A STUDY OF THE RELATIONSHIP BETWEEN PHYSICAL FITNESS AND ACADEMIC PERFORMANCE

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Relationship Between Physical Fitness and Academic Performance

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Abstract

Karen Rodenroth. RELATIONSHIPS BETWEEN PHYSICAL FITNESS AND ACADEMIC ACHIEVEMENT. (Under the direction of Dr. Leonard Parker) School of Education, January 2010.

In this study, fourth and fifth grade students' physical fitness levels were compared to their academic achievement based on the idea that health and physical fitness have an impact on the ability to achieve academically. Because of the recent pressures of *No Child Left Behind*, many schools have opted to limit the amount of time students spend in physical education classes and recess. With the increased percentages of students who suffer from diabetes and other health related risks, eliminating or reducing physical activity from the school day is not the answer. Data was collected from 90 students (46 males and 44 females) during the 2009-2010 school year by using the President's Challenge Physical Fitness Test, STAR Reading Percentile scores, and Grade Point Averages (GPA's). Through multiple regressions, the researcher did not find statistically significant relationships between physical fitness levels and STAR Reading Percentiles or between physical fitness levels and Grade Point Averages. When physical fitness levels were combined with STAR Reading percentile scores, a significant correlation was found between these two variables and Grade Point Averages. A significant correlation was found between physical fitness levels and mathematics. Lastly, another significant correlation was found between STAR, Grade Point Averages, and sit ups. With these varying results, the researcher decided to retain the following null hypotheses of this study: there will not be a significant relationship between physical

fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school, and there will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school. This study does not prove causality; therefore, the results should be interpreted with caution.

Dedication

This study is dedicated to my Lord and Savior, Jesus Christ. He has been my strength throughout this entire process. Without his blessings, this dissertation would not have been possible. The scriptures I lived by while writing my dissertation are: Philippians 4:13 "I can do all things through Christ who strengthens me," and 1 Thessalonians 5:16-18 "Be joyful always, pray continually, give thanks in circumstances, for this is God's will for you in Christ Jesus." He believed in me, and He deserves all the Glory.

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CHAPTER ONE: INTRODUCTION

More than half of the American adults do not get the daily recommended number of minutes of physical activity, while a disturbing one-fourth of the U.S. adult population does not get any physical activity at all (West Virginia Department of Health and Human Resources, 2005). This pattern of inactivity begins early on in life. Teachers play an integral role to help foster the importance of lifelong physical activity in children. Unfortunately, the opportunities for children to engage in physical activity at school are dwindling. Physical education classes and recess are being eliminated from the school day. Schools and teachers have been under increased pressure to increase student achievement. With the recent pressures of *No Child Left Behind* and the obvious effects of childhood inactivity, it is essential for teachers to integrate these two domains in order to teach the whole child to attain his or her fullest potential (Blaydes, 2000).

People know that most children are innately curious and physically active (Fernie, 2009). Physical movements of the body are vital for normal brain development (Wolfsont, 2002). It is imperative that teachers increase the amount of physical activity opportunities that children have during the school day. More than ever before, children today find themselves playing video games, watching television, or occupying themselves on the computer on the weekends and after school. In fact, there is a growing concern regarding the number of children who are living a sedentary lifestyle (Standage, Duda, & Ntoumamis, 2003). Consequently, children are becoming more and more immobile with health concerns which include being overweight, childhood obesity, high

blood pressure, depression, and other diseases and trepidations. These health concerns can linger for long periods of time, if not for a lifetime (Scott, 2008).

Research has been conducted concerning movement suggesting its benefits. The most commonly researched use for movement is certainly for the purpose of physical exercise directly impacting the body (Emery, Shermer, & Hauck, 2003). The correlation between movement and health has been researched including the importance of cardiac, muscle, joint, and pulmonary functioning (Emery et al., 2003), and even psychological functioning (Hansen, Stevens, & Coast, 2001). Regular physical movement has been proven to have a positive relationship with the healthy functioning of all of these areas (Schneider, Spring, Pagoto, & Sherry, 2007).

In addition to the physical benefits of movement, researchers have found relationships between the amount of movement one participates in and cognitive functioning (Emery, et al., 2003). Past literature consistently supports participation in movement and exercise, which leads to the reduction of stress, improvement of emotional state, and helps one to function comfortably (Steinberg, Nicholls, & Sykes, 1998). Brain Gym exercises and balanced movements have been proven to reduce anxiety (Wolfont, 2002). Regular physical activity increases the amount of oxygen delivered to the brain, which increases children's capacity to learn (Galley, 2002). Allowing oxygen to flow to the brain enables one to cognitively function and make decisions.

Since January 8, 2002, the day former President George W. Bush signed the *No Child Left Behind Act* (*NCLB*), public education has been held accountable for academic achievement and standardized test scores. In fact, *NCLB* represents the most significant

expansion of the federal government into education in the United States' history (Yell & Drasgow, 2005). This legislation has resulted in an increased effort to improve student achievement, which unfortunately means leaving programs like physical education behind. The *NCLB* Act has forced schools to place a stronger emphasis on subjects that will be assessed on standardized tests, at the expense of non-academic subjects that are not tested. New mandates and policies are limiting the amount of time children participate in physical activity. Physical education has become a lower priority in public education.

With childhood obesity becoming a national health problem and physical education classes dwindling, physical health, cognitive functioning, and academic achievement have also become growing concerns (Hessler, 2009). Physical activity can be the answer to all of these problems. Physical activity is linked to lowered risks of obesity, increased cardiovascular fitness, improved health, and academic achievement (DeBate, Gabriel, Zwald, Huberty, & Zhang, 2009). Incorporating physical activity during every school day is essential for numerous reasons. Physical activity has physical and mental health benefits.

Health and educational professionals believe that physically active students perform better in the classroom. One study found a statistically significant relationship between fitness and academic achievement (Chomitz, Slining, McGowan, Mitchell, Dawson, & Hacker, 2009). Promoting physical fitness and increasing opportunities for physical activity has implications to support academic achievement. Results from animal studies have shown that physical activity stimulates the neural development in the brain

(Studenski, Carlson, Fillit, Greenough, Kramer, & Rebok, 2006). Also, physical fitness and physical activity have been linked to positive effects on cognition and concentration in the classroom (Etnier, Salazar, Landers, Petruzzello, Han, & Nowell, 1997).

Physical activity has also been linked to higher levels of self-esteem and lower levels of anxiety, which are associated with higher academic performance in the classroom (Ekeland, Heian, Hagen, Abbott, & Nordheim, 2004; Shephard, 1983; & Flook, Repetti, & Ullman, 2005). Other studies have shown a positive relationship between the amount of time in physical education class and classroom performance based on grades (Shephard, 1996). Additionally, several studies have found positive associations between physical fitness and academic performance (Kim, Frongillo, & Han, 2003; California Department of Education, 2005). An Illinois study found that students' fitness levels, as measured on the *FitnessGram*, was positively correlated to academic achievement, based on the Illinois State Achievement Test, especially in the content areas of mathematics and science (Castelli, Hillman, Buck, & Erwin, 2007).

Research studies, like the ones described above, warrant the premise of the importance of teaching physical education in the academic curriculum. Schools can serve as a venue to provide students with opportunities to perform physical activity daily, as well as teach the importance of staying physically active. Unfortunately, students are not receiving an ample amount of physical activity at school. Given the recent pressures that educators are under to achieve grade level standards for all students, understanding this relationship between physical fitness and academic success is crucial.

To date, while there is some evidence that positively correlates physical fitness

and physical activity to academic performance, few studies have examined the relationship by using standardized fitness and academic achievement scores. Also, few studies have examined the relationship of physical fitness and academic achievement among elementary students.

Statement of the Problem

Due to the accountability pressures of *No Child Left Behind* (NCLB) and reaching *Adequate Yearly Progress* (AYP), schools are feeling compelled to create more time to teach academic subjects that are assessed on standardized tests than on other non-academic subjects, like physical education. The *No Child Left Behind* Act has forced educational leaders and teachers to shift their focus solely on students' academic achievement. A more focused mindset on academic performance has hindered the quality and quantity of physical education classes.

The relationship between physical fitness and academic achievement has received attention because of the increasing number of children who are overweight and physically unfit. Also, schools are feeling the pressure to meet academic standards (Maeda & Murata, 2004). A study found that physical fitness tests were positively related to academic achievement in an elementary setting (Castelli, Hillman, Buck, & Erwin, 2007). Perhaps, physical fitness may be related to academic performance in the classroom for elementary aged students. Even though there are numerous positive effects related to being physically active and physical fitness, their effect on cognition and academic achievement is not clear.

Higher levels of physical fitness have been associated with higher academic achievement (California Department of Education, 2001). Similar research conducted in a school setting, observed a positive relationship between vigorous physical activity and higher academic achievement in the classroom, based on grades (Coe, Pivarnik, Womack, Reeves, & Malina, 2006). Other research has found a link between aerobic fitness to an increase in neuroelectric and behavioral performance in children (Hillman, Castelli, & Buck, 2005). These findings suggest that students who exhibit a greater amount of time being physically active have a greater allocation to their working memory. In addition, Sibley and Ethnier (2003) conducted a meta-analysis that confirmed a slight significant relationship exists between physical activity and cognitive performance in children. These findings confirm that physical activity may be beneficial to children's cognitive health and academic achievement. Understanding the relationship between physical activity and academic achievement has been a popular subject to research, but determining how physical fitness effects student achievement is still unclear.

More studies have found an association between physical activity and academic achievement. It has been suggested that the benefits of physical education are related to academic achievement (Almond & McGeorge, 1998; Black, 1995), while some advocate that physical fitness is related to cognitive performance and academic achievement (Dustman, Emmerson, & Shearer, 1994). This belief has caused some schools to adopt the saying "healthy children learn better" (Symons, Cinelli, James & Groff, 1997).

Research about the relationship between physical activity and academic achievement is forcing some schools to take action.

Even earlier studies researched physical activity and academic achievement. These studies reported a positive relationship between sport participation and academic achievement (Stevenson, 1975; Holland & Andre, 1987. Bluechardt, Wiener, & Shephard, 1995; Otto & Alwin, 1997). More recently, Stegman and Stephens (2000) conducted a study that included high school juniors and seniors. Stegman and Stephens found that those who actively participated in sports outperformed their peers who were not active in sports based on their class rank and grade point averages. Furthermore, many schools with top-rank athletic departments perform better on standardized tests (Gehring, 2002). Both physical activity and participation in sports were found to be independently associated with a higher Grade Point Average (GPA) for high school girls (Fox, Barr-Anderson, Neumark-Sztainer, & Wall, 2010). Again, these findings indicate a positive relationship between physical activity involvement and academic achievement among students.

Colcombe, Kramer, Erickson, Scalf, McAuley, and Cohen (2004) found that performing exercise on a regular basis for several weeks can alter the way the brain functions that control cognition and behavior. Physical activity causes biological responses in the muscles and organs, which then regulates the structure and function of the brain (Dishman, Berthound, Booth, Cotman, Edgerton & Fleshner, 2006). These exercise experiences can have important implications for children's education and increase student learning.

Sibley and Etnier (2003) identified 44 studies that they compared for analysis. These researchers found that physical activity was significantly related to the cognitive functioning in children. The overall effect size was 0.32. It was concluded that the type of physical activity did not seem to matter, but the effect of physical activity was greater for middle and elementary aged children. As a result, physical activity may have a positive impact on learning and memory, which have implications for an increase in academic achievement.

Results of cross-sectional studies indicate that "children who are physically fit perform cognitive tasks more rapidly and display patterns of neurophysiological activity indicative of greater mobilization of brain resources than do less fit children" (Tomporowski, Davis, Miller, & Naglieri, p. 120, 2007). Another study explored the relationship between physical activity and body fat to classroom performance. Frauhiger's (2002) subjects consisted of six to ten year olds, and he found a positive correlation between physical activity level and academic achievement. The research regarding physical fitness and academic achievement advocates that physical activity may actually enhance the development of mental processes for an increase in academic achievement.

Less research has been conducted to figure out how exercise influences children's mental development. Based on previous research with children, physical fitness can be globally related to academic achievement. Future research is deemed necessary to better determine the role physical fitness has on academic achievement.

Statement of the Purpose

The purpose of this study was to explore the relationship between physical fitness and academic achievement. Physical activity is important for a number of reasons. It reduces the risk of childhood obesity; therefore, it prevents long-term at risk diseases (Tremblay & Willms, 2003). Being active impacts learning, attention, and behaviors within the classroom (Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001). Other benefits for students to be physically fit are it increases energy levels, and it expands students' capability to learn (Pica, 2004). The development of motor skills and learning by active play also contribute to healthier learning (Active Healthy Kids Canada, 2009). All in all, there are advantages of being active when learning.

Summerfield (1998) indicates that eleven percent of six through eleven year olds and fourteen percent of twelve through seventeen year olds are obese. Schools, teachers, parents, and students need to work together to develop a plan that will decrease the disturbing number of children suffering from obesity, which in turn, deters their performance in school. Integrating physical fitness into the school day and incorporating movement into the different content areas as much as possible has the potential to help increase student learning. Although it has been proven that physical activity assists students in better concentration, less fidgeting in school, and increases academic levels, there is not a federal law that requires schools to have recess (Research Brief, 2007). This seems to be a case that needs to be settled and encouraged to get kids active again. Hannaford (2005) states that muscular activities, particularly coordinated, balanced movements, appear to stimulate the production of neurotrophins, such as dopamine,

natural substances that stimulate the growth of existing nerve cells and increase the number of new nerve cells, and neural connections in the brain.

Hypothesis

This research study was warranted because physical activity plays a fundamental role in students' lives. More research on the relationship between physical activity and academic achievement demands attention. The research problem generated the following hypotheses for this study:

- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will be a significant relationship between physical fitness levels based

on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.

- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

Statement of Null Hypothesis

- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness levels

based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.

- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will not be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

Specifically for this study, it was anticipated that students with higher physical fitness scores would score higher on the STAR Reading assessment and have higher Grade Point Averages (GPA).

Research Objective

Data was collected in order to determine the relationship, or lack thereof, between physical fitness and academic achievement. In addition, data was collected to compare gender with physical fitness and academic achievement.

Definitions of Key Terms

This section provides a brief description of the terms and technical language that was used in the study, as well as meanings to explain and highlight prevalence in the research. This provided consistency throughout the study.

Academic achievement. The academic subjects a child studies in school and the skills a student is expected to master in each subject (Present Levels, n.d.).

Agility. The ability to change the direction of the body in an efficient and effective manner (Verschuren, Ketelaar, Gorter, Helders, & Takken, 2009).

Cardiopulmonary Endurance. The ability of the cardiovascular and respiratory systems to deliver oxygen to working muscles. It consists of both aerobic and anaerobic energy systems (Candidate Physical Abilities Test, 2002).

Core Muscle Strength. These muscles help keep your body stable and balanced. (Waehner, 2009).

Flexibility. The ability to move your joints and muscles through their full range of motion (Fitness, 2005).

Movement. The act of changing position or shifting one's body (Hannaford, 1995).

Muscular Endurance. The ability of a muscle or group of muscles to sustain repeated

contractions against a resistance for an extended period of time (Quinn, 2007).

Upper Body Strength. This targets the large muscle groups located in the upper part of the body (Upper body strength training exercises, 2008).

Needs Improvement. A level of fitness that the child should try to improve upon (Cooper Institute, 1992).

Physical activity. The movement of the body that uses energy (Inside the Pyramid, 2009).

Physical fitness. The capacity to perform physical activity (Haga, 2009). There is not a universal definition of this term.

President's Challenge Physical Fitness Test. A comprehensive program that is designed to improve physical activity levels (You're It. Get Fit, 2009).

Sedentary. Not consistently partaking in physical activity (Science Daily, 2009).

Overview of Methodology

The principal of the targeted school released the academic and physical fitness data to the researcher. All confidential data was stored in a secure and locked safe. The sample consisted of all of the fourth and fifth graders who were enrolled at the targeted school during the first quarter of the 2009 – 2010 school year. Each student was given a numerical code instead of using their name when the data was analyzed.

All data was entered into the Analyze It program. Once the data was entered, multiple linear regressions were conducted. The results were analyzed to determine if, in fact, a relationship existed between physical fitness and academic achievement.

Subjects

The subjects of the study included 90 fourth and fifth grade students from a rural

northeast Georgia Title I elementary school. The students' physical fitness levels were assessed according to the President's Challenge Physical Fitness Test to establish if students had an "Outstanding," "Basic," or a "Needs Improvement" physical fitness level. Academic achievement was determined by using the STAR Reading percentiles and Grade Point Averages. Gender data was also obtained. Correlations between physical fitness and the STAR Reading percentile scores and Grade Point Averages were calculated.

Instruments

President's Challenge Physical Fitness Test.

Physical fitness data was collected from the first quarter of the 2009-2010 academic school year based on the President's Challenge Physical Fitness Test. This instrument was developed in 1953 to help promote a basic level of physical fitness for students. It is sponsored by the President's Council on Physical Fitness and Sports (PCPFS). This program has now increased its population to include adults as well to strive to make being active a part of their everyday lives. The President's Challenge Physical Fitness Test was used in order to recognize each student's physical fitness level.

The President's Challenge Physical Fitness Test is a nationally recognized program and is a valid assessment tool that determines physical fitness levels. For students, the performance levels for each fitness test are identified as either "Outstanding," which means a student has performed within the 85th percentile, "Basic," which means a student has performed between the 50th – 84th percentile, or "Needs Improvement," which means a student has performed below the 50th percentile.

The five physical fitness tests that were used in the study include: curl-ups, shuttle run, endurance run/walk, pull-ups, and sit and reach. It is important for programs, such as the President's Challenge Physical Fitness Test, to be available to elementary students in order to help children set goals for themselves to improve their physical fitness level. With this program, physical education teachers are able to identify potential health risks early on so adjustments can be made in order to improve physical fitness levels. It also allows physical educators to individualize the physical education instruction to challenge students and help them obtain their individual physical fitness goals.

STAR Reading.

Academic achievement data was collected from the first quarter results of the STAR Reading percentile scores from the 2009-2010 school year. STAR Reading is sponsored by Renaissance Learning. STAR Reading is rated among the highest of all progress monitoring tools, as identified by the National Center on Response to Intervention (NCRTI) (Renaissance Learning, 2010). STAR Reading is based on sound scientific research, and it provides norm-referenced scores for each student.

STAR Reading is a reliable and valid tool for reading achievement. It is supported by evidence with study designs including, "experimental and quasi-experimental as well as correlational, case study, and psychometric (reliability and validity) research. Many have been published in peer review journals and thus upheld to the highest scrutiny" (Renaissance Learning, 2010). This program is regarded as reliable and valid by the National Center on Response to Intervention.

The STAR Reading assessment is a computer-based program that tailors the test

based on previous answers on each test item. This helps increase the reliability of this instrument. After students conduct the STAR Reading assessment on the computer, the results provide teachers with a norm-referenced reading percentile score for grades 1-12 and reading levels. With the results, teachers are able to make informed data-driven decisions to match grade-level appropriate books for students, as well as provide apposite curricular materials for each student. Educators can also track each student's reading growth with this assessment.

Grade Point Averages.

Grade Point Averages (GPA's) were collected and calculated by the researcher from the first quarter grading period of the 2009-2010 school year. The GPA's were used as another instrument for the academic data in the study. GPA's were calculated and used to determine student achievement in Reading, English/Language Arts, Mathematics, Science, and Social Studies. The researcher was aware that Grade Point Averages diminish the internal reliability and validity due to confounding and uncontrollable variables including individual teacher's grading policies. However, at the participating school, grade level teachers congregate once a week to create lesson plans together, as well as collectively look over student work to increase consistency with the grading policies. Despite this, another form of academic data was necessitated.

Procedures

Principal consent was obtained in order to undergo the study. The data from the President's Challenge Physical Fitness Test, STAR Reading percentiles, and GPA's were collected on the subjects. A letter was sent to the principal explaining the purpose and

legalities of this study. All data was kept confidential, and students were assigned a number instead of using their names. Parental consent was not necessary, as FERPA allows schools to disclose records without parental consent to organizations or researchers conducting studies for the school.

The researcher met with the principal, the physical education teacher, and the fourth and fifth grade teachers of the participating school. At this meeting, the purpose and procedures of the study were explained in detail.

The physical education teacher collected data from each of the five fitness tests of each subject during the first quarter of the 2009-2010 school year. The researcher collected this data and determined a mean percentile score for each participating subject. Each subject was also given a score ranging from 1 – 5 based on how many times the student scored in the "Outstanding" physical fitness level on each of the five fitness tests.

The fourth and fifth grade teachers administered the computer-based STAR Reading assessment also during the first quarter of the 2009-2010 school year. The GPA's were calculated based on the collected data from the first quarter grading period of the 2009-2010 school year. The researcher used the summary mark for each subject including: Reading, English/Language Arts, Math, Science, and Social Studies. An Exceeds (E) was converted into a 4, a Meets (M) was converted into a 3, an In Progress (IP) was converted into a 2, and a Does Not Meet (DNM) was converted into a 1 for the purposes of this study. Prior to this school year, the school district, that includes the participating school, used 1, 2, 3, and 4 to determine grades, and the school district decided to convert each of the numbers to the corresponding letter. In other words, there

is a legitimate reason behind the conversion and calculations for the GPA's. The researcher obtained the percentile scores for each student from the STAR Reading assessment and GPA's and compared these rankings with the President's Challenge Physical Fitness Test to determine whether or not a correlation exists between physical fitness and academic achievement. At this point, the null hypothesis was retained or rejected.

Data Organization

The collected data was analyzed to determine if a relationship exists between physical fitness and academic achievement, as determined by the President's Challenge Physical Fitness Test, STAR Reading, GPA's, and gender. The physical fitness levels were compared to the STAR Reading percentile scores and calculated GPA's. Gender was also compared to the physical fitness levels. Data was entered in Microsoft Excel, and then it was analyzed using the Analyze It program in order to assess the relationship among the collected data. The Analyze It program assisted the researcher in performing multiple regressions on the data.

Statistical Procedures

Multiple regressions were used to investigate the relationship between the President's Challenge Physical Fitness Test, STAR Reading, GPA's, and gender. The researcher conducted various regressions to examine the strength and direction of the correlation between physical fitness and academic achievement.

Applications/Significance of Study

There are a myriad of factors that influence student achievement. This study contributes to the existing body of knowledge about the importance of physical fitness. Physical fitness is one component that can impact student performance. Together, schools and families can work together to develop a plan for a healthy lifestyle that includes physical activity.

Our society is becoming more and more sedentary. It is hoped that school leaders can learn from the study about the importance of physical fitness and its effect on student achievement. All students should be encouraged to participate in extracurricular activities that involve physical activity. Additionally, students should feel welcome to participate to their fullest potential in physical education classes. Everyone, including parents, teachers, and the students, needs to work together to solve this sedentary problem that can cause health risks.

As obesity is a growing concern among the youth, health professionals and schools can use this research study to help formulate guidelines for certain individuals. This study can help restructure physical education classes in order for students to obtain the greatest physical fitness education as possible. Physical education teachers can differentiate instruction based on the needs of the individual students. Having high levels of physical fitness can lead to a healthier life (Centers for Disease Control and Prevention, 2009). Teachers should act like advisors and encourage students to stay physically active.

With the help of this study and others similar in nature, educational policy makers

will be able to make informed decisions about whether or not to eliminate or reduce recess. Also, the principal, assistant principal, and physical education teacher of the participating school can collectively make decisions to address the physical fitness needs of the students in the school. Studies involving physical fitness can also guide policy makers in deciding how many minutes of structured physical education and recess a child should receive on a weekly basis. Keeping as many people educated about the importance of physical fitness and the implications it may have, will help keep our youth healthy.

Limitations

1. The participating rural Title I elementary school in Georgia was the only school used in this study; therefore, the results cannot be generalized for other schools.
2. The students used in this study were fourth and fifth grade students; therefore, the results cannot be generalized to other grade levels.
3. STAR Reading percentile scores and Grade Point Averages were the only two instruments of academic achievement used in this study; therefore, the results may not be generalized to other instruments that measure academic achievement.
4. A limited diversity existed among the students; therefore, the results cannot be generalized into other educational settings.

5. Physical fitness is just one component that effects student achievement. There are a plethora of factors effecting academic achievement including, but not limited to, natural ability, nutrition, sleep, life patterns, etc.

Summary

The first chapter established the purpose behind examining the relationship between physical fitness and academic achievement by using the President's Challenge Physical Fitness Test, STAR Reading, and GPA's. It also gave a brief introduction regarding the benefits of staying physically active. The second chapter is intended to provide a review of literature and will go into further detail and support the claims with research.

CHAPTER TWO: REVIEW OF THE LITERATURE

The existing literature on the nature of physical activity provides a basis for this future study. This study relies on previously published literature and online resources to defend the hypothesis that a relationship exists between physical fitness and academic achievement. This chapter will explain the theoretical and historical background, as well as review the related literature in the field.

Theoretical Background

In 1983, the United States was labeled "A Nation at Risk." The United States has found itself competing with other countries academically. Since then, and even as early as the 1920s, there have been a plethora of reforms to help improve the academia in schools. For example, when Sputnik was launched in October of 1957, new math and science curriculums were adapted. Content that is not tested, such as physical education, has become a lower priority (National Association for Sport and Physical Education, 2006).

Exercise for students appears to be decreasing, (Mulrine, Prater, & Jenkins, 2008) which has resulted in more children becoming obese since the 1960s (Hinkle, 1992). Also, an increased number of children are being diagnosed with Type 2 Diabetes (Mayo Clinic, n.d.). More specifically and across all age groups, girls tend to be less physically active than boys (DeBate, Gabriel, Zwald, Huberty, & Zhang, 2009).

With the current implications of *No Child Left Behind* (NCLB), schools and teachers have felt accountability pressure to increase performance until all students are performing on grade level (Maeda & Murata, 2004). With the increased pressure, physical education

classes and recess have been eliminated in some school systems. A national movement to eliminate recess began in the late 1980's (Sutton-Smith, 1990). Many school systems are choosing to follow this trend of eliminating recess and excluding physical activity. Elementary physical education programs are diminishing, (Hall, 2007). Although most states require physical education, forty percent allow exemptions from physical education requirements (Burgeson, Wechsler, Brener, Young, & Spain, 2001, 2001). This is a result of being more concerned with satisfying political needs rather than educational needs (Gratz, 2000).

Currently, Illinois is the only state that requires daily physical education classes for students in grades Kindergarten through twelfth grade (Brink, 2002). Certified elementary physical education teachers are required in only twenty-eight states (Hall, 2007). Lastly, eight percent of elementary schools in the United States provide daily physical education classes for the entire year (Burgeson et al., 2001). Thus, the reduction in physical activity and exercise, an increase in poor eating habits, and sedentary lifestyles are causes of the increased number of children and adults with obesity and diabetes, high blood pressure, and other health risks.

Incorporating physical education and activity into the school day assists in educating the whole child (Rairigh & Townsend, 2001). Teachers need to integrate physical movement in their lesson plans. There are current efforts in integrating content areas into physical education classes (Hill, 1991) and interdisciplinary teaching (Nilges & Usnick, 2000). Integration, when used as a teaching method, has helped increase student learning (Blaydes, 2000; California Department of Education, 2005; Michaud & Wild,

1991; NASPE, 2002). Additionally, "physical movement, such as stretching every twenty minutes in the classroom, can help stimulate the BDNF in a child's brain and help learning occur more easily" (Hall, 2007, p. 4). Integrating physical activity on a daily basis into the school day is a powerful teaching method with an abundance of benefits.

There are many factors that effect learning, and physical education is one of the many factors that impacts academic achievement. In this day in age, it is necessary to integrate physical activity with other content areas to enhance learning in the physical education setting, as well as the classroom setting. Movement improves cognitive functioning, and learning is more fun (Leppo & Davis, 2005). Physical activity is a different type of learning style.

Project Specific Information

The concepts described below offer advantages of being physically active. These factors include health benefits, reducing risks of childhood obesity, impacting learning in the classroom, development of motor skills, active play, and increased energy. They provide conceptual basics upon which the future study is based.

Health Benefits

Regular physical activity has considerable health benefits. It builds and maintains bones, muscles, and joints (Centers for Disease Control and Prevention, 2008). The building of lean muscle ultimately reduces fat (Saunders, 2009). Physical fitness prevents or reduces the risk of cardiovascular disease (Centers for Disease Control and Prevention, 2008). Additionally, it decreases the number of children struggling from diseases including diabetes, hypertension, elevated blood cholesterol, lowers the risk of

colon cancer, and depression (Dimeo, Bauer, Varahram, Halter, 2001). All in all, physical activity leads to good health (Young, 2001). For some children, the structured physical education class that they receive at school may be the only preparation they have for an active lifestyle.

Reducing Risks of Childhood Obesity

More kids today are overweight or obese than ever before. Overweight is defined as extra weight because of muscle, bone, fat, and/or water, and obesity is defined as having an excess amount of body fat (National Heart and Lung Institute, 2008). This is a major concern for our current youth because these statistics are correlated with the high risk of cardiovascular disease and diabetes (Shaw, 2007). Physical activity is crucial in order to prevent childhood obesity (Dubbert, 2002). It is recommended that adolescents and adults attain at least 30 minutes of physical activity a day, while 60 minutes is suggested for children (KidsHealth, 2009). This will help decrease sedentary behaviors, which, in turn, will help with the overwhelming high percentage of children who are overweight and obese. The promotion of physical activity should begin as early in life as possible to stop the current United States trend of physical inactivity.

Impacts on Learning in Classroom

Physical activity increases students' capacity for learning (Kong, 1999). Learning through movement is vital for a successful experience in school. "Exercise, besides shaping up bones, muscles, heart and lungs also activates major growth of neurons and nerve nets in the basal ganglion, cerebellum and corpus callosum of the brain. Aerobic exercise increases the supply of blood and oxygen to the brain" (Hannaford, 2005, p.

107). Physical activity helps children concentrate and focus (Young, 2001). Being physically active in school has positive impacts on learning in the classroom.

Thanks to advances in brain research, we are now aware that most of the brain is activated during some sort of physical activity, much more than when sitting behind a desk (Maier, 2001). Movement expands blood vessels that allow for the delivery of oxygen, water, and glucose to the brain, which optimizes the brain's performance (Pica, 2004). Therefore, physical activity increases the blood flow, which in turn, increases cognitive functioning.

One Canadian study conducted by Pica (2004) shows how academic scores increased when a third of the school day was devoted to physical education. Another study by Pica (2004) demonstrated children participating in five hours of vigorous physical activity a week had stronger academic performance in math, English, natural sciences, and French than children with only two hours of physical activity per week. Children who participate in daily physical education have been shown to perform better academically and to have a better attitude toward school (Sadler & Tentinger, 1993). Physical activity and fitness may actually help students do better in the classroom.

According to Hannaford (2005), movement is vital on how individuals embody and express their learning, their understanding, and themselves. Movement integrates and anchors new information and experiences into the brain; therefore, it activates one's mental capacities (Field, Diego, & Sanders, 2001). Movement assists brain growth and health for a lifetime, and exercise may improve the functioning of the brain (Jarret, Hoge, Davies, Maxwell, Yetley, & Dickerson, 1998). Physical activity has been shown to

develop greater academic performances in children (Larson & Zaichkowsky, 1995). Thus, moving by learning has implications for increasing academic achievement.

Development of Motor Skills

One of the most basic benefits of physical activity is the development of motor skills. Every child's earliest learning is based on motor development (Wolfson, 2000). Fundamental movement skills, including locomotor and object control skills, usually evolve between the ages of one year of age to seven years old (Burton & Miller, 1998). Providing students with these opportunities to learn these skills is important (Richardson, 2006). It is believed that there is a relationship between motor skills, fitness, and physical activity (Haga, 2009). Children with low motor competence are likely to have poor physical fitness when compared to children with high motor competence (Haga, 2009). Physical activity helps children learn and develop their complex, fine, and gross motor skills in order to be successful in being physically active.

Active Play

Physical activity and active play are vital to the development of children and young people (Hessler, 2009). School grounds, therefore, have become important places, where children and young people can enjoy and benefit from physical activity and active play. Active play is an important part of children's culture and should be valued for its own sake, but it is also fundamental to their development of learning, creativity, and independence (Garaigordobil, 2006). Children love to move, and play keeps children healthy and active (Williams, 1999). Regular physical activity and active play form the basis of a healthy lifestyle, which will help children to be fit and well throughout their

lives.

Increased Energy

Burning up energy by participating in physical activity may pay off with increased energy in the long run (ECU, 2007). Regular exercise can increase energy levels (West & Shores, 2008). Physical activity every day can provide the energy students need. Regular exercise increases energy and reduces fatigue (U.S. Department of Health and Human Services, n.d.). In his book, *The Minds of Boys*, Gurian (2005) comments that "the boy, fueled by his boy energy, tends to learn by innovating in risk-taking ways, wearing goggles so the dangerous game can go on. This energy involves a lot of physical movement and manipulation of physical objects" (p. 44). All students, boys and girls, need time during the day to be active so they can have the energy to get through the rest of the day.

Historical Background

From what seems not too long ago, children ranging in various ages played together until it was dark outside (Ray, 2007). Unfortunately, busy lifestyles and new technology invented for children have been the cause of the decline in physical activity. Nowadays, it is prevalent to hear that both parents of the household are working, instead of just the father. With both parents working, this has caused more families to live busy lifestyles and eat unhealthy food, including dinners from fast food restaurants. Additionally, new video game systems, computer games, and television are growing in popularity, allowing children to stay inside and remain sedentary while they play sitting down.

Together, families and schools must work together by creating a shared vision to increase the health and well-being of children of all ages. Physical fitness has research to support its claims of increasing student achievement. Remaining physically active can be the answer to both increasing student achievement and physical fitness levels.

Since the time period of the ancient Greeks, there have been beliefs that physical activity is linked to intellectual capabilities. However, the relationship between physical activity or physical fitness and academic achievement was not researched thoroughly until the 1950's. Since then, many have learned that by eating a healthy and substantial breakfast and by being physically fit, academic achievement can improve.

A study, conducted by Brown (1967), assigned 40 twelve year old boys, with a mean IQ of 135, randomly to either a six-week exercise program or an attention control condition group. The exercises in the exercise program consisted of twelve different yoga-like exercises. These activities required the subjects to exert muscle tension to maintain their body position. For academic data, the Stanford–Binet Intelligence Test was utilized. Children who participated in the exercise program, when compared to those who did not exercise, improved on the IQ test. In conclusion, Brown hypothesized that the exercise related improvements were due to the mental demands the children had to undergo.

Furth and Wachs (1974) documented a study in their book, *Thinking Goes To School: Piaget's Theory in Practice*. They titled their study, "The Project at Charleston" in which they observed teachers incorporating movement games with learning disabled

students instead of utilizing a traditional education system. The results of the study showed that movement in the classroom can assist in child development and help students acquire traditional academic skills (Furth & Wachs, 1974). Two years after the study was finished, the experiment spread into other areas of the participating school. This study is a significant resource for the future study because Furth and Wachs investigated the correlation between movement and classroom performance long before other related research was published and available. Furth and Wachs' study demonstrates how movement can be used to fuel learning in classroom, which supports this study design and hypothesis.

Dennison is the creator of the Brain Gym curriculum and programs which are built on the idea that physical movement leads to mental organization and mental organization leads to learning and productivity. Dennison believes that integrating movement into the classroom scheduled both before and during learning can help with focus, information processing, information retention, and improve functioning. Dennison's programs were implemented into school settings and became notorious for their improvement in learning. Because of Dennison's research and initiation of the Brain Gym exercises, his literature strongly supports the hypothesis of this study, which believes that a relationship exists between physical fitness and achievement in the classroom.

Related Research

Childhood obesity is now one of the leading health issues facing U.S. children, and it continues to increase in numbers (Ogden, Carroll, & Flegal, 2008). Obesity has

become an urgent health concern among children. Physical education programs in schools can engage students in regular physical activity to help children learn the skills and habits necessary to live a healthy lifestyle. School based physical education programs can help prevent childhood obesity. However, physical education classes are being cut from the daily school schedule. According to a national study, and since the passing of *No Child Left Behind*, 62 percent of elementary schools and 20 percent of middle schools have increased instructional time to accommodate for reading, language arts, and mathematics (Center on Education Policy, 2007). Additionally, this same study found that 44 percent of school districts reported cutting time in instructional areas as social studies, art, music, physical education, and recess. On average, schools reduced the time in these subjects by more than 30 minutes per day. However, some studies have shown that increasing instructional time for physical education has resulted in an improvement in academic achievement (Trost & Van der Mars, 2010).

Childhood Overweight and Obesity

There has been an increased prevalence in childhood obesity. The statistics have more than doubled the past two decades. In 1980, 6.5 percent of children aged six through eleven were considered obese, and in 2006, seventeen percent of children from the same age group were obese. The percentage of obese children ranging in age from twelve through nineteen more than tripled. In 1980, five percent of children from twelve through nineteen were considered obese, and in 2006, 17.6 percent of children from the same age range were obese (Ogden et al., 2008). Childhood obesity has even turned into a global challenge.

The explanation behind the growing concern of children who are overweight or obese has been a result of a decrease in physical education classes at schools, more families eating out at restaurants or fast food restaurants, and not getting the recommended daily intake of fruits and vegetables (Science Daily, 2009). Starting these habits early in life, have the potential of stretching over into adulthood. Physical education programs are necessary to defeat this national problem in America.

The dramatic increase in the number of children and adolescents who are overweight or obese has led to an emergence of other associated health concerns such as dyslipidemia, hypertension, type 2 diabetes, musculoskeletal disorders, respiratory conditions, emotional problems, and increased risk of cardiovascular disease and cancer as adults (Barnard, Gonzales, Liva, & Ngo, 2006; Buddeberg-Fischer, Klaghofer, & Reed, 1999; Harvie, Howell, Vierkant, Kumar, Cerhan, & Kelemen, 2005; Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999; Ogden, Troiano, Briefel, Kuczmarski, Flegal, & Johnson, 1997; Carroll, Curtin, McDowell, Tabak, Flegal, 2006; Ramirez, Suarez, Chalela, Talavera, Marti, Trapido, 2004; Saltzman, Doherty, Hill, Beresford, Voigt, & Chen, 2008; Strauss & Pollack, 2003). Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal (2006) found that children and adolescents of the Hispanic, African American, and Native American ethnicities are more likely to be overweight and have more cardiovascular and diabetes risk factors than non-Hispanic white children. Non-white Hispanic children and adolescents are the most at risk (Tortolero, Goff, Nichaman, Labarthe, Grunbaum, & Hanis, 1997; Troiano & Flegal, 1998; Whitaker & Orzol, 2006).

Childhood obesity has been linked to adult obesity (Bouchard, 1997). In addition,

overweight and obese children are more prone to be diagnosed with Type II Diabetes and heart disease (Dietz, 2004). Obesity impacts the physical and psychological health in individuals. Policymakers are now turning to schools to help with the growing concern of children who are overweight and obese. There are studies that examine the impact that school-based physical education programs can have on increased physical activity (Mavis, Pearson, Stewart, & Keefe, 2009; Evenson, Ballard, Lee, & Ammerman, 2009).

Children who have physically active parents have been proven to have lower Body Mass Index (BMI) values than those of children with less active parents (Li & Hooker, 2010). Physically active parents appear to stress the importance of exercising to their children. The number of hours spent in front of a television or playing video games are linked to BMI values (Li & Hooker, 2010). Other research has associated watching television with being overweight (Lowry, Wechsler, Galuska, Fulton, & Kann, 2002).

Physical Fitness and Health

There are several research studies concerning the relationship between physical activity and the functioning of an individual. Emery et al. (2003) concluded their study with a strong correlation between increased movement and general improved health and healing. Another correlation has been found between cognitive function and recess (Pellegrini, 1997).

Another study regarding movement was performed by Bruning and Frew (1987). These researchers looked at exercise and relaxation techniques and how these factors affect one's physiological stress indicators. As the authors hypothesized, a relationship exists between these variables. Additional studies investigating movement and stress

include the studies by Armstrong, Collins, Greene, & Panzironi (1988) and Campbell, Eaton, & McKeen (2002). Armstrong et al. (1988) analyzed the effects of relaxation techniques and found a short-term significance of using these techniques to reduce stress. Campbell et al. (2002) also incorporated movement as a therapy treatment for students struggling with stress and also found a positive correlation between movement and stress reduction.

Additionally, Cohen and Walco (1999) researched the effects of dance movement therapy (DMT). This form of movement was used successfully in the implementation with children with cancer and other severe medical conditions. In this particular study, DMT helped these students with the psychological adjustment and reduced stress.

Physical Fitness and Academic Achievement

One study proved that students who met the physical fitness tests, scored higher on the math and reading portion of the SAT-9 and CST (California Department of Education, 2005). Research conducted in a classroom setting by Case-Smith (1995) suggested that movement could aid fine-motor and academic skills development. Thus, it has implications for this study because it researched movement and academia with preschool aged children.

A study conducted in a primary school found that after six hours a week of doing various forms of exercise, academics, confidence, social skills, and health improved (Harper, 1992). Additionally, physical activity has been found to have a significant effect on reading achievement (Donczik, 2001). Academic learning time in physical education

has been used as a predictor of student achievement (Lacy & LaMaster, 1996).

All students, especially those who suffer from Attention Deficit Hyperactivity Disorder (ADHD), need exercise to help them concentrate (Mulrine et al., 2008). Consequently, exercise can aid the brain with memory and attention (Olsen, 1994).

The Brain Gym program, created by Dennison (1985), is another example of related research that advocates a relationship between movement and children's abilities in the classroom. Brain Gym is based on the theory that includes a battery of structured exercises designed to activate certain brain functions (Dennision, 1985).

Physical activity can impact student achievement and increase test scores (Jensen, 2005). "Physical fitness may be a more precise way to predict health outcomes in children than physical activity" (Haga, p. 1095, 2009). Exercise has been proven to improve classroom behavior as well as increase academic achievement (Dwyer et al., 2001). Hall (2007) states, "when the movement part of the brain is stimulated, so is the learning part of the brain" (p. 3). Therefore, physical fitness can be used as a way to optimize learning.

Post-recess attention has been found to be greater after outdoor play periods or recess (Pellegrini & Smith, 1993; Jarrett, et al., 1998). Thus, outdoor recess breaks get the blood flowing, which rejuvenates the brain to help them attend better on classroom tasks.

A study conducted in Virginia consisted of more than 500 elementary schools across the state. The study examined the effect of decreasing the amount of physical education on academic performance. At the conclusion of the study, the results found

that reducing or eliminating the time students spent in physical education classes did not increase academic achievement (Wilkins et al., 2003). This study proves that decreasing physical education time will not increase academic achievement. In fact, there are studies that show when students participate in physical education, achievement is positively affected for some groups (Trost & Van der Mars, 2010).

A Canadian study observed the effects of 546 elementary students and their academic performance after one additional hour of physical education per day. The students in grades 2-6 who participated in extra hours of physical education per day earned better grades in French, mathematics, English, and science when compared to their counterparts who only received physical education for one period per week (Shephard, 1996). Physical education classes are needed more than once a week. In fact, physical activity should be implemented daily.

Tremarche, Robinson, and Graham (2007) studied 311 4th grade students in two schools. Their study found that the students who received 56 or more hours of physical education per school year scored significantly higher on the Massachusetts standardized test in English and Language Arts when compared to the other subjects in the study who only received 28 hours of physical education per year.

With the heightened demands and pressures of academic achievement, reducing or eliminating physical education programs from schools cannot be justified. Physically fit youth are more likely to have higher academic achievement than their inactive peers. National health surveys, including children from around the world, have reported significant positive relationships between physical activity and academic achievement

(Trost, 2007).

Another study analyzed data from 12,000 high school students across the United States. This study found that the students participating in extracurricular physical activities or played sports were twenty percent more likely to earn an 'A' in mathematics or English than their inactive peers (Nelson & Gordon-Larsen, 2006). After reviewing physical fitness test results of 800,000 California students, this study discovered a positive relationship between physical fitness and academic achievement based on California's achievement tests in reading and mathematics (Grissom, 2005).

In an Illinois study, the students who performed well on two aspects of a physical fitness test achieved higher scores in reading and math on state exams than the students who scored lower on the physical fitness tests, regardless of gender and socioeconomic status (Castelli, Hillman, Buck, & Erwin, 2007). The available research provides evidence for schools to grant children more opportunities to help improve their physical fitness levels. In fact, research has shown that aerobic exercise can improve memory and cognitive functioning in children, especially those who are overweight (Buck, Hillman, & Castelli, 2008; Davis, Tomporowski, Boyle, Waller, Miller, Naglieri, & Gregoski, 2007).

A meta-analysis, consisting of more than 40 studies, analyzed the effects of physical training on cognitive functioning (Sibley & Ethnier, 2003). This study found that regular physical activity can improve the cognitive function in children and adolescents. Sibley and Ethnier found significant improvements in perceptual skills, IQ, achievement scores on verbal and mathematics tests, concentration, memory, achievement, and academic readiness. Providing students with physical activity breaks

has the potential and evidence to increase achievement and concentration.

A study conducted in North Carolina involved giving students, in grades Kindergarten through the fifth grade, several ten minute breaks throughout each school day to do some form of physical activity. This study lasted for twelve weeks. The researchers observed the students thirty minutes before and after each break. In conclusion of the study, the researchers found that the physical activity breaks increased on-task behavior by eight percent. For those students who struggled with focusing in class, the physical activity breaks improved on-task behavior by twenty percent (Mahar, Murphy, Rowe, Golden, Shields, & Raedeke, 2006). Another related study examined the effects of different recess times on preschoolers' classroom attention. The findings revealed that the preschoolers' post-recess attention was greater following a recess play period outside (Holmes, Pellegrini, & Schmidt, 2005).

Advances in neuroscience suggest that regular physical activity enhances the growth of new brain cells, stimulates the formation of blood vessels in the brain, and enhances synaptic activity or communication among brain cells (Hillman, Erickson, & Kramer, 2008). More specifically, girls who are physically active have higher grades, have lower dropout rates, and have higher self-esteem (Marsh & Kleitman, 2003; Sabo, Miller, Melnick, & Haywood, 2004; Tucker Center for Research on Girls and Women in Sports, 2007).

Physical Fitness and Rural Areas

Since the proposed study will be conducted in a rural school, a review of literature including how physical activity affects rural dwellers is warranted. Rural areas have been

shown to have higher amounts of sedentary behavior, lower exercise rates, and a limited access to nutritionists and exercise promotion programs (Tai-Seale & Chandler, 2003). Urban children are more likely to engage in sports on a weekly basis than their rural counterparts (Bathrellow, Lazarou, Panagiotakos, & Sidossis, 2007). This same study found no substantial difference in physical activity habits among children living in urban and rural areas. Tremblay, Barnes, Copeland, and Esliger (2005) found that children living in rural areas were less active, had lower aerobic fitness scores, and had higher levels of obesity than their urban peers. Another study concluded that children living in a rural area of North Carolina had an odds ratio for obesity by fifty percent (McMurray, Harrell, Bangdiwaia, & Deng, 1999). In a qualitative study, the results found that the majority of the rural schools studied had limited or no physical education programs because of budget cuts (Walker, Del Rosso, & Held, 2005).

Physical Fitness and Gender

Gender and its effect on physical fitness was also analyzed in the study. So, a review of literature regarding this topic is relevant. The Centers for Disease Control and Prevention performed a longitudinal study that consisted of two national samples. The study involved 5,316 students from grades ranging from Kindergarten through 5th grade. The females from the study who participated in physical education for seventy or more minutes per week had significantly higher achievement scores in mathematics and reading than the females who participated in physical education for thirty five or fewer minutes per week (Carlson, Fulton, Lee, Maynard, Brown, Kohl, & Dietz, 2008).

Girls tend to be less physically active than boys (Kimm, Glynn, Kriska, Barton,

Kronsberg, & Daniels, 2002). Other research studies parallel this notion (Sallis, 1993; Sherar, Eslinger, Baxter-Jones, & Tremblay, 2007; Trost & Pate, 1999). Physical activity can decline in girls as early as the late elementary school age. Furthermore, research has noted a decline in physical activity from childhood to adolescence, and this trend is more prominent in females (Sherar, Eslinger, Baxter-Jones, & Tremblay, 2007; Centers for Disease Control and Prevention, 2002; Pate, Freedson, Sallis, Taylor, Sirard, & Trost, 2002; Ziviani, Macdonald, Ward, Jenkins, & Rodger, 2008). Several factors have been contributors to lower physical activity levels observed in girls. Some of these include low self-esteem and body image (Tucker Center for Research on Girls and Women in Sports, 2007), lack of motivation (Dwyer, Allison, Goldenberg, Fein, Yoshida, & Boutilier, 2006), enjoyment (Lee, 2004), interest of value of physical activity (Pate, Ward, O'Neil, & Dowda, 2007), low athletic competence (Vu, Murrie, Gonzalez, & Jobe, 2006) and lack of parental and/or peer support (Xiang, McBride, & Bruene, 2006). Therefore, physical activity programs for girls should provide experiences that focus on increasing self-esteem, positive body image, value for physical activity, motivation to be physically active, and fun activities that girls will enjoy (The President's Council on Physical Fitness and Sports, 1997). Based on the research, it seems that females need physical education classes than males.

Gender has been found to be a major factor influencing physical activity among children (Chiang, Huang, & Fu, 2005). In this study, gender was found to help determine differences in physical self-concept. Men have been recorded as sitting more than women, as women are more likely to engage in walking or light activities (Larsson,

Lissner, Maslund, & Lindroos, 2004). However, in the same study both men and women who had high Body Mass Index (BMI), also engaged in less physical activity. Another study examining gender and academic achievement found that girls perform better on academic assessments and school conduct (Willingham & Cole, 1997). Willingham and Cole also found that the girls did not have higher self-esteem than the boys. These findings suggest that the girls' self-esteem was not influenced by academic achievement as much as that of the boys.

Physical Education School-Based Programs

Physical educators have the capability of encouraging young children to become physically active (Manohar, 2010). These teachers can describe the benefits of remaining physically active, as well as show them different opportunities of how individuals can get physically fit. Physical activity can be encouraged during recess, and after school health programs can be developed to involve children. Curriculum changes may need to be revisited (Pivarnik & Pfeiffer, 2002). Wellness and health lessons need to be integrated more into the physical education classes. Physical educators need to encourage individuals to remain physically active throughout their entire lives.

Research justifies the importance of physical education school programs. Reducing or eliminating physical education programs will not increase academic achievement. Schools' physical education programs are crucial for promoting physical activity for young children and adolescents (Kelso, 2009). Students who live sedentary lives need to be encouraged to live a healthy lifestyle. Schools can create positive experiences with physical activity for children, as well as provide students with the

knowledge on how to lead active lives. Physical education must remain in schools, and policymakers must stop trying to cut physical education from schools. Physical activity opportunities should be maximized in order to teach the whole child (Luepker, 1999).

Summary

In conclusion, the importance of physical activity and its implications at the school level have research to back its claim. The past and recent literature supports the hypothesis for this study. Research will continue to expand as the phenomena increases across schools in the United States of America.

CHAPTER THREE: METHODOLOGY

This chapter presents the methodology of this correlational research study. This study has been established to examine the relationship between physical fitness levels and student achievement. Physical fitness levels were determined by the President's Challenge Physical Fitness Test. The researcher also collected academic data through STAR Reading and Grade Point Averages (GPA). This chapter includes the research design, description of the site and subjects, instrumentation, and procedures. This chapter concludes with the data analysis.

To the researcher's knowledge, no other research has reviewed fourth and fifth grade students' physical fitness levels and academic achievement at the participating school. The researcher compared the fourth and fifth graders' physical fitness levels based on the President's Challenge Physical Fitness Test to their academic achievement based on STAR Reading percentile scores and GPA's. All of the data, physical fitness levels and academic achievement, were taken and collected from the first quarter grading period of the 2009-2010 school year.

Overview of the Study

This quantitative study examined the relationship between physical fitness levels and academic achievement. The researcher looked at a sample made up of fourth and fifth graders from the target school. The researcher collected data and analyzed the results from the President's Challenge Physical Fitness Test, STAR Reading, and GPA's to see if a correlation exists between physical fitness and academic achievement. Gender was also analyzed to examine the relationship between physical fitness and gender.

The study compared the percentiles of the President's Challenge Physical Fitness test to the STAR Reading percentiles and GPA's. All students in this study were assessed on the President's Challenge Physical Fitness Test, STAR Reading Test, and Grade Point Averages during the first quarter of the 2009-2010 school year.

Hypothesis

- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.

- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

Statement of Null Hypothesis

- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.

- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will not be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

Research Design

The research design is a correlational study. This correlational research sought to provide a relationship among the three variables that were used. The purpose of the study was to compare the physical fitness percentile scores of the fourth and fifth graders to academic achievement, based on the hypotheses of the study. The collected data was

gathered from the President's Challenge Physical Fitness scores, STAR Reading percentiles, and GPA's. This study determined if students were identified as being at an "Outstanding" level of physical fitness, a "Basic" level of physical fitness, or below the 50th percentile, which were categorized as "Needs Improvement" for the purposes of this study, while examining the relationship between physical fitness and academic achievement. Additionally, the researcher determined if a relationship exists between physical fitness, academic achievement, and gender. The following questions provided a foundation of which this study was based:

1) Does a significant positive relationship exist between physical fitness levels and academic achievement, as determined by the President's Challenge Physical Fitness Test, STAR Reading percentile scores, and Grade Point Averages, respectively for fourth and fifth graders at the targeted school?
2) Will gender play a role in the relationship between physical fitness levels, based on the President's Challenge Physical Fitness Test and academic achievement, based on STAR Reading percentile scores and Grade Point Averages for fourth and fifth graders at the targeted school?

Preliminary Procedures

Before conducting this study, a review of literature was produced to warrant a purpose for this quantitative study. The review of literature focused on the benefits of being physically active, including increasing student achievement. Other ideas that were explored were the importance of physical fitness programs in schools, the role physical fitness plays with regard to gender, and studies that incorporated movement in the

classroom. The researcher received approval from the Institutional Review Board (IRB) in order to conduct research on human subjects.

Selection of Sample

One Title I elementary school was chosen for this study. The subjects included all of the fourth and fifth grade students who were enrolled at the participating school during the first quarter of the 2009-2010 school year. The researcher was given access to the physical fitness and academic data. The principal at the participating school was the former assistant principal at the researcher's school. Also, the physical education teacher at the sample school is the researcher's husband.

The population of this study included all 90 fourth and fifth grade students from a rural northeast Georgia Title I elementary school. The participating school currently uses the President's Challenge Physical Fitness Test, and the five physical fitness tests were conducted by the physical education teacher. A permission letter was issued to the school principal in order to proceed with the research study.

Since the current physical education teacher has been employed at the school, the sample school has used the President's Challenge Physical Fitness Test in order to obtain physical fitness levels of individual students. Sixty-five percent of the student population qualifies for the Free and Reduced Price Lunch Program. The school has a certified staff population of twenty-eight teachers across all disciplines. A total of nineteen percent of the certified staff holds a graduate degree of at least a Master's Degree. As part of the *No Child Left Behind* initiative, all teachers are highly qualified to teach in their assigned

subject areas. The selected school includes grades Pre-Kindergarten through the fifth grade with a population of 302 students.

Out of the 302 students, 90 (46 males and 44 females) are fourth and fifth graders. 62 of the 90 fourth and fifth graders are Caucasian, 18 are Hispanic, 7 are African American, 2 are Asian, and 1 is American Indian. All of the subjects are proficient in English.

The fourth and fifth grade students attend a physical education class twice a week for a 45 minute session. Physical education classes are held from 8:00 – 8:45 AM or 8:45 – 9:30 AM for the fourth grade classes, and fifth grade physical education classes are held 10:05 – 10:50. This schedule remains constant for the entire school year. Fourth and fifth graders receive fifteen minutes per day of recess. Fourth and fifth grade students were chosen out of convenience. In order to control as many extraneous variables as possible, only fourth and fifth graders were chosen for the future study.

The researcher and the physical education teacher conferred to review the purpose of the study and to gain a better understanding of the components of the President's Challenge Physical Fitness Test. Physical fitness data from each of the five fitness tests were used to determine a mean percentile score for each student. Based on this mean, each subject was identified as having either an "Outstanding," "Basic," or a "Needs Improvement" physical fitness level. Each subject was also given a raw score of 1 – 5 depending on how many times he or she scored in the "Outstanding" physical fitness level for each fitness test. Academic data was determined based on the STAR Reading percentile scores and GPA's from the first quarter of the 2009-2010 school year. The

results from the STAR Reading assessment and Grade Point Averages were compared to the fitness levels from the President's Challenge Physical Fitness Test to examine the relationship between physical fitness and academic achievement. Gender was also considered and used to determine if a correlation exists between gender and physical fitness.

Instruments Used in Data Collection

Physical fitness data was collected from the results of the President's Challenge Physical Fitness Test from the first quarter of the 2009-2010 school year. This test provided pertinent information to determine the students' level of physical fitness. The results of this physical fitness test provide normative data. The goal of this program is to promote a healthy lifestyle that will continue throughout the students' lives.

The researcher used the President's Challenge Physical Fitness test because it is a nationally recognized physical fitness test. It was created in 1953 by Kraus and Weber, and was administered by Dwight E. Eisenhower, out of the growing concern of the lack of physical activity of American children in relation to the European counterparts. The President's Challenge Physical Fitness test has intentions of promoting the benefits of fitness for individuals of all ages including kids, teens, adults, and seniors. The President's Challenge Physical Fitness test is designed to assess students based on five areas of physical fitness abdominal/core muscle strength and endurance (sit-ups), upper body strength and endurance (pull-ups), flexibility (sit and reach), agility (shuttle run), and cardiopulmonary endurance (mile run),.

The five areas assessed on the President's Challenge Physical Fitness Test were scored based on students' percentile ranks when compared to other students their age. A score below the 50th percentile will be categorized as a physical fitness level that "Needs Improvement." This level of physical fitness alerts physical education teachers that special interventions should be made for that particular student. Physical fitness tests, such as the President's Challenge Physical Fitness Test, are important because they reveal what could be potential health risks later on in life. If children are labeled with a "Needs Improvement" physical fitness level, physical education teachers can work independently with children to create goals to improve their fitness. Physical education teachers can help guide these students toward a more active and healthier lifestyle.

President's Challenge Physical Fitness Test

Students were assessed on the five different events that measure physical fitness, which included muscular strength/endurance, cardiopulmonary endurance, speed, agility, and flexibility. A certified physical education teacher must administer and conduct the tests. The tests that the physical education teacher assessed, and the ones the researcher used for the study were sit-ups, shuttle run, one-mile run, pull-ups, and the sit and reach. The reason these fitness tests were used is because these are among the most common physical fitness tests for the identified areas of physical fitness. The results for each test give a percentile ranking for the student performing the physical fitness test. The given percentile scores are based on age and gender to indicate physical fitness levels. Students fall within a "Needs Improvement," "Basic," or an "Outstanding" fitness level.

All of the research for the President's Challenge Physical Fitness test is conducted and reported by the President's Council on Physical Fitness and Sports. It is also a program of the U.S. Department of Health and Human Services. The President's Council continues to publish extensive information on fitness and physical education. An "Outstanding" level of physical fitness is having an 85th percentile or higher, and a "Basic" level of physical fitness is equitable to a 50th – 84th percentile rank, and below the 50th percentile will be identified as having a "Needs Improvement" physical fitness level, based on the 1985 School Population Fitness Survey.

The program that was used in the study helps assess the fitness levels of students ranging in age from six through seventeen years of age. The President's Challenge offers awards for students to encourage them stay physically active. The President's Council on Physical Fitness and Sports recommends conducting fitness testing at least twice a year, at the beginning of the year and the end of the year. Before conducting any physical fitness test, physical education teachers are expected to consider the medical status of each individual to identify any medical or health problems. Throughout the testing, students are informed on the proper technique for each event. In order to increase the validity of the collected fitness data, students are already familiar with the physical fitness tests, as the same ones are used each year. The individual's age is compared to the appropriate standards, based on the 1985 National School Population Fitness Survey, which was validated in 1998. Students with disabilities or special needs have their own individual physical fitness program.

Abdominal/Core Muscle Strength and Endurance.

The purpose of this event is to measure abdominal strength and endurance by totaling the maximum number of sit-ups performed in a one-minute time span. The proper technique includes having the students lie on a cushioned flat surface with their knees bent and feet flat on the floor. Their feet should be approximately twelve inches from their buttocks. A predetermined partner applies pressure to both feet to keep them stationary. The arms are crossed with hands placed on the opposite shoulders, with the elbows close to the chest. Students can then lift their torso, touch their elbows to their thighs, and then lower their back until the shoulder blades touch the floor. This process would be considered one sit-up. The timer is set for one minute, and the students stop when time is called. Sit-ups are only counted if proper form is executed.

Agility.

The objective of the shuttle run is to measure speed and agility. Two parallel lines are pre-marked thirty feet apart. Two similar objects (i.e. blocks or chalkboard erasers close to the size of 2”x2”x4”) are placed behind one of the lines. Students start from behind the opposite line. When the event commences, the students run toward the opposite line, grab one of the objects, run back to the starting line, gently place the object behind the starting line, run back toward the opposite line, grab the second and last object, and run back across the finish line. The objects should not be thrown across the starting line. The time is reported to the nearest tenth of a second.

Cardiopulmonary Endurance.

The one-mile run measures the heart and lung endurance by timing how long it takes to cover the designated one mile distance. On a pre-determined path, students perform a one-mile run by either walking, running, or a combination of the two. However, the students are encouraged to cover the one-mile distance in the shortest time possible time.

Prior to this event, students are instructed on how to pace themselves and are given practice time to run against their own time. Warm-up periods and cool down sessions are implemented before and after the test. The students' times are recorded in minutes and seconds. Shorter distance runs are options for younger children.

Upper Body Strength and Endurance.

Pull-ups are measured to determine the upper body strength and endurance by completing the maximum number of pull-ups. During this event, students hang from a stable horizontal bar with arms and legs fully extended. The students' feet should not touch the floor. Students can choose whether they would like to use an overhand (palms facing away from the body) or underhand (palms facing towards the body) grasp. Students attempt to raise their body until their chin clears the bar, and then they lower themselves back down to the initial position. Students are encouraged to complete as many pull-ups as possible. The pull-up motion should be smooth, as kicking or bending the legs are not permitted, and the body is prohibited from swinging.

Flexibility.

The sit and reach event measures the flexibility of the lower back and the hamstrings. The President's Challenge offers a sit and reach box to help with the flexibility testing. The box has a built-in footplate. This constructed box is marked in centimeters, with 23 centimeters at the level of the feet. Before completing the event, the students remove their shoes and sit on the floor with their knees fully extended. The feet should be shoulder-width apart, and the soles of the feet should be flat against the end of the box. One hand is placed on top of the other with palms down and legs flat while the students reach along the measuring line as far as possible. After three attempts, the fourth reach is held for three seconds while the distance is being recorded. The students' legs must remain straight and the soles of the students' feet should be flat against the box throughout the event. The measurements are recorded to the nearest centimeter.

Each year, the President's Challenge Physical Fitness Test recognizes three schools from each state with the State Champion Award. The President's Council on Physical Fitness and Sports partner with the American College of Sports Medicine (ACSM) in recognizing elementary and secondary schools that meet state physical education standards. The schools that receive this award must have the highest percentage of students qualifying for the President's Physical Fitness Award in each of the three enrollment categories. In other words, these qualifying schools have the highest number of students ranking in the 85th percentile, or with an "Outstanding" physical fitness level, in all five events. The three categories include schools with an enrollment

of 50-200 students, 201-500 students, and over 500 students enrolled in the President's Challenge Physical Fitness Program. The program is free for schools.

Academic Assessment Tools

Academic data was collected from the STAR Reading program taken the first quarter of the 2009-2010 school year. STAR Reading is one instrument that was used for the academic assessment tool. The purpose of using the STAR Reading program is to determine reading levels of the subjects involved in the study. This assessment tool is provided by Renaissance Learning and is supported with scientific research. STAR Reading is proven to predict future performances on standardized tests. STAR Reading is a reliable and valid assessment tool for reading achievement and reading comprehension. Students take this test on the computer, because it is a web-based program. The questions adjust to the students' responses. Based on the results and the given level, teachers can adjust the reading level instruction for each student.

For students in Grades 1 – 12, STAR Reading provides norm-referenced reading scores and criterion referenced measures of instructional reading levels. With this program, teachers can monitor student growth throughout the school year. The STAR Reading program is regarded as reliable and valid from The National Center for Student Progress Monitoring and the Southwest Educational Development Laboratory.

STAR Reading

Reliability is the degree in which a test achieves consistent results multiple times. To determine the reliability of STAR Reading 4.3, Renaissance Learning used three methods: split-half method, test-retest method, and the estimation of generic reliability.

National norms for STAR Reading were determined in 1996, with newer norms created in 1999. In the Spring of 2008, a national sample of students were used, and the latest norms were developed. The final size for the normal sample was 69,738 students in grades 1 – 12. These students were enrolled in 2,709 schools from 48 states plus the District of Columbia.

The generic reliability coefficient is a more accurate estimate of STAR Reading's internal reliability. The generic reliability coefficients for STAR Reading range from 0.89 (Grades 3 and 4) – 0.93 (Grades 10-12). The overall reliability of these scores is approximately 0.95. The results from the split-half reliability analysis test is about 0.92, with ranges from 0.88 (Grade 1) – 0.91 (Grade 12). These results are consistent across Grades 1 – 12. The reliability of STAR Reading is considered high considering the test is composed of 25 tested items (Renaissance Learning, 2010).

The STAR Reading 4.3 test-retest reliability estimates were determined by using two different tests, in order to eliminate any conflicts with test items that were encountered in the first test. All other components of the two tests were the same. The test-retest reliability estimate for Grades 1-12 is 0.91. The coefficients of the test-retest range from a low of 0.80 (Grades 8, 10, and 11) to a high of 0.90 (Grade 12). These results are consistent across Grades 1-12. The overall reliability coefficients compare favorably with other reliability estimates of other published reading tests (Renaissance Learning, 2009).

The validity of an assessment is the extent to which it measures what it claims to assess. Validity measures determine the usefulness of the test. During the STAR

Reading norming study, participating schools submitted their STAR Reading scores as well as the results on any standardized tests including the Iowa Test of Basic Skills (ITBS), Stanford Achievement Test (SAT9), California Achievement Test (CAT), as well as other statewide tests. The collected data included more than 12,000 students. It was determined that the within-grade average concurrent validity coefficient ranged from 0.71 to 0.81 in grades 1 through 6 and from 0.64 to 0.75 in grades 7 through 12. The overall concurrent validity coefficient for grades 1-6 was 0.73 and for grades 7-12, it was 0.72. The predictive validity coefficients varied from 0.68-0.82 in grades 1-6, with an overall average of 0.79. The predictive validity coefficients for grades 7-12 ranged from 0.81-0.86, with an overall average of 0.82. The research study found that STAR Reading 2.x test correlates with other standardized tests. Therefore, STAR Reading has construct validity (Renaissance Learning, 2009).

Grade Point Averages

Grade Point Averages (GPA's) were also used to determine academic achievement in this study. GPA's were determined from the first quarter of the 2009-2010 school year. The researcher calculated the Grade Point Averages. The summary marks for Reading, English/Language Arts, Mathematics, Science, and Social Studies were used. An Exceeds (E) was equivalent to a 4, a Meets (M) was equivalent to a 3, an In Progress (IP) was comparable to a 2, and a Does Not Meet (DNM) was equal to a 1. The GPA was determined by calculating an average of these five subjects. The researcher acknowledges the lack of reliability and validity when using Grade Point

Averages, due to uncontrollable and confounding variables, but another form of academic achievement was deemed necessary for this study.

Procedures

The researcher sought permission from the principal of the school first. All data was kept confidential and anonymous. Student names were not used in the study, but students were given a number instead.

The researcher obtained the physical fitness and academic data from the principal. The researcher met with the physical education teacher to go over the components of each physical fitness test and how each of tests was administered. Additionally, the physical education teacher informed the researcher on how he was trained on the administration of the President's Challenge Physical Fitness test.

The President's Challenge Physical Fitness Test was administered during the first quarter of the 2009-2010 school year during the regularly scheduled physical education class times. The testing time took approximately 1,350 minutes over six class periods over a three week span. Fourth and fifth grade classes have physical education for forty-five minutes twice a week. Since the physical fitness tests were administered during the scheduled physical education class time, no instructional time was disturbed, and the school day was unchanged. The physical education teacher at the school was trained on how to administer the President's Challenge Physical Fitness test prior to conducting the physical fitness tests. The researcher met with the physical education teacher to determine how the training took place and the details of each physical fitness test.

The school principal at the school mandates that every student take the STAR Reading test at the beginning of the school year. The fourth and fifth grade teachers administered the computer-based STAR Reading assessment during the first quarter of the 2009-2010 school year. This test is also administered during the middle of the year and again at the end of the year. GPA's were calculated from the first quarter and collected with the STAR Reading data. The researcher compared the STAR Reading percentile scores and GPA data to the results of the President's Challenge Physical Fitness Test. This study determined whether or not a relationship exists between physical fitness and academic achievement.

Data Analysis

Data was collected and analyzed to determine if a relationship exists between the President's Challenge Physical Fitness Test scores and the academic achievement of STAR Reading percentile scores, Grade Point Averages (GPA's), and gender. Microsoft Excel and Analyze It were used to enter and analyze data, respectively to determine if a relationship exists. Multiple regressions were used to determine any relationships between President's Challenge Physical Fitness Test, STAR Reading percentile scores, GPA's, and gender.

The physical fitness data was based from five areas of physical fitness: abdominal/core muscle strength and endurance, agility, cardiopulmonary endurance, upper body strength and endurance, and flexibility. All five of these areas were entered in Microsoft Excel for each subject involved in the study. A mean raw score for each subject was calculated. The mean percentile score for each student determined whether

each subject had an "Outstanding" physical fitness level, "Basic" physical fitness level, or a "Needs Improvement" physical fitness level. Medians, frequencies, and standard deviations were also calculated, with the help of Microsoft Excel. Students were also assigned a numerical fitness score from 0-5 based on how many fitness tests the subjects fall into the range of an "Outstanding" physical fitness level.

The physical fitness scores, as well as STAR Reading percentiles scores, GPA's, and gender were entered into Microsoft Excel. Using the Analyze It Program, multiple regressions were computed for the data analysis. Finally, the data was reported in narrative text, tables, and figures.

Summary

The President's Challenge Physical Fitness Test is intended to encourage students to stay physically active everyday of their lives. It is important to ascertain the percentiles early so that teachers and parents can help students improve their fitness. It is clear that the health benefits of staying committed to physical activity far outweigh the risks.

This chapter announced the methods that the researcher took for this quantitative study. Physical fitness percentiles, as defined by the President's Challenge Physical Fitness Test, STAR Reading Percentiles, GPA's, and gender were analyzed to examine the strength and direction of the relationship between physical fitness and academic achievement based on the notion that physical fitness has an effect on how students achieve academically. Gender was analyzed to see if gender plays a role in the expected relationship. Chapter four will discuss the results from the quantitative study.

CHAPTER FOUR: FINDINGS

The purpose of this study was to determine if a relationship exists between physical fitness and academic achievement. The physical fitness levels were determined by using the President's Challenge Physical Fitness Test and academic achievement was measured by STAR Reading percentile scores and Grade Point Averages (GPA). This study was based on the belief that physical fitness levels influence an individual's cognitive functioning and the ability to achieve academically. This study is warranted because more research was deemed necessary in order to better understand the relationship between the two variables. The hypotheses stated that:

- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance

based on STAR Reading percentiles scores for females.

- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

The Null Hypotheses stated:

- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the

participating school.

- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will not be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

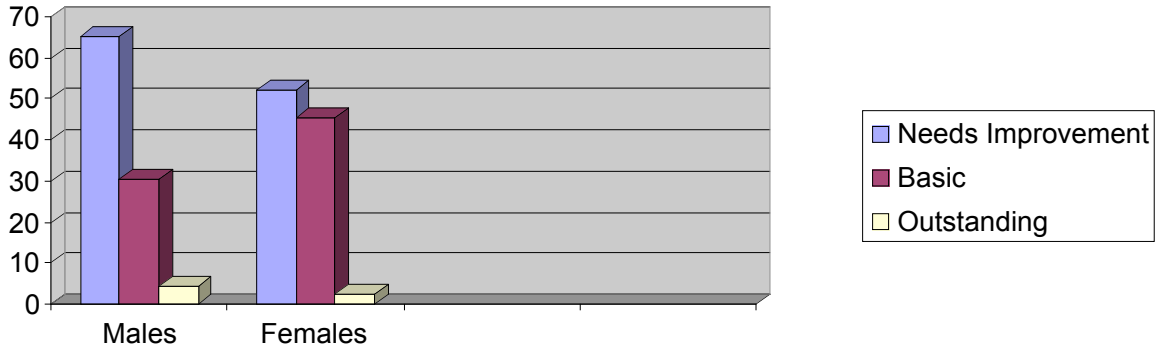
For the purposes of this study, a research objective was established. The data included physical fitness levels, STAR Reading percentile scores, Grade Point Averages, and gender. These variables were compared and the results are described within the chapter.

The results of this study can be an addition to the existing body of knowledge and literature regarding the relationship between physical fitness and academic achievement. There are limitations to this study; therefore, the results from this study should be interpreted cautiously.

Findings

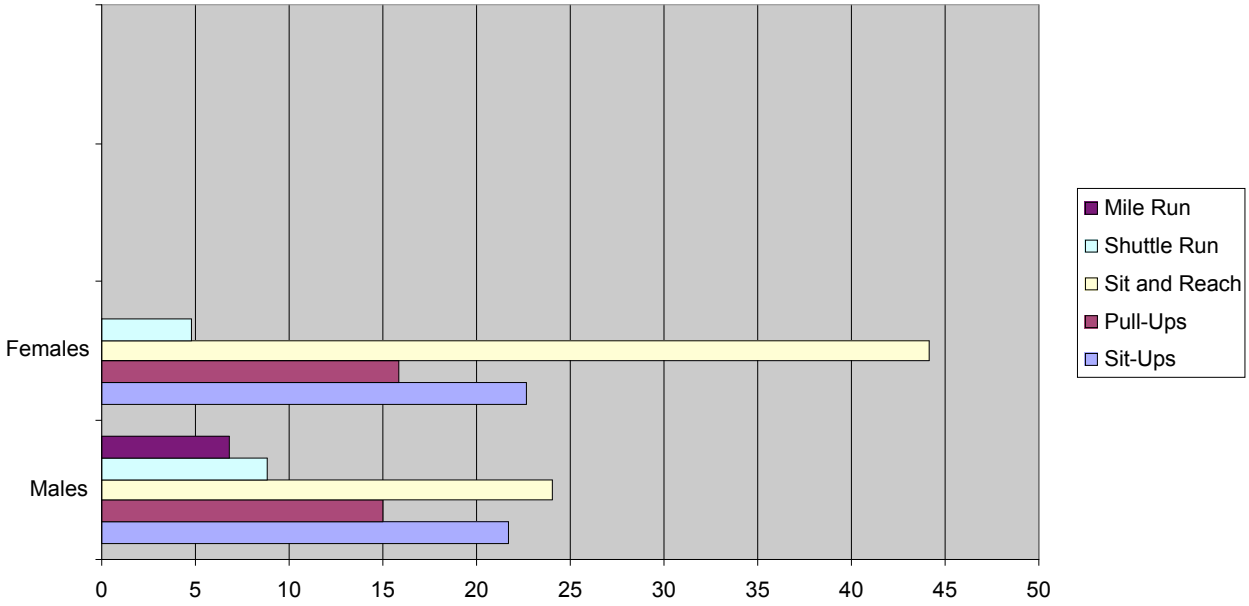
There were 90 participants in this study. These subjects were in grades 4 or 5. 51% of the participants were male, and 49% were female. More specifically, 29% of the fourth and fifth graders were nine years old, 61% were ten years old, 9% were eleven years old, and 1% was twelve years old. Results from the study indicated that 4% of the males had an average physical fitness level above the 85th percentile based on all five physical fitness tests (see Figure 4.1). 2% of the females had an average physical fitness level above the 85th percentile based on the five physical fitness tests used in the study (see Figure 4.1). These particular males and females were labeled with an "Outstanding" physical fitness level. The breakdown of each of the physical fitness tests and the percentage of males who scored in the 85th percentile or above is as follows: sit-ups 21.7%, pull-ups (15%), sit and reach (24%), shuttle run (8.8%), and mile run (6.8%) (see Figure 4.2). The breakdown of each of the physical fitness tests and the percentage of females who scored in the 85th percentile or above is as follows: sit-ups (22.7%), pull-ups (15.9%), sit and reach (44.1%), shuttle run (4.8%), and mile run (0%) (see Figure 4.2).

Figure 4.1. Percentages of Males and Females Who Scored in the "Needs Improvement," "Basic," or "Outstanding" Physical Fitness Level



Among the students that were used in this research study, the percentages for both males (4.3%) and females (2.3%) at the 85th percentile or higher, indicate that the level of physical fitness is relatively low. The findings show that the males and females had similar percentages in the number of students performing in the "Needs Improvement," "Basic," and "Outstanding" physical fitness levels; therefore, these findings led the researcher to conclude that gender did not play a significant role in the relationship between physical fitness and academic achievement in this study. However, the number of students not performing at the "Outstanding" and "Basic" level of physical fitness is disturbing. With 52.2% of the females and 65.2% of the males having a physical fitness level labeled "Needs Improvement," educators, parents, and students should work collaboratively to set physical fitness goals for the individual students who performed in this physical fitness range.

Figure 4.2. Percentages of Males and Females Who Performed in the "Outstanding" Physical Fitness Range for Each Test



The major differences between percentages of males and females falling in the "Outstanding" physical fitness level are Sit and Reach, Shuttle Run, and the Mile Run. 44.1% of the females scored at the 85th percentile or higher on the Sit and Reach physical fitness test, as opposed to only 24% of the males scored at the 85th percentile or higher. In regards to the Shuttle Run physical fitness test, 8.8% of the males scored in the "Outstanding" physical fitness range, while only 4.8% of the females scored in this same range. While 0% of the females scored at the 85th percentile or higher on the mile run physical fitness test, 6.8% of the males scored at the 85th percentile or higher. These findings could suggest that the females need more assistance with agility and cardiopulmonary endurance, and the males are struggling more with flexibility. With obesity on the rise, these statistics need to be addressed.

Multiple Regression

Multiple regression was chosen as the appropriate statistical procedure because it looks at the relationship among several variables (Ary, Jacobs, Razavieh, & Sorenson, 2006). This correlational procedure enables researchers to find the best possible weighting of two or more independent variables to yield a maximum correlation with a single dependent variable (Ary, Jacobs, Razavieh, & Sorenson, 2006). Multiple regressions are helpful when researchers yearn to see if variables were related, and if so, to what degree. The researcher used multiple regressions to see if a relationship existed between physical fitness and academic achievement, based on STAR Reading percentiles and Grade Point Averages. For the purposes of this study, the statistical significance was determined at $p < 0.05$, the multiple correlation coefficient (R) > 0.195 values, and with a 95% Confidence Interval. Multiple regressions were conducted to examine the relationships between the President's Challenge Physical Fitness Test with STAR Reading Percentile scores (Table 4.1, Figure 4.3), Grade Point Averages (Table 4.2, Figure 4.4), STAR for Males (Table 4.3, Figure 4.5), STAR for Females (Table 4.4, Figure 4.6), Grade Point Averages for Males (Table 4.5, Figure 4.7), Grade Point Averages for Females (Table 4.6, Figure 4.8), STAR Reading percentiles v. Grade Point Averages (Table 4.7, Figure 4.9), Physical Fitness Levels and STAR v. Grade Point Averages (Table 4.8, Figure 4.10), Reading (Table 4.9, Figure 4.11), English/Language Arts (Table 4.10, Figure 4.12), Mathematics (Table 4.11, Figure 4.13), Science (Table 4.12, Figure 4.14), Social Studies (Table 4.13, Figure 4.15), Sit Ups (Table 4.14, Figure

4.16), Pull Ups (Table 4.15, Figure 4.17), Sit and Reach (Table 4.16, Figure 4.18), Shuttle Run (Table 4.17, Figure 4.19), and the Mile Run (Table 4.18, Figure 4.20).

Table 4.1

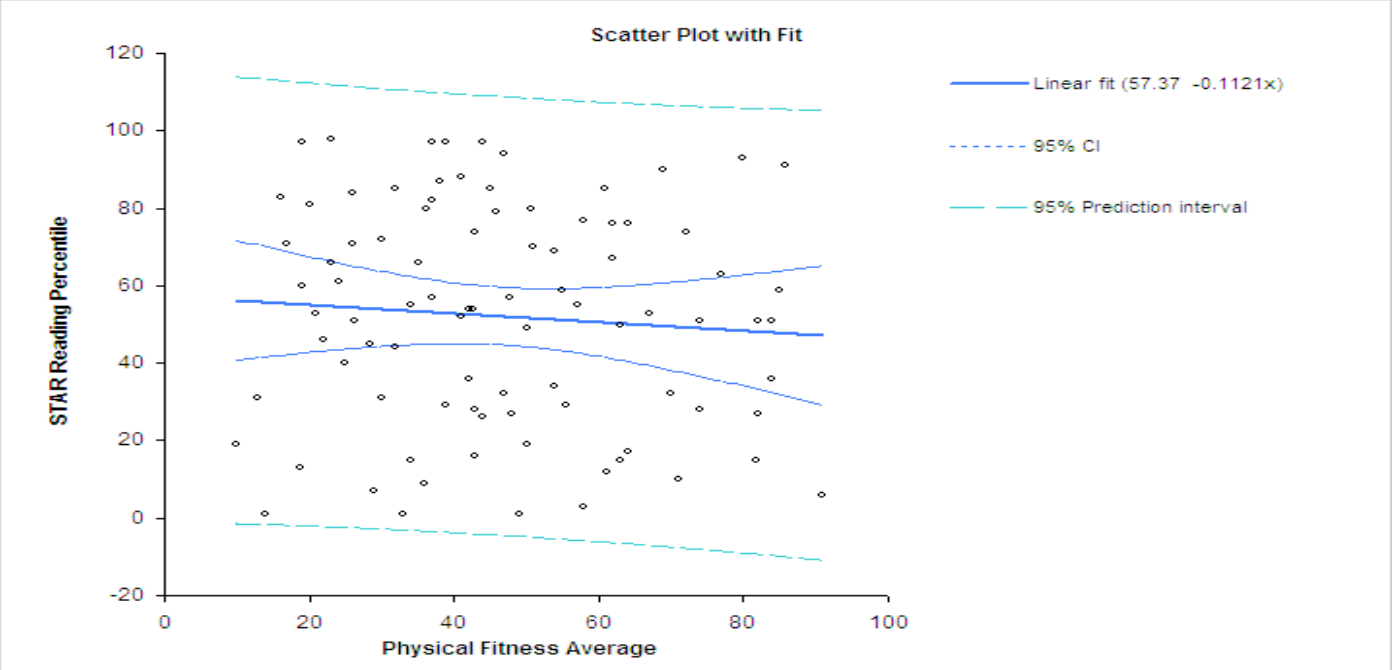
Physical Fitness Levels and STAR Reading Percentiles

n	90
R^2	0.01
Adjusted R^2	0.00
SE	28.3

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	57.37	42.37	to 72.37	7.547	7.60	88	<0.0001
Slope	-0.1121	-0.4065	to 0.1822	0.14810	-0.76	88	0.4510

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	460.4	1	460.4	0.57	0.4510
Residual	70687.2	88	803.3		
Total	71147.7	89			

Figure 4.3. Physical Fitness Levels and STAR Reading Percentiles



The value of p is 0.4510 (> 0.05), which indicates no correlation between physical fitness levels and STAR Reading percentile scores. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness based on the President's Challenge Physical Fitness Test and academic performance, based on the STAR Reading percentile scores.

Table 4.2

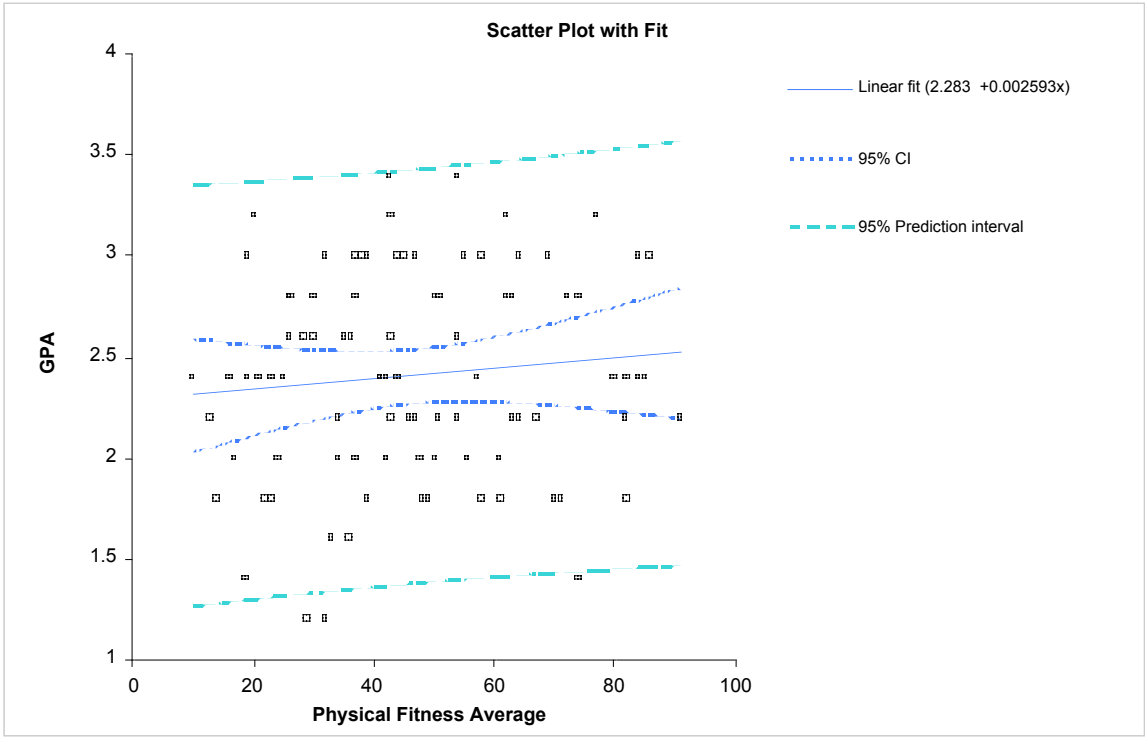
Physical Fitness Levels and Grade Point Averages

n	90
R^2	0.01
Adjusted R^2	0.00
SE	0.51

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	2.283	2.011	to 2.555	0.1369	16.67	88	<0.0001
Slope	0.002593	-0.002747	to 0.007934	0.0026873	0.97	88	0.3372

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	0.25	1	0.25	0.93	0.3372
Residual	23.27	88	0.26		
Total	23.52	89			

Figure 4.4. Physical Fitness Levels and Grade Point Averages



The value of *p* is 0.3372 (> 0.05), which indicates no correlation between physical fitness levels and Grade Point Averages. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance, based on Grade Point Averages.

Along with the results above, more multiple regressions were conducted to research the relationship between STAR Reading, Grade Point Averages, and physical fitness levels further. The additional multiple regressions were used to determine whether or not the variables had an effect on each other. Gender was also analyzed with varying results. Also, physical fitness was compared with each individual subject: Reading, English/Language Arts, Mathematics, Science, and Social Studies.

Table 4.3

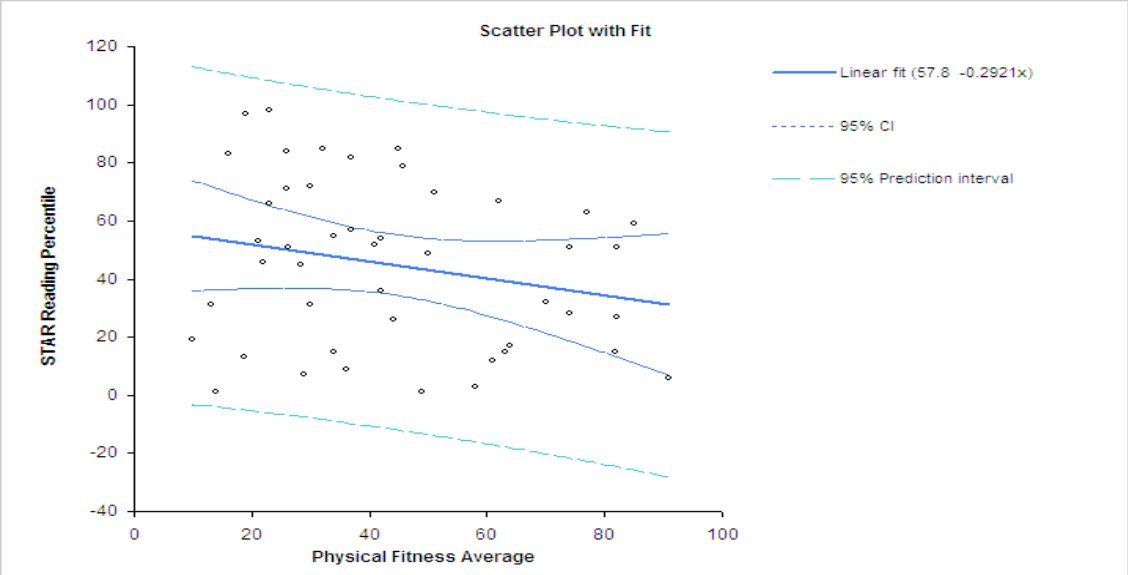
Physical Fitness Levels and STAR Reading Percentiles for Males

n	46
R^2	0.05
Adjusted R^2	0.03
SE	27.8

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	57.8	39.5	to 76.1	9.08	6.37	44	<0.0001
Slope	-0.2921	-0.6639	to 0.0797	0.18448	-1.58	44	0.1205

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	1941.8	1	1941.8	2.51	0.1205
Residual	34085.2	44	774.7		
Total	36027.0	45			

Figure 4.5. Physical Fitness Levels and STAR Reading Percentiles for Males



The value of *p* is 0.1205 (> 0.05), which indicates no correlation between physical fitness levels and STAR Reading Percentile Scores for males. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance, based on STAR Reading Percentile Scores for males.

Table 4.4

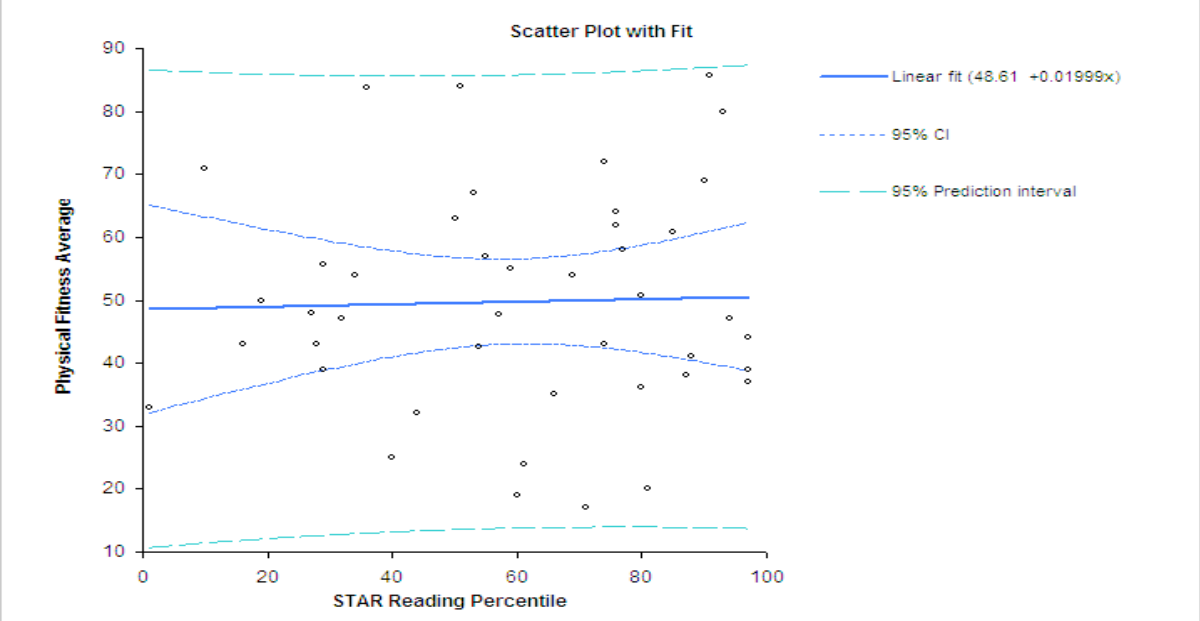
Physical Fitness Levels and STAR Reading Percentiles for Females

n	44
R^2	0.00
Adjusted R^2	-0.02
SE	17.637

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	48.61	35.30	to 61.92	6.596	7.37	42	<0.0001
Slope	0.01999	-0.18443	to 0.22441	0.101292	0.20	42	0.8445

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	12.115	1	12.115	0.04	0.8445
Residual	13065.057	42	311.073		
Total	13077.172	43			

Figure 4.6. Physical Fitness Levels and STAR Reading Percentiles for Females



The value of *p* is 0.8445 (> 0.05), which indicates no correlation between physical fitness levels and STAR Reading Percentile Scores for females. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance, based on STAR Reading Percentile Scores for females.

Table 4.5

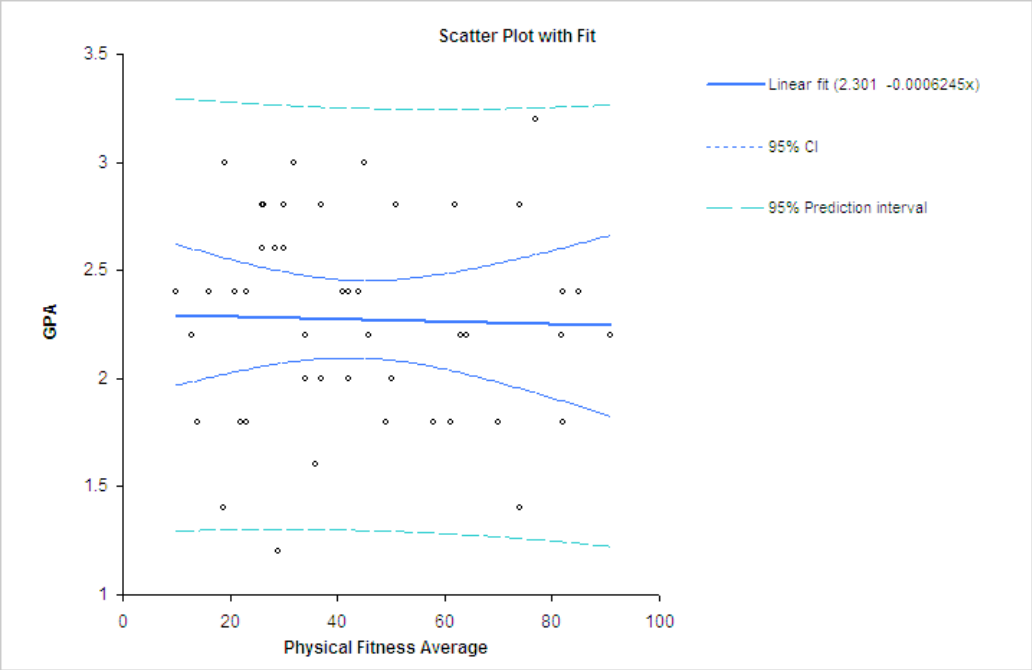
Physical Fitness Levels and Grade Point Averages for Males

n	46
R^2	0.00
Adjusted R^2	-0.02
SE	0.48

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.301	1.986	to 2.616	0.1563	14.72	44	<0.0001
Slope	-0.0006245	-0.0070244	to 0.0057753	0.00317554	-0.20	44	0.8450

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	0.01	1	0.01	0.04	0.8450
Residual	10.10	44	0.23		
Total	10.11	45			

Figure 4.7. Physical Fitness Levels and Grade Point Averages for Males



The value of *p* is 0.8450 (> 0.05), which indicates no correlation between physical fitness levels and Grade Point Averages for males. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance, based on Grade Point Averages for males.

Table 4.6

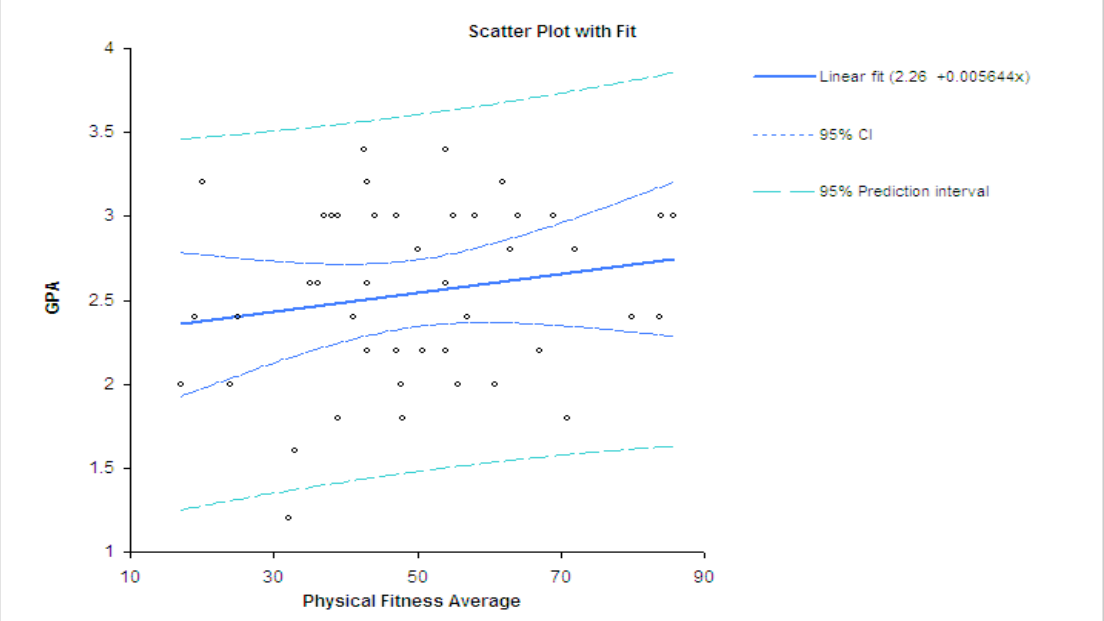
Physical Fitness Levels and Grade Point Averages for Females

n	44
R^2	0.04
Adjusted R^2	0.01
SE	0.52

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.26	1.78	to 2.74	0.240	9.42	42	<0.0001
Slope	0.005644	-0.003546	to 0.014834	0.0045538	1.24	42	0.2221

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	0.42	1	0.42	1.54	0.2221
Residual	11.39	42	0.27		
Total	11.81	43			

Figure 4.8. Physical Fitness Levels and Grade Point Averages for Females



The value of *p* is 0.2221 (> 0.05), which indicates no correlation between physical fitness levels and Grade Point Averages for females. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance, based on Grade Point Averages for females.

Table 4.7

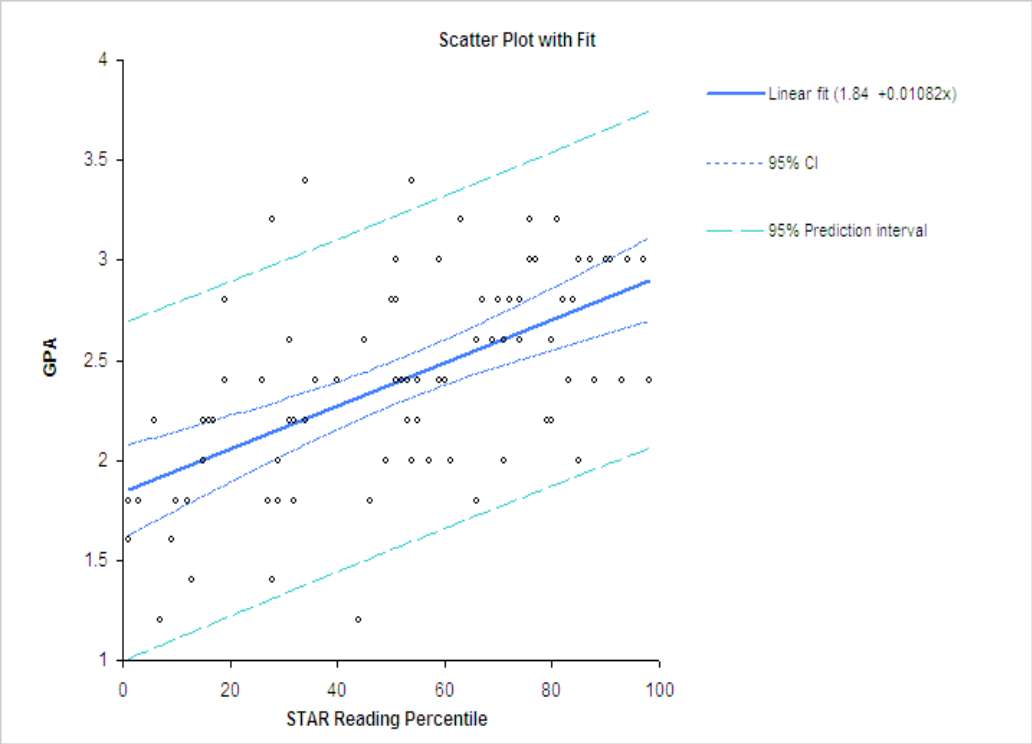
STAR Reading Percentile Scores and Grade Point Averages

n	90
R^2	0.35
Adjusted R^2	0.35
SE	0.42

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	1.84	1.66	to 2.02	0.092	19.96	88	<0.0001
Slope	0.01082	0.00773	To 0.01392	0.001557	6.95	88	<0.0001

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	8.34	1	8.34	48.32	<0.0001
Residual	15.18	88	0.17		
Total	23.52	89			

Figure 4.9. STAR Reading Percentile Scores and Grade Point Averages



The value of *p* is < 0.001 (< 0.05), which indicates a significant correlation between STAR Reading percentile scores and Grade Point Averages. According to the results, 35% of the variance of STAR Reading percentile scores can be accounted for by Grade Point Averages, which leaves 65% unexplained with a Standard Error of 0.42. With the Standard Error so low, these results conclude a high reliability.

Since STAR Reading Percentiles had a t statistic of 6.95 (> 2.0) and showed a significant correlation with Grade Point Averages, the researcher ran another multiple regression to see if physical fitness scores, combined with STAR Reading, would have an effect on the correlation.

Table 4.8

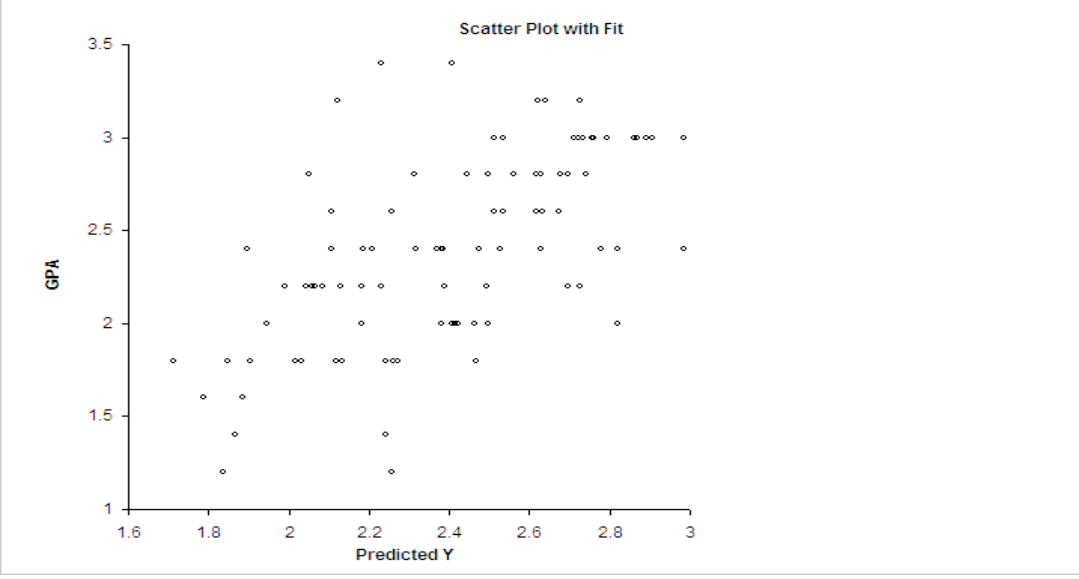
Physical Fitness Levels, STAR Reading Percentile Scores, and Grade Point Averages

n	90
R^2	0.38
Adjusted R^2	0.36
SE	0.41

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	1.649	1.370	to 1.929	0.1406	11.73	87	<0.0001
Physical Fitness Average	0.003832	-0.000444	to 0.008107	0.0021511	1.78	87	0.0783
STAR Reading Percentile	0.01105	0.00798	to 0.01411	0.001543	7.16	87	<0.0001

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	8.87	2	4.44	26.34	<0.0001
Residual	14.65	87	0.17		
Total	23.52	89			

Figure 4.10. Physical Fitness Levels, STAR Reading Percentile Scores, and Grade Point Averages



The value of p is < 0.0001 (< 0.05), which indicates a significant correlation between physical fitness levels, based on the President's Challenge Physical Fitness Test, and STAR Reading percentile scores and Grade Point Averages.

Table 4.9

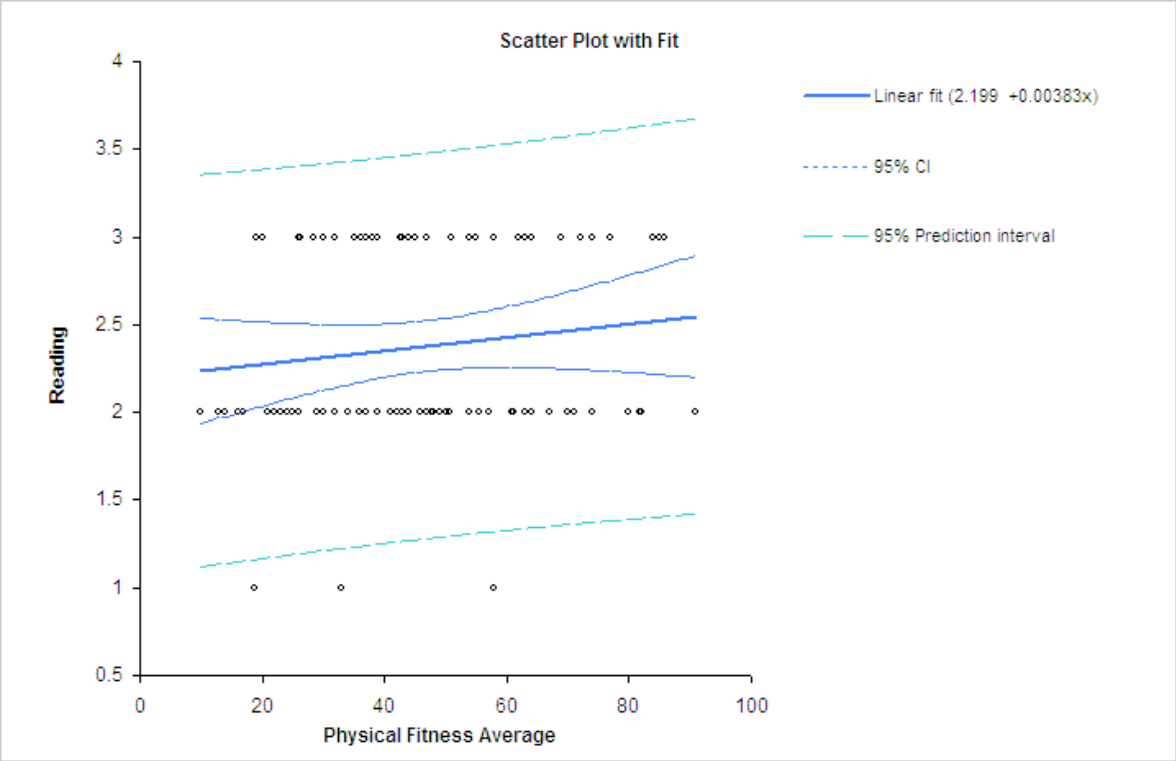
Physical Fitness Levels and Reading

n	90
R^2	0.02
Adjusted R^2	0.01
SE	0.5

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.199	1.908	to 2.490	0.1464	15.01	88	<0.0001
Slope	0.00383	-0.00188	to 0.00954	0.002874	1.33	88	0.1861

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	0.5	1	0.5	1.78	0.1861
Residual	26.6	88	0.3		
Total	27.2	89			

Figure 4.11. Physical Fitness Levels and Reading



The value of *p* is 0.1861 (> 0.05), which indicates no correlation between physical fitness levels and Reading. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels, based on the President's Challenge Physical Fitness Test, and Reading.

Table 4.10

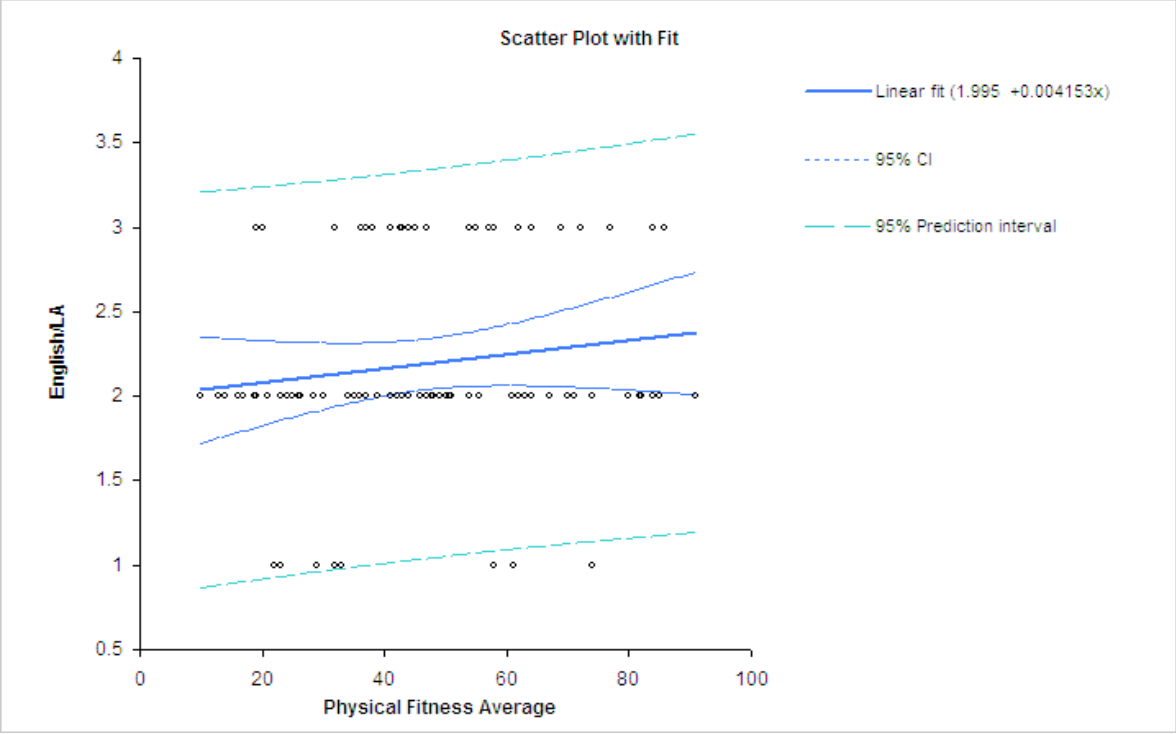
Physical Fitness Levels and English/Language Arts

n	90
R^2	0.02
Adjusted R^2	0.01
SE	0.6

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	1.995	1.690	to 2.299	0.1533	13.01	88	<0.0001
Slope	0.004153	-0.001825	to 0.010131	0.0030079	1.38	88	0.1709

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	0.6	1	0.6	1.91	0.1709
Residual	29.2	88	0.3		
Total	29.8	89			

Figure 4.12. Physical Fitness Levels and English/Language Arts



The value of *p* is 0.1709 (> 0.05), which indicates no correlation between physical fitness levels and English/Language Arts. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels, based on the President's Challenge Physical Fitness Test, and English/Language Arts.

Table 4.11

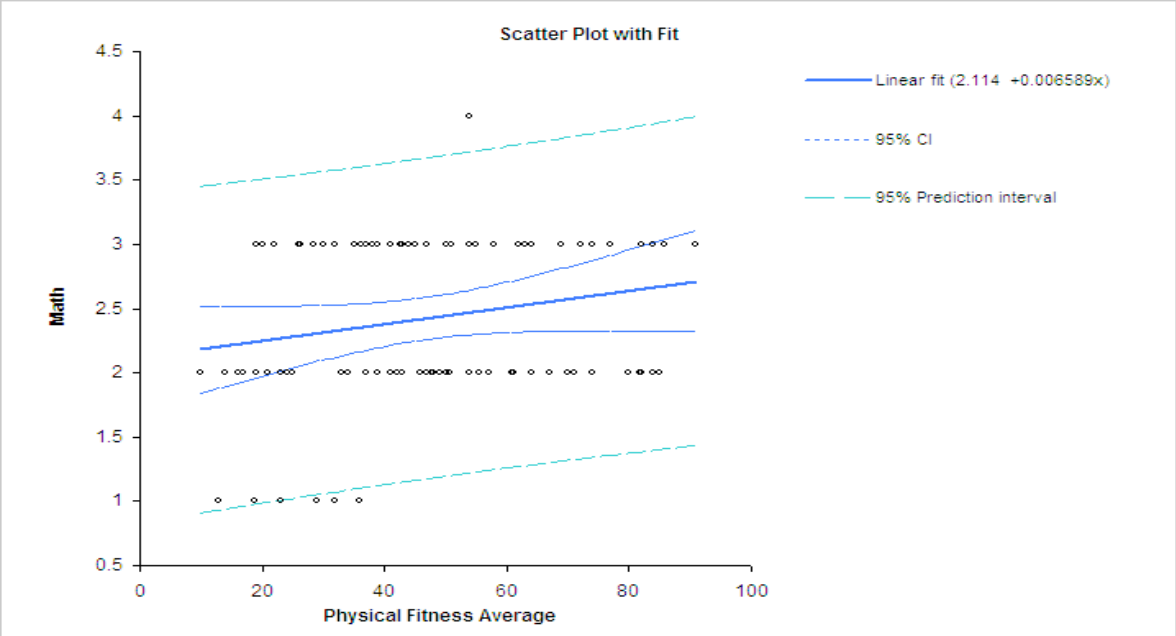
Physical Fitness Levels and Mathematics

N	90
R^2	0.04
Adjusted R^2	0.03
SE	0.6

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.114	1.783	to 2.445	0.1664	12.70	88	<0.0001
Slope	0.006589	0.000099	to 0.013078	0.0032656	2.02	88	0.0467

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	1.6	1	1.6	4.07	0.0467
Residual	34.4	88	0.4		
Total	36.0	89			

Figure 4.13. Physical Fitness Levels and Mathematics



The value of p is 0.0467 (< 0.05), which indicates a significant correlation between physical fitness levels and Mathematics. At this point in the research study, the hypothesis was supported, which stated that a relationship exists between physical fitness levels, based on the President's Challenge Physical Fitness Test, and Mathematics.

Table 4.12

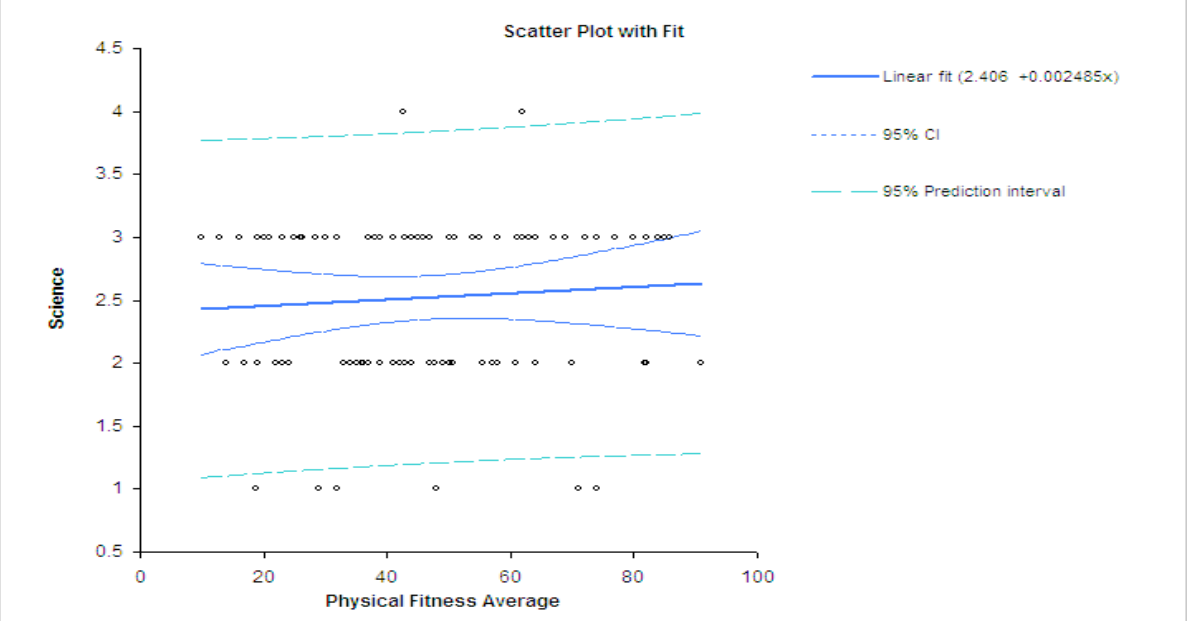
Physical Fitness Levels and Science

n	90
R^2	0.01
Adjusted R^2	-0.01
SE	0.7

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.406	2.057	to 2.755	0.1755	13.71	88	<0.0001
Slope	0.002485	-0.004360	to 0.009330	0.0034442	0.72	88	0.4725

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	0.2	1	0.2	0.52	0.4725
Residual	38.2	88	0.4		
Total	38.5	89			

Figure 4.14. Physical Fitness Levels and Science



The value of *p* is 0.4725 (> 0.05), which indicates no correlation between physical fitness levels and Science. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels, based on the President's Challenge Physical Fitness Test, and Science.

Table 4.13

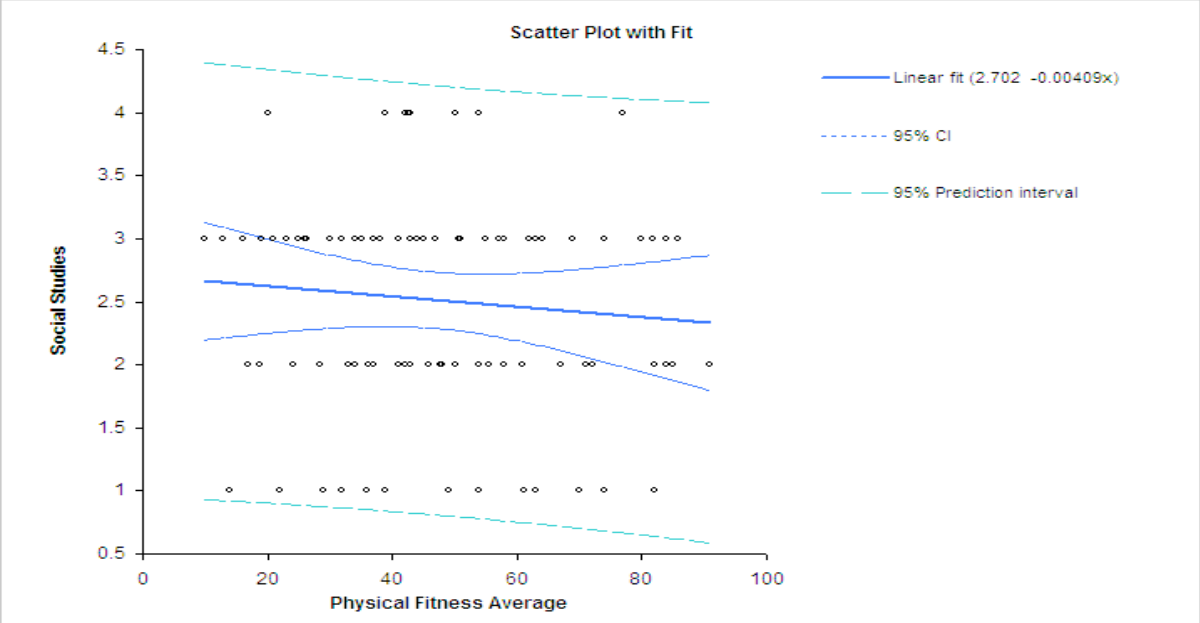
Physical Fitness Levels and Social Studies

n	90
R^2	0.01
Adjusted R^2	0.00
SE	0.9

Term	Coefficient	95% CI		SE	t statistic	DF	P
Intercept	2.702	2.252	to 3.153	0.2269	11.91	88	<0.0001
Slope	-0.00409	-0.01294	to 0.00476	0.004452	-0.92	88	0.3608

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	0.6	1	0.6	0.84	0.3608
Residual	63.9	88	0.7		
Total	64.5	89			

Figure 4.15. Physical Fitness Levels and Social Studies



The value of *p* is 0.3608 (> 0.05), which indicates no correlation between physical fitness levels and Social Studies. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between physical fitness levels, based on the President's Challenge Physical Fitness Test, and Social Studies.

These results indicate that there is no relationship between physical fitness levels and grades in Reading, English/Language Arts, Science, and Social Studies. However, there is a significant correlation between physical fitness levels and mathematics.

Table 4.14

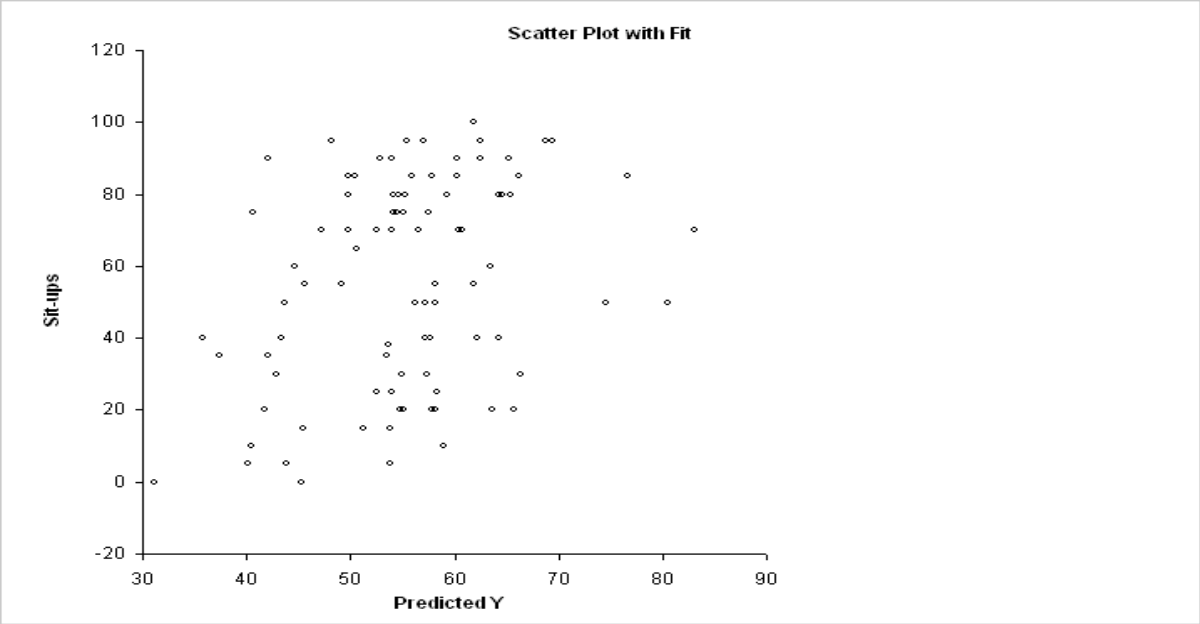
STAR Reading Percentile Scores, Grade Point Averages, and Sit Up Physical Fitness Test

n	90
R^2	0.11
Adjusted R^2	0.09
SE	27.6

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	18.6	-10.1	to 47.3	14.42	1.29	87	0.2004
STAR Reading Percentile	-0.3198	-0.5760	to -0.0636	0.12891	-2.48	87	0.0150
GPA	22.15	8.06	to 36.25	7.091	3.12	87	0.0024

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	7906.0	2	3953.0	5.18	0.0075
Residual	66404.4	87	763.3		
Total	74310.4	89			

Figure 4.16. STAR Reading Percentile Scores, Grade Point Averages, and Sit Up Physical Fitness Test



The value of *p* is 0.0075 (< 0.05), which indicates a significant correlation between STAR Reading percentile scores, Grade Point Averages and the sit up physical fitness test. At this point in the research study, the hypothesis was supported, which stated that a relationship exists between STAR Reading percentile scores, Grade Point Averages and the sit up physical fitness test.

Table 4.15

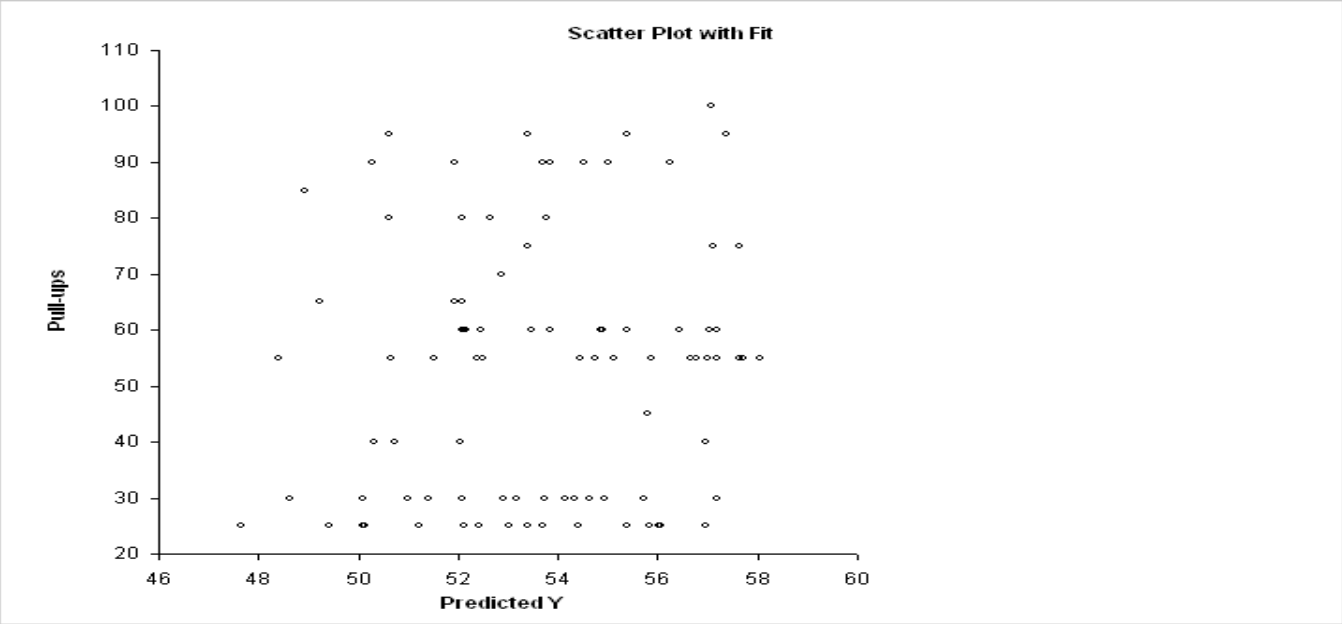
STAR Reading Percentile Scores, Grade Point Averages, and Pull Up Physical Fitness Test

n	90
R^2	0.01
Adjusted R^2	-0.01
SE	23.3

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	42.35	18.13	to 66.57	12.186	3.48	87	0.0008
STAR Reading Percentile	0.02022	-0.19634	To 0.23678	0.108953	0.19	87	0.8532
GPA	4.292	-7.619	to 16.203	5.9926	0.72	87	0.4758

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	596.0	2	298.0	0.55	0.5809
Residual	47432.1	87	545.2		
Total	48028.1	89			

Figure 4.17. STAR Reading Percentile Scores, Grade Point Average, and Pull Up Physical Fitness Test



The value of *p* is 0.5809 (> 0.05), which indicates no correlation between STAR Reading percentile scores, Grade Point Averages, and the pull up physical fitness test. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between STAR Reading percentile scores, Grade Point Averages, and the pull up physical fitness test.

Table 4.16

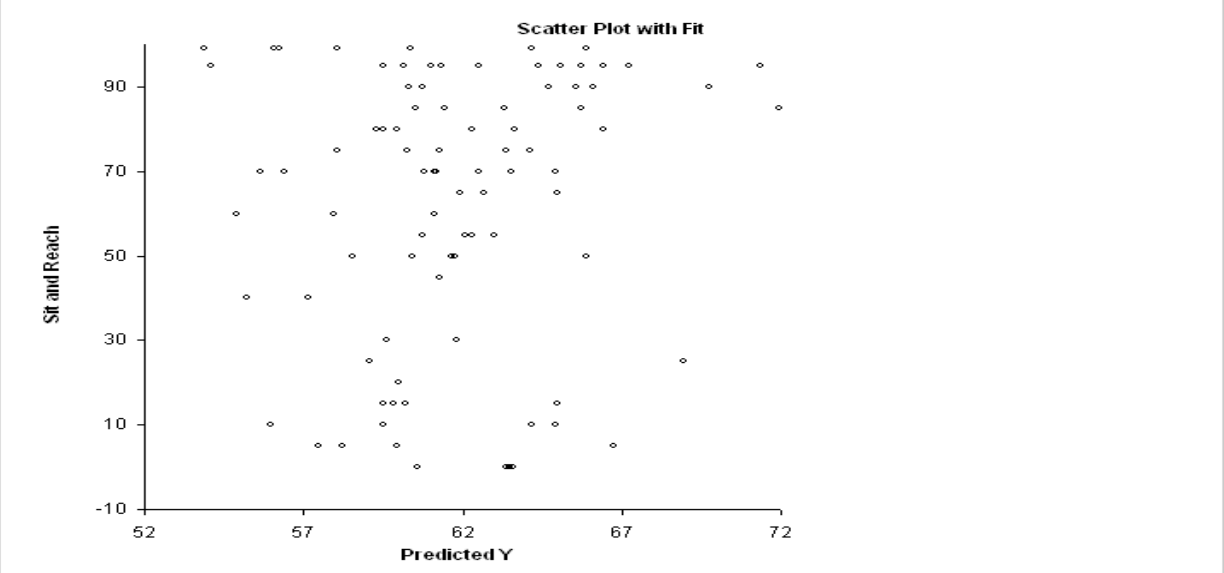
STAR Reading Percentile Scores, Grade Point Averages, and Sit and Reach Physical Fitness Test

n	88	(cases excluded: 2 due to missing values)
R^2	0.01	
Adjusted R^2	-0.01	
SE	32.3	

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	51.76	17.98	to 85.55	16.993	3.05	85	0.0031
STAR Reading Percentile	-0.1504	-0.4516	to 0.1508	0.15150	-0.99	85	0.3237
GPA	7.436	-9.263	to 24.135	8.3989	0.89	85	0.3785

Source of variation	Sum squares	DF	Mean square	F statistic	P
Model	1168.8	2	584.4	0.56	0.5741
Residual	88912.2	85	1046.0		
Total	90081.0	87			

Figure 4.18. STAR Reading Percentile Scores, Grade Point Averages, and Sit and Reach Physical Fitness Test



The value of *p* is 0.5741 (> 0.05), which indicates no correlation between STAR Reading percentile scores, Grade Point Averages, and the sit and reach physical fitness test. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between STAR Reading percentile scores, Grade Point Averages, and the sit and reach physical fitness test.

Table 4.17

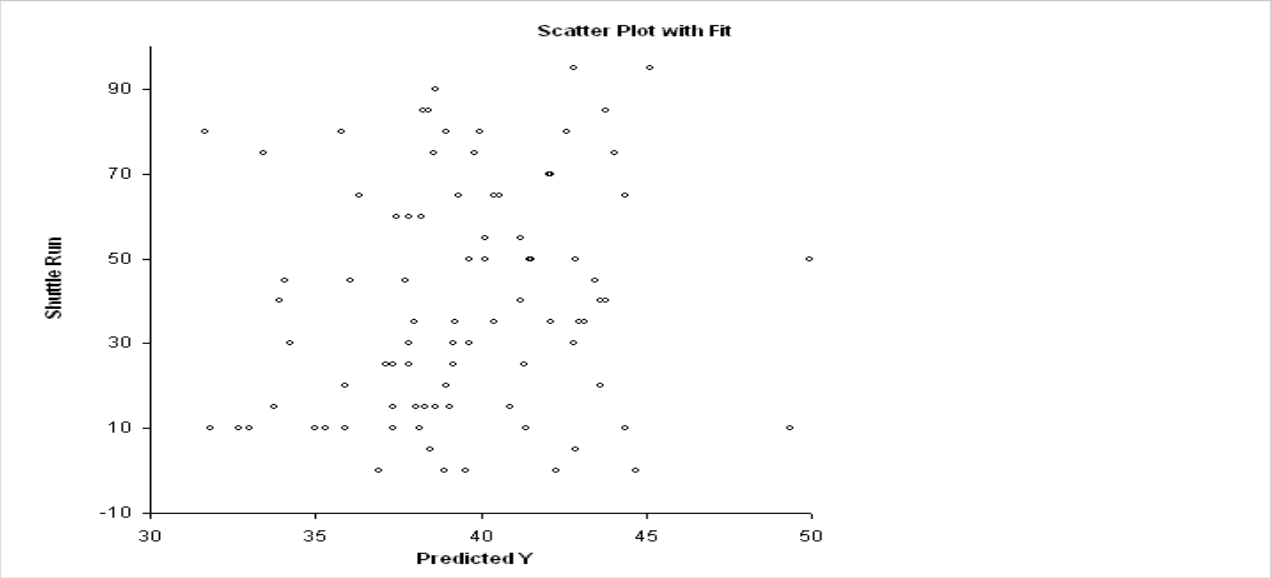
STAR Reading Percentile Scores, Grade Point Averages, and Shuttle Run Physical Fitness Test

n	87	(cases excluded: 3 due to missing values)
R^2	0.02	
Adjusted R^2	-0.01	
SE	27.3	

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	29.46	0.25	to 58.66	14.686	2.01	84	0.0481
STAR Reading Percentile	-0.1517	-0.4149	to 0.1116	0.13240	-1.15	84	0.2552
GPA	7.542	-7.206	to 22.289	7.4161	1.02	84	0.3121

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	1085.9	2	543.0	0.73	0.4852
Residual	62515.8	84	744.2		
Total	63601.7	86			

Figure 4.19. STAR Reading Percentile Scores, Grade Point Averages, and Shuttle Run Physical Fitness Test



The value of *p* is 0.4852 (> 0.05), which indicates no correlation between STAR Reading percentile scores, Grade Point Averages, and the shuttle run physical fitness test. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between STAR Reading percentile scores, Grade Point Averages, and the shuttle run physical fitness test.

Table 4.18

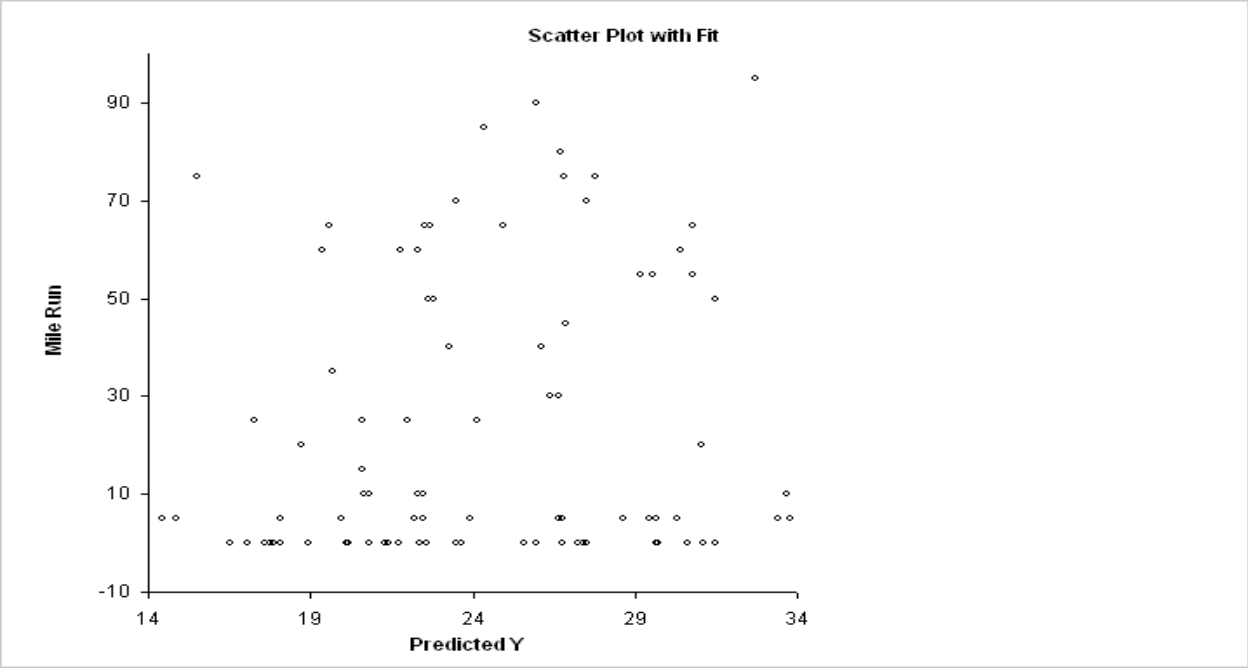
STAR Reading Percentile Scores, Grade Point Averages, and Mile Run Physical Fitness Test

N	87	(cases excluded: 3 due to missing values)
R^2	0.03	
Adjusted R^2	0.01	
SE	28.8	

Term	Coefficient	95% CI		SE	t statistic	DF	p
Intercept	21.36	-9.26	to 51.98	15.397	1.39	84	0.1691
STAR Reading Percentile	-0.2112	-0.4801	to 0.0577	0.13522	-1.56	84	0.1221
GPA	5.735	-9.200	to 20.671	7.5105	0.76	84	0.4472

Source of variation	Sum squares	DF	Mean square	F statistic	p
Model	2046.0	2	1023.0	1.24	0.2955
Residual	69464.4	84	827.0		
Total	71510.3	86			

Figure 4.20. STAR Reading Percentile Scores, Grade Point Averages, and Mile Run Physical Fitness Test



The value of *p* is 0.2955 (> 0.05), which indicates no correlation between STAR Reading percentile scores, Grade Point Averages, and the mile run physical fitness test. At this point in the research study, the researcher retained the null hypothesis of this study, which stated that a relationship does not exist between STAR Reading percentile scores, Grade Point Averages, and the mile run physical fitness test.

Summary

The percentages of the males and females falling within the "Needs Improvement" physical fitness range indicate a substantially low level of physical fitness among the students tested for this research study. Within each of the physical fitness tests, the males and females scoring in the "Outstanding" physical fitness range fell

within close proximity to one another, with the exception of sit and reach, shuttle run, and the mile run. 24% of the males scored at the 85th percentile or higher for sit and reach, while 44.1% of the females scored at the 85th percentile or higher. There was not a huge difference in the shuttle run and mile run results between the males and females, but the researcher finds it worth mentioning. 8.8% of the males scored in the "Outstanding" physical fitness range for the shuttle run, and only 4.8% of the females scored within this same range. Also, 6.8% of the males scored in the "Outstanding" physical fitness range for the mile run, and 0% of the females scored at least at the 85th percentile.

With these low and varying results, flexibility, agility, and cardiopulmonary endurance are described in more detail in the following sentences. Flexibility, assessed by the sit and reach, enables individuals to move their joints further with less energy. By increasing one's flexibility, it will increase physical performances. Flexibility also increases the blood supply and nutrients to the joints, which helps increase the circulation (Later Life, 2005). Agility has been linked to be the primary determining factor for success in sports (Westermann, 2010). Cardiopulmonary endurance is how strong your heart is, which has the potential to increase the life expectancy of individuals. Cardiopulmonary endurance is the most important aspect of fitness (Gonzalez, 2009). Increasing the physical fitness levels of the students in these three areas can help increase the overall physical fitness levels.

Having low percentages of students scoring in the 85th percentile or higher, raises an awareness that needs to be taken into consideration. Also, high numbers of students with "Needs Improvement" physical fitness levels is associated with higher amounts of

body fat. Higher amounts of body fat are coupled with an increased risk of heart disease and diabetes. Health issues emerge in obese or overweight children.

According to the results of this study, many variances in correlation between physical fitness and academic achievement are present. The coefficient of multiple regression is considered statistically insignificant when comparing physical fitness levels and Grade Point Averages and also between physical fitness levels and STAR Reading percentile scores. Also, when physical fitness levels were combined with STAR Reading percentiles scores, a correlation was found between these two variables and Grade Point Averages. Lastly, other correlations were found between physical fitness and mathematics, as well as between STAR Reading percentiles scores, Grade Point Averages, and the sit up physical fitness test.

Even though the hypotheses were not supported with the results of this research study, this study adds to the literature on the relationship between physical fitness and academic achievement, which is elaborated on more in Chapter Five. There was no relationship found between physical fitness levels and STAR Reading percentiles or Grade Point Averages, and possible explanations are presented in the next chapter. Since the predictors of this study did not show a significant correlation and because of the statistically insignificant results, the researcher retains the null hypotheses of this study which states that a relationship does not exist between physical fitness and academic achievement, based on the President's Challenge Physical Fitness Test and STAR Reading percentiles, and a relationship does not exist between physical fitness and academic achievement, based on the President's Challenge Physical Fitness Test and

Grade Point Averages. This relationship, or lack thereof, can be interpreted by the variable physical fitness level cannot help predict the outcome of academic achievement according to this study.

The results of this do not support the relationship between physical fitness and academic achievement. Therefore, this study does not infer that an increase in physical fitness increases academic achievement. More detailed explanations and findings are described in the next chapter.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter Five provides a statement of the problem on which this study is based, a description of the methodology, summary of the results, as well as a discussion of the findings. Limitations of the study will also be addressed. Implications and recommendations will be provided in hopes of offering suggestions for future practice and research on the relationship between physical fitness and academic achievement.

Summary

Introduction

There are a plethora of factors that impact academic achievement, some indefinable. With the increasing number of children in the United States suffering from being overweight or obese, more research is warranted to study the relationship between physical fitness and academic achievement, as well as other factors, among school-aged children (Hall, 2007).

This study had intentions of finding a relationship between physical fitness and academic achievement. Even though this particular study did not attain such results, this study adds to the existing body of literature and knowledge regarding physical fitness and academic achievement.

Purpose

The purpose of this study was to determine the physical fitness levels of fourth and fifth grade students based on the President's Challenge Physical Fitness Test and academic achievement using the STAR Reading percentile scores and Grade Point Averages in order to determine if a relationship existed between the two variables. This

study was based on the premise that the health and physical well-being of a child can have an effect on his or her ability to achieve academically. Extraneous variables, other than physical fitness, can effect academic achievement, which could possibly be the reason for the results of this study. The researcher was unable to identify or control the other factors.

By using the President's Challenge Physical Fitness Test, fourth and fifth grade students from a rural Northeast Georgia Title I elementary school were assessed on core muscle strength and endurance, upper body strength and endurance, flexibility, agility, and cardiopulmonary endurance. The research collected was based on the data from the first quarter grading period of the 2009-2010 school year.

Participants

For the purposes of this study, the subjects consisted of ninety (46 males and 44 females) fourth and fifth grade students from a rural northeast Georgia Title I elementary school. Of the 90 students, 62 were Caucasian, 18 were Hispanic, 7 were African American, 2 were Asian, and 1 was American Indian. All of the students included in the study were proficient in English.

The fourth and fifth grade students' physical fitness levels were assessed using the President's Challenge Physical Fitness Test to determine if students fell within the "Outstanding," "Basic," or "Needs Improvement" physical fitness level. STAR Reading percentile scores and Grade Point Averages were used as the academic measures. The researcher calculated the Grade Point Averages by using the summary mark grades for Reading, English/Language Arts, Mathematics, Science, and Social Studies from the first

quarter grading period of the 2009-2010 school year. Gender and other pertinent demographic data were also obtained. The relationship between physical fitness and academic achievement was then determined.

Methods

The researcher obtained the physical fitness data by working collaboratively with the principal and physical education teacher of the chosen elementary school. The physical education teacher shared how he was trained to administer the President's Challenge Physical Fitness Test. The physical education teacher also shared many resources with the researcher in order to become more knowledgeable about each specific physical fitness test. It was determined that the President's Challenge Physical Fitness Test was required of each elementary school in the county school district. The testing time for each class was approximately 270 minutes over 6 class periods. The physical fitness assessments were given during the regularly scheduled physical education class, as to not disturb any other classes or disruptions in the school day.

Permission from the school principal and the Institutional Review Board (IRB) was permitted. The students were assessed during their regularly scheduled physical education class. All information was kept confidential and anonymous. In fact, students were given a number when their data was being analyzed.

Fourth and fifth grade teachers administered the computer-based STAR Reading test during the first quarter of the 2009-2010 school year, which is a mandated requirement each year. Grade Point Averages were calculated based on the summary marks from the first quarter Standards Based Report Card. Grade Point Averages were

compiled with the results of the STAR Reading assessment. The data was analyzed to see if a relationship existed between physical fitness and academic achievement based on the President's Challenge Physical Fitness Test scores, STAR Reading percentile scores, and Grade Point Averages. Because of the strong correlation between the STAR Reading percentile scores and Grade Point Averages, the researcher ran a multiple regression on physical fitness with STAR Reading percentiles scores and compared it to Grade Point Averages. The researcher also ran multiple regressions comparing physical fitness levels and the individual subjects of Reading, English/Language Arts, Mathematics, Science, and Social Studies. Gender was also analyzed. Additionally, the researcher ran multiple regressions to compare academic achievement, based on STAR Reading percentile scores and Grade Point Averages, with individual physical fitness tests. Microsoft Excel was used to enter and organize the collected data. The statistical program, Analyze-it, was then used to determine if a relationship existed among the collected data. To explore the relationships among the variables (President's Challenge Physical Fitness Test, STAR Reading percentile scores, Grade Point Averages, and gender), multiple regressions were used. Other multiple regressions were ran to determine if a relationship existed between STAR Reading percentile scores, Grade Point Averages, and individual subjects, as well as, STAR Reading percentile scores, Grade Point Averages, and each physical fitness test.

The physical fitness data was collected and organized into Microsoft Excel. The researcher averaged the physical fitness scores of each of the five physical fitness tests to determine an overall average physical fitness level and determined whether it was in the

"Needs Improvement," "Basic," or "Outstanding" physical fitness range. Having an overall physical fitness level average in the range of 0 – 49 was labeled as "Needs Improvement," between 50 – 84 was considered a "Basic" physical fitness level, and having an overall physical fitness level at the 85th percentile or higher was considered "Outstanding." The data was reported through narrative text, tables, and figures. Students were also given a rank (0 –5) based on how many physical fitness tests they scored at or above the 85th percentile. This numerical ranking helped the researcher determine the physical fitness level of each student. The physical fitness and academic achievement data was entered and organized using Microsoft Excel. Multiple regressions were used to help the researcher analyze the data.

Hypotheses

The hypotheses stated that:

- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance

based on the STAR Reading percentiles scores for males.

- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

The null hypotheses stated:

- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading Percentile scores for fourth and fifth graders at the participating school.

- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for fourth and fifth graders at the participating school.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on the STAR Reading percentiles scores for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on STAR Reading percentiles scores for females.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for males.
- There will not be a significant relationship between physical fitness levels based on the President's Challenge Physical Fitness Test and academic performance based on Grade Point Averages for females.
- There will not be a significant relationship between physical fitness scores based on the President's Challenge Physical Fitness Test and each content area (i.e. Reading, English/Language Arts, Mathematics, Science, and Social Studies).
- There will not be a significant relationship between academic achievement based on the STAR Reading percentile scores and Grade Point Averages and

each physical fitness test (i.e. sit ups, pull ups, sit and reach, shuttle run, and the mile run).

In addition to the hypothesis and null hypothesis, a research objective was also stated. Physical fitness scores, academic achievement, and gender data were collected in order to compare the variables with multiple regressions. After statistical comparison, the results were reported.

Discussion

The results of this study provided varying correlations between physical fitness and academic achievement, leaving the researcher to retain the null hypotheses of the study which stated that there will not be a significant correlation between physical fitness scores based on the President's Challenge Physical Fitness Test and academic achievement based on STAR Reading Percentiles, and there will not be a significant correlation between physical fitness scores based on the President's Challenge Physical Fitness Test and Grade Point Averages.

Physical fitness levels were compared to STAR Reading percentile scores and then to Grade Point Averages. The results from both of these multiple regressions indicated that a relationship did not exist between physical fitness and academic achievement. When gender was analyzed, a significant relationship did not exist between physical fitness and gender. A significant correlation ($R = 0.5917$) was found between STAR Reading percentiles scores and Grade Point Averages. This correlation was also considered statistically significant since $p < 0.05$ ($p = < 0.001$). Also, when physical

fitness levels and STAR Reading percentiles were combined and compared to Grade Point Averages, a significant correlation was found (p is < 0.0001).

Although no relationship was found between physical fitness levels and STAR Reading percentile scores and Grade Point Averages independently, the research discovered correlations among the dependent variables by combining physical fitness levels and STAR Reading percentile scores and comparing these variables to Grade Point Averages. The researcher also found a correlation between physical fitness levels and mathematics ($p = 0.0467$). However, as previously stated, both of the academic measures used in this study, STAR Reading percentiles ($p = 0.4510$) and Grade Point Averages ($p = 0.3372$) did not have a significant correlation with physical fitness levels independently, which were the original hypotheses of this study. Another correlation was found between STAR Reading percentile scores, Grade Point Averages, and sit ups (p is 0.0075). With the varying result of this study, the researcher suggests that the relationship between physical fitness and academic achievement be studied further, especially physical fitness levels and mathematics and academic achievement and sit ups.

By retaining the null hypotheses of this study, the results of this study do not support existing literature that has found a link between physical fitness and academic achievement. The researcher suggests further research be conducted to determine the relationship between physical fitness levels, academic achievement, and gender. Current research is not able to describe *why* some studies have found a relationship between physical fitness and academic achievement. Several theories exist, but more research needs to be conducted to determine the causal factors of the relationship between

physical fitness and academic achievement. Further areas that need to be explored are the other variables that could effect academic achievement besides physical fitness.

The results of this study differ from other studies that involved physical fitness and academic achievement, in that numerous studies have found a significant correlation between physical fitness and academic achievement, and this research study did not.

Conclusion

Many researchers have found and believe in the relationship among the variables physical fitness and academic achievement, but some studies, such as this one, have found otherwise. The purpose of this correlational study was to examine the relationship between physical fitness and academic achievement. This study was based on the notion that physical fitness can have an impact on children's ability to learn and perform academically. Demographic data, including gender, was obtained and analyzed. Because this research is considered as a correlational study, it does not prove causality; therefore, the results should be interpreted cautiously. It is a possibility that extraneous variables could have affected the results of this study that were not evaluated in this study.

Implications for Practice

The researcher intended to find a relationship between physical fitness levels and academic achievement. However, the researcher retained the null hypotheses of this study. Literature entails that there are a plethora of factors that could potentially effect students' academic achievement. The results of this study could be different than expected because of other confounding variables that can effect academic achievement

were uncontrollable by the researcher. Some of these extraneous variables are described in detail below.

Parental Involvement

Research supports the positive effects of parental involvement in their child's education (Paulu, 2005). Parents have the ability of making an impact in their child's academic career by simply encouraging them to do their best in school or by showing a genuine interest in helping them do well. Studies also show that successful students have parents that help guide them through a regular and consistent schedule daily (N.E.A., 2002). When schools gain the support of parents in areas that involve learning, students will be able to improve their learning. This could include support with discipline or extra help at home in areas of weakness. On the other hand, if schools and children do not have ample parental involvement, students are less likely to make marked gains in school. Working together, parents and the school community can make and maintain communication that enables students to improve their own achievement.

According to Hammer (2003), achievement "is not only about what goes on once students get into the classroom. It's also about what happens to them before and after school. Parents and teachers have a crucial role to play to make sure that every child becomes a high achiever" (as cited in Halawah, 2006, p. 3). Parental involvement is an important aspect contributing to a child's success in school. This pertinent role of parents is and will continue to be an ever-increasing focus for student achievement in schools.

Family Structure

Family structure means the family make-up including family size and family type. According to the study by Gary Marks (n.d.), there are negative correlations between the number of siblings within one household and their reading achievement. The negative effects of the larger sized families include the countries of the United States, Australia, Finland, Israel, and Hong Kong. The reasons for the achievement gap between smaller and larger family sized households are that larger families are more likely to have lower socioeconomic status than those of smaller sized households. Larger families also tend to have fewer academic resources to assist students in their academic endeavors, and parents have less time to spend with each child on their studies or to insure the work is done correctly. The logic behind this study is that the larger the family, the fewer material resources and personal attention there is among the children of that household. Each additional sibling is associated with an even lower reading achievement level. Also, the effects of family size and mathematics achievement are similar to the findings of reading achievement. Again, much of this impact of family size is due to the socioeconomic status of the family.

Burns and Brassard (as cited in Hargreaves, 1991) agree that children living in single-parent households have an increased likelihood that they will have poor academic achievement. "Life in a one-parent family seems to affect a child's school performance adversely as well as their total educational attainment…The consensus is that relatively little of the harm is directly caused by the absence of one parent. Instead, much more of the problem is associated with the family's lack of income and related stresses that

typically accompany a parent's absence" (Hargreaves, 1991, p.40). In Gary Marks' study (n.d.), he found that in single-parent homes, the reading and mathematics achievement levels are lower than those of children living with two parents.

Transience

Student learning is impacted by transitory lifestyle that some students have to live with. Some students are moved from school to school simply because of the economics of the rent coming due, while others move because of divorce. Many are wards of foster care systems. Sometimes moving seems like a beneficial thing. When a family moves because a parent got a better job, the outcome can be positive for the parents, but the children may have problems adjusting which can affect academic performance. Regardless of the reason, the impact of moving on academic achievement and behavior of students cannot be overstated. These children frequently bring to school more personal problems than other students (Bainbridge, 2003). The more a child mobilizes from one school to another school, the more it effects their educational achievement.

Even though moving is out the child's control, moving a child around hinders the possibility of performing well in school. Hartman and Leff (2002) state that "high mobility rates negatively affect the educational outcomes of transient students, as well as their stable classroom peers." Moving brings a changing environment that young children are not ready to face. The inconsistency of faces inhibits community building in a classroom. Student transience lowers the academic achievement levels and insists a slower pacing of academics. Additionally, "over a period of six years, students who have

moved more than three times can fall a full academic year behind stable students" (Hartman and Leff, 2002).

Video Games and Television

A study completed by Iman Sharif and James Sargent (2006), which examined whether video games and television watching resulted in poor school performance, was completed with over 4,500 students participating. Based on their findings, students who played video games or watched television on school days, were not as likely to do well in school. They found that parents who restricted their child's time watching movies, television, or playing video games on school days did much better in school (Sharif & Sargent, 2006).

Many school age children are allowed to watch television, movies and play video games during the school week. Sharif and Sargent (2006) found there is a bigger probability these students will not perform as well in school, thus weekly media opportunities may play a part in student achievement and progress. Sharif and Sargent (2006) went on to say that spending the time after school playing video games, watching television and movies "displaces time that would normally be spent doing schoolwork, reading for pleasure, or engaging in other educational activities." Carlsson-Paige and Levin (1990) wrote:

> Television is an all pervasive influence. Television, after all, has only been around for fifty years. We were the first generation raised on TV. Now over 97 percent of all U.S. households have at least one television set. Young children watch an average of four hours of TV a day. They are likely to see thousands of

> acts of violence and thousands of ads each year. What they see reflects a set of social values which may not be those of their parents and is often, white, middle-class, "all-American" world which may not look like the one they know. And independent of the content of what they see on TV, children sit passively glued to it, unable to affect what happens in any way except turning the knobs" (Carlsson-Paige and Levin, 1990).

Smoking

Many may not consider smoking to be a factor in children's performance in school, but many children are exposed to second-hand smoke on a daily basis. Not only are children exposed to cigarette smoke in their homes, but also in cars and other places they may frequent with their parents. While the smoke itself may not interfere with there actual performance at school, it does often affect the health of some students who may suffer from asthma or other upper respiratory ailments which may lead to excessive absences.

The American Lung Association website (n.d.) reports, "Secondhand smoke exposure causes disease and premature death in children and adults who do not smoke. Secondhand smoke contains hundreds of chemicals known to be toxic or carcinogenic, including formaldehyde, benzene, vinyl chloride, arsenic ammonia and hydrogen cyanide." The same site reported as many as 15,000 children exposed to second hand smoke are hospitalized each year for upper respiratory tract infections each year. With all the chemicals the students are exposed to if they are around adults who smoke in the home, children are more prone to ear infections, and frequent upper respiratory infections

which will result in absences from school, which will lead to missed instruction. Children who miss many days because of these health related problems, will not perform as well in academic areas. If a student is absent just one day, the amount of concepts they miss in each subject, which is pertinent to perform on grade level, will cause them to get behind. This will affect their performance on school concepts.

Emotional Intelligence

Another aspect that could affect student performance in school is their emotional maturity and ability to respond, react or think in an appropriate way, which may lead to poor choices with regard to work completion, staying on task, or being uncooperative in team activities. Goleman (1995) stated, "research in brain-based learning suggests that emotional health is fundamental to effective learning." There are significant differences in the social and emotional levels of the students in each classroom. Many students appear to have a healthy emotional understanding while some seem to have no concept as to how to handle situations that require an appropriate emotional response. An example would be students who are identified as gifted. Given many of them are mature beyond their actual age, they tend to be more adult-like intellectually, which sometimes leads to some emotionally immature reactions if they cannot perform as well as they want or if they feel the other students are not able to understand them intellectually or socially. Many of them do not know how to interact with peers their own age, which leads to negative feelings about themselves, because they want to fit in just like any other child.

As suggested by Rhoda Rosen (1998), gifted children process all kinds of information differently, and they spend a lot of time thinking about what they need to

think about when problem solving. She went on to say, "while these are all wonderful qualities, they can cause dissonance for the child, particularly when the child is placed in a class with students achieving at a wide range of levels. Often, these qualities will be viewed as different by other children. Feeling different can be difficult for many children" (Rosen, 1998).

On the other hand, students who are on the lower end of the academic performance level, or who become easily frustrated when learning new concepts, tend to have more immature emotional responses that can also interfere with their academic progress. For instance, a student may react quickly to a variety of situations due to impulsiveness. This student may choose an answer on an activity without looking at the entire question being asked or without considering all the possibilities. This same child will most likely react to inadvertent situations impulsively which may result in being disciplined, thus having to be removed from the classroom and missing the concepts of the instruction. Not only are these children impulsive, but they are emotionally immature and do not get along well with their peers or even adults, which may be due to factors stemming from their home situation. O'Neil, (1996) gave a concise detailed definition of emotional intelligence:

> Emotional intelligence is a different way of being smart. It includes knowing what your feelings are and using your feelings to make good decisions in life. It's being able to manage distressing moods well and control impulses. It is being motivated and remaining hopeful and optimistic when you have setbacks in working toward goals. It is empathy; knowing what the people around you are

feeling. And it's social skill—getting along well with other people, managing emotions in relationships, being able to persuade or lead others (O'Neil, 1996).

These children are not able to express their emotions or react appropriately in given situations and they often takes things personally. Yet, even these children can be taught how to react less impulsively and to process their own emotions as well as have empathy for others as long as they have good role models at school and other situations if they do not have them at home. A child's emotional intelligence should be another consideration when trying to determine why a student may not be performing well academically.

All in all, there are varied factors that may interfere with the child's intellectual development that cannot be addressed by the education system or this study.

Delimitations and Limitations

1. The participating rural Title I elementary school in Georgia was the only school used in this study; therefore, the results cannot be generalized for other schools.
2. The students used in this study were fourth and fifth grade students; therefore, the results cannot be generalized to other grade levels.
3. STAR Reading percentile scores and Grade Point Averages were the only two instruments of academic achievement used in this study; therefore, the results may not be generalized to other instruments that measure academic achievement.

4. A limited diversity existed among the students; therefore, the results cannot be generalized into other educational settings.
5. Physical fitness is just one component that effects student achievement. There are a plethora of factors effecting academic achievement including, but not limited to, natural ability, nutrition, sleep, life patterns, etc.

Recommendations for Future Practice

The purpose of this study was to determine if a relationship exists between physical fitness levels based on the President's Challenge Physical Fitness Test and academic achievement based on STAR Reading percentile scores and Grade Point Averages. This study was based on the belief that the physical fitness level of a student can impact his or her cognitive functioning and academic capabilities.

Recommendations for Future Research

In this study, gender was evaluated in order to determine its role in physical fitness and academic achievement. The results of the study did not find a significant relationship between physical fitness and either measure of academic achievement, STAR Reading percentile scores and Grade Point Averages. This could be due to confounding variables not controlled and addressed in this study, including but not limited to natural ability, nutrition, sleep, and life patterns.

It is quite clear that further research is necessary in the area of the relationship between physical fitness and academic achievement. This study needs to be replicated at other schools in other states. Also, non-Title I schools need to be investigated as well. Other grade levels, at different levels including middle and high schools, should be

evaluated to determine if a relationship exists between physical fitness and academic achievement. Other common academic measures with high reliability and validity should be used in future studies. Since this study did not find a significant correlation between physical fitness and academic achievement and other studies have, more research is deemed necessary to offer validation on this relationship. Another instrument of physical fitness, besides the President's Challenge Physical Fitness Test, could be used to see if results vary or achieve the same results as this study. Gender also needs to be explored more, especially as children get older, to see if gender has more of an impact at different ages. The more research conducted on this topic, the closer researchers are to obtaining a reason as to why some studies show a relationship between physical fitness and academic achievement.

More research as to how physical activity effects the functioning of the brain and its role on cognition needs to be explored more. Extensive brain research may be able to provide researchers with more answers. Additionally, extensive further research on other variables that effect academic achievement is needed.

Reasons as to why the percentages of the males and females performing in the "Needs Improvement" range were so high would warrant an effective qualitative study. This could lead to an interesting and future research study. Also, the researcher would like to know if adding more grade levels to the study would impact the results of the study.

Summary

Chapter Five restated the purpose of this study, as well as reviewed the methodology, detailed important findings, implications for practice, depicted the delimitations and limitations of the study, and suggested recommendations for future practice and research. Additional research is vital in order to further validate the relationship between physical fitness and academic achievement.

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Appendix A

Abdominal Strength and Endurance (Sit-Ups)

Appendix B

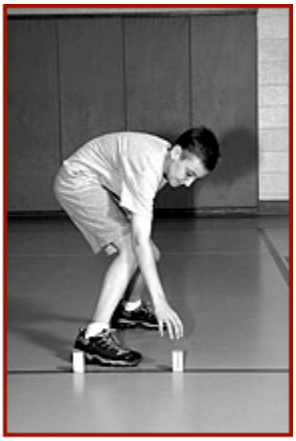
Upper Body Strength and Endurance (Pull-Ups)

Appendix C

Flexibility (Sit and Reach)

Appendix D

Agility (Shuttle Run)



Appendix E

Cardiopulmonary Endurance (Mile Run)

Appendix F

President's Challenge Physical Fitness Test Percentiles for Males for Sit-ups

CURL-UP FOR BOYS

Percentile Scores Based on Age/Test in No. of Curl-ups in 60 seconds

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	53	56	58	60	64	68	67	76	79	81	77	73
95	40	42	47	48	51	51	57	59	62	62	62	61
90	37	38	42	44	48	49	53	55	58	59	58	57
85	33	36	40	41	45	47	50	53	56	57	56	55
80	31	34	38	40	43	45	48	51	54	55	53	53
75	28	33	37	38	41	43	47	50	52	53	51	51
70	26	31	36	37	40	42	45	48	51	51	50	50
65	25	31	35	35	40	40	44	46	49	50	48	48
60	24	30	34	34	38	39	43	45	48	49	48	46
55	23	29	32	33	36	38	42	43	47	47	46	45
50	22	28	31	32	35	37	40	42	45	45	45	44
45	21	26	30	31	34	36	39	41	44	44	44	43
40	20	25	29	30	33	35	38	40	42	43	42	41
35	19	24	28	29	32	34	37	39	41	41	40	40
30	17	22	26	27	30	32	35	38	40	40	40	40
25	16	21	25	26	30	31	34	36	39	38	38	38
20	14	20	23	24	28	29	32	34	37	36	37	36
15	13	18	20	22	25	27	30	32	35	35	35	35
10	10	15	18	20	23	25	27	30	33	32	31	32
5	7	12	14	16	19	20	25	26	28	29	27	27
0	0	1	0	1	4	0	7	0	0	0	6	1

Appendix G

President's Challenge Physical Fitness Test Percentiles for Females for Sit-ups

CURL-UP FOR GIRLS

Percentile Scores Based on Age/Test in No. of Curl-ups in 60 seconds

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	55	55	59	62	61	67	62	72	72	74	77	67
95	36	42	43	45	45	48	50	52	53	55	53	53
90	33	36	40	41	42	44	47	50	49	51	49	47
85	32	34	38	39	40	42	45	46	47	48	45	44
80	31	32	36	38	38	40	43	44	45	46	43	41
75	30	31	35	36	37	39	41	42	43	44	41	40
70	28	30	33	35	35	37	40	42	42	41	40	38
65	27	29	31	34	34	35	39	40	41	40	38	37
60	25	27	30	32	32	35	38	40	40	39	37	36
55	24	26	30	31	32	33	36	38	39	37	36	35
50	23	25	29	30	30	32	35	37	37	36	35	34
45	21	24	28	30	29	31	34	36	36	35	34	33
40	20	23	27	29	28	30	32	35	35	34	33	31
35	20	22	25	27	27	29	31	33	34	32	32	30
30	19	21	24	26	26	28	30	31	32	31	30	30
25	17	20	23	25	25	27	29	30	31	30	30	28
20	16	19	22	23	23	25	27	28	30	28	27	25
15	14	17	20	20	21	24	25	26	28	26	25	25
10	11	15	18	19	19	20	23	23	25	23	23	22
5	7	10	12	13	14	16	20	19	20	20	19	19
0	0	0	0	0	0	2	0	0	0	0	0	0

Appendix H

President's Challenge Physical Fitness Test Percentiles for Males for Push-ups

PULL-UPS FOR BOYS

Percentile Scores Based on Age/Test Scores in Number of Pull-ups

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	11	14	15	21	22	25	21	20	23	29	26	26
95	5	6	8	8	9	10	10	11	13	14	15	17
90	3	5	6	6	7	7	8	9	11	12	12	15
85	2	4	5	5	6	6	7	7	10	11	11	13
80	1	4	4	5	5	5	6	7	9	10	10	12
75	1	3	4	4	4	4	5	6	8	10	10	11
70	1	2	3	4	4	4	5	5	7	9	9	10
65	0	2	3	3	3	3	4	5	6	8	8	10
60	0	2	2	3	3	3	3	4	6	7	8	10
55	0	1	2	2	2	2	3	4	5	7	7	9
50	0	1	1	2	2	2	2	3	5	6	7	8
45	0	1	1	1	2	1	2	2	4	5	7	7
40	0	1	1	1	1	1	1	2	4	5	6	7
35	0	0	0	1	1	1	1	1	3	4	5	6
30	0	0	0	0	1	0	1	1	3	4	5	5
25	0	0	0	0	0	0	0	1	2	3	4	5
20	0	0	0	0	0	0	0	0	1	2	4	4
15	0	0	0	0	0	0	0	0	1	2	3	3
10	0	0	0	0	0	0	0	0	0	1	2	2
5	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix I

President's Challenge Physical Fitness Test Percentiles for Females for Push-ups

PULL-UPS FOR GIRLS

Percentile Scores Based on Age/Test Scores in Number of Pull-ups

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	8	8	14	11	9	24	22	18	24	14	10	21
95	4	4	5	4	5	5	5	5	4	3	4	4
90	3	3	3	3	3	3	3	2	3	2	2	2
85	2	2	2	2	3	3	2	2	2	2	1	1
80	1	1	2	2	2	2	2	1	1	1	1	1
75	1	1	1	1	2	2	1	1	1	1	1	1
70	1	1	1	1	1	1	1	0	1	1	1	1
65	0	0	1	1	1	1	0	0	1	0	0	1
60	0	0	0	0	1	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix J

President's Challenge Physical Fitness Test Percentiles for Males for Sit and Reach

SIT AND REACH FOR BOYS

Percentile Scores Based on Age/Test Scores in Centimeters

	AGE												
PERCENTILE	5	6	7	8	9	10	11	12	13	14	15	16	17+
99	36	37	38	38	37	37	39	52	41	43	47	45	48
95	32	34	33	34	34	33	34	35	36	39	41	42	45
90	31	32	31	32	32	31	32	32	34	37	39	40	43
85	30	31	30	31	31	30	31	31	33	36	37	38	41
80	29	30	29	30	30	29	30	30	32	34	36	37	40
75	29	29	28	29	29	28	29	29	30	33	34	36	40
70	28	28	27	28	28	28	28	29	29	31	33	35	38
65	27	28	27	27	28	27	27	28	28	30	32	34	37
60	26	27	26	27	27	26	26	27	27	30	32	32	36
55	26	26	25	26	26	26	26	27	27	29	31	31	35
50	25	26	25	25	25	25	25	26	26	28	30	30	34
45	25	25	24	25	25	24	24	25	25	27	29	29	33
40	24	24	24	24	24	23	23	24	24	26	28	28	32
35	23	24	23	23	23	22	23	23	23	25	27	27	31
30	23	23	22	23	22	21	22	22	22	24	26	26	30
25	22	22	22	22	22	20	21	21	20	23	24	25	28
15	21	20	19	20	20	18	18	18	18	21	22	21	25
10	19	18	18	18	18	17	16	16	15	18	19	18	23
5	17	16	16	16	16	12	12	13	12	15	13	11	15

Appendix K

President's Challenge Physical Fitness Test Percentiles for Females for Sit and Reach

SIT AND REACH FOR GIRLS

Percentile Scores Based on Age/Test Scores in Centimeters

	AGE												
PERCENTILE	5	6	7	8	9	10	11	12	13	14	15	16	17+
99	37	38	37	39	39	41	41	46	49	49	49	48	47
95	34	34	34	36	35	35	37	40	43	44	46	46	44
90	32	33	33	34	34	34	36	38	40	42	44	43	43
85	31	32	32	33	33	33	34	36	38	40	43	42	42
80	31	31	31	32	32	32	33	35	37	39	42	41	41
75	30	30	31	31	31	31	32	34	36	38	41	39	40
70	29	29	30	30	30	30	31	33	35	36	40	38	40
65	28	29	29	30	30	29	30	32	33	36	39	37	39
60	28	28	29	29	29	29	30	32	32	35	37	36	37
55	27	27	28	28	28	28	29	31	31	34	37	35	36
50	27	27	27	28	28	28	29	30	31	33	36	34	35
45	26	26	27	27	27	27	28	29	30	32	34	33	34
40	25	25	26	26	26	27	27	28	29	31	33	33	33
35	25	25	26	25	25	26	26	27	27	30	32	32	33
30	24	24	25	24	24	25	25	26	26	29	32	31	32
25	23	23	24	23	23	24	24	25	24	28	31	30	31
20	23	22	23	22	22	22	23	23	23	26	30	28	29
15	22	22	22	21	21	21	22	22	22	24	28	26	28
10	20	20	20	19	20	19	20	20	20	23	25	23	26
5	18	18	16	17	17	16	16	15	17	18	19	14	22

Appendix L

President's Challenge Physical Fitness Test Percentiles for Males for Shuttle Run

SHUTTLE RUN FOR BOYS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	11.0	8.3	8.0	8.1	7.4	7.0	7.5	8.0	6.6	6.3	6.5	6.9
95	11.7	10.8	10.4	10.4	9.8	9.5	9.4	9.0	8.8	8.5	8.4	8.5
90	12.0	11.2	10.9	10.6	10.0	9.9	9.6	9.3	9.0	8.8	8.6	8.6
85	12.1	11.5	11.1	10.9	10.3	10.0	9.8	9.5	9.1	9.0	8.7	8.7
80	12.3	11.7	11.2	11.0	10.5	10.2	9.9	9.6	9.3	9.1	8.9	8.9
75	12.4	12.0	11.4	11.1	10.7	10.4	10.0	9.8	9.4	9.2	8.9	8.9
70	12.5	12.2	11.5	11.3	10.8	10.5	10.1	9.9	9.5	9.3	9.0	9.0
65	12.8	12.4	11.8	11.5	11.0	10.6	10.3	10.0	9.6	9.4	9.1	9.1
60	13.0	12.5	11.9	11.6	11.2	10.8	10.4	10.1	9.7	9.5	9.2	9.2
55	13.1	12.7	12.0	11.8	11.3	11.0	10.5	10.1	9.8	9.5	9.3	9.3
50	13.3	12.8	12.2	11.9	11.5	11.1	10.6	10.2	9.9	9.7	9.4	9.4
45	13.5	13.0	12.3	12.0	11.6	11.2	10.7	10.3	10.0	9.8	9.5	9.5
40	13.7	13.2	12.5	12.2	11.8	11.4	10.8	10.4	10.1	9.9	9.6	9.6
35	13.8	13.3	12.7	12.5	12.0	11.5	11.0	10.6	10.2	10.0	9.7	9.6
30	14.0	13.5	13.0	12.8	12.2	11.7	11.1	10.7	10.3	10.1	9.8	9.8
25	14.3	13.8	13.3	13.0	12.4	12.0	11.2	10.8	10.5	10.2	10.0	9.9
20	14.5	14.0	13.6	13.3	12.7	12.2	11.4	11.0	10.7	10.4	10.1	10.1
15	14.8	14.5	13.8	13.6	13.1	12.6	11.6	11.1	11.0	10.7	10.3	10.3
10	15.2	14.9	14.2	14.1	13.6	13.0	12.0	11.4	11.3	11.0	10.6	10.6
5	16.0	15.4	15.0	14.5	14.5	13.5	12.4	12.0	12.0	11.8	11.1	11.1
0	19.5	25.0	18.0	18.8	16.9	16.8	16.1	16.4	19.9	19.8	23.0	23.0

Appendix M

President's Challenge Physical Fitness Test Percentiles for Females for Shuttle Run

SHUTTLE RUN FOR GIRLS

Percentile Scores Based on Age/Test Scores in Seconds and Tenths

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	9.1	9.5	8.3	8.3	7.2	7.1	7.7	9.0	8.0	8.3	6.4	7.6
95	12.0	11.5	11.2	10.4	10.1	10.0	10.0	9.8	9.6	9.5	9.6	9.5
90	12.2	11.9	11.5	10.8	10.6	10.3	10.2	10.0	9.9	9.8	10.0	9.9
85	12.4	12.1	11.8	11.1	10.8	10.5	10.4	10.2	10.1	10.0	10.1	10.0
80	12.7	12.3	12.0	11.3	11.1	10.6	10.5	10.4	10.3	10.1	10.2	10.2
75	13.0	12.5	12.1	11.5	11.3	10.8	10.7	10.5	10.5	10.3	10.4	10.3
70	13.0	12.6	12.2	11.7	11.4	11.0	10.8	10.6	10.6	10.4	10.5	10.4
65	13.3	12.8	12.4	11.9	11.6	11.1	10.9	10.8	10.8	10.6	10.6	10.6
60	13.4	13.0	12.6	12.1	11.8	11.2	11.0	10.9	10.9	10.7	10.7	10.7
55	13.6	13.1	12.8	12.2	11.9	11.4	11.2	11.0	11.0	10.8	10.8	10.9
50	13.8	13.2	12.9	12.5	12.1	11.5	11.3	11.1	11.2	11.0	10.9	11.0
45	14.0	13.5	13.0	12.7	12.2	11.7	11.4	11.2	11.3	11.1	11.0	11.1
40	14.1	13.6	13.3	12.9	12.4	11.9	11.5	11.4	11.4	11.2	11.2	11.2
35	14.5	13.9	13.5	13.0	12.6	12.1	11.7	11.5	11.6	11.4	11.4	11.3
30	14.7	14.0	13.7	13.2	12.8	12.2	11.9	11.6	11.7	11.5	11.5	11.5
25	14.8	14.3	13.9	13.4	13.1	12.5	12.1	11.8	11.9	11.7	11.7	11.7
20	15.0	14.5	14.3	13.7	13.3	12.8	12.3	12.0	12.1	11.9	11.9	11.9
15	15.3	14.9	14.8	14.0	13.7	13.0	12.5	12.4	12.5	12.2	12.2	12.1
10	15.5	15.4	15.2	14.6	14.2	13.4	12.9	12.8	12.9	12.6	12.6	12.7
5	16.1	16.4	16.2	15.6	15.0	14.0	13.4	13.4	14.0	13.2	13.2	13.2
0	19.8	29.1	20.5	20.5	17.8	20.6	16.1	19.8	21.4	16.6	15.4	19.8

Appendix N

President's Challenge Physical Fitness Test Percentiles for Males for Mile Run

ONE-MILE RUN/WALK FOR BOYS

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	6:18	7:41	6:30	6:50	6:24	6:29	6:03	5:40	4:30	4:42	4:49	4:46
95	8:54	8:31	8:00	7:48	7:10	6:56	6:43	6:25	6:01	5:50	5:40	5:35
90	9:41	5:56	8:28	8:14	7:39	7:17	6:57	6:39	6:13	6:07	5:56	5:57
85	10:15	9:22	8:48	8:31	7:57	7:32	7:11	6:50	6:26	6:20	6:08	6:06
80	10:32	9:43	9:00	8:47	8:08	7:45	7:25	7:00	6:33	6:29	6:18	6:14
75	10:53	10:02	9:23	9:04	8:19	8:00	7:41	7:11	6:45	6:38	6:25	6:23
70	11:17	10:20	9:38	9:12	8:37	8:14	7:56	7:20	6:59	6:48	6:33	6:32
65	11:41	10:34	9:56	9:30	8:59	8:27	8:05	7:29	7:09	6:57	6:44	6:40
60	12:00	10:55	10:15	9:47	9:11	8:45	8:14	7:41	7:19	7:06	6:50	6:50
55	12:20	11:19	10:39	10:07	9:29	9:01	8:25	7:55	7:29	7:16	6:58	6:57
50	12:36	11:40	11:05	10:30	9:48	9:20	8:40	8:06	7:44	7:30	7:10	7:04
45	13:00	11:56	11:27	10:46	10:10	9:46	8:58	8:17	7:59	7:39	7:20	7:14
40	13:39	12:17	11:55	11:03	10:32	10:07	9:11	8:35	8:13	7:52	7:35	7:24
35	14:11	12:50	12:08	11:20	10:58	10:25	9:40	8:54	8:30	8:08	7:53	7:35
30	14:48	13:23	12:30	11:44	11:14	10:54	10:00	9:10	8:48	8:29	8:09	7:52
25	15:12	13:49	12:54	12:08	11:40	11:25	10:22	9:23	9:10	8:49	8:37	8:06
20	15:34	14:16	13:23	12:33	12:15	12:00	10:52	10:02	9:35	9:05	8:56	8:25
15	16:30	15:00	14:10	12:59	13:07	12:29	11:30	10:39	10:18	9:34	9:22	8:56
10	17:25	16:12	14:57	13:52	13:50	13:08	12:11	11:43	11:22	10:10	10:17	9:23
5	18:12	17:43	16:08	15:01	14:47	14:35	13:14	12:47	12:11	11:25	11:49	10:15
0	22:05	21:20	22:40	19:40	23:00	23:32	23:05	24;12	18:10	21:44	20:15	16:49

Appendix O

President's Challenge Physical Fitness Test Percentiles for Females for Mile Run

ONE MILE RUN-WALK FOR GIRLS

Percentile Scores Based on Age/Test Scores in Minutes and Seconds

	AGE											
PERCENTILE	6	7	8	9	10	11	12	13	14	15	16	17+
100	8:36	8:04	8:00	6:11	6:26	7:07	6:22	5:42	5:00	5:51	5:58	6:20
95	10:06	9:30	9:10	8:21	8:07	8:06	7:35	7:21	7:20	7:25	7:26	7:22
90	10:29	10:05	9:45	9:07	8:49	8:40	8:00	7:49	7:43	7:52	7:55	7:58
85	11:20	10:36	10:02	9:30	9:19	9:02	8:23	8:13	7:59	8:08	8:23	8:15
80	11:37	10:55	10:20	10:03	9:38	9:22	8:52	8:29	8:20	8:24	8:39	8:34
75	12:00	11:17	10:55	10:22	10:08	9:44	9:15	8:49	8:36	8:40	8:50	8:52
70	12:12	11:25	11:20	10:45	10:19	10:04	9:36	9:09	8:50	8:55	9:11	9:15
65	12:20	11:45	11:38	10:58	10:42	10:24	10:05	9:30	9:09	9:09	9:25	9:33
60	12:31	12:20	11:53	11:13	10:52	10:42	10:26	9:50	9:27	9:23	9:48	9:51
55	12:45	12:39	12:10	11:32	11:00	11:00	10:44	10:07	9:51	9:37	10:09	10:08
50	13:12	12:56	12:30	11:52	11:22	11:17	11:05	10:23	10:06	9:58	10:31	10:22
45	13:56	13:21	12:46	12:13	11:40	11:36	11:23	10:57	10:25	10:18	10:58	10:48
40	14:14	13:44	13:07	12:24	11:58	12:00	11:47	11:20	10:51	10:40	11:15	11:05
35	14:45	14:04	13:31	12:48	12:08	12:21	12:01	11:40	11:10	11:00	11:44	11:20
30	15:09	14:32	13:56	13:19	12:30	12:42	12:24	12:00	11:36	11:20	12:08	12:00
25	15:27	14:55	14:21	13:44	13:00	13:09	12:46	12:29	11:52	11:48	12:42	12:11
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10	17:36	16:35	15:45	15:40	14:30	14:44	14:39	14:49	14:10	14:13	16:03	14:01
5	19:00	17:27	16:55	16:58	15:43	16:07	16:00	16:10	15:44	15:17	18:00	15:14
0	21:40	22:19	20:40	24:00	24:00	21:02	24:54	20:45	20:04	24:07	21:00	28:50