GPA.

- I think moderate regular physical exercise can increase grades, but if becomes too intense or too time-consuming, then I think grades will drop. Intense work-outs can tire someone so they cannot think clearly and too often work-outs take time away from studying.

Another 35% of students believe there is no relationship between physical activity and academic achievement.

- “I get fine grades and I don’t ever do physical activity.”
- “I don’t believe that my physical activity makes me do better in school. I’ve had consistent A’s and B’s all my life.”

The remaining 15% of students were unsure if there was a relationship between physical activity and academics.

(d) Low physical activity and low academic achievement. According to the qualitative responses, 61.9% of students believe there is a positive relationship between physical activity and academic achievement, while 4.8% believe there is a negative relationship

- “Physical activity helps you stay focused and you get good grades if your stay focused.”
• “They really go hand in hand. The better you feel about yourself the more successful you will be.”

Another 23.8% of students said there is no relationship between physical activity and academic achievement.

• “Physical activity has no impact on school unless you play for a team where you have to get good grades.”

The remaining 9.5% of students were unsure if there was a relationship between physical activity and academics.

Data shows students are mixed in their perceptions of the relationship between physical activity and academic achievement. Out of the four extreme groups, 56.9% of participants believe there is a positive relationship, 7.2% believe it is negative, 24.8% believe no relationship exists, and 11.2% are unsure if there is a relationship. Extreme group data was found to be comparable to overall participant data (N = 208). Data collected from open ended survey responses found 54.8% of students felt there was a positive relationship between physical activity and academic achievement, while 25% of participants felt there was no relationship.

One group that stood out was the low physical activity/high academic group. Only 40% of students felt there was a relationship between physical activity and academic achievement and 35% believed there was no relationship. Students described they do not participate in physical activity and are able to do well academically. One student stated, “I wouldn’t say the lack of physical activity might hurt your grades, because there’s people out there that don’t do any physical activity and they get really good grades.”
Another surprising finding was the low physical activity/low academic group. In this group 61.9% of the participants said there was a positive relationship, but they were not physically active.

In conclusion, data suggests more students feel there is a positive relationship between physical activity and academic achievement (56.9%). However, 36% of students believe there is no relationship or are unsure of the relationship between physical activity and academic achievement. Suggestions for increasing physical activity are provided in the next section.

**Research question 5 analysis.** Analysis of this research question involved exploring qualitative findings. The research question was: For adolescents with different physical activity and academic achievement levels, what recommendations are offered for increasing physical activity? Adolescent suggestions were summarized and are outlined in Table 5.2.

Themes that emerged from this data provide suggestions for adolescents (find something they enjoy, involve friends, make time, and set goals), parents (limit time indoors, start kids young and keep them active, and discourage drug use), schools (make it fun, require more physical education, offer more intramurals or recreational leagues, allow students choices during physical education, make equipment more accessible to all students, and do not cut students from a team), and community (stress the importance of health, provide more opportunities after school, and expand intramurals or high school recreational leagues). Further discussion on these themes is provided in the implications section of the paper.
Table 5.2

Adolescent Recommendations for Increasing Physical Activity

<table>
<thead>
<tr>
<th>High Physical Activity</th>
<th>High Physical Activity</th>
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<tbody>
<tr>
<td>High Academic Achievement</td>
<td>Low Academic Achievement</td>
</tr>
</tbody>
</table>

- Find something you enjoy and stick with it
- Involve friends
- Offer more intramurals
- Student choices during physical education
- School sponsored recreational leagues
- Stress the importance of health

- Set goals
- Involve friends
- Get outside, limit time indoors
- Make it fun
- Student choices during physical education
- Stress the importance of health

<table>
<thead>
<tr>
<th>Low Physical Activity</th>
<th>Low Physical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Academic Achievement</td>
<td>Low Academic Achievement</td>
</tr>
</tbody>
</table>

- Make time for it
- Encourage friends to participate
- Start kids young and keep them active
- Make it fun
- Make equipment more accessible
- Stress the importance of health

- Increase motivation
- Offer rewards, praise, and recognition
- Provide more opportunities after school
- Do not cut students from the team
- Require more physical education classes
- Stress the importance of health

*Note:* Themes that emerged from the data provide recommendations for adolescents, parents, schools, and the community.
A goal of this research was to inform parents, schools, and the community on how to encourage adolescents to lead a physically active life. This study provides knowledge to reinforce and build on literature (CDC, 1997; Pate et al., 2006) so parents, schools and the community can promote physical activity among youth. Numbered statements are suggestions from the literature. Lettered statements are specific suggestions to add to the literature. These suggestions were taken from discussions during the research.

1. Establish policies that promote enjoyable, lifelong physical activity among adolescents.
   a. Schools can build this into the physical education and health curriculum.

2. Require adolescents to participate in a minimum of 60 minutes of moderate-to-vigorous physical activity during the day; this includes recess, physical education classes, and extra-curricular activities.
   a. Require students to participate in at least one physical activity of their choice each year.
   b. Do not cut students from high school teams.

3. Implement standards-based physical education curriculum that emphasizes enjoyable and moderate-to-vigorous physical activity participation and helps students adopt and maintain physically active lifestyles.
   a. Physical education classes can provide differentiation and offer students choices to make physical activity fun and meaningful.
4. States should hold schools districts accountable for delivering physical education programs that meet national standards for quality and quantity of 225 minutes per week for grades 9 to 12 of physical activity.
   a. Require more physical education classes.

5. Provide safe and enjoyable environments that encourage physical activity.
   a. Provide more opportunities before and after school.

6. Provide extracurricular physical activity programs that meet the needs and interests of all students.
   a. Offer more intramurals
   b. Offer non-competitive clubs: biking, walking, running, yoga, weightlifting

7. Include parents and guardians in physical activity instruction, extracurricular and community physical activity programs.
   a. Start children young and keep them active.
   b. Provide school sponsored recreational leagues.

8. Provide training for educators, coaches, and other community personnel to promote enjoyable, lifelong physical activity among youth.
   a. Offer speakers, training sessions, and seminars to educate parents and the community on physical activity for body and brain health.

9. Provide a range of developmentally appropriate community sports and recreation programs that are attractive to all young people.
   a. More non-competitive opportunities should be provided for high school students.
10. Make facilities available to community based organizations during after-school, weekend, and summer periods.
   a. Make equipment more accessible for all students to use.

11. Schools can collaborate with community organizations in promoting physical activity programs to students and parents.

Implications

This study has provided insight into adolescents’ perceptions on the relationship between physical activity and academic achievement. The major contributions of this study were to determine if students recognize the role physical activity plays in brain health, to explore students’ perceptions and understanding of the reason for decline in physical activity, and for adolescents to provide recommendations for increasing participation. It is believed no research to date has explored students’ perceptions to explain the relationship between physical activity and academic achievement. This study has reinforced and discovered some important factors which influence physical activity participation. Perhaps now an effort can be made to reverse the decline in physical activity participation among adolescents. The use of the mixed methods design to collect and analyze quantitative and qualitative data, allowed a more complete understanding of the research questions.

The results of this study are intended for several audiences: adolescents, parents, physical education teachers and school administrators, healthcare providers, and community members and leaders. Recognizing the gap in students’ beliefs in the relationship between physical activity and academic achievement and knowing which ecological factors influence physical activity participation, may assist in future
development of family, school, and community programs to enhance physical activity participation among youth. Specifically, the implications in this study include:

**Adolescents.** Student motivation was found to be important for physical activity. Therefore, if students are not seeing some type of incentive or enjoyment they are more likely to decrease activity participation. It was suggested by the students that adolescents find something they enjoy doing, set goals, make time everyday to exercise, and encourage friends to participate.

**Parents.** Environmental influence and adult support were found to be high influences on physical activity participation. Data found, when parents and family participate in physical activity, adolescents are more likely to be involved. Parents should provide opportunities for involvement, encourage the use of indoor and outdoor facilities (health clubs, fitness center, parks and recreation areas), and explore alternatives if there are financial constraints. Adolescents suggested parents should start children young and continue to keep youth active, set aside time for exercise, limit time indoors, and stress the importance of physical activity for a healthy life.

**Schools.** Physical activity enjoyment, adult support, and social influences were found to be strong ecological factors for adolescent participation in physical activity. Therefore, physical activity needs to be fun and more meaningful to the students. Quantitative data show no mean significant difference on physical education between physical activity and academic achievement groups. The data indicates students are slightly positive in feelings about physical education classes. This suggests students view physical education classes as equitable for all students, regardless of the level of physical activity or academic achievement. However, qualitative data revealed displeasures with
physical education classes. Students said it was not as fun, rigorous, or meaningful as it should be. Educators and administrators should be aware of suggestions from students and provide opportunities to promote positive attitudes toward physical activity. Schools should provide a relaxed, non-competitive atmosphere to encourage meaningful participation for all students. It was suggested physical education class provide more curriculum on the importance of physical activity for body and brain health, require more physical education classes for graduation, and offer more meaningful opportunities during class. Students described the need for physical education classes to provide more differentiation. Other recommendations were to make health equipment more accessible to all students, provide more opportunities after school, offer more intramurals, and recognize the importance of fitness for life by not cutting students from a team.

**Community.** The greatest influences the community has on adolescent participation in physical activity is recognizing and modeling the importance of fitness for life and providing more after school and summer opportunities for high school students. The community could also offer outreach and training to parents so they could encourage life-long physical activity and provide a healthy lifestyle in the home.

**Recommendations for Future Research**

With the topic of physical activity and academic achievement, countless questions are feasible, thereby creating many options for future research. Some questions which still remain unanswered in this study include:

1. Would the results of this study be different if the population was random 9th – 12th graders rather than purposefully choosing 11th – 12th graders?
2. Why do some students feel there is a relationship between physical activity and academics, while others do not? What factors are influencing these beliefs?

3. Why is motivation stronger in the low physically active – low academic group than the low physically active – high academic group? Why is there a greater gap between the high physically active group trends on academic achievement with the high academic group reporting lower motivation than the low academic achievement group? The idea of motivation needs to be explored further.

4. Does the outcome of physical activity engagement have short term rather than long term implications on student learning, that is, how students feel in class after participating in physical education class verses cumulative GPA.

These and other questions lead to the following suggestions for consideration for future research:

1. Replicating this study with a larger, more diverse population (ethnicity, socioeconomic status, rural/urban).

2. Investigating physical activity influences on younger adolescents ages 12 – 14 to examine possible explanations for continued or discontinued participation.

3. Exploring the concept that adolescents are more likely to participate in fitness for life if parents and siblings are physically active.

4. Studying intrinsic and extrinsic motivation in adolescents to describe how this could influence physical activity participation.
5. Examining the 40 Developmental Assets (Search Institute, 2010) to see how these building blocks of healthy development might play a role in physical activity participation.

6. Conducting an experimental study to see if physical activity improves classroom grades or achievement scores.

7. Conducting longitudinal studies to follow the extreme cases for 3 – 5 years.

8. Researching medical case studies to examine underlying factors of motivation, nutrition, sleep, and BMI on academic achievement.

9. Refining measurements for examining physical activity levels of high school youth.
Chapter 6

Summary

Study Design

The purpose of this sequential explanatory mixed method study was to explain the relationship between physical activity and academic achievement by exploring adolescent’s perceptions on physical activity and academics.

In the first quantitative phase of the study, adolescent’s physical activity levels and GPAs were reported, descriptive statistics were analyzed, and correlations were performed. The first research question was to determine if there was a statistically significant relationship between physical activity and academic achievement. Based on the correlation scatterplot performed in the first question, participants were selected and grouped into four extreme cases. For the second quantitative question, two-way ANOVAs were conducted to determine if differences existed between high/low physical activity and high/low academic achievement (GPA) for each of the Likert scale items on ecological factors that influence physical activity participation (ie., enjoyment, motivation, self-efficacy, social, support, environment).

During the second qualitative phase, four to six students from each of the four extreme cases were interviewed in small focus groups. The rationale for the focus groups was to answer the third research question by exploring student’s perceptions on physical activity and academics.

Finally, quantitative and qualitative findings were integrated in the discussion section of the study to answer the fourth and fifth research questions. To answer these questions, both sets of data were merged, using student’s perceptions on physical activity
and academics to explain the relationship between physical activity and academic achievement among adolescents and to provide suggestions for increasing physical activity participation in youth.

**Quantitative Phase**

In the first quantitative phase, data was collected via a web-based survey developed by the researcher. Overall, 208 students agreed to participate in the survey. In the first section of the survey, participants were asked to self-report physical activity participation in the past 12 months in organized and non-organized physical activity. The second section asked the participants to complete a series of Likert scale and open ended questions on physical activity and academic achievement. The open ended survey questions were used for the qualitative data collection. A series of descriptive statistics, correlations, and two-way ANOVAs were conducted to analyze the first two research questions.

Examination of descriptive statistics revealed most students (61.5%) meet the daily recommendation of 60 minutes of physical activity each day (Strong et al., 2005). Data indicated 98.1% of students are participating in some form and amount of physical activity each day. Data showed more students engaged in physical activity during the fall and summer than during the winter months. Organized physical activity had the greatest amount of students participating in the fall, with less students participating in the summer. Non-organized physical activity had the greatest amount of participation during the summer, with fewer students participating in the winter. Physical education was reported to have the highest number of student participants for organized physical
activity, while walking, running, and weightlifting were reported to have the highest student participants for non-organized physical activity.

Analysis of the first research question did not provide support for the hypothesis that there would be a positive linear association between physical activity and academic achievement.

For the second research question, a series of two-way ANOVA results showed support for significant differences in ecological factors influencing physical activity among adolescents with different levels of physical activity and academic achievement. Factors that showed significance due to physical activity included enjoyment, motivation, support, and environmental influences. Partial eta squared results showed medium to large variance for enjoyment and motivation. Motivation was found to account for 24% of a student’s physical activity participation. This physically active group also reported being more athletic, competitive, and hardworking, than their peers.

Factors that showed significance due to academic achievement included academics, social, and environmental influences. Results indicated academic dispositions had the greatest significance difference. Partial eta squared results indicated academics had the greatest amount of variation; while 25% of a student’s academic achievement can be explained by academic dispositions. This academic group reported greater mean scores compared to their peers in academics, being disciplined, and feeling successful.

Ecological factors with the greatest differences in mean scores between the physical activity and academic achievement groups were motivation and enjoyment. Statistical analyses showed motivation as a statistically significant interaction between physical activity and academic achievement. The low academic achievement group had
lower motivation, while the high academic group had greater motivation. Data found the low physically active/high academic group was less motivated than the low physically active/low academic group. The lowest differences in mean scores between groups were social influences and self-efficacy. Correlations between ecological factors revealed moderate correlations for enjoyment and motivation, enjoyment and self-efficacy, and motivation and self-efficacy.

High physically active groups reported environment and support as top influences on physical activity participation, while low physically active groups reported social pressures as a main influence. For the high academic groups, academics and environment were the highest influences, while the low academic groups reported self-efficacy and social pressures as the top influences. All groups reported social influences as a top ecological factor for influencing physical activity participation. Different influences found among the groups were in academics, environment, support, and self-efficacy.

The high physical activity/high academic achievement group had the greatest mean scores for all ecological factors. This group reported academics and environment as the top physical activity influences. The high physically active/low academic group reported self-efficacy, environment, and social influences as the greatest influences. The low physically active/high academic group reported academics and social pressures as the highest influences. The low physically active/low academic group had social influences and self-efficacy as the greatest influences on physical activity participation.

Quantitative analyses indicated significant differences in ecological factors that influence physical activity participation among extreme physical activity and academic achievement groups. However, qualitative analyses needed to be conducted to further
examine these ecological factors to explain the relationship between physical activity and academic achievement.

**Qualitative Phase**

In the second qualitative phase, extreme case sampling was used to select participants. Data collection and analysis involved coding and developing themes from short response survey questions and focus group interviews using participants from each of the extreme groups. A series of narratives, tables, and figures were presented to answer the third research question.

Analysis of the third research question revealed substantive differences in perceptions of physical activity and academic achievement between each of the four extreme groups. However, similar perceptions were found among groups according to high physically active, low physically active, high academic, and low academic. Analysis of students perceptions on physical activity influences suggested there were ten themes to emerge from the data, (a) enjoyment, (b) motivation, (c) self-efficacy, (d) perceived feelings, (e) health, (f) social influences, (g) adult support, (h) environmental influences, (i) academics, and (j) barriers.

Similarities reported between the groups were the importance of physical activity for health and the significance of grades for college. Another similarity included social influences; if friends are involved in physical activity then adolescents are more likely to participate. The barrier discussed among all four groups was the lack of time for more physical activity participation.

Differences appeared among groups according to whether they were high/low physical activity or high/low academic achievement. The variation in perceptions among
the groups included the themes of enjoyment, motivation, self-efficacy, adult support, environmental influences, and academics. Data shows students high in physical activity enjoy participating in physical activity, have greater motivation, higher self confidence, set goals for themselves, have family who exercise, and parents with high expectations. High physically activity students described positive environmental influences playing a role in participation, while those with low physical activity expressed negative environmental influences affecting participation. Data suggests adolescents who are high in physical activity and/or academic achievement have greater parental support than students in the low physical activity/low academic achievement group. Data revealed students in the high academic groups describe grades as a priority, feel successful, and have parents with high expectations. The top ecological factors influencing physical activity found among the four groups extreme groups were:

a)  High physical activity/High academic: academics, environment, support, social
b)  High physical activity/Low academic: self efficacy, environment, support, social
c)  Low physical activity/High academic: academics, social, environment, self efficacy
d)  Low physical activity/Low academic: social, self efficacy, support

The final section of the study connects the qualitative themes to the quantitative findings to explain the relationship between physical activity and academic achievement in adolescents.
Interpretation of Quantitative and Qualitative

Upon analysis of both quantitative and qualitative data, interpretations of the final research questions were answered by connecting the data. In this final strategy, data merging, the two types of data are linked to provide a better understanding of ecological factors that influence physical activity participation among adolescents. A connection of the quantitative and qualitative results found social influences, self-efficacy, support, environment, academics, and motivation the greatest influences statistically and substantively on physical activity influences.

The fourth analysis answered the question, how do adolescent’s perceptions on physical activity and academics, help us to explain the relationship between physical activity and academic achievement? Data suggested there is a relationship between physical activity and academic achievement.

The fifth analysis provided suggestions for increasing physical activity among adolescents. One-third of an adolescent’s day is spent in a classroom. Therefore, it is essential that schools systematically and effectively provide and promote more participation in physical activity. Most schools have programs that provide students with some physical activity, but the increasing trend for obesity suggests American youth need more. Although parents, schools, healthcare, and the community are asked to share the responsibility of promoting physical activity, it makes most sense for parents and schools to enforce it.

A goal of this research was to inform parents, educators, and the community of our responsibility as adults and role models to promote healthy, physically active lives. Recommendations that emerged from this data provide suggestions for adolescents,
parents, physical education teachers, school administrators, school and community counselors, and community outreach groups.

**Conclusion**

Although the data showed no significant linear relationship between physical activity and academic achievement, participants from all four extreme groups felt there was a connection between physical activity and academic achievement. All groups reported physical activity is important for health, and has a positive impact on their learning. Ecological factors found to have the greatest influence on physical activity participation included social influences, self-efficacy, support, environment, academics, and motivation.
References


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Appendix A

IRB Approval from University of Nebraska
Dear Megan:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board’s opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution’s Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46). Your project was approved as an Expedited protocol, category 7.

You are authorized to implement this study as of the Date of Final Approval: 10/18/2010. This approval is Valid Until: 10/17/2011.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,

William Thomas, Ph.D.
Chair for the IRB
Appendix B

Permission to Perform Research in School District
Memo

To: Megan Hylok
From: Dr. Tami Williams
CC: ad hoc committee
Date: 02/27/2010
Rec: Research Application

The ad hoc committee met and reviewed your proposal to conduct research in Millard Public Schools. We are pleased to inform you that your research has been approved. You may begin your research immediately. At the conclusion of your study, the Department of Assessment, Research, and Evaluation will require a copy of your dissertation.

Cc: Dr. Pat Crum, Nancy Johnston, Greg Tiemann
Appendix C

Parental Informed Consent Form: Online Survey
Parental Informed Consent Form: Online Survey
IRB #11090

Hi, my name is Megan Hylak and I am a teacher in your child’s school. I am currently working on my doctoral degree at the University of Nebraska at Lincoln and I need your child’s help to complete my research study. I am asking for your permission to invite your child to participate in this study. I am interested in exploring adolescent thoughts about physical activity and academic achievement. The following information is provided in order to help you make an informed decision whether or not to allow your child to participate. Your child will also be asked if he/she is willing to participate. If you have any questions please do not hesitate to ask.

Identification of Study:
EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS: A MIXED METHODS STUDY

Purpose of the Study:
The purpose of this study is to explore student perceptions to explain the relationship between physical activity and academic achievement in adolescents.

Procedure:
Participation in this study requires approximately 30 minutes for the completion of an online survey. The survey collects information on: participation in physical activity, demographics, and perceptions on physical activity and academic achievement. Those individuals who agree to participate will be asked to complete the survey during their class time. The survey will be completed and submitted electronically via a secured computer and website. Students will use identification numbers. No names will be used in this study.

Upon completion of the survey, student cumulative grade point averages will be obtained from student records and recorded in a secured database. Again, no names will be recorded.

Upon analysis of the survey data and cumulative grade point averages, students may be invited to participate in follow-up focus group interviews. If students are asked to participate in the follow-up focus group, your contact information would be obtained for scheduling purposes only and would not be associated with the data in any way. Therefore, names may be obtained from the identification numbers so that students may be invited to participate in a follow-up focus group interview. The focus group interview will consist of a small group of 4-6 students. The purpose of the focus group is to gain a deeper understanding of student perceptions on physical activity and academic achievement. The focus group session will require an additional 30 minutes of your child’s time. Focus group sessions will occur during student release periods, therefore no students will be penalized for missing class.

Risks:
There are no known risks associated with this research.

Benefits:
There are no direct benefits to your child as a participant; however, the results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement.
Confidentiality:
All data obtained during this study will remain strictly confidential. At no time will names or the school be identified. Study data will be stored on a password protected computer and in a locked cabinet in the investigators office. This data will only be used by the investigator during the study and for a period of one year following the completion of the study. The information obtained from this study will be published as a dissertation and possibly published in journal articles or presented at professional conferences.

Compensation:
There is no compensation for participation in this study.

Opportunity to ask questions:
Your child’s rights as a research participant have been explained to you. You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study.

For questions pertaining to the online survey, focus group interviews, or this study in general, please see contact information below. If you have questions concerning your rights as a participant you may ask the researcher who has received specific training in conducting research with human subjects or contact the University of Nebraska Institutional Review Board at 402-472-6965. Please use the following IRB # 11090 for questions related to this specific research study.

Consent to Participate and Right to Receive a Copy of the Consent:
Participation in this study is voluntary. You can refuse to participate or withdraw your child at any time without harming their or your relationship with the researchers or the University of Nebraska-Lincoln. Participating in this survey is not a part of the class curriculum or grade. If your student chooses not to participate in the study, an alternate online reading assignment will be made available.

DOCUMENTATION OF INFORMED CONSENT
YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THE RESEARCH STUDY. YOUR SIGNATURE CERTIFIES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE HAVING READ AND UNDERSTOOD THE INFORMATION PRESENTED. A COPY OF THIS CONSENT FORM IS AVAILABLE UPON REQUEST.

__________________________
Child’s Name

__________________________  _______________________
Signature of Parent  Date

Contact Information:
Megan J. Hylok: Principal Investigator of Research Study & Science Teacher
Office Phone: 715-6041  e-mail: mhylok@mpsomaha.org
Mr. Greg Tiemann: Principal of School
Office Phone: 715-6002  e-mail: getiemann@mpsomaha.org
Appendix D

Participant Assent Form: Online Survey
Participant Assent Form: Online Survey
IRB # 1109C

Hi, my name is Mrs. Hylok and I am a science teacher here at your school. I am currently working on my doctoral degree at the University of Nebraska at Lincoln and I need your help to complete my research study. I am inviting you to participate in this study because you are a teenager, and I am interested in exploring your thoughts about physical activity and academic achievement. There are no direct benefits to you as a participant; however, the results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement.

Identification of Study:
EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS. A MIXED METHODS STUDY

Purpose of the Study:
Explore adolescent views on physical activity and academic achievement and use this information to explain the relationship between physical activity and academic achievement.

Your participation in the first part of this study requires approximately 30 minutes of your class time. During this time, you will be asked to complete an online survey using your technology identification number. All of your responses will be strictly confidential. Upon completion of the survey, I will obtain your cumulative grade point average from student records and record this information in a secured database. Again, no names will be used.

Upon analysis of your survey data and cumulative grade point average, you may be invited to participate in a follow-up focus group interview. If you are selected to participate in the follow-up focus group interview, your contact information may be obtained for scheduling purposes only and would not be associated with the data in any way. Therefore, your name may be obtained from the identification number so you can be invited to participate in the follow-up focus group interview. The focus group interview will consist of a small group of 4-6 students. The purpose of the focus group interview is to gain a deeper understanding of your thoughts about physical activity and academic achievement. The focus group session will require an additional 30 minutes of your time. Focus group sessions will occur during a release period, so you will not be penalized for missing class.

I will also ask your parents for their permission for you to do this study. Please talk this over with them before you decide whether or not to participate. If you have any questions at any time, please feel free to ask me or the building principal.

Consent to Participate and Right to Receive a Copy of the Consent:
Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researcher or the University of Nebraska-Lincoln. Participating in this survey is not a part of the class curriculum or grade. If you choose not to participate in the study, an alternate online reading assignment will be available.

DOCUMENTATION OF INFORMED CONSENT
YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO PARTICIPATE IN THE RESEARCH STUDY. YOUR SIGNATURE CERTIFIES THAT YOU HAVE DECIDED TO PARTICIPATE HAVING READ AND UNDERSTOOD THE INFORMATION PRESENTED. A COPY OF THIS CONSENT FORM IS AVAILABLE UPON REQUEST.

________________________
Signature of Participant

________________________
Date

Contact Information: Megan J. Hylok  Office Phone: 715-6041  e-mail: mihylok@mps.org

206 Avery Hall  P.O. 880417  Lincoln, NE 68588-0127
(402) 472-3341  FAX (402) 472-3697
Appendix E

Participant Online Survey Directions
Participant Online Survey Directions

Identification of Study:
EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS: A MIXED METHODS STUDY

You are invited to participate in this study during your class time. The purpose of this study is to explore your thoughts on physical activity and academic achievement.

Participation in this study requires approximately 30 minutes of your time. You will be asked to complete an online survey. No names will be used in this study.

At a later date, you may be invited to participate in a follow-up focus group interview. The focus group interview will consist of a small group of 4-6 students. The purpose of the focus group is to gain a deeper understanding of your thoughts on physical activity and academic achievement. The focus group session will require an additional 30 minutes of your time. Focus group sessions will occur during a release period so you will not be penalized for missing class.

Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researcher or the University of Nebraska-Lincoln. Participating in this survey is not a part of the class grade. All data obtained during this study will remain strictly confidential.

Your rights as a research participant have been explained to you. You may ask questions concerning this research at any point in time. For questions pertaining to this study please contact Mrs. Hylo: Principal Investigator of Research Study & Science Teacher. Office Phone: 715-6041, or by e-mail at mhylo@mpsomaha.org

Please answer each question in the survey to the best of your ability.

Use the following website to complete the Survey:

Tips:
1. Read each question carefully.
2. All questions require an answer before moving forward.
3. If you click on “No” in the table, make sure you click the “NA’s” in the columns that follow.
Appendix F

Quantitative Instrument: Online Survey
Quantitative Instrument: Online Survey

Physical Activity and Academic Achievement Survey

1. The purpose of this survey is to determine your participation level in physical activity and explore your thoughts on physical activity and academic achievement.
2. This survey is divided into 4 sections:
   a. Section A: Organized Sports and Activities
   b. Section B: Non-Organized Sports and Activities
   c. Section C: Demographic and Attitudinal Questions
   d. Section D: Short Answer Response
3. Take your time and read each question carefully. Answer all questions as best as you can before moving forward.
4. All responses to this survey will be confidential.

Section A: Organized Sports and Activities

Organized physical activities are:
• Usually supervised by an adult
• Involve training or practice
• Have organized competitions

Participation in organized activities during the past 12 months.

<table>
<thead>
<tr>
<th>Organized Sport or Activity</th>
<th>Participation</th>
<th>Level of Physical Activity in a Normal Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Days/week</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>0-1, 2-3, 4-5, 6-7</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minutes/Day</td>
<td>0-19, 20-39, 40-59, 60 +</td>
</tr>
<tr>
<td>Baseball/Softball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basketball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheerleading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Country</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Football</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intramural Sports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soccer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track &amp; Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volleyball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrestling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section B: Non-Organized Sports and Activities

Non-Organized physical activities are:

- NOT usually supervised by an adult
- NO training or practice
- NO competitions

Participation in Non-organized activities during the past 12 months.

<table>
<thead>
<tr>
<th>Non-organized Sport or Activity</th>
<th>Participation</th>
<th>Level of Physical Activity in a Normal Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Days/week</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fall 0-1, Winter 2-3, Spring 4-5, Summer 6-7</td>
</tr>
<tr>
<td>Aerobics</td>
<td></td>
<td>Minutes/Day 0-19, 20-39, 40-59, 60 +</td>
</tr>
<tr>
<td>Basketball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golfing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnastics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jogging/ running</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soccer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skiing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weightlifting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gym</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section C: Demographic and Attitudinal Questions

Background

1. Are you male or female?
   a. Male
   b. Female

2. What is your ethnicity?
   a. Asian
   b. Black
   c. Hispanic/Latino
   d. Native American
   e. White
   f. Other
Circle the response that best reflects your thoughts and feelings.

1 = Strongly Disagree  2 = Disagree  3 = Neutral  4 = Agree  5 = Strongly Agree

### Physical Education (PE)
1. I enjoy physical education class
   - 1 2 3 4 5
2. I try my best during physical education class
   - 1 2 3 4 5
3. Physical education class teaches me about fitness for life
   - 1 2 3 4 5
4. I feel good after completing physical education class
   - 1 2 3 4 5
5. I am focused in my next class after physical education class
   - 1 2 3 4 5

### Physical Activity Enjoyment
6. Physical activity is fun
   - 1 2 3 4 5
7. Physical activity helps me feel good about myself
   - 1 2 3 4 5
8. I enjoy physical activity because I get to be with my friends
   - 1 2 3 4 5
9. I feel less depressed after physical activity
   - 1 2 3 4 5
10. I feel less stress after physical activity
    - 1 2 3 4 5

### Self Efficacy
11. I enjoy setting goals for myself
    - 1 2 3 4 5
12. Physical activity improves my self-esteem
    - 1 2 3 4 5
13. I want to improve my health
    - 1 2 3 4 5
14. I want to improve my body
    - 1 2 3 4 5
15. I feel successful when I work hard
    - 1 2 3 4 5

### Motivation
16. Physical activity helps me stay fit
    - 1 2 3 4 5
17. Physical activity helps me do better in school
    - 1 2 3 4 5
18. Physical activity keeps me out of trouble
    - 1 2 3 4 5
19. I want to play sports in college
    - 1 2 3 4 5
20. I like competing against others
    - 1 2 3 4 5

### Social
21. I get to be with my friends
    - 1 2 3 4 5
22. I get to meet new friends
    - 1 2 3 4 5
23. I enjoy being a part of a team
    - 1 2 3 4 5
24. I take pleasure in being a leader/role model
    - 1 2 3 4 5
25. I like being involved in the community
    - 1 2 3 4 5
Circle the response that best reflects your thoughts and feelings.
1 = Strongly Disagree    2 = Disagree    3 = Neutral    4 = Agree    5 = Strongly Agree

**Support**
28. My family encourages/supports me 1 2 3 4 5
29. Friends encourage/support me 1 2 3 4 5
30. Teachers/coaches encourage/support me 1 2 3 4 5
31. Teammates encourage/support me 1 2 3 4 5
32. My community encourage/support me 1 2 3 4 5

**Environment**
33. One or both of my parents exercise regularly 1 2 3 4 5
34. I have siblings/friends who exercise regularly 1 2 3 4 5
35. Opportunities are provided for me to do physical activity 1 2 3 4 5
36. Access to facilities are available to do physical activity 1 2 3 4 5
37. Financial support is available for me to do physical activity 1 2 3 4 5

**Academics Expectations**
38. I enjoy learning at school 1 2 3 4 5
39. I do my best in school 1 2 3 4 5
40. My parents expect me to do well in school 1 2 3 4 5
41. My teachers/coaches expect me to do well in school 1 2 3 4 5
42. I feel successful when I get good grades 1 2 3 4 5

**Physical Activity and Academic Achievement**
43. Physical activity allows me to concentrate better 1 2 3 4 5
44. Physical activity helps me stay on task during class 1 2 3 4 5
45. Physical activity improves my classroom behavior 1 2 3 4 5
46. Physical activity allows me to perform better in school 1 2 3 4 5
47. Athletes are expected to get good grades 1 2 3 4 5

**Compared to my peers I would say I am:**

<table>
<thead>
<tr>
<th></th>
<th>Near bottom</th>
<th>Below average</th>
<th>Average</th>
<th>Above average</th>
<th>Top</th>
</tr>
</thead>
</table>
48. Athletically          | 1           | 2             | 3       | 4             | 5   |
49. Academically          | 1           | 2             | 3       | 4             | 5   |
50. Hard working          | 1           | 2             | 3       | 4             | 5   |
51. Competitive           | 1           | 2             | 3       | 4             | 5   |
52. Successful            | 1           | 2             | 3       | 4             | 5   |
53. Motivated             | 1           | 2             | 3       | 4             | 5   |
54. Disciplined           | 1           | 2             | 3       | 4             | 5   |
Section D: Short Answer Response
Please respond briefly to the following questions.

55. Describe how you feel about physical activity.

56. What influences you to participate or not to participate in physical activity?

57. What recommendations do you have for encouraging greater physical activity among your peers?

58. Describe the importance of grades in your life.

59. Discuss your thoughts on a relationship between physical activity and grades in school.

60. Please provide any additional comments to clarify your responses.
Appendix G

Parental Informed Consent Form: Focus Group Interview
Parental Informed Consent Form: Focus Group Interview
IRB # 11090

Hi, my name is Megan Hylak and I am a teacher at your child’s school. I am currently working on my doctoral degree at the University of Nebraska at Lincoln and I need your help to complete a research study. I am asking for your permission to invite your child to participate in a follow-up focus group interview, the second phase of the physical activity and academic achievement research study. Your child has been chosen for this second phase because they took the online survey during their class and I am interested in exploring their thoughts about physical activity and academic achievement further. There are no direct benefits to your child as a participant; however, the results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement. The following information is provided in order to help you to make an informed decision whether or not to allow your child to participate. If you have any questions please do not hesitate to ask.

Identification of Study:
EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS: A MIXED METHODS STUDY

Purpose:
The purpose of this study is to explore student perceptions to explain the relationship between physical activity and academic achievement in adolescents.

Procedure:
Your son/daughter is invited to participate in a follow-up focus group interview. The focus group interview will consist of a small group of 4-6 students. The purpose of the focus group is to gain a deeper understanding of student perceptions on physical activity and academic achievement. The focus group session will require an additional 30 minutes of your child’s time. Focus group sessions will occur during student release periods, so no students will be penalized for missing class.

I will record the interview so it can be summarized later. This will give me an accurate interpretation of responses to the questions. It is important that I maintain the integrity of your child’s words and intentions; therefore, I may ask him/her to review the summary if I have any difficulties with the interpretation.

Risks:
There are no known risks associated with this research.

Benefits:
There are no direct benefits to your child as a participant; however, the results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement.
Confidentiality:
All data obtained during this study will remain strictly confidential. At no time will names or the school be identified. Study data will be stored on a password protected computer and in a locked cabinet in the investigators office. This data will only be used by the investigator during the study and for a period of one year following the completion of the study. The information obtained from this study will be published as a dissertation and possibly published in journal articles or presented at professional conferences.

Compensation:
There is no compensation for participation in this study.

Opportunity to ask questions:
Your child’s rights as a research participant have been explained to you. You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study.
For questions pertaining to the focus group interview or this study in general, please see contact information below. If you have questions concerning the rights of a participant you may ask the researcher who has received specific training in conducting research with human subjects or contact the University of Nebraska Institutional Review Board at 402-472-6965. Please use the following IRB # 11090 for questions related to this specific research study.

Consent to Participate and Right to Receive a Copy of the Consent:
Participation in this study is voluntary. You can refuse to participate or withdraw your child at any time without harming their or your relationship with the researchers or the University of Nebraska-Lincoln. Participating in this survey is not a part of the class curriculum or grade.

DOCUMENTATION OF INFORMED CONSENT
YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THE RESEARCH STUDY. YOUR SIGNATURE CERTIFIES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE HAVING READ AND UNDERSTOOD THE INFORMATION PRESENTED. A COPY OF THIS CONSENT FORM IS AVAILABLE UPON REQUEST.

Child’s Name

__________________________________________________________
Signature of Parent

__________________________________________________________
Date

Contact Information:
Megan J. Hylko: Principal Investigator of Research Study & Science Teacher
Office Phone: 715-6041 e-mail: mjhylok@mpsomaha.org
Mr. Greg Tiemann: Principal of School
Office Phone: 715-6002 e-mail: getiemann@mpsomaha.org
Appendix H

Participant Assent Form: Focus Group Interview
Participant Assent Form: Focus Group Interview
IRB # 11090

H, my name is Mrs. Hylok and I am a science teacher here in your building. I am currently working on my doctoral degree at the University of Nebraska at Lincoln and I need your help to complete my research study. I am inviting you to participate in this study because you took the online survey during class, and I am interested in exploring your thoughts about physical activity and academic achievement further. There are no direct benefits to you as a participant; however, the results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement.

Identification of Study:
EXPLORING STUDENT PERCEPTIONS TO EXPLAIN THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND ACADEMIC ACHIEVEMENT IN ADOLESCENTS: A MIXED METHODS STUDY

Purpose of the Study:
Explore adolescent views on physical activity and academic achievement and use this information to explain the relationship between physical activity and academic achievement.

I am asking for your participation in the second phase of the study, a follow-up focus group interview. The focus group interview will consist of a small group of 4-6 students. The purpose of the focus group interview is to gain a deeper understanding of your thoughts about physical activity and academic achievement. The focus group session will require an additional 30 minutes of your time. Focus group sessions will occur during a release period, so you will not be penalized for missing class.

I will also ask your parents for their permission for you to do this study. Please talk this over with them before you decide whether or not to participate. If you have any questions at any time, please feel free to ask me or the building principal.

Consent to Participate and Right to Receive a Copy of the Consent:
Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researcher or the University of Nebraska-Lincoln. Participating in this survey is not a part of the class curriculum or grade.

DOCUMENTATION OF INFORMED CONSENT
YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO PARTICIPATE IN THE RESEARCH STUDY. YOUR SIGNATURE CERTIFIES THAT YOU HAVE DECIDED TO PARTICIPATE HAVING READ AND UNDERSTOOD THE INFORMATION PRESENTED. A COPY OF THIS CONSENT FORM IS AVAILABLE UPON REQUEST.

__________________________                     ________________
Signature of Participant                                      Date

Contact Information:
Megan J. Hylok: Principal Investigator of Research Study & Science Teacher
Office Phone: 715-6041                                      e-mail: njhylok@mps.org

206 Avery Hall  P.O. Box 880417 / Lincoln, NE 68588-0127
(402) 472-0044 / FAX (402) 472-8537
Appendix I

Qualitative Instrument: Focus Group Protocol and Questions
Qualitative Instrument:

Focus Group Protocol and Questions
IRB # 11090

**Purpose:** The purpose of this study and focus group interview is to explore your thoughts about physical activity and grades.

Focus Group: 1 2 3 4
Date of interview: __________ Time of interview: __________

**Introduction:**
1. I am researching student’s perceptions on physical activity and academic achievement for a doctoral dissertation at the University of Nebraska-Lincoln. This study is being conducted to explore your thoughts on physical activity and grades. The results of this research study will be used to provide suggestions to educators and community leaders on how to incorporate more physical activity into the lives of adolescents to improve health and academic achievement.

2. I want to assure you that this interview is strictly confidential. Your names will never be used.

3. You have completed an Informed Assent form outlining your rights as a research participant. I want to remind you that you may decide at any time not to participate or to withdraw from participating in this study. Contact persons are provided on the Informed Assent/Consent Form in case you have questions or concerns. I gave you and your parent a copy to keep.

4. I am going to record this interview so that the interview can be transcribed later. This will give me an accurate interpretation of responses to the questions.

5. It is important that I maintain the integrity of your words and intentions; therefore, I may ask you to review the transcription if I have any difficulties with the interpretation.

6. Please feel free to discuss your views openly while in this room. From time to time, I may ask for clarification to further understand a comment that you have shared among the group. Please remember all responses are confidential. I ask that when you leave, you do not share what other people have said here today in this room.

7. Thank you for sharing your thoughts with me. Let’s begin.
Focus Group Questions:
Physical Activity
1. Which physical activities do you remember the most when you were younger, and why?

2. Growing up, were you active in sports/physical activities?
   a. How long?
   b. Why continue/discontinue?

3. Why/why aren’t you involved in physical activity?

4. Why are some people more “active” than others?

5. Why are some people less “active” than others?

Academics
6. What are your favorite classes?

7. How do you feel about grades?
   a. What motivates/discourages you from doing well?

8. Do you think physical activity has an impact on your learning?
   a. How do you feel after physical activity?
   b. How do you feel in your next class after PE class?

9. Do you think there is a relationship between physical activity and grades?

10. Would you exercise more if you knew physical activity improved your
    a. health?
    b. moods?
    c. learning?

11. What suggestions do you have for improving/increasing physical activity in adolescents?

12. Anything else you want to share about how physical activity may relate to your school work?

13. If you have any questions, concerns or realize you have more to share, please feel free to email me at mjhylok@mpsomaha.org.