THE EFFECTS OF SINGLE-GENDER CLASSES ON STUDENTS’ PHYSICAL FITNESS TEST PERFORMANCES AND ATTITUDES.

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ABSTRACT

The purpose of this pretest-posttest control group study was to test the Social Cognitive Theory by comparing the effects of class type, coeducational or single-gender, on physical fitness test performance and attitudes, controlling for previous fitness levels, among sixth-grade male and female physical education students at a Northwest Georgia Middle School. A total of 277 students participated in the newly state-mandated FitnessGram physical fitness test as part of their regular physical education class. The groups then participated in standard physical education lessons for four weeks. Then, in each of the two sixth-grade physical education periods, students were divided among the teachers according to gender, resulting in a female-only group, a male-only group, and a typical coeducational group. Students again participated in the FitnessGram with their newly formed groups. Afterwards, students were given the Physical Fitness Attitudinal Scale to determine their attitudes about physical education and fitness. The data collected were then analyzed by ANCOVA and MANOVA to determine the effect of gender-grouped classes on physical fitness test performance and student attitudes. The data revealed statistically significant differences between participant groups’ performances on some but not all parts of the FitnessGram physical fitness assessment. The data did not show a statistically significant difference between student attitudes toward physical fitness with and without single-gender grouping on the Physical Fitness Attitudinal Scale.
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American Association of Health, Physical Education, Recreation, & Dance (AAHPERD)
Analysis of Covariance (ANCOVA)
Body Mass Index (BMI)
Centers for Disease Control (CDC)
Fennema-Sherman Mathematics Attitude Scale (FSMA)
Georgia Student Health and Physical Education Act (SHAPE)
Healthy Fitness Zone (HFZ)
National Institute of Health (NIH)
National Institute of Mental Health (NIMH)
Needs Improvement Zone (NI)
No Child Left Behind Act of 2001 (NCLB)
CHAPTER ONE: INTRODUCTION

Background

In the current educational climate, documented evidence of student learning in all subject areas is becoming the standard. Before this level of accountability, the primary concern seemed to be whether students put in enough seat time at the school. At that time, attendance in a predetermined set of classes was the minimum expectation for students. Then the implementation of the No Child Left Behind Act of 2001 (NCLB) raised the bar for student performance and schools. Though not without controversy, NCLB has increased student performance goals in subjects across the curriculum.

Physical education is one of the latest subjects to be brought into the fold. In 2009, the State of Georgia passed the Georgia Student Health and Physical Education (SHAPE) Act, which set two requirements: 1) that each child in grades 1 through 12 enroll in a physical education course and receive an annual physical fitness assessment beginning in 2011; and 2) that the test results be collected to aid future policy decisions (Talking Points, 2009). In June of 2010, the Georgia Department of Education selected FitnessGram as the assessment to be implemented in their schools. Officials cited the criterion-referenced nature of the FitnessGram test and its standardized method of producing and printing individual student and parent reports as rationale for the assessment’s selection.

The FitnessGram program was piloted in five school systems during the 2010-2011 school year to refine teacher training plans and test protocol. The state has mandated the test items upon which students will be assessed, which include the PACER
or one-mile run, sit-and-reach test for flexibility, curl-up, push-up, and entering height and weight for body mass index (FitnessGram: Georgia, 2010). The law stipulates that the FitnessGram must be conducted by a certified physical education teacher. Individual results of the assessment must be communicated to the student’s parents or guardian. Aggregate results for each school and system must be reported to the Georgia Department of Education. The law also states that the Governor can work with private corporations to develop and implement programs that use monetary or other incentives to school systems or schools for attaining certain levels of health status (Georgia General Assembly, 2009).

The Georgia SHAPE Act stipulates the amount of physical education instruction to be provided to students in the public school system. Elementary students must receive a minimum of 90 hours per year of physical education instruction. Middle schools, however, are required only to make health and physical education instruction available to their students, with no minimum contact hours required. High school students must pass one semester of health and one semester of personal fitness as part of their graduation requirements.

Reporting requirements for the Georgia FitnessGram also differ by grade level. In first through third grades, the goal of testing is to familiarize the students with the assessment. The only data entered at this level is body composition, and reporting individual results to the parents is optional. In fourth and fifth grades, students are annually assessed on all parts of the FitnessGram, with all individual results reported to
parents. Middle school and high school students enrolled in any type of physical education class are also assessed annually, with results reported to parents.

The development of this legislation would seem to be a long-term win for Georgia’s children. In Georgia, 1 in 3 children is considered overweight, and any action that might bring this problem to the forefront for both parents and schools would be a step in the right direction. School physical education requirements in Georgia are relatively low and are often disregarded due to lack of enforcement (Talking Points, 2009). Through the assessment required by the SHAPE Act, student health problems at a school and individual level may have a chance of being addressed.

It is clear from the legislation that school physical educators will eventually be asked to do more than administer the fitness test; they will be expected to take steps to make their physical education programs more effective and enable students to develop fitness. Limited school days and budgets along with home habits will pose resistance to these efforts. But one controversial approach may provide a relatively simple solution by increasing student effort in physical education classes.

Single-gender classes are not a new idea, but the practice in public schools was all but abandoned after the passing of Title IX of the Education Amendments of 1972. More recently, the No Child Left Behind Act of 2001 authorized single-sex schools and classrooms, although the regulations for implementing these programs were not published until late 2006 (Sneed & Anderson, 2009).

Recent discoveries in brain development research have sparked renewed interest in differentiated instruction for male and female students. Male and female brains may
not be ready to learn the same ways at the same ages (Lenroot et al., 2007). Rather than being based on perceived cultural inappropriateness of coeducation, today’s single-gender classes are conducted in a new format based on new knowledge and spurred by a new sense of urgency to teach both genders more effectively.

The idea and many possible effects of single-gender physical education classes have been investigated in other studies. These studies include focuses on teacher and student perceptions (Lirrg, 1994; Olafson, 2002; Hannon & Williams, 2008), student-teacher interactions and participation opportunities (Hannon & Ratliffe, 2007; Constantinou, Manson, and Silverman, 2009), and student physical activity levels in coeducational and single-gender physical education (McKenzie, Prochaska, Sallis, & LaMaster, 2004; Hannon & Ratliffe, 2005). These reports have produced conflicting results and are not related specifically to physical fitness assessment. More research is required to better understand the possible effects of single-gender physical education classes on physical fitness assessment.

Problem Statement

The occurrence of childhood obesity has more than tripled over the past 30 years. Obese children and adults are at a greater risk for life-threatening conditions. The incidence of obesity among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008. This rate has also increased in adolescents aged 12 to 19 years from 5.0% to 18.1% (CDC, 2010). In 2007, 19.1% of U.S. Army recruits 18-29 years old were considered obese, which was up from 10% in 1995 (Bedno et al., 2010).

Researchers have identified physical education as an essential way for students to
increase and maintain physical activity levels (Scruggs, 2007), but current methods have fallen short. The Surgeon General recommends children should engage in an hour of moderate activity most days of the week, yet, according to estimates, only 3.8% of elementary schools, 7.9% of middle schools, and 2.1% of high schools provide daily physical education (Lee, Burgeson, Fulton, & Spain, 2007). The state of Georgia’s physical education instruction requirements are 60 hours per year for elementary (grades K-5) students, none for middle school (grades 6-8) students, and one semester of instruction for high school (grades 9-12) students (Metzler, 2002). Schools have the ability to both educate students about the dangers of obesity and provide appropriate physical activity in their physical education courses, but recent education reforms have reduced physical education requirements. As the expectations for physical education in Georgia’s schools have shrunk, the students’ waistlines have grown. Nearly 1 in 3 children in Georgia is overweight, the percentage of obese children is 4 times higher than the expected 5%, and the state spends almost $2.1 billion yearly in costs associated with obesity (Talking Points, 2009).

Within all classrooms, gyms included, positive student perceptions of the learning environment are essential for students to perform at their highest levels, and high performance in physical education is likely to help reduce the obesity rates. Research has shown that student attitudes may be affected by single-gender grouping in physical education classes and positive perceptions may increase student participation and learning (Smith & St. Pierre, 2009).

As part of the referendum on current physical education practices, mandatory
physical fitness assessments have proliferated across the country. Student performances on these assessments have the potential to greatly impact policy changes in education, which makes this type of assessment ideal for measuring experimental methods in physical education. There has been little to no research studying a possible relationship between gender-grouping and fitness assessments. Improved understanding is needed regarding the effects of single-gender physical education on students’ attitudes and physical performances.

**Purpose Statement**

The purpose of this research is to contribute to the understanding of the influence of gender grouping in physical education by measuring the influence of a single-gender physical education setting on sixth-grade students in physical education through a physical fitness assessment. The study will also measure the influence of single-gender grouping in physical education on the students’ attitudes towards physical fitness.

Physical fitness testing is a common aspect of physical education classes, but it is not without controversy. According to Cale and Harris (2009), proponents of the practice claim that fitness testing in schools promotes healthy lifestyles and physical activity, motivates young people to maintain or enhance their physical fitness or physical activity levels, facilitates goal setting, self-monitoring and self-testing skills, promotes positive attitudes, and enhances cognitive and affective learning. Opponents of fitness testing question the type, validity, and reliability of fitness tests as well as the ethics and value or purpose of testing (Cale & Harris, 2009). Some physical educators fear that focus on
fitness will harm other aspects of physical education, particularly motor skill
development (Lloyd et al., 2010).

Different states have had both successes and failures determining how to motivate
students and teachers for physical fitness assessments. A variety of extrinsic and intrinsic
motivators have been used with mixed success (Domangue & Solmon, 2010; Ferguson &
Keating, 2005; Kutahl, 2008; Prusak et al., 2011). Changing the testing environment is a
strategy mentioned little, if at all, in the literature. Understanding the effects of such a
change would help educators identify methods to improve student effort and performance
in physical education for both genders. This study will make a significant contribution to
the current research on single-gender physical education by assessing its impact on
student performance as assessed by physical fitness testing.

Regardless of gender, student enjoyment has been determined to have the greatest
effect on developing positive attitudes and continued participation in physical education,
physical activity, and sport (Smith & St. Pierre, 2009). The physical education
environment is a major factor in student enjoyment. This environment can be directly
affected by single-gender grouping, resulting in a change in student enjoyment
perceptions.

Lirgg (1994) found that single-sex and coeducational physical education classes
have quite different climates and are perceived differently depending on gender. More
research will benefit physical educators by providing them insight into variables that can
affect student performance and overall student health and fitness.
Research Questions

Research Question 1: How does single-gender grouping affect student performances on the components of FitnessGram physical fitness assessment?

Research Question 2: How does single-gender grouping affect student attitudes in the physical education environment?

Hypotheses

Physical Fitness. 1) *Null Hypothesis:* There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Sit and Reach test results.

2) *Null Hypothesis:* There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Curl-Up test results.

3) *Null Hypothesis:* There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Push-Up test results.

4) *Null Hypothesis:* There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram One Mile Run test results.

Student Attitudes. 1) *Null Hypothesis:* There will be no significant difference in student attitudes as reflected by the Confidence for Learning Physical Fitness Scale because of single-gender or coeducational grouping.
2) *Null Hypothesis:* There will be no significant difference in student attitudes as reflected by the Physical Fitness Usefulness Scale because of single-gender or coeducational grouping.

3) *Null Hypothesis:* There will be no significant difference in student attitudes as reflected by the Gender-Appropriateness of Physical Fitness Scale because of single-gender or coeducational grouping.

**Identification of Variables**

**Independent Variables.** Single-gender gender-experimental groups and coeducational control groups are the independent variables. Single-gender grouping is an independent variable and operationally defined as a physical education class containing either all females or all males with one physical education teacher. Coeducational grouping is an independent variable and operationally defined as a physical education class containing both females and males with one physical education teacher. Physical fitness pre-testing performance is a covariate and operationally defined by the FitnessGram (2010) as a measure of physical fitness through the assessment of aerobic capacity, body composition, flexibility, upper body strength and endurance, and abdominal strength and endurance.

**Dependent Variables.** Physical fitness post-testing performance is a dependent variable and operationally defined by the FitnessGram (2010) as a measure of physical fitness through the assessment of aerobic capacity, body composition, flexibility, upper body strength and endurance, and abdominal strength and endurance. Student attitudes are a dependent variable and operationally defined as the students’ views of their
academic selves in the physical education learning environment with perceptions of their own confidence related to physical fitness, the usefulness of physical fitness, and the gender appropriateness of physical fitness.

Definitions of Key Terms

**FitnessGram.** A physical fitness assessment that measures physical fitness in five different areas: aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition. It uses scoring standards that minimize comparisons between children and emphasize personal health (Cooper Institute for Aerobics Research, 1992).

**Gender Grouping.** This is the practice of grouping students into single-gender groups for educational benefit. The practice in public schools was all but abandoned after the passing of Title IX of the Education Amendments of 1972. The No Child Left Behind Act of 2001 authorized single-sex schools and classrooms, although the regulations for implementing these programs were not published until late 2006 (Sneed & Anderson, 2009).

**Georgia Student Health and Physical Education Act (SHAPE).** Georgia state law requiring that each child enrolled in a physical education course receive a physical fitness assessment beginning in 2011. The FitnessGram has been adopted as the official assessment by the State Department of Education.

**Healthy Fitness Zone (HFZ).** Objective criterion-based standards used by the FitnessGram assessment. These standards are not based on class averages or any other peer comparisons. Instead, they are based on levels of fitness needed for good health and...
set specifically for males and females of various ages using the best available research 
(Cooper Institute for Aerobics Research, 1992).

**Physical Fitness.** A measure of the body’s ability to function efficiently and 
effectively in work and leisure activities in order to be healthy, to resist disease, and to be 
able to meet emergency situations. It is also the capacity of the heart, blood vessels, 
lungs, and muscles to function at optimum efficiency.

**Physical Fitness Attitudinal Scale.** A questionnaire adapted from three of the 
Fennema-Sherman Mathematics Attitude scales (FSMA) (1976) to assess student 
attitudes in physical fitness. The FSMA has been used in numerous research studies 
across different content areas, including science (Levin, 1984), music (Wehr-Flowers, 
2006), educational technology (Kahveci, 2010), and physical education (Whitlock, 2006).

**Physical Fitness Testing.** For the purposes of this research, physical fitness 
testing the practice of assessing health-related fitness concepts of body composition, 
flexibility, muscular strength, muscular endurance, and cardiovascular endurance during 
physical education classes. These include, but aren’t limited to, FitnessGram, The 
President’s Challenge, and various state physical fitness tests (Cooper Institute for 
CHAPTER TWO: LITERATURE REVIEW

Introduction

The practices and goals of physical education in the United States have gone through numerous changes over time. As the culture of the country has transformed, so have the expectations and environments in physical education classrooms. Currently, the major decline in student physical activity levels, nutritional habits, and overall health are the primary focus of physical educators.

Theoretical Framework

The goal of this research is to investigate the following questions: 1) How does single-gender grouping affect student performances on physical fitness testing? and 2) How does single-gender grouping affect student attitudes in the physical education environment? At the center of the research is a change in student environment from coeducational to single gender, and the idea that such a change would affect student learning through a change in observations comes from Social Cognitive Theory.

Social Cognitive Theory is primarily credited to Albert Bandura in 1977. Bandura’s theory is an expansion of Social Learning Theory, which was developed originally by Cornell Montgomery in the late 1800s and posited that human behavior is the result of cognitive factors alone. Social Cognitive Theory contends that parts of an individual’s knowledge acquisition and human behavior are the result of both psychological and environmental factors. These environmental factors shape our knowledge through our observation of others modeling physical, emotional, and cognitive responses. These models can come from social interaction, experiences, and the media. Through these observations, individuals learn what reward or punishment
outcomes to expect from specific behaviors (Parajes, 2009).

The learning models present in and therefore offered by a single-gender classroom will most likely differ from those of a coed classroom. This study hypothesizes that male and female student behaviors will adapt to this new environment and result in positive, measurable changes. These changes will be measured by collecting data that document the students’ attitudes and physical performance in this setting.

**Historical Background**

The goal of physical education in the American school system has shifted over time. Early on, exercise and physical fitness were seen as a medical prescription, rather than an area of education. During the progressive movement of the early 1900s, Thomas Dewey changed this perception and incorporated physical education into his philosophy, which urged teaching the “whole child” through both mind and body. Sports and dance were also introduced into the school setting at this time, increasing the need for a new focus on physical education. This new sport focus for physical education would last until America’s participation in both World Wars uncovered a need for change. The discovery that so many young men were physically unfit for military service powered the effort to change the focus of physical education to physical fitness (Freeman, 2000). Along with movement education, physical fitness remains a focus of contemporary physical education.

During the 20th century, student grouping in physical education also underwent philosophical shifts. Coeducational school settings have been commonplace in the United States, but a few specific subjects held onto single-gender settings longer than most. Along with home economics and industrial education, physical education has
historically been a single-gender anomaly in the American public school system (Scraton, 1993). Doubts regarding females’ ability to physically compete with males and the culture’s perception of the inappropriateness of this type of interaction shaped the practice. At the time, the goals for physical education were “aimed at educating males to become proficient soldiers and females to become healthy mothers” (Pfister, 2005, p. 1328). Some argue that this practice, grounded in traditional assumptions and beliefs about differences between the sexes, contributed to gender-role stereotyping that led to unequal treatment of the genders in physical education classes (Davis, 2003). The idea of a specific, measurable academic gain attained through either coeducational or single-gender grouping was not the priority at the time.

It was not uncommon for male students to receive preferential treatment in physical education and sport for most of the 20th century. These advantages came in the form of better facilities and equipment for males, often leaving females with second-hand equipment or a practice schedule that worked around male teams’ practice times. All of this changed with the passage of Title IX (Furrer, 2010).

Title IX of the Education Amendments of 1972 prohibited sexual discrimination in programs that receive federal money and virtually eliminated single-gender public education for quite a while. Title IX assumed that once equal access to the same type of instruction was provided for both genders, skill levels would increase in the weaker subject areas for each group. The rest of the world agreed with this idea, and soon after Title IX was enacted, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) stated that "each human being has a fundamental right of access
to physical education and sport opportunities essential for the inclusive development of the total child" (Davis, 2003).

An undoubtedly successful result of Title IX was the dramatic increase in females’ participation in sports. In 1971, there were fewer than 300,000 females participating in high school sports. By the year 2000, this number had increased to over 2.6 million. But these sporting benefits have not necessarily transferred to the physical education setting. Almost half of the young people in the US are not active on a regular basis, and adolescent females are twice as likely to be inactive (Penney, 2002).

To comply with Title IX, all physical education classes must be coeducational except those that are defined as “contact sports”: wrestling, boxing, rugby, ice hockey, football, basketball, and any that have bodily contact as their major objective. These may be conducted as single-gender classes, but do not have to be (Dougherty, Goldberger, & Carpenter, 2002). Schools preferring single-gender physical education environments sometimes conduct coeducational classes on paper to appear in compliance with the law, but divide students in actual practice.

The success and intention of the Title IX amendment have been hotly debated among educators and politicians. In the 1996 case of the United States vs. Virginia, the Supreme Court ruled that single-sex public education is constitutional if comparable courses, services, and facilities are made available to both sexes (Johnson, 2004). The No Child Left Behind Act of 2001 authorized single-sex schools and classrooms; released in 2006, the regulations for implementing these programs state that programs organized by gender must be based on the attainment of an educational objective, completely voluntary, implemented in an even-handed manner, substantially equal for males and
females, and reviewed every two years. In addition, a coed option in identical classes must be available (Sneed & Anderson, 2009). This possibility has led to a rise in the number of public schools offering single-gender classrooms, from about a dozen in 2001 to around 540 in June of 2010 (National Association for Single-Sex Public Education, 2010).

It is also worth considering physical education practices in other countries. Mixed-gender physical education courses are the norm in many Western countries, and are more common at the elementary level. In many Eastern and developing countries physical education is not even a subject studied in females’ schools. But there are exceptions to these generalities. Both Germany and Australia have moved towards single-gender physical education classes for adolescents to avoid educational problems presented by coeducation (Pfister, 2005).

**Physical Education National Standards**

In the late 1980s, the National Association for Sport and Physical Education (NASPE) formed a committee to define who is “physically educated” and to define outcomes and benchmarks for developing physical education curriculum. Working over five years, the committee came to define a physically educated person as an individual who 1) has learned the necessary skills to perform a variety of physical activities, 2) is physically fit, 3) participates regularly in physical activity, 4) knows the implications of and benefits from involvement in physical activity, and 5) values physical activity and its contributions to a healthful lifestyle. Outcomes and benchmarks created for kindergarten, second, fourth, sixth, eighth, tenth, and twelfth grades were then developed to create six national physical education content standards:
• Standard 1: Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities.

• Standard 2: Demonstrates understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities.

• Standard 3: Participates regularly in physical activity.

• Standard 4: Achieves and maintains a health-enhancing level of physical fitness.

• Standard 5: Exhibits responsible personal and social behavior that respects self and others in physical activity settings.

• Standard 6: Values physical activity for health, enjoyment, challenge, self-expression, and/or social interaction.

Of all these standards, Standard 4 is most directly linked to the need and practice of physical fitness assessments. The National Standards for Physical Education view fitness as the product of a physically active lifestyle. A physically active lifestyle is defined as the product of movement competency and knowledge gained through positive participation in physical activity (NASPE, 2004).

**Health-Related Fitness**

When discussing fitness, it is important to have a clear understanding of the different types of fitness. Although physical fitness is the standard term used when describing fitness assessments, these tests actually measure health-related fitness. Physical fitness can also be defined as sports or athletic fitness, which is skill-related and differs from health-related fitness. An individual can be proficient at athletic fitness skills but not have healthy fitness levels. For instance, many football linemen may be
athletic and highly skilled at their sport and the associated movement patterns, but their body composition ratios would not fall within a healthy zone. At the other extreme, distance runners might have great body composition and cardiovascular endurance, but their upper body muscular strength is often well below health-related fitness standards (CDC, 2005).

The components of health-related fitness are as follows:

**Cardiovascular Fitness.** Also sometimes known as stamina, cardiovascular fitness is the ability of a person’s body to continuously provide enough energy to sustain sub-maximal levels of exercise. To do this the circulatory and respiratory systems must work together efficiently to provide the working muscles with enough oxygen to enable aerobic metabolism. This type of fitness has enormous benefits to our lifestyle as it allows us to be active throughout the day. It helps fat metabolism, improves delivery of oxygen, allows faster removal of waste products, and decreases stress levels.

**Muscular Strength and Muscular Endurance.** Strength is the ability of a muscle to exert a force to overcome a resistance. Strength is important in day-to-day life, as when lifting heavy bags or using our legs to stand up from a chair. Muscular endurance, unlike strength, is the ability of a muscle to make repeated contractions over a period of time. Endurance is used in day-to-day life in such activities as climbing stairs, digging in a garden, and cleaning. Muscular strength and endurance enable us to avoid injuries, maintain good posture, and remain independent in older age.

**Flexibility.** Flexibility is the movement available at our joints, usually controlled by the length of our muscles. If we do not have flexibility, our movement decreases and
joints become stiff. Flexibility helps prevent injuries, improve posture, reduce low back pain, maintain healthy joints, and improve balance during movement.

**Body Composition.** Body composition is the combination of muscle, fat, bone, cartilage, and other components in our bodies. In terms of general health, these components fall into two categories: body fat and lean body tissue. The recommended amounts of body fat vary based on gender and age. In general, a healthy amount of fat for a man is between 15 and 18%, while for women it is higher, at 20-25%. Maintaining a healthy body composition is important because excess body fat has been linked to chronic diseases such as heart disease, stroke, diabetes, and cancer. Excess body fat also places strain on the joints, muscles, and bones, increasing the risk of injury (CDC, 2005).

**Gender Developmental Differences**

As many parents will attest, adolescence is a time of great transformation and turmoil. Sixth-grade students are typically around 11 or 12 years old and generally considered to be preadolescent and at the beginning of the puberty process. During this time, children begin to mature intellectually, emotionally, and physically. Within each gender, there is a large variance in the rate at which each aspect of the maturation process takes place. The added variable of two genders undergoing very different changes results in classrooms with a multitude of student maturity levels. Females may actually begin puberty in the preadolescent years, while the onset of male puberty begins later and may continue beyond the teenage years. Personal accomplishment and social agendas also undergo a transformation, taking on greater importance and becoming more challenging and complicated for students. Adolescents are at once recognizing their sexual feelings,
trying to determine their personal identity, and using morality when making decisions (Shaffer & Kipp, 2009). Social interaction takes precedent over family and often affects academic performance.

Sax’s (2005) research on the learning styles of both genders cites biological differences as strong factors in the success of male and female students. He found that female children have an 80% advantage over males in acoustic brain response. This is most prominent in the 1,000 to 4,000 Hz range, which is critical for human speech recognition. Sax (2005) hypothesized that these hearing differences could have a dramatic affect on student success, based on the noise level of the learning environment. For example, a quiet classroom setting might be more comfortable to females and a louder setting, such as a physical education or vocational class, might be more comfortable to males.

Visual response by each gender also differs because the ratio of rods and cones in the eye that send visual signals to the brain varies between the genders (Sax, 2005). As a result, males prefer moving objects with few colors and female students prefer stationary objects with depth and a variety of colors, so young male students are more likely to use few colors and draw action pictures, while females draw more colorful, stationary scenes. Sax hypothesizes that because of these developmental differences, male students are unknowingly taught at an early age that art is a female subject.

Brain researchers have also discovered physical evidence that demonstrates the learning differences between males and females. Many of these differences exist because various regions of the brain develop in a different sequence in each gender. For example, the areas of the brain involved in language and fine motor skills mature about six years
earlier in females than in males. For males, the regions of the brain involved in targeting and spatial memory mature about four years earlier than in females (Anokhin, Lutzenberger, & Nikolaev, 2000; Hanlon, Thatcher, & Cline, 1999). In 2007, the National Institutes of Health (NIH) and the National Institute of Mental Health (NIMH) published the world’s largest study on brain development in children. This study demonstrated that there is no overlap in the trajectories of brain development between the genders (Lenroot et al., 2007). In other words, the brains of males and females both have the capacity to learn the same material, but their brains are ready to learn different things at different times. Proponents cite these studies as research-based evidence of the need for single-gender education in public schools.

Physical changes caused by puberty can increase the difference between performance levels of male and female students in physical education. Early-maturing male students develop increased strength and speed, which often lends itself to body satisfaction. On the other hand, early maturing females often become self-conscious of their changing bodies and make physical adjustments to cope with these changes. Their experience in physical education may be embarrassing, and they may therefore be less successful in competition. Thus, teaching adolescents in physical education is complicated by varying levels of student self-perception and participation (Gabbei, 2004).

**Gender Grouping and Physical Education Overview**

Proponents of coeducational physical education claim that it provides equal opportunity for participation, in compliance with Title IX, and allows both genders to interact, developing students’ social skills (Koca, 2009). They point out that mixed
physical education courses offer a chance to improve empathy and cooperation skills for both genders and argue that potential differences in motor skills are a nonissue since most students fall in the same middle range of achievement regardless of gender. They contend that coeducational classes guarantee equal opportunity and education by exposing both genders to the same instruction (Pfister, 2005).

On the other hand, Hannon and Williams (2008) contend that access to the same class does not guarantee equality in physical education. Equality of instruction depends on many other variables, including teacher interaction, instructional methods, and student perceptions. They call for further research to determine the most beneficial grouping for physical education classes.

Some argue that the social interaction touted by coed supporters is actually what prevents females from participating in coed physical education. While studying causes of female adolescent resistance to schooling, Olafson (2002) found that subjects consistently expressed their dislike for physical education. These females developed strategies to avoid physical education, including skipping class, having a parent write a note to excuse them from class, disappearing into the change room after attendance had been taken, refusing to change into gym clothes, and non-participation. Two key reasons the females attempted to avoid physical education were unbearable peer interactions and uncomfortable cultural messages about femininity. Gender-segregated classes were one of the primary suggestions the female subjects offered to improve their participation in physical education.

The potential effect the gender of the physical education teacher may have on both single-gender and a coeducational student group has also been questioned. During
physical education, student and teacher interaction is influenced by variables such as verbal behaviors, perceived differences in physical ability, teaching styles and strategies, class management, and curricular issues (Davis, 2003). Gabbei (2002) believes that the behaviors and perceptions of teachers play a large role in the effectiveness of class groupings. Gabbei’s study had one male and one female middle school physical education teacher teach invasion games to three different groups: all male, all female, and mixed. The students’ performances were measured through skill testing, and student perceptions were measured through random interviews and inductive analysis. It is worth noting that the random interviews were conducted on only three students from each group; such a small sample may not sufficiently represent the perceptions of the entire group. Nevertheless, skill test and student response data both showed greater improvement when students were taught by a teacher of their own gender. Gabbei (2002) attributed this improvement to an increase of student enjoyment in those groupings that was observed by both students and teachers.

Shimon (2005) supports the idea that the teacher greatly impacts the effectiveness of student grouping, but for different reasons. Recalling her own experiences as a secondary physical educator, Shimon (2005) observed similar behaviors by students in both single-gender and coeducational classes. Each group had both model students and troublemakers who exhibited both high and low levels of participation and high and low levels of skill. She concludes that these student issues are independent of gender grouping. Instead, the true nature of the problem lies with what level of equity physical educators teach to the two genders. Common physical educator habits that contribute to gender inequity are listed and include selecting males more than females to demonstrate a
skill, providing more feedback to males, giving more attention to males, and using gender-biased language, such as the common phrase "man-to-man defense." She also suggests that alternate student-led grouping methods based on skill level and activity choice may improve student participation and enjoyment in coeducational settings, although she believes the root of the problem remains with improving teacher behavior.

Others support Shimon’s (2005) idea that physical educators’ student interactions are inequitable; multiple studies have identified related teacher habits. Teachers have been identified as interacting more often both verbally and nonverbally with male students (Dunbar & O'Sullivan, 1986; Griffin, 1981; MacDonald, 1990). Teachers have been shown to ask questions of male students more often (Dunbar & O'Sullivan, 1986). They praise genders more often for different reasons, praising male students for good performance and female students for their effort (Dunbar & O'Sullivan, 1986; MacDonald, 1990). Teachers use male students more often to demonstrate physical skills in class (Dunbar & O'Sullivan, 1986; Griffin, 1981). They express gender-biased perceptions and explanations for student behavior (Griffin, 1985; MacDonald, 1990). Finally, teachers create curricula that ignore the needs and interests of female students (Gabbei & Mitchell, 2000; Griffin, 1981).

There have been a few more recent studies that contradict the idea that physical educators show favoritism to male students during interactions. McBride (1990) found little evidence that students were treated differently by gender in his study on gender-role stereotyping by physical educators. Weiller and Doyle (2000), with a study on elementary school physical education teachers, and Davis (2000), with a study on high school physical education teachers, found that teachers actually interacted more often
with the opposite gender: in those studies, male teachers interacted more often with female students and female teachers interacted more often with male students.

**Student Attitudes Toward Physical Education**

Regardless of gender, student enjoyment has been determined to have the greatest effect on developing positive attitudes and continued participation in physical education, physical activity, and sport (Smith & St. Pierre, 2009). Through student interviews, Smith and St. Pierre (2009) categorized four themes as the determining factors of enjoyment in physical education: teacher impact, student characteristics, class activities and content, and the physical education environment. Both student characteristics and the physical education environment have the potential to be directly affected by single-gender grouping, resulting in a change in student enjoyment perceptions.

Research has also found that positive attitudes towards physical education decline with student age. Using a survey-based study, Subramanian and Silverman (2007) questioned 995 middle school students regarding their opinions on physical education. The survey measured the domains of "enjoyment" and "perceived usefulness." The researchers found that students of both genders consistently found the subject more enjoyable than useful overall. They also found that student scores in both domains declined with age, resulting in much lower scores for eighth graders than for sixth and seventh graders. The authors suggested that this may decline be due to a repetitive physical education curriculum.

Fitness-specific activities are also often described by students as having no meaning or lacking fun because of their repetitiveness and tediousness (Williams & Germain, 2008). Unappealing activities will fail to motivate students to become
physically fit. This finding suggests that what should be one of physical education’s strengths, disguising learning as fun, is a weakness when it comes to physical fitness.

Research into student perceptions of single-gender and coed classes in physical education focuses on several themes. Students preferring coed physical education most often cited the increased social nature of the class. They enjoyed being able to interact with the opposite gender and stated they were exposed to more ideas by being grouped together. Students stating a preference for single-gender classes had varied reasons, including that “separate classes would allow males and females to focus on activities more suited for them; females viewed coeducational physical education classes as inequitable and unpleasant; females felt that males were not cooperative enough in class; and the males felt that females did not exhibit a high enough effort” (Hannon & Williams, 2008, p. 7). Lirgg (1994) found that single-sex and coeducational physical education classes have quite different climates and are perceived differently depending on gender. A majority of the females in same-sex classes perceived students in female-only classes to have better behavior, more teacher interaction, and more group affiliation and cooperation than coed classes. The majority of the males and females in single-gender classes perceived more intense competition than coed classes. While perceiving same-gender classes as more competitive, males perceived themselves to be more involved in coed classes. These findings indicate that each gender may receive benefits in different types of grouping. Males may receive some worthwhile advantages from participating in coeducational classes, such as increased confidence, group affiliation, and helping behaviors. Females, however, may be more engaged, feel happier, and receive more teacher attention in a single-gender classroom.
In her research, Griffin (1984, 1985) identified and categorized the way male and female students perceived a coeducational middle school physical education class. Examples of the patterns Griffin (1984) identified in females included “Athletes,” "JV Players," "Cheerleaders," "Femme Fatales," "Lost Souls," and "System Beaters." Unfortunately, Griffin (1984) identified very few assertive “Athletes” and “JV Players,” noting that the majority of female students employed strategies to avoid direct conflict with males and avoid the activity as much as possible. Males, on the other hand, were identified by Griffin (1985) as "Machos," "Junior Machos," "Nice Guys," and "Invisible Players." The majority of the males tended to dominate game play and act domineering towards female students.

Constantinou, Manson, and Silverman (2009) conducted in-depth interviews with 20 seventh- and eighth-grade females to determine how they perceived their PHYSICAL EDUCATION teachers’ gender role expectations and how that affected attitude and participation in physical education. The findings of the study suggested that females' participation in and attitude toward PE is influenced by multiple factors: teachers' expectations; the females' own gender-role stereotypes; and whether the PHYSICAL EDUCATION environment is safe for them, emotionally and physically. The females in the study perceived themselves as equally athletic to the males in their physical education class, so physical ability differences were not seen as an impediment to participation.

Using a survey study, Couturier, Chepko, & Coughlin (2007) examined gendered perspectives on middle and secondary school physical education. Over 5,000 surveys were collected from one school system’s middle and high schools. Overall, more similarities existed between the responses of males and females than differences.
Differences noted included male preference for competition along with a positive perception of athletic ability and female preference for a less competitive and more cooperative environment. Males more often selected team and individual sports as their choice activities, while most females selected dance and fitness. Females also expressed displeasure with the locker room changing and showering process associated with physical education. The survey data from this study was then used to form an action plan for the system to reduce any environmental barriers to student participation and improve the quality of instruction for all students.

**Physical Activity Levels**

Participation in physical education has been identified as an essential way for students to increase and maintain physical activity levels. Healthy People 2010 recommended that adolescents be active for at least 50 percent of the lesson time. These activity levels are often measured through pedometry, which measures the number of steps students take during the class. Scruggs (2007) found that in a typical middle school physical education class, students do in fact achieve the Healthy People 2010 goal of 50% activity per class, but that the overall activity time falls well short of the overall weekly goals for both Healthy People 2010 and the President's Council on Physical Fitness. So current physical activity levels in physical education courses can be improved, but for students to meet such guidelines would require additional opportunities to engage in physical activity outside of physical education. Scruggs (2007) also notes that physical education involves more than simple physical activity, although it should attempt to maximize physical activity levels.
Student motivation would seem to be a major factor in improving physical activity levels. Pangrazi, Alderman, & Beighle (2006) offer three strategies for “turning on” students to physical activity. First, connect to students through intrinsic motivation by allowing students more freedom to make choices during physical education. Second, teachers should seek to enhance each student’s perception of his or her physical competence. By providing activities that increase students’ confidence in their physical abilities, teachers make the physical education environment more appealing. Finally, they suggest creating an environment that provides a variety of tasks and optimal challenges with an adequate pace of instruction and sufficient time for children to learn and practice movement skills.

Motivation may come from numerous sources, but intrinsic motivation is particularly important in physical education. Intrinsic motivation is the degree to which an individual chooses to participate in an activity for the pleasure derived within, rather than for any extrinsic reward that may be come from the outside. When people are intrinsically motivated, they experience interest in an activity, enjoyment, and feelings of competence and control. Voluntary participation in physical activity rests largely on intrinsic motivation, because extrinsic rewards are rarely available. In addition, motivation researchers suggest that extrinsic rewards may not be effective in encouraging a lifelong pursuit of physical activity (Mitchell, 1996).

Physical educators often express concern that an increased class focus on health-related fitness can be done only at the expense of motor skill, social, and cognitive development during class time. The perception by many physical educators is that a focus on health-related fitness means an increase in physical activity during physical
education, which would require either sacrificing class time for other types of instruction or adding class time to allow for the additional activity. But making increased time available for physical education may not be the solution. Cawley, Meyerhoefer, and Newhouse (2006) found that just adding more time in physical education courses did not make a difference in overall student physical activity for over 37,000 high school students. Both male and female students fell short of current recommended physical activity levels. Cawley et al. (2006) argue that increasing time in physical education will not lead to benefits if the instruction remains subpar. It is the classic quantity versus quality debate. Adding time for more poor physical education practices is equivalent to adding time in secondary mathematics for students to practice counting skills. Both instances present tasks that students find boring and repetitive, resulting in a negative association with the subject matter.

The idea that teaching students sport-specific skills will lead to physical activity and higher levels of health does not seem to be validated in the research. Former athletes are as vulnerable to coronary heart disease as nonathletes (Brill et al., 1989). A review of longitudinal studies conducted over the past 30 years found in effect no link between PE curricula and adult activity patterns (Shephard & Trudeau, 2000). Thus, sport-specific skills may influence sport performance, but they do not seem to determine future activity levels. The key to a lasting influence on student physical activity levels has yet to be discovered in the field of physical education.

In general, adolescent physical activity levels may be affected by many variables. Wenthe, Janz, and Levy (2009) found that family support was the most consistent factor associated with high levels of physical activity for both male and female adolescents.
Being female, having a low socioeconomic status, and being overweight have been linked to a greater risk for low levels of physical activity (Bengoechea, Sabiston, Ahmed & Farnoush, 2010).

Few studies have measured physical activity levels for single-gender and coeducational physical education classes. Those that do exist provide conflicting results. Adolescent and pre-adolescent females have the lowest physical activity levels of all students. Research has verified educators' concerns that female students often do not receive equitable physical education instruction or activity levels in coed classes (Gabbei, 2004). One reason for this may be that single-gender physical education classrooms result in a higher number of student/teacher and student/student interactions for female students than do coed classes. It has been reported that female physical activity levels and participation tend to increase in the single-gender setting, possibly due to the elimination of male dominance during game play (Hannon & Ratcliffe, 2007).

Other studies show that students in females-only classes achieve lower physical activity levels than males-only and coed classes (McKenzie, Prochaska, Sallis, & LaMaster, 2004; Hannon & Ratcliffe, 2005). These findings can be misleading, as other classroom variables have impacts upon student physical activity levels. Female-only physical education classes allot more time for skill drills, which are usually performed at a lower activity level, than for game play, which is more often performed at a moderate to vigorous activity level (McKenzie et al., 2004). This shift in lesson focus allowed female students to meet their own developmental needs.

Data in these studies were also limited by having students participate only in team sports activities. Adolescent male and female students prefer different types of physical
activity. Females were more likely to select individual and noncontact activities (volleyball, swimming, dance) while males were more likely to select contact activities (basketball, football, wrestling) (Hill & Cleven, 2005). One study showed that female-only classes can increase physical activity levels through the use of a female-friendly, choice-based instructional program. Activities that young women typically enjoy (e.g., aerobics, dance, walking, self-defense, martial arts, and weight training) were offered in addition to competitive sports and other traditional physical education activities (Pate et al., 2005).

Student physical activity levels in the school day can impact performance in other subjects. The CDC conducted a review of the literature that examined the association between school-based physical activity, including physical education, and academic performance. This review did not focus on any gender differences; rather, it looked at the associations of school-based physical activity and academic performance, academic behavior, cognitive skills, and attitudes. Studies were divided into four categories: 1) school-based physical education studies, 2) recess studies, 3) classroom physical activity studies, and 4) extracurricular physical activity studies. The review found substantial evidence that physical activity during the school day can help improve academic achievement, including student grades and standardized test scores. The articles reviewed suggested that physical activity can have a positive impact on cognitive abilities such as enhanced concentration, higher attention levels, and improved classroom behavior. The review found that maintaining or increasing physical education time did not appear to negatively impact academic performance (CDC, 2010).
Childhood Obesity

Wrynn (2011) contends that historically the mission of physical education/kinesiology has been to focus on body measurement, the use of exercise as a treatment for injured people, the teaching of sport skills to children, and the fitness of children and adolescents. Prusak et al. (2011) are not as kind; they conclude that physical education has historically been designed to do one thing: teach sport skills. Both Prusak et al. (2011) and Wrynn (2011) agree that the expectations for physical education are undergoing a change to deal with lifestyle issues such as obesity and inactivity. As the target and purposes of physical education change, a fundamental shift must be undertaken to change the way it is delivered.

While it may not have been the primary focus, concern about obesity is not a recent revelation for physical educators. A review (Wrynn, 2011) of the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) publications from the early 20th century provides evidence. Themes of alarm regarding the sedentary nature of American life, the appropriate method to measure the overweight body for fitness, and weight reduction methods are peppered through these early practitioner journals.

Instead of addressing these concerns, the profession has generally ignored them from a practical standpoint. Physical Education Teacher Education (PETE) programs have not changed to meet these new and different targets. Prusak et al. (2011) assert that PETE programs have erred by focusing on two primary goals: 1) exclusive learning of sport-centered motor skills and competition, and 2) forced, steady-state exercise.
prescription. Based on current obesity rates, one could surmise that this strategy has met with little or no success.

The tide seems to be shifting as media outlets decry the health risk factors associated with obesity. The medical community has redefined excess body weight from a lifestyle choice to a medical problem. As American waistlines and obesity statistics skyrocket, the epidemic grows more dire.

The occurrence of childhood obesity has more than tripled over the past 30 years. The incidence of obesity among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008. This rate has also increased in adolescents aged 12 to 19 years from 5.0% to 18.1% (CDC, 2010). In 2007, 19.1% of U.S. Army recruits 18-29 years old were considered obese, up from 10% in 1995 (Bedno et al., 2010). However, this epidemic does not begin at school age. A steady rise in the prevalence of obesity among low-income, preschool-aged children reached 14.6% in 2008 (Sharma et al., 2010). These objective statistics are jaw-dropping, but may not resonate with everyone. A more subjective example is seen in the comparison of current class photos to those from 30 years ago. The difference would not only include more overweight and obese students today, but also a disparity in what would have been considered overweight for each generation.

Regardless of the method used to garner the serious attention this problem deserves, obese children are at a greater risk of serious health problems as well as an overall lower quality of life. These health issues include heart disease, type II diabetes, stroke, several types of cancer, bone and joint problems, sleep apnea, and social and psychological problems such as stigmatization and poor self-esteem (CDC, 2010).
Many factors contribute to childhood obesity, making the problem of identifying the proper intervention infinitely more difficult. These factors are very often the result of the lifestyle choices made for our families. Parents of obese children often subscribe to the indulgent feeding style. In this style, parents give in to the child’s desires, not thinking about the long-term effect of unhealthy eating. The added convenience of fast food takes precedent over nutritional value in the increasingly hectic lives of this era’s families (Devi, 2008). The fast food consumption by two- to eighteen-year-olds increased five-fold from 1977 to 1995 (Harris, Kuramoto, Schulzer, & Retallack, 2009). Research conducted by Davis and Carpenter (2009) indicated that youth who attended schools located near fast food restaurants were heavier than were other students with similar observable characteristics who attended schools not located near fast food restaurants.

Murtagh and Ludwig’s (2011) controversial article in the *Journal of the American Medical Association* suggests that parents of severely obese (above the 99th percentile of BMI) children could be guilty of child abuse and neglect. They go on to propose that state intervention and foster care may be appropriate to save the lives of these children. At first thought, the idea seems ridiculous—parents should have the freedom to raise their children as they see fit, and the government should mind its business and not overstep the rights of parents. But Murtagh and Ludwig (2011) make a compelling argument based on legal precedent. They assert that poor parenting techniques that lead to overweight and mildly obese children are akin to secondhand smoke in the child’s home. Both practices have negative effects on the child, but do not warrant legal action. Their call for state intervention is for severe obesity situations more analogous to undernourishment.
cases. It has been established that chosen feeding practices that cause children undernourishment and failure to thrive should be considered child abuse and neglect. But cases of over nourishment have been less frequently prosecuted, despite the risks to health and quality of life they present (Murtagh & Ludwig, 2011). This position and rationale may or may not lead to more state intervention regarding childhood obesity, but it does manage to bring the seriousness of the public health issue that is childhood obesity into public debate.

Higher levels of physical activity are positively associated with higher levels of physical fitness and lower risk for obesity in adolescents and children (Dumith et al., 2010). The odds for children developing cardiovascular disease decrease as physical activity and cardiovascular fitness increase (Lloyd, Colley, & Tremblay, 2010). By investigating the factors determining student physical activity levels in physical education classes, researchers may improve the health status of all children. Obesity is arguably the greatest health epidemic for America’s youth.

Schools have the ability to both educate students about the dangers of obesity and provide appropriate physical activity in their physical education courses. However, recent education reforms have reduced physical education requirements. The Surgeon General recommends children should engage in an hour of moderate activity most days of the week, yet estimates show that only 3.8% of elementary schools, 7.9% of middle schools, and 2.1% of high schools provide daily physical education (Lee, Burgeson, Fulton, & Spain, 2007). The state of Georgia’s physical education instruction requirements are 60 hours per year for elementary (grades K-5) students, none for middle school (grades 6-8) students, and one semester of instruction for high school (grades 9-
12) students (Metzler, 2002). As the expectations for physical education in Georgia’s schools have shrunk, the students’ waistlines have grown. Nearly 1 in 3 children in Georgia is overweight, the percentage of obese children is 4 times higher than the expected 5%, and the state spends almost $2.1 billion yearly in costs associated with obesity (Talking Points, 2009).

Other obstacles face school attempts to combat student obesity, possibly including the attitudes of physical education teachers themselves. A review performed by Kirk (2006) notes that many of the realities of school life, including large class sizes, no administrative support, and lack of funding, have lowered physical educators’ expectations for health-related physical education. In fact, health benefits and education are more often considered a by-product of game-related curriculum and not a true objective of most activities. Kirk’s (2006) argument has merit. For physical education to be effective in helping students develop strategies to battle obesity and maintain a healthy lifestyle, there must be a greater concentration on physical “education” over physical activity. Students must know the objectives and rationale for the activities performed in physical education settings.

There is also reluctance between health educators and physical educators to integrate their two separate but closely related subjects. This opinion varies between states as health and physical education are combined as one certificate in some and divided into two separate certificates in others. Goodwin (1993) suggests a practical relationship might consist of using the physical education classroom as a laboratory to explore the topics covered in health class. An integrated approach would seem to offer a new method for reversing the upsetting health trends across the country, but to alter
health and physical educators’ deep-rooted opinions and perhaps flawed practices presents the biggest hurdle. Mandates to change might not be as effective as a well-designed, integrated curriculum.

Despite the multitude of shortcuts offered by medical science, the safest and most economical path to healthy body weight is through a healthy lifestyle that includes abundant physical activity and quality food choices. The disciplines of health and physical education must reequip themselves with the educational tools to face this challenge.

**Physical Fitness Testing**

American physical fitness testing and what would become AAHPERD were developed in the 1950s at President Eisenhower’s request, due to his alarm over the poor performance of American youth versus their European counterparts on the Kraus-Weber minimal fitness test. The Kraus-Weber test battery had a significant impact on physical education programs in schools by increasing the emphasis on student exercise to increase student fitness, making that the major focus of physical education. The most recent alarm bell being heard in physical education focuses on the lack of physical activity by children and the increase in overweight and obese children (Graham, Holt, & Parker, 2010).

The test developed in response to Eisenhower’s concern has become known as the Presidential Physical Fitness Test. The original components of the test were skill-related tasks, including tasks such as the long jump and a softball throw. Over the years the parts of the test were changed to emphasize health-related concepts of flexibility, muscular strength, muscular endurance, and cardiovascular endurance. Scoring of the tests was
also changed to the criterion-referenced standards thought to be related to health (Freedson, Cureton, & Heath, 2000).

Currently, the FitnessGram has become the assessment favored and required by states with mandated fitness testing requirements (AAHPERD, 2010). The FitnessGram was developed in 1982 by the Cooper Institute for Aerobics Research in Dallas, TX, and is endorsed by AAHPERD. Two notable ways FitnessGram differs from the Presidential Fitness test are the assessment of body composition and scoring standards that minimize comparisons between children and emphasize personal health (Freedson, Cureton, & Heath, 2000). States including California, Georgia, and Texas have stated their selection of the FitnessGram fitness battery due to its established test validity and its sophisticated data-tracking software (Morrow, Scott, & Jackson, 2010).

Physical fitness testing is a common aspect of physical education classes, but it is not without controversy. Proponents of the practice claim that fitness testing in schools promotes healthy lifestyles and physical activity, motivates young people to maintain or enhance their physical fitness or physical activity levels, facilitates goal-setting, self-monitoring, and self-testing skills, promotes positive attitudes, and enhances cognitive and affective learning. Opponents of fitness testing question the type, validity, and reliability of fitness tests as well as the ethics and value or purpose of testing (Cale & Harris, 2009). Some physical educators fear that focus on fitness will harm other aspects of physical education, particularly motor skill development (Lloyd et al., 2010).

In the current educational climate, documented evidence of student learning in all subject areas has become the standard. Physical fitness tests are becoming the chosen assessment for student performance in physical education. Nineteen states currently
require assessment in physical education, and the states of Alabama, California, Connecticut, Delaware, Missouri, Texas, Virginia, and West Virginia require schools to assess student fitness levels with a physical fitness test. More states, including Georgia, North Carolina, and Oklahoma, plan to add such requirements in the coming school year. The chosen assessment and grade levels of students assessed vary from state to state (AAHPERD, 2010).

California has long been a frontrunner to mandate fitness testing as part of the physical education curriculum. The statewide physical fitness testing program was first authorized in 1976 and reestablished in 1995 as part of the California Assessment of Academic Achievement Act. In February 1996, the California State Board of Education designated FitnessGram as the required physical fitness test that school districts shall administer to California students in grade five, seven, and nine. Because of the length of time the program has been running, California has been a common setting for research into the possible effects of mandated physical fitness testing on the student population.

Ferguson and Keating (2005) conducted survey-based research to study the attitudes of California physical education teachers towards the FitnessGram test. The survey measured attitudes both cognitively and affectively in three sub domains: usefulness of fitness test results, effects of fitness tests, and enjoyment of using fitness test results. Data from the study suggested that teachers did not strongly believe that the test results were useful. Teachers also did not like executing the test.

The fitness scores supported these attitudes at the time. In fact year after year, the California kids scored poorly on the tests with no improvement. This changed in 2007, when Gov. Arnold Schwarzenegger implemented the Governor's Challenge to encourage
children to increase their physical activity level by having them log their activity and introducing the possibility for their fitness to win prizes. In addition to rewards for good fitness, the law mandated consequences for poor fitness. California high school freshmen must pass at least five of the six FitnessGram tests or be required to take additional physical education courses as a result. California already requires two years of high school physical education to graduate (Kutahl, 2008). Through the use of this plan, it seems the state went a step further than testing to give students additional tools and time to improve their fitness.

Domangue and Solmon (2010) also studied the relationship between reward and motivation on physical fitness assessments. The President’s Challenge Fitness Test uses awards as part of its program and was chosen for this study. After completing the test, students were divided into two groups: award winners and non-award winners. Students then completed a motivational questionnaire. Data analysis showed that students who received an award reported higher levels of task involvement, perceived competence, effort, enjoyment, and future intentions regarding fitness than those who did not. The only gender difference noted was higher levels of ego-involvement for males. The study suggests that awards alone will not motivate all students.

Still, these strategies would be classified as extrinsic motivators. How are physical education teachers helping students develop a cognitive understanding of the health-related physical-fitness components before and after test administration to develop intrinsic motivators? In a study of California middle and high school physical educators, Eastham (2009) found that most are not giving specific health-related fitness instruction to explain the relevance for students participating in the assessment. Only half of the
teachers in the study provided students with their test results. These practices would seem to limit both extrinsic and intrinsic student motivation on a fitness assessment—or any type of assessment, for that matter.

State required fitness assessments seem to be a measurement tool, but far from the complete answer to such a complicated problem. At best, they may be a first step towards increasing accountability in the physical education classroom. One of the flaws with fitness tests, and standardized testing in general, as accountability measures is that they are summative and place too much weight on assessment rather than looking at the overall learning process.

A better model to increase accountability in physical education can be found in legislation passed by the state of South Carolina in 2005 (Prusak et al., 2011). Physical education teachers must document, through program-level evaluation, that state and national standards are being met. Each physical education department in every school across the state is evaluated on a three-year cycle. Teachers are accountable for student learning on four performance indicators aligned with the NASPE (2004) national standards. These are that 1) students demonstrate competency in at least two movement forms, 2) students design and develop an appropriate physical fitness program to achieve a desired level of personal fitness, 3) students participate in regular health-enhancing physical activity outside of the physical education class, and 4) students meet the gender- and age-group health-related physical fitness standards published by NASPE (2004) (Prusak et al., 2011).

South Carolina physical education programs must also implement the FitnessGram physical fitness assessment. The assessment is performed for all students
grades K-12, with their FitnessGram scores placed on their report cards. As of the 2008-2009 school year, elementary students must receive a minimum of 90 minutes of physical education each week. They must also participate in 60 minutes of physical activity during school, but outside of the physical education class (SCAHPERD, 2011). To insure this activity is appropriate, the law requires an elementary school physical education teacher to serve as a physical activity director for the school. Also, lower class size limits have been placed on elementary physical education classes. A student-to-physical education teacher ratio of 500:1 or lower is required for each elementary school. Physical education courses should not exceed a ratio of 28:1 (SCAHPERD, 2011).

The state of South Carolina has adopted a coordinated school health model approach to battle obesity and improve student health. In addition to physical educators, health educators, nutrition services, school health services, staff wellness, guidance and social services, parent and community involvement, and a healthy school environment have been made priorities and mandated responsibilities by this legislation. Schools found to be performing poorly will be offered state assistance to improve their programs (SCAHPERD, 2011).

**Summary**

As the obesity rates across our country expand, the desire to understand how to change our current practices and better serve and motivate our students in physical education is increasing as well. Single-gender physical education has been studied with mixed results. This manipulation of the learning environment has been used to measure outcomes in such areas as teacher and student perceptions, student-teacher interactions, participation opportunities, and student physical activity levels. While the research is far
from conclusive, this change in the learning environment seems to have the potential to
greatly change both student experience and performance in the physical education
classroom.

States are taking legislative action to shine light on the problem. The SHAPE Act
appears to be the first step of an attempt to both provide evidence of student learning in
physical education in the state of Georgia and improve student health. Researchers and
quality physical educators know that proper physical education assessment occurs not
only in the psychomotor domain, but in the cognitive and affective domains as well. To
get a more accurate picture of the fitness levels of students, it is important to understand
the variables that may affect their fitness performance and assessment. This research will
help fill this gap in understanding and improve efforts to increase the quality of activity
and learning in physical education classes.
CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this research was to contribute to the understanding of the influence of gender grouping in physical education by measuring the influence of a single-gender physical education setting on the attitudes and physical performances of sixth-grade students. The methods used in this study are discussed in the following topics: participants, setting, instrumentation, procedures, design, and data analysis.

Design

A true-experimental randomized control group, pretest-posttest design was used to determine whether single-gender grouping had a significant effect on sixth-grade student performance during the physical fitness assessment. The research design was chosen because although the students are already organized into classes by the school, this physical education setting with multiple classes allowed students to be randomly assigned into control and experimental groups without affecting the greater school schedule. The inclusion of a pretest in the design enabled the researcher to check on the equivalence of each group on the dependent variable and eliminate selection bias as a threat to the internal validity of the study. The sensitizing effect was a potential threat to internal validity of this experimental design (Ary, Jacobs, Razavieh, & Sorensen, 2006). In this research, the sensitizing effect should not have been an issue, as the participants had been frequently exposed to fitness testing throughout their school years, and this particular test is very similar in its design to those they had taken before.

A true-experimental randomized, posttest-only control group design was used to determine whether single-gender grouping had a significant effect on student attitudes
towards physical education and physical fitness. At the end of the FitnessGram posttest, students completed the Physical Fitness Attitudinal Scale assessment within their experimental groups. This assessment was conducted anonymously with only general demographic data of age, gender, and ethnic background submitted by students. Instructors kept the assessments of each group separate and marked them as single-gender female (SGF), single-gender male (SGM), coed female (COF), and coed male (COM) after the forms had been submitted.

Questions and Hypotheses

Research Questions. 1) How does single-gender grouping affect student performances on the components of FitnessGram physical fitness assessment? 2) How does single-gender grouping affect student attitudes in the physical education environment?

Physical Fitness Null Hypotheses. 1) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Sit and Reach test results. 2) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Curl-Up test results. 3) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Push-Up test results. 4) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram One-Mile Run test results.
Student Attitudes Null Hypotheses. 1) There will be no significant difference in student attitudes for the Confidence for Learning Physical Fitness Scale because of single-gender or coeducational grouping.

2) There will be no significant difference in student attitudes for the Physical Fitness Usefulness Scale because of single-gender or coeducational grouping.

3) There will be no significant difference in student attitudes for the Gender-Appropriateness of Physical Fitness Scale because of single-gender or coeducational grouping.

Participants

The participants in the study consisted of sixth-grade students enrolled in middle-school physical education for the fourth nine-week grading period of 2010-2011. A total of 277 students participated in the FitnessGram assessments for both the baseline pretest and for the posttest after the intervention. Of those, 157 completed all components of the pre- and post-FitnessGram assessments. The students were split into a coeducational control group, a single-gender male experimental group, and a single-gender female experimental group. The researcher randomly assigned the instructors to coeducational or single-gender groups.

Setting

The research was conducted in the physical education department of a sixth-through eighth-grade middle school in a rural section of a Southern suburban school district. The school system contained 12 elementary, 4 middle, and 3 high schools. Table 1 provides a snapshot of the economic composition of the setting.
Table 1 Research Setting Demographics

<table>
<thead>
<tr>
<th>Measure</th>
<th>County</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
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<td>9,687,653</td>
</tr>
<tr>
<td>Persons per sq. Mile</td>
<td>217.9</td>
<td>168.4</td>
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<td>59.7</td>
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<tr>
<td>% African American</td>
<td>10.2</td>
<td>30.5</td>
</tr>
<tr>
<td>% Asian</td>
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<td>3.2</td>
</tr>
<tr>
<td>% Hispanic or Latino</td>
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<td>8.8</td>
</tr>
<tr>
<td>Per Capita Income</td>
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<td>$25,098</td>
</tr>
<tr>
<td>% Persons Below Poverty Level</td>
<td>14.9</td>
<td>16.6</td>
</tr>
</tbody>
</table>

Source: United States Census Bureau, 2010

The school is located adjacent to a local parks and recreation complex. The facilities include a stadium with football field and track, a large gymnasium, and an auxiliary gymnasium. These classes were conducted during the last two periods of the school day. The student body ethnicity had a make-up of 91% white, 5% black, 3% Hispanic, and 1% multiracial. Economically disadvantaged students made up 47% of the student body. Students categorized as having disabilities made up 18%.

Instrumentation
Two instruments were used in the study. The FitnessGram was used to measure physical fitness. The Physical Fitness Attitudinal Scale was used to gauge student attitudes towards physical fitness testing. Quantifying the information enabled the study to measure the effects of gender grouping in the physical education setting.

**FitnessGram.** The FitnessGram physical fitness test was chosen for this experiment because of its selection by the Georgia Department of Education to be used by physical educators to comply with the Georgia SHAPE Act. The FitnessGram was developed in 1982 by the Cooper Institute for Aerobics Research in Dallas, TX, and is endorsed by AAHPERD. The FitnessGram is appropriate for participants as young as kindergarten to young adults up to 30 (FitnessGram: Georgia, 2010). The FitnessGram has been shown to be one of the most frequently used physical fitness assessments by physical education teachers (Keating & Silverman, 2004).

The FitnessGram measures physical fitness in five different areas: aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition. Student scores are measured against objective criterion-based standards called Healthy Fitness Zone (HFZ) standards. A list of the HFZ Standards can be found in Appendix B. The category below the HFZ is referred to as Needs Improvement Zone (NIZ) to indicate dimensions of fitness that may require special attention. These standards are not based on class averages or any other peer comparisons. Instead, they are based on levels of fitness needed for good health and set specifically for males and females of various ages using the best available research (Cooper Institute for Aerobics Research, 1992). Morrow, Martin, & Jackson (2010) found that large-scale, teacher-administered
FitnessGram Assessments appear to yield reliable and valid data. Reliability for each field test is listed in the description of the appropriate test.

**Body Composition.** Various methods are available for estimating body composition, including underwater/hydrostatic weighing, bioelectrical impedance, skin fold measures, and body mass index (BMI). FitnessGram recommends the use of body calipers by instructors to conduct skin fold measurements. This method requires training and familiarity with the test to ensure accurate measurements. BMI has the limitation of the largest percent error in estimating body composition. Despite this drawback, it is the test to be mandated by the state of Georgia. The BMI is also the least physically invasive, requires less equipment, and is less subjective than the other methods (FitnessGram: Georgia, 2010). This combination of factors led to the BMI being selected to measure body composition in this study. Reliability and validity scores for the FitnessGram BMI test are unavailable. BMI is not considered a reliable measure of body composition, because it does not take into account the amounts of body fat and lean body mass (National Institutes of Health, 2007). Unlike other portions of the FitnessGram, BMI is not easily influenced by a single effort. Changes in BMI occur gradually over time. Due to these factors and the relatively short span of this study, BMI results were not analyzed in relation to student grouping.

**Aerobic Capacity.** Each area of fitness measured by the FitnessGram can be assessed by a choice of field tests. Aerobic capacity can be measured through the PACER test, the one-mile run, and the walk test. For this study, the one-mile run was used to measure students’ aerobic capacity. This test was chosen because the school at which the assessment occurred already used the one-mile run in the physical education
programs and because it is very comparable to the PACER test to be mandated by the state of Georgia (FitnessGram: Georgia, 2010). Lack of both student and instructor experience with the PACER test was considered to be a considerable disadvantage to that test’s usefulness. The validity of the original FitnessGram one-mile run test’s ability to measure VO$_{2}$Max has been evaluated and found to be reasonably valid, with 85% of participants classified correctly (Cureton & Warren, 1990). The reliability of the one-mile run test has been measured to be between .91 and .93 with similarly aged participants (Bono, Roby, Micale, Sallis, & Shepard, 1991). Lower reliability results have been documented for distance runs with young children, which may be due to variables in student motivation and ineffective pacing strategies. To truly calculate VO$_{2}$Max, a participant’s BMI and mile-run time must be used as factors. This step could be completed, but was not necessary in this research, as measurement of changes in student performance can be conducted without this calculation. Students performed the one-mile run on the school’s quarter-mile athletic track.

**Flexibility.** Being able to move the joints through a normal range of motion is an essential component of fitness. FitnessGram test options for this measurement include the sit-and-reach, back-saver sit-and-reach, and shoulder stretch. The state of Georgia will mandate the sit-and-reach. The back-saver sit-and-reach assessment is comparable to the traditional sit-and-reach test, except it is performed on one side at a time; it is scored identically to the traditional sit and reach. The advantage of testing one leg at a time is that a determination can be made of any asymmetry in hamstring flexibility, and hyperextension of both knees is avoided. It has been shown to be an accurate measurement of hamstring flexibility (FitnessGram: Georgia, 2010). Independent studies
have measured the reliability of the back-saver sit-and-reach at .93 to .99 (Welk & Meredith, 2008).

Students were given a five-minute warm-up of jogging and stretching prior to the administration of this test. This allows increased blood flow to the legs, reduced risk of injury, and increased joint flexibility. The measuring apparatus consisted of a 1-foot-high box with a measuring stick adhered to the front edge of the box at the 9-inch mark. Students removed their shoes for this test. One leg was fully extended, while the other leg was bent with its instep placed to the side of the straightened leg’s knee. With their backs straight and heads up, the students reached 4 times along the scale and held the final reach for at least 1 second. The students then switched legs and repeated. The student’s score was the highest number of inches reached to the nearest half inch, with a maximum of 12 inches to discourage hypermobility.

**Abdominal Strength and Endurance.** The abdominal muscles are used to measure strength and endurance because of the perceived role in posture, active daily living, and pelvic alignment. The curl up test will be mandated by the state of Georgia to measure muscular endurance. The FitnessGram assessment recommends the curl up over the traditional sit up because it does not involve the assistance of the hip flexor muscles and minimizes compression in the spine, compared to a full sit-up. The curl up test was chosen for this study for the same reasons. A number of studies have tested the reliability of the curl up test, revealing a range of .70-.93 (Morrow, Martin, & Jackson, 2010).

Students were partnered for this test. Students lay on their backs with knees bent at approximately 140 degrees and feet flat on the floor. A piece of paper was placed under their heads to remind students to return their heads to the mat between repetitions.
Arms and hands were laid flat on the mat along the participant’s sides. A measuring strip 4.5 inches wide was placed under the students’ legs at the edge of their fingertips. A CD containing a recorded cadence for the curl up test was played. Upon the direction of the CD, the participants curled up slowly and slid their fingers to the other side of the testing strip. Students continued along with the pace of the CD either until the student completed a maximum of 80 curl ups or until two form corrections were made by the instructor and partners. Form corrections were made when any of the following guidelines were not adhered to: heels must remain in contact with the floor; head must return to the mat on each repetition; pauses and rest periods are not allowed; the movement should be continuous and with the cadence; fingertips must touch the far side of the measuring strip. The student’s score was the number of curl ups correctly performed.

**Upper Body Strength and Endurance.** Physical fitness assessments use many methods to test upper body strength and endurance, such as pull-ups, chin-ups, flexed-arm hang, and push-ups. It should be noted that these tests do not all involve the same muscle groups, nor do they handle the same amount of body weight. Additionally, student experience on each of these movements may affect form, which can affect performance. With the exception of push-ups, these tests require the use of a pull-up bar. The 90-degree push-up test is recommended by FitnessGram and will be mandated by the state of Georgia in its new physical fitness testing program. The participants in the study have experience performing push-ups as part of their physical education classes. Also, the setting lacks pull-up bars. For these reasons, the 90-degree push-up test was chosen.
for this study. Reliability for this test has been measured at .50 to .86 for elementary and high school students (McMannis, Baumgartner, & West, 2000).

The objective is to perform as many 90-degree push-ups as possible at a rhythmic pace. The pace is set by audio CD at a cadence of 1 push up every 3 seconds. While keeping the back and legs straight, the student lowers the body using the arms until the elbows bend at a 90-degree angle. Students continued along with the pace of the CD until two form corrections were made by the instructor and/or partners. Form corrections were made when any of the tester did any of the following: stopping to rest or not maintaining a rhythmic pace; not achieving a 90-degree angle with the elbows on each repetition; not maintaining correct body position with a straight back; not extending arms fully (FitnessGram: Georgia, 2010).

**Physical Fitness Attitudinal Scale.** Student attitudes were measured using a questionnaire adapted from three of the Fennema-Sherman Mathematics Attitude scales (FSMA) (1976). The FSMA Scales are nine domain-specific, Likert-type scales that measure attitudes towards learning mathematics. These scales may be used individually or in any combination. They were designed to look at gender differences in attitudes towards learning mathematics (1976). This study’s adaptation will be done through minor word changes from “mathematics” to “physical fitness” to allow for the change in content area. The FSMA has been used in numerous research studies across different content areas, including science (Levin, 1984), music (Wehr-Flowers, 2006), educational technology (Kahveci, 2010), and physical education (Whitlock, 2006). As in Whitlock’s (2006) study, the scales chosen for this study were as follows: the confidence for learning physical fitness scale, the physical fitness usefulness scale, and the gender-
appropriateness of physical fitness scale. These scales were found to have an original split-half reliability of .87 or higher (Fenema & Sherman, 1976) and have been statistically validated (Melancon & Thompson, 1994). The Confidence for Learning Physical Fitness Scale will measure each student’s confidence in his or her ability to learn about and perform tasks related to physical fitness. The Physical Fitness Usefulness Scale will measure to what extent students feel learning about physical fitness will be useful for them later in life. The Gender- Appropriateness of Physical Fitness Scale will measure student perceptions about physical fitness as a masculine or feminine pursuit. Each scale will use a 10-item questionnaire with a five-point Likert scale (Appendix A). In each scale, five items will be positively worded and five items will be negatively worded.

**Procedures**

IRB approval was obtained from Liberty University’s Institutional Review Board (IRB) prior to beginning the study. Approval from the school system administration was also granted. The Liberty University IRB application requested an expedited review from the IRB Committee to study physical education students in a specific school system using a confidential questionnaire and fitness assessment with no participant compensation.

A waiver of informed consent was requested and approved by the IRB committee. It was determined the research would be impracticable without the waiver. Students might change their level of participation and perceptions if the true nature of the study were known prior to participating. Awareness of the research would contaminate student efforts in the study.
The approved application included the proposed research rationale, which identified the benefits of studying the effects of single-gender grouping in a physical education setting. Specific procedures were detailed in the application, including the approaches to administer the FitnessGram assessment and Physical Fitness Attitudinal Scale. A maximum of 300 participants was proposed in the IRB application.

Confidentiality steps were described via the use of anonymous survey response and coding of physical fitness assessment data. The physical education teachers returned completed surveys and fitness assessment results to the researcher only. An explanation of storing data for at least three years and then destroying research records was included. Parent consent was waived and students were debriefed by their physical education teachers during class at the completion of the post-test survey. Potential risks to participants were discussed and found to be minimal and restricted to non-sensitive topics.

Prior to the study, the researcher held meetings with the physical education teachers at the school where the research was conducted. These meetings provided an orientation that consisted of discussing the research with the teachers, watching the FitnessGram DVD, demonstrating each of the assessments for the teachers, and providing educational resources.

Baseline data on the FitnessGram assessment was collected from the participants prior to the formation of experimental and control groups. A sample of the FitnessGram Score Sheet can be found in Appendix C. Students completed the FitnessGram test to establish physical fitness baselines. The tests took place in four separate areas of the school: the gym, the auxiliary gym, the gym lobby, and the track. Four physical
education instructors conducted the test as part of their regular sixth-grade classes near the end of the school day. Each instructor conducted one of the field tests for all of the participants. These assessments were arranged to maximize student performance. Students rotated from the push-up test, to the sit-and-reach test, to the curl-up test, and then to the BMI test. This allowed students to alternate the more physically demanding tests with the less strenuous ones. The mile-run was conducted on a separate day after the other four tests were completed. Each instructor measured his assigned class in the one-mile run.

This initial data collection process took three class meetings. Once baseline data was collected, the students resumed regular physical education instruction for the following four weeks.

At the end of the four weeks, participants were reassigned to different groups. This time frame was selected to help control for the variables of participant growth and development by conducting the study over a relatively short span. Other considerations included the school calendar and student schedule changes.

Experimental groups were formed by creating a single-gender female group and a single-gender male group. The remaining participants were assigned to a coeducational group, which served as the control group for the experiment. The coeducational group was divided in half so that the physical education teachers could conduct the same FitnessGram field test that they did in the pretest. Student selection into each group was determined randomly. However, the size and makeup of each group was determined by the male-to-female student ratio during that class period. Male students made up a larger percentage of the physical education students, so the single-gender male experimental
group had more participants than the single-gender female group. The coeducational group also had a larger percentage of males than females.

The FitnessGram assessment was then conducted as a posttest in the newly assigned groups. The study required the posttest FitnessGram assessments for each group to take place in four separate areas of the school: the gym, the auxiliary gym, the gym lobby, and the track. This was done at this time to guarantee that the different groups did not come in contact with each other during test administration. Each instructor conducted the same field test as they did in the pretest for all of the participants. Groups rotated locations throughout the assessment to complete each component. The assessments were arranged to maximize student performance. As before, students rotated from the push-up test, to the sit-and-reach test, to the curl-up test, and then to the BMI test. This allowed students to alternate the more physically demanding tests with the less strenuous ones and mirrored the procedure for the pretest. The mile-run was again conducted on a separate day after the other four tests were completed. This time only one group was allowed at the track at a time. Each instructor measured a randomly assigned group in the one-mile run. The other groups remained in the gym participating in low-energy activities.

This second data collection process took three class meetings. These test results were recorded by hand by the instructors and later transcribed into electronic data to be placed into a statistical analysis program.

Within two days of completing the FitnessGram posttest, students were placed back into their experimental groups to complete the Physical Fitness Attitudinal Scale. The scale was completed anonymously. Instructors kept the assessments of each group
separate and marked them as single-gender female (SGF), single-gender male (SGM), coed female (COF), and coed male (COM) after the forms were submitted. This scale was given as a posttest only. Student responses were later transcribed into electronic data to be placed into a statistical analysis program.

**Data Analysis**

**ANCOVA.** An Analysis of Covariance (ANCOVA) was used to determine the effect of gender-grouped classes on physical fitness test performance. Prior to ANCOVA, a Test of Homogeneity of Slopes was conducted. This is an assumption of ANCOVA. The null hypothesis for this test is that the population slopes are homogenous. In the case of heterogeneous slopes, a Test of Simple Group Main Effects was conducted.

The statistical significance of the difference in average between the pretest and posttest scores on the FitnessGram could be determined through a $t$-test or F-test, but this would be a measure of gain scores, which can cause statistical problems. ANCOVA is a more powerful statistical test and will yield more explicable data than a comparison of gain scores would. ANCOVA was been selected because of its ability to control for extraneous variables (Ary, Jacobs, Razavieh, & Sorensen, 2006). The fitness levels of the students prior to the intervention are a variable in need of control because they are certainly related to the dependent variable of physical fitness test performance. Scores from the FitnessGram and pretest were used as a baseline for the participants. At the end of the experiment, ANCOVA was used to statistically adjust the mean physical fitness posttest scores for any initial differences between the control and experimental groups on the pretest. This allowed the $F$ values created to be checked for statistical significance.
MANOVA. A One-way Multivariate Analysis of Variance (MANOVA) was conducted to test the hypotheses related to Physical Fitness Attitudes and determine the effect of gender grouping on the Physical Fitness Attitude Scale dependent variables: Confidence for Learning Physical Fitness Scale, Physical Fitness Usefulness Scale, and Gender-Appropriateness of Physical Fitness Scale (Green & Salkind, 2010). Likert-scale scores on negatively worded items were reversed to transform to a positive item for the statistical analysis to guarantee that the participants’ opinions were accurately reflected. Box’s Test of Equality of Covariance Matrices was used to test the null hypothesis that the observed variances and covariance of the dependent variables are equal across groups. ANOVA tests on the dependent variables were conducted as follow ups to the MANOVA to control for Type I errors.

MANOVA is a procedure used for comparing multivariate (population) means of several groups. Unlike ANOVA, it uses the variance-covariance between variables in testing the statistical significance of the mean differences. It is used when there are two or more dependent variables. In this case, the three different attitude scales are the dependent variables. MANOVA helps to answer the following questions: 1) do changes in the independent variable (gender grouping) have significant effects on the dependent variables? 2) what are the interactions among the dependent variables? and 3) what are the interactions among the independent variables (Stevens, 2002)?
CHAPTER FOUR: RESEARCH FINDINGS

As stated in the introductory chapter, the purpose of this study was to examine the differences in the physical fitness assessment performance and perceptions of sixth-grade physical education students placed in single-gender and coeducational testing groups. The researcher used the FitnessGram battery of physical fitness tests to evaluate the physical fitness levels of the participants while in their regular coeducational physical education classes over three class periods. After a period of four weeks, students were randomly grouped into single-gender and coeducational experimental groups and retested on the FitnessGram battery of physical fitness tests over three class periods. After completing the FitnessGram for the second time, the participants completed the Physical Fitness Attitudinal Scale to measure their attitudes regarding their confidence for learning physical fitness, the usefulness of physical fitness, and the gender-appropriateness of physical fitness. All data were analyzed using the SPSS v19.0 statistical software (Green & Salkind, 2010).

FitnessGram

**Interpretation of FitnessGram.** Student scores on most of the components of the FitnessGram assessment are placed into two categories: Healthy Fitness Zone (HFZ) or Needs Improvement (NI). The exceptions to this rule are the BMI and Aerobic Capacity tests. The BMI categorizes scores as either Very Lean, HFZ, Needs Improvement-Some Risk (NI-SR), or Needs Improvement-High Risk (NI-HR). The Aerobic Capacity test utilizes the same categories as BMI with the exception of Very Lean. The one-mile run test was substituted for Aerobic Capacity in this study. The one-mile run uses the HFZ and NI category designations.
Sit-and-Reach. Null Hypothesis: There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Sit and Reach test results.

Baseline data was collected for the sit-and-reach assessment at the pretest when all students were in their heterogeneously grouped classes. At that time, 53% of all of the females performed in the HFZ and 47% performed in the NI category. The males measured slightly lower, with 50% for both the HFZ and NI categories.

This pre-intervention data was also sorted into the experimental groupings later used in the study for comparison purposes. It should be understood that the students had not yet been placed into experimental or control groups at the time this data was collected. They are labeled in these groups to demonstrate the initial fitness levels of the later randomized groupings. The percentages of participants in each group that passed the pre-intervention sit-and-reach test at the HFZ are as follows: co-ed males 66%, co-ed females 52%, single-gender males 42%, and single-gender females 53%.

After four weeks in single-gender experimental groups and co-ed control groups, the students repeated the sit-and-reach test. At this time, 64% of the females performed in the HFZ and 36% in the NI category. The males measured slightly higher with 67% in the HFZ and 33% in the NI category for both the HFZ and NI categories. When divided into experimental and control groups, the percentages of participants in each group that passed the post-intervention sit-and-reach test at the HFZ are as follows: co-ed males 78%, co-ed females 67%, single-gender males 61%, and single-gender females 62%.

An ANCOVA-type design was conducted. The independent variable was identified as the experimental groups, including four categories: co-ed males, co-ed
females, single-gender males, and single-gender females. The dependent variable was the participants’ scores on the post-test sit-and-reach. The covariate for the analysis was the participants’ scores on the pre-test sit-and-reach. A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated the relationship between the covariate and dependent variable did not differ significantly as a function of the independent variable, \( F(3, 210) = 1.76, \text{MSE} = 2.146, p = .157 \), and partial \( \eta^2 = .025 \), so homogeneity of slopes could be assumed.

An ANCOVA was then run to check for statistically significant differences between the experimental groups. The ANCOVA showed that there was no significant difference between the groups on the post-test sit-and-reach, \( F(3, 210) = 0.66, \text{MSE} = 2.17, p = 0.576, p > .05 \). The adjusted means for the groups were very similar: single-gender female group (\( M = 9.65 \)), the single-gender males (\( M = 9.35 \)), co-ed males group (\( M = 9.62 \)), and co-ed females group (\( M = 9.70 \)). Fisher’s Least Significant Difference (LSD) pairwise comparisons revealed that there were no significant differences between the adjusted means of the groups.

**Curl-Ups. Null Hypothesis:** There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Curl-Ups test results.

Baseline data was collected for the curl-ups assessment at the pre-test when all students were in their heterogeneously grouped classes. At that time, 89.7% of all of the females performed in the HFZ and 10.3% performed in the NI category. The males measured slightly higher with 92% in the HFZ and 8% NI categories.
This pre-intervention data was also sorted into the experimental groupings used in the study for later comparison purposes. Again, the students had not yet been placed into experimental or control groups at the time this data was collected. They are labeled in these groups here to demonstrate the initial fitness levels of the later randomized groupings. The percentages of participants in each group that passed the pre-intervention curl-up test at the HFZ are as follows: co-ed males 95.7%, co-ed females 84.3%, single-gender males 87.9%, and single-gender females 92.3%.

After students were placed into single-gender experimental groups and co-ed control groups, they participated in the curl-up test again. At that time, 91.3% of all of the females performed in the HFZ and 8.7% in the NI category. The males measured slightly higher with 97.7% in the HFZ and 2.3% in the NI category. When divided into experimental and control groups, the percentages of participants in each group that passed the post-intervention curl-up test at the HFZ are as follows: co-ed males 90.9%, co-ed females 89.2%, single-gender males 95.6%, and single-gender females 92.1%.

An ANCOVA-type design was conducted (Green & Salkind, 2010). The independent variable was identified as the experimental groups, including four categories: co-ed males, co-ed females, single-gender males, and single-gender females. The dependent variable was the participants’ scores on the post curl-up test. The covariate for the analysis was the participants’ original scores on the curl-up test. A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated the relationship between the covariate and dependent variable differed significantly as a function of the independent variable, $F(3, 204) = 3.64, MSE = 331.16, p = .015$, and partial $\eta^2 = .05$, so homogeneity of slopes could not be assumed.
Based on these result of the partial $\eta^2$, simple main effect tests were conducted instead of ANCOVA to allow for heterogeneity of slopes. Simple main effects were conducted to assess differences among groups at particular levels of the covariate. These levels were at low (one standard deviation below the mean), medium (mean), and high (one standard deviation above the mean). A $p$ value of .017 (.05/3) was required for the significance for each of these tests. If any one simple main effect was significant, pairwise comparisons were evaluated at the same level (.017) as the simple main effects test, following the LSD procedure.

Univariate tests showed a statistically significant difference among the means of the group, $F(3, 208) = 3.64$, $MSD = 331.2$, $p = 0.014$, $p < .017$. As a result, pairwise results amongst the groups were examined. There were no significant differences amongst participant groups in the medium or high value on the covariate. However, LSD comparisons revealed there was a significant difference between the performances of participants in the co-ed male ($M = 29.64$) and single-gender male ($M = 42.08$) groups with a low value on the covariate at the .017 level, $p = .014$.

Table 2

*Test of Simple Main Effects Pairwise Comparison for Curl Ups*

<table>
<thead>
<tr>
<th>Group</th>
<th>Group</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig. *</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AllBoys</td>
<td>AllGirls</td>
<td>6.355</td>
<td>4.435</td>
<td>.153</td>
<td>-4.318</td>
<td>17.027</td>
</tr>
<tr>
<td>CoEdB</td>
<td></td>
<td>12.434*</td>
<td>5.002</td>
<td>.014</td>
<td>.396</td>
<td>24.471</td>
</tr>
<tr>
<td>CoEdG</td>
<td></td>
<td>7.410</td>
<td>5.658</td>
<td>.192</td>
<td>-6.205</td>
<td>21.026</td>
</tr>
</tbody>
</table>

*Based on estimated marginal means
*. The mean difference is significant at the .017 level.
**Push-Ups. Null Hypothesis:** There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Push-Ups test results.

Baseline data was collected for the push-up assessment at the pre-test when all students were in their heterogeneously grouped classes. Both groups performed similarly with 86% of both males and females performing in the HFZ and 14% of both males and females performing in the NI category.

For comparison purposes, this pre-intervention data was also sorted into the experimental groupings later used in the study. Students had not yet been placed into experimental or control groups at the time this data was collected. They are labeled in these groups here to demonstrate the initial fitness levels of the later randomized groupings. The percentages of participants in each group that passed the pre-intervention push-up test at the HFZ are as follows: co-ed males 91.6%, co-ed females 87.8%, single-gender males 83.5%, and single-gender females 85.4%.

After students were placed into single-gender experimental groups and co-ed control groups, they participated in the push-up test again. At that time, 94% of all of the females performed in the HFZ and 6% in the NI category. The males measured slightly higher with 95.6% in the HFZ and 4.4% in the NI category. When divided into experimental and control groups, the percentages of participants in each group that passed the post-intervention push-up test at the HFZ are as follows: co-ed males 97.7%, co-ed females 93.3%, single-gender males 92.2%, and single-gender females 96.7%.

Data were analyzed with an ANCOVA to test the research hypotheses (Green & Salkind, 2010). The independent variable was identified as the experimental groups,
including four categories: co-ed males, co-ed females, single-gender males, and single-gender females. The dependent variable was the participants’ scores on the push-up post-test. The covariate for the analysis was the participants’ scores on the push-up pre-test.

A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariate and dependent variable did not differ significantly as a function of the independent variable, $F(3, 204) = 0.81$, $MSE = 112.29$, $p = .490$, and partial $\eta^2 = .012$, so homogeneity of slopes could be assumed.

An ANCOVA was then run to check for statistically significant differences between the experimental groups. Table 3 includes the results of the ANCOVA, which showed and that there were significant differences between the groups on the push-up post-test, $F(3, 207) = 13.25$, $MSE = 111.97$, and $p < .05$.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrePU</td>
<td>10223.679</td>
<td>1</td>
<td>10223.679</td>
<td>91.304</td>
<td>.000</td>
<td>.306</td>
</tr>
<tr>
<td>Group</td>
<td>4450.285</td>
<td>3</td>
<td>1483.428</td>
<td>13.248</td>
<td>.000</td>
<td>.161</td>
</tr>
<tr>
<td>Error</td>
<td>23178.629</td>
<td>207</td>
<td>111.974</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < .05$

The single-gender female group had the largest adjusted mean ($M = 30.93$), and the co-ed females had the next largest adjusted mean ($M = 21.44$), followed by the co-ed males group ($M = 20.74$) and single-gender males group ($M = 20.1$). It should be noted that differences in adjusted means are not the same as differences among the dependent measure.
In Table 4, pairwise comparisons were conducted using Fisher’s least significant difference (LSD) as a post-hoc test to the ANCOVA. Based on the LSD, pairwise group differences were significant, \( p = .00 \) and \( p < .05 \), on push-ups between the single-gender girls group and all other groups: coed girls, single-gender boys, and coed boys. Differences among other groups were non-significant.

### Table 4

**LSD Comparison for Push-Ups**

<table>
<thead>
<tr>
<th>(I) Group</th>
<th>(J) Group</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval for Difference</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>AllBoys</td>
<td>AllGirls</td>
<td>-10.784*</td>
<td>1.836</td>
<td>.000</td>
<td>-14.403 - 7.165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdB</td>
<td>AllBoys</td>
<td>-.588</td>
<td>1.988</td>
<td>.768</td>
<td>-4.508 - 3.331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdG</td>
<td>AllBoys</td>
<td>-1.290</td>
<td>2.260</td>
<td>.569</td>
<td>-5.746 - 3.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AllGirls</td>
<td>AllBoys</td>
<td>10.784*</td>
<td>1.836</td>
<td>.000</td>
<td>7.165 - 14.403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdB</td>
<td>AllGirls</td>
<td>10.196*</td>
<td>2.149</td>
<td>.000</td>
<td>5.958 - 14.433</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdB</td>
<td>AllGirls</td>
<td>.588</td>
<td>1.988</td>
<td>.768</td>
<td>4.508 - 3.331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdG</td>
<td>AllGirls</td>
<td>-10.196*</td>
<td>2.149</td>
<td>.000</td>
<td>-14.433 - -5.958</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdB</td>
<td>CoEdB</td>
<td>.701</td>
<td>2.524</td>
<td>.781</td>
<td>5.678 - 4.276</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoEdG</td>
<td>CoEdB</td>
<td>-7.01</td>
<td>2.524</td>
<td>.781</td>
<td>-4.774 - 5.678</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

**Mile-Run. Null Hypothesis:** There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Mile-Run test results.

Baseline data was collected for the mile-run assessment at the pre-test when all students were in their heterogeneously grouped classes. At that time, 36.7% of all of the
females performed in the HFZ and 63.3% performed in the NI category. The males measured higher with 41.8% in the HFZ and 58.2% in the NI categories.

This pre-intervention data was also sorted into the experimental groupings later used in the study for comparison purposes. Students had not yet been placed into experimental or control groups at the time this data was collected. They are labeled in these groups here to demonstrate the initial fitness levels of the later randomized groupings. The percentages of participants in each group that passed the pre-intervention mile-run test at the HFZ are as follows: co-ed males 52.6%, co-ed females 41.6%, single-gender males 36.7%, and single-gender females 44.5%.

After students were placed into single-gender experimental groups and co-ed control groups, they participated in the mile run again. At this time, 44.3% of all of the females performed in the HFZ and 55.7% in the NI category. The males measured slightly higher with 56.4% in the HFZ and 43.6% in the NI category. When divided into experimental and control groups, the percentages of participants in each group that passed the post-intervention mile run at the HFZ are as follows: co-ed males 57.9%, co-ed females 33.3%, single-gender males 55.7%, and single-gender females 49.1%.

Data were analyzed in an ANCOVA-type design to test the research hypotheses (Green & Salkind, 2010). The independent variable was identified as the experimental groups, including four categories: co-ed males, co-ed females, single-gender males, and single-gender females. The dependent variable was the participants’ scores on the mile-run post-test. The covariate for the analysis was the participants’ scores on the mile-run pre-test.
A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated the relationship between the covariate and dependent variable did not differ significantly as a function of the independent variable, $F(3, 194) = 0.996, MSE = 18401.15$, $p = .396$, and partial $\eta^2 = .015$, so homogeneity of slopes could be assumed.

An ANCOVA was then run to check for statistically significant differences between the experimental groups. The ANCOVA showed that there was a significant difference between the group means on the mile-run post-test, $F(3, 199) = 4.0, MSE = 19076$, and $p < .05$.

Table 5

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreMiSec</td>
<td>4980722.638</td>
<td>1</td>
<td>4980722.638</td>
<td>261.089</td>
<td>.000</td>
<td>.567</td>
</tr>
<tr>
<td>Group</td>
<td>226210.820</td>
<td>3</td>
<td>75403.607</td>
<td>3.953</td>
<td>.009</td>
<td>.056</td>
</tr>
<tr>
<td>Error</td>
<td>3796274.040</td>
<td>199</td>
<td>19076.754</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < .05$

In Table 6, pairwise comparisons were conducted using Fisher’s least significant difference (LSD) as a post-hoc test to the ANCOVA. Pair-wise comparisons revealed that the mean for the co-ed females group differed significantly from the single-gender females, single-gender males, and coed males. This suggested that the co-ed female group performed significantly more poorly on the posttest than any other group.
Table 6  
**LSD Comparison for One-Mile Run**

<table>
<thead>
<tr>
<th>Group</th>
<th>(J) Group</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig. ( ^a )</th>
<th>95% Confidence Interval for Difference ( ^a )</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoEdG</td>
<td>AllBoys</td>
<td>99.924*</td>
<td>30.750</td>
<td>.001</td>
<td>Lower Bound: 39.286  Upper Bound: 160.562</td>
</tr>
<tr>
<td></td>
<td>AllGirls</td>
<td>100.881*</td>
<td>32.417</td>
<td>.002</td>
<td>Lower Bound: 36.957  Upper Bound: 164.806</td>
</tr>
<tr>
<td>CoEdB</td>
<td></td>
<td>82.883( ^)</td>
<td>34.614</td>
<td>.018</td>
<td>Lower Bound: 14.625  Upper Bound: 151.141</td>
</tr>
</tbody>
</table>

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

*. The mean difference is significant at the .05 level.

**Student Attitudes.**

Research Question 2: How does single-gender grouping affect student attitudes in the physical education environment?

Null Hypothesis 1: There will be no significant difference in student attitudes for the Confidence for Learning Physical Fitness Scale because of single-gender or coeducational grouping.

Null Hypothesis 2: There will be no significant difference in student attitudes for the Physical Fitness Usefulness Scale because of single-gender or coeducational grouping.

Null Hypothesis 3: There will be no significant difference in student attitudes for the Gender-Appropriateness of Physical Fitness Scale because of single-gender or coeducational grouping.
A one-way multivariate analysis of variance (MANOVA) was conducted to determine the effect of gender grouping on the dependent variables of three attitude scales: Confidence for Learning Physical Fitness Scale, Physical Fitness Usefulness Scale, and Gender-Appropriateness of Physical Fitness Scale (Green & Salkind, 2010). Likert-scale scores on negatively worded items were reversed to transform to a positive item for the statistical analysis to guarantee the participants’ opinions were accurately reflected.

Box’s Test of Equality of Covariance Matrices was used to test the null hypothesis that the observed variances and covariance of the dependent variables are equal across groups. The data showed the covariance matrices were heterogeneous, Box’s M = 26.347, $F = 1.42$, $P = .110$.

Multivariate tests showed significant differences between the groups at the .05 level. Table 7 provides the full results of this test.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pillai's Trace</td>
<td>.074</td>
<td>1.900</td>
<td>9.000</td>
<td>678.000</td>
<td>.049</td>
<td>.025</td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td>.927</td>
<td>1.914</td>
<td>9.000</td>
<td>545.308</td>
<td>.048</td>
<td>.025</td>
</tr>
<tr>
<td>Hotelling's Trace</td>
<td>.078</td>
<td>1.922</td>
<td>9.000</td>
<td>668.000</td>
<td>.046</td>
<td>.025</td>
</tr>
</tbody>
</table>

a. Exact statistic
b. The statistic is an upper bound on $F$ that yields a lower bound on the significance level.
Analyses of variances (ANOVA) on the dependent variables were conducted as follow-up tests to the MANOVA. The Bonferroni procedure was used to adjust the confidence level by dividing .05 by the number of dependent variables, \( .05 / 3 = .017 \). The univariate ANOVA for the Gender Appropriateness Scale was significant, \( p < 0.17 \). Table 8 provides the full details of this test.

Table 8

*Analysis of Variance Summary: Physical Fitness Attitudinal Scale*

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Confid</td>
<td>27.628</td>
<td>3</td>
<td>9.209</td>
<td>.119</td>
<td>.949</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Useful</td>
<td>120.143</td>
<td>3</td>
<td>40.048</td>
<td>.698</td>
<td>.554</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>327.163</td>
<td>3</td>
<td>109.054</td>
<td>3.475</td>
<td>.016</td>
<td>.044</td>
</tr>
</tbody>
</table>

- a. R Squared = .002 (Adjusted R Squared = -.012)
- b. R Squared = .009 (Adjusted R Squared = -.004)
- c. R Squared = .044 (Adjusted R Squared = .031)

In Table 9, pairwise comparisons were conducted using Fisher’s least significant difference (LSD) as a post-hoc test to the ANOVA. Pair-wise comparisons revealed that the mean for the single gender female group differed significantly from the single-gender male group. This suggested that the single female group more strongly believed that the physical fitness was appropriate for both genders than the single gender male group believed.
Table 9
*LSD Comparison Summary: Physical Fitness Attitudinal Scale*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(I) Group</th>
<th>(J) Group</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>LSD B</td>
<td>CB</td>
<td>-0.02</td>
<td>1.053</td>
<td>.988</td>
<td>-2.55</td>
<td>2.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CG</td>
<td>-2.56</td>
<td>1.217</td>
<td>.036</td>
<td>-5.49</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G</td>
<td>-2.34*</td>
<td>.889</td>
<td>.009</td>
<td>-4.48</td>
<td>-.21</td>
</tr>
<tr>
<td>CB</td>
<td>B</td>
<td>CB</td>
<td>.02</td>
<td>1.053</td>
<td>.988</td>
<td>-2.51</td>
<td>2.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CG</td>
<td>-2.55</td>
<td>1.367</td>
<td>.064</td>
<td>-5.83</td>
<td>.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G</td>
<td>-2.33</td>
<td>1.085</td>
<td>.033</td>
<td>-4.94</td>
<td>.28</td>
</tr>
<tr>
<td>CG</td>
<td>B</td>
<td>CB</td>
<td>2.56</td>
<td>1.217</td>
<td>.036</td>
<td>-3.36</td>
<td>5.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CB</td>
<td>2.55</td>
<td>1.367</td>
<td>.064</td>
<td>-7.4</td>
<td>5.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G</td>
<td>.22</td>
<td>1.245</td>
<td>.860</td>
<td>-2.77</td>
<td>3.21</td>
</tr>
<tr>
<td>G</td>
<td>B</td>
<td>CB</td>
<td>2.34*</td>
<td>.889</td>
<td>.009</td>
<td>-3.32</td>
<td>4.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CG</td>
<td>-2.22</td>
<td>1.245</td>
<td>.860</td>
<td>-3.21</td>
<td>2.77</td>
</tr>
</tbody>
</table>

Based on observed means.
The error term is Mean Square(Error) = 31.380.

*. The mean difference is significant at the .017 level.

Cronbach's alpha reliability coefficient was also computed to check reliability and see how the test functioned in a physical education subject. Coefficients for the test were .88 for Confidence, .81 for Usefulness, .60 for Gender Appropriateness, and .90 for all statements combined.
CHAPTER FIVE: DISCUSSION

The previous chapter presented data analyses utilizing ANCOVA, Multivariate MANOVA, Tests of Simple Group Main Effects, ANOVA, and Fisher’s LSD to examine relationships between gender grouping and student fitness testing performance and student attitudes toward physical fitness. This chapter is organized into a summary of the findings and a discussion of the findings in light of the literature in Chapter Two. Next, study limitations and implications from the project are discussed and, finally, recommendations for future research are made.

Review of the Findings

The data revealed statistically significant differences between single-gender grouping and physical fitness test performance on some but not all parts of the FitnessGram physical fitness assessment. Gender grouping affected student performance for the curl-up (muscular endurance), push-up (muscular strength), and one-mile run (cardiorespiratory endurance) portions of the test. This result disproved the null hypotheses for three research questions: 2) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Curl-Up test results; 3) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram Push-Up test results; and 4) There will be no significant difference in student performance because of single-gender or coeducational grouping as shown by FitnessGram One Mile Run test results. The particular group affected and the direction of the effect varied for each test. This data supports a promising relationship between gender grouping and physical fitness assessment performance.
The data revealed statistically significant differences between single-gender grouping and student attitudes on part of the Physical Fitness Attitude Scale. The data showed a statistically significant difference after MANOVA between single-gender grouping and student attitudes toward physical fitness at the .05 confidence level. Student attitudes towards the gender-appropriateness of physical fitness were shown to be statistically different due to group assignment. This rejected the null hypothesis for student attitude research question two, which stated, “There will be no significant difference in student attitudes because of single-gender or coeducational grouping.” Pair-wise comparisons revealed that the mean for the single gender female group differed significantly from the single-gender male group. This suggested that the single female group more strongly believed that the physical fitness was appropriate for both genders than the single gender male group believed. While the two other student attitude null hypotheses were not rejected, this analysis does suggest a possible relationship between student gender grouping and student attitudes.

**Discussion of the Findings and Implications of Relevant Literature**

The findings of this research support Bandura’s Social Cognitive Theory that parts of an individual’s knowledge acquisition and human behavior are the result of both psychological and environmental factors (Parajes, 2009). Participant performance data from the FitnessGram suggest that changes in the fitness testing environment had an effect on the behavior of the students. Note that the theory suggests only “parts” of knowledge acquisition and human behaviors are determined in this way. Similarly, not all factors related to a student’s performance on an assessment are determined by the environment. Prior knowledge, or in this case fitness, may be a limitation for
performance on the high end of the scale. Students are limited by their natural abilities. But a quality, comfortable, encouraging environment free from extraneous stressors and irregularities can motivate student performance and raise the low end of the performance scale. Quality preparation is probably the best indicator of quality performance, but the environment is a large factor that should be accounted for no matter the type of assessment.

Other researchers have addressed the importance of the physical education environment. Smith and St. Pierre (2009) noted that a positive classroom environment affects positive student perceptions, which may increase student participation and learning. Constantinou, Manson, and Silverman (2009) conducted in-depth student interviews and found females' participation in and attitude toward PE is influenced by multiple factors, including whether the PHYSICAL EDUCATION environment is safe for them, emotionally and physically.

Gender grouping in the study had the most significant effects on the parts of the FitnessGram that could be most easily influenced by a change in participant effort. The level to which a student performs sit-ups, push-ups, or a mile run is greatly influenced by the effort put forth. The data supports the idea that the type of group not only changed the class environment, but also changed the extrinsic and intrinsic motivating factors for the group members. Pangrazi, Alderman, and Beighle (2006) agree that a change that makes the physical education environment more appealing can increase students’ confidence in their own abilities.

On the other side, flexibility tests take little effort. They are unlikely to be changed by a participant’s frame of mind on one particular day, but must be improved
over time. Whether the student is motivated or not on the day of the assessment would seem to have little bearing on their performances for these portions of the FitnessGram.

The physical activity and fitness level for middle school-aged females is a prevalent concern in the research (Gabbei, 2004; Hannon & Ratliffe, 2007). The data collected here suggests that gender grouping may be a plausible solution for improving these levels. There was a statistically significant difference in the push-up test performance for the single-gender females group over the co-ed females group. Not only that, but the adjusted mean improvement in performance by the all-females group outperformed both male groups, as well. The single-gender female group also did statistically significantly better than the co-ed females group, with an adjusted mean score over 80 seconds faster. There was not a single test in which a coeducational group significantly outperformed a single gender group.

There is of course concern for the health and fitness levels of all students. Those with low fitness levels are of the greatest concern (Dumith, et al., 2010; Lloyd, Colley, & Tremblay, 2010). A pleasant surprise was found deep in the data regarding these students. There was a statistically significant difference among the groups who had scored low on the curl-up pretest (covariate). The participants in the single-gender male group at this level scored an adjusted mean average of 12 more curl-ups than males in the co-ed group at this level.

The Physical Fitness Attitudinal Scale data delivered evidence to suggest that student attitudes regarding fitness might be influenced by environment. Ultimately a statistically significant difference was found between groups on the dependent variable of gender appropriateness of physical fitness. There were no noticeable differences in the
mean and standard deviations for each group regarding the usefulness and confidence attitude scales.

It could be argued that gender differences in attitudes towards the gender appropriateness of physical fitness are to be expected of middle-school aged participants. If that is the case, then perhaps the more interesting data is that there was no significant difference between the co-ed male and co-ed female groups. This would seem to encourage the rationale of supporters of coeducational grouping in physical education. They argue that one of the benefits of co-ed grouping is improved empathy and understanding of different genders (Koca, 2009). Student attitudes are formed over a lifetime, so it is likely that such a relatively short intervention would do little to change established student opinions.

**Study Limitations**

The study was not intended to replicate other research studies or continue the work of researchers using the FitnessGram assessment, but to add to the body of physical education knowledge and its relevance to schools and student health.

1. The study is limited to sixth-grade males and females enrolled in physical education, and thus generalizations to younger and older grade levels cannot be made.
2. The study was conducted in a single school, as opposed to multiple, randomly selected schools.
3. The research was conducted over a relatively short period of time.
4. A reliability score for part of the Physical Fitness Attitudinal Scale was lower than recommended.
Implications.

This research calls into question the effectiveness of a coeducational physical education setting in terms of student motivation and performance for health-related fitness activities. Like all other facets of the education system, physical education should be ever evolving and changing to meet the needs of our changing student population. Title IX changed the expectations and opportunities for all students for the better, but that was 40 years ago. As we continue to strive to offer instruction and opportunity of equal quality for both genders, we must continue to adjust our methods in light of what research has revealed. Ensuring an environment that maximizes student health and performance for all students is essential to the mission of our educational system.

Expectations will continue to escalate in our schools across the curriculum. Physical educators across the country now find themselves preparing students for state-mandated assessments, just as their colleagues in other disciplines have been doing. Many will be discouraged by this prospect, but physical educators should take heart and see the opportunity before them to improve student health and physical education instruction. Granted, teaching to a test is not what educators strive for, but accountability in physical education is needed just as it is in any other academic subject.

Ultimately, how schools present and use the data collected from the assessment will determine the impact of the Georgia SHAPE Act. Sending scores home on a report card will most likely have some initial benefit. At the very least, it sends the message to parents that public schools are in fact concerned about student health. The entire fitness
assessment should be an educational experience for students, teachers, and parents. In addition to computer scoring, scores should also be recorded with teacher/child activity sheets to provide interactive participation and visual representation of scores on each test item for the children. It may also be a good idea for students to write a journal on their feelings regarding the test results. The students can then develop their personal fitness goals for the year. A second assessment could be done later in the year to chart changes in fitness and attainment of goals.

Ideally, the mandated assessment will provide oversight and motivation for physical educators to develop and implement standards-based curriculum. As we reach to meet these new opportunities, we must consider all the factors that impact students in a physical education learning environment. Gender grouping is but one of a multitude of interventions that could improve student perceptions, performance, and learning in physical education. It is the responsibility of educators to continue to identify and test quality teaching methods and strategies. Physical educators must act in leadership roles within their school setting so that their contributions can be fully understood.

**Recommendations for Future Research.**

To understand possible relationships between gender grouping and student performance and attitudes related to physical fitness, the study attempted to determine significant relationships between the variables. While ample research exists on gender grouping and physical fitness testing separately, there is little to no research addressing both topics together. Further research would add to education’s body of knowledge. Based on this project’s results, the following recommendations for further research are presented:
1. Conduct a larger study across several school systems to look for trends and increase the sample size of the project.

2. Conduct the study for a broader range of grade levels to include elementary and high schools.

3. Develop or identify an appropriate and more reliable measurement tool for student physical fitness attitudes.

4. Conduct a more longitudinal study that measures the effects of gender grouping on physical fitness over time.

5. Conduct a more longitudinal study that measures the effects of gender grouping on student attitudes over time.

6. Conduct a similar study in different states and regions.

**Summary**

Educators must find ways to motivate and encourage student learning of any subject. The learning environment itself plays a large role in this effort. The classroom must be both physically and emotionally safe for students to be comfortable enough to focus on their studies. A basic feeling of safety must be met before a student can move to an increased level of challenge.

This research showed that students in single gender groups more often had an increased level of physical performance over students who remained in coeducational groups. I believe this is because the change in class environment gave them a more positive perception of their personal safety and allowed them to take the risk of giving their best effort. Without the opposite gender in view, the social ramifications of a failed attempt were much lower.
Improving student fitness is part of a public health epidemic and thus a complex problem. It cannot be fixed with one solution. Proper curricula and increased time devoted to physical activity are just part of the solution. Teaching and learning is about relationships between students and teachers, as well as between just the students. Our genders are part of who we are and have influence over how we act. By understanding these relationships we can find the key to motivation and increased knowledge. This study seems to suggest that by manipulating the gender make-up of a class, we change the safety and motivation levels of the students and it can positively effect student performance.
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**APPENDIX A**

Self-confidence for Learning Physical Activity, Usefulness of Physical Activity, and Gender-appropriateness of Physical Activity.

**Section 1:** Demographics (Circle One)

A. What is your age? 11 12 13  
B. What is your gender? Female Male  
C. Ethnic Background? White Black Hispanic Asian Other

**Section 2:**

Please circle the number that matches how you feel right now about each question.

(CODE: C = Confidence, U = Usefulness, G = Gender-Appropriateness)

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<tbody>
<tr>
<td><strong>C 1.</strong> Generally, I feel confident about attempting fitness activities in physical education.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Not Sure</td>
<td>Agree</td>
<td>Strongly Agree</td>
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<td><strong>U 2.</strong> It’s good to know about physical fitness so that I can practice it in my free time.</td>
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<td><strong>G 3.</strong> I would have more faith in letting a male demonstrate physical fitness than a female.</td>
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<td><strong>C 4.</strong> I’m no good at physical fitness.</td>
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<td><strong>U 5.</strong> Physical fitness is not important for me to use in my free time.</td>
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<td><strong>G 6.</strong> Learning physical fitness in P.E. is just as appropriate for females as it is for males.</td>
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<td><strong>C 7.</strong> I have a lot of self-confidence when it comes to physical fitness.</td>
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<td><strong>U 8.</strong> I will probably practice physical fitness as I grow up.</td>
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<td><strong>G 9.</strong> Females are certainly coordinated enough to do well in physical fitness activities.</td>
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<td><strong>C 10.</strong> I don’t think I could do harder physical fitness tasks.</td>
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</table>
U 11. I see physical fitness as an activity I will rarely participate during my free time as I get older.

G 12. When a female engages in fitness activities, it is feminine to let the male win.

C 13. I am sure that I can learn skills for physical fitness.

U 14. I learn physical fitness now because I know how useful it will be later in life.

G 15. I would trust a female just as much as I would trust a male to perform a physical fitness test.

C 16. I’m not the type of person to do well at physical fitness tests.

U 17. Learning physical fitness is a waste of time.

G 18. It’s hard to believe that a female could be great at physical fitness tests.

C 19. I think I could handle more difficult tasks in physical fitness tests.

U 20. Knowing physical fitness will help me enjoy my free time.

G 21. Physical fitness is for males, not females.

C 22. For some reason, even though I try, physical fitness tests seem really hard for me.

U 23. When thinking about my adult life, it is not important for me to learn about physical fitness.
G 24. Females can do just as well as males in physical fitness tests.

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C 25. I can do well in physical fitness tests.

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U 26. Physical fitness is a worthwhile subject area to learn.

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G 27. I would expect females who succeed at fitness tests to be a masculine type of person.

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C 28. Some activities I can handle O.K., but I usually mess up on physical fitness tests.

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U 29. I expect to make little use of physical fitness when I get out of school.

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G 30. Males are not actually better than females in physical fitness.

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**Section 2: Self – Perception Items**

(4 = Strongly agree, 3 = Agree, 2 = Disagree, 1 = Strongly disagree)

____ 1. I like physical education.

____ 2. I try hard in physical education.

____ 3. I follow rules and behave well in physical education.

____ 4. I have good sport skills in physical education.
### APPENDIX B

**FITNESSGRAM® Healthy Fitness Zones**

The FITNESSGRAM® uses Healthy Fitness Zones (HFZs) to evaluate fitness performance. These zones represent minimum levels of fitness that offer protection against the diseases that result from sedentary living.

#### Females

<table>
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<tr>
<th>Age</th>
<th>Aerobic Capacity</th>
<th>Body Composition</th>
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<tr>
<td></td>
<td>One-Mile Run $VO_{2\text{max}}$ (mL/kg/min)$^a$</td>
<td>20m PACER $VO_{2\text{max}}$ (mL/kg/min)$^a$</td>
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<td>17+</td>
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#### Abdominal Strength and Endurance

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<thead>
<tr>
<th>Age</th>
<th>Curl-Up $^b$</th>
<th>Trunk Lift $^r$</th>
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<td>5</td>
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#### Trunk Extensor Strength and Flexibility

<table>
<thead>
<tr>
<th>Age</th>
<th>30° Push-Up $^r$</th>
<th>Modified Pull-Up $^r$</th>
<th>Flexed-Arm Hang $^r$</th>
<th>Back-Saver Sit &amp; Reach $^r$</th>
<th>Shoulder Stretch</th>
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$^a$ $VO_{2\text{max}}$ reflects the maximum rate that oxygen can be taken up and utilized by the body during exercise. It is estimated by utilizing the student’s height, weight, and other specific information, which is based on the test option (i.e., One-Mile Run, 20m PACER, or Walk Test) administered. The calculation procedures are found in the Reference Guide on the California Department of Education (CDE) Physical Fitness Test (PFT) Overview Web page at http://www.cde.ca.gov/tp/ps/pft/psintro.asp

$^b$ The California Department of Education (CDE) considers a student who exceeds the HFZ as meeting the HFZ. For Body Composition, exceeding the HFZ means obtaining a score less than a number on the lower end or right side of the HFZ.

$^r$ Student must reach the distance on both the right and left sides to achieve the HFZ.
**FITNESSGRAM® Healthy Fitness Zones**

The FITNESSGRAM® uses Healthy Fitness Zones (HFZs) to evaluate fitness performance. These zones represent minimum levels of fitness that offer protection against the diseases that result from sedentary living.

### Males

#### Aerobic Capacity

<table>
<thead>
<tr>
<th>Age</th>
<th>One-Mile Run VO₂ max (mL/kg/min)</th>
<th>20m PACER VO₂ max (mL/kg/min)</th>
<th>Walk Test VO₂ max (mL/kg/min)</th>
<th>Skinfold Measurements/Bioelectric Impedance Analyzer Percent Body Fat</th>
<th>Body Mass Index</th>
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<tbody>
<tr>
<td>5</td>
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#### Body Composition

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<tr>
<th>Age</th>
<th>Abdominal Strength and Endurance</th>
<th>Trunk Extensor Strength and Flexibility</th>
<th>Upper Body Strength and Endurance</th>
<th>Flexibility</th>
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> To achieve the HFZ, the score must be greater than or equal to the indicated value.

(1) VO₂ max reflects the maximum rate that oxygen can be taken up and utilized by the body during exercise. It is estimated by utilizing the student's height, weight, and other specific information, which is based on the test option (i.e., One-Mile Run, 20m PACER, or Walk Test) administered. The calculation procedures are found in the Reference Guide on the California Department of Education CDE Physical Fitness Test (PFT) Overview Web page at http://www.cde.ca.gov/ta/tg/pft/overview.asp.

(2) The California Department of Education (CDE) considers a student who exceeds the HFZ as meeting the HFZ. For Body Composition, exceeding the HFZ means obtaining a score less than a number on the lower end or right side of the HFZ.

(3) Student must reach the distance on both the right and left sides to achieve the HFZ.
APPENDIX C

FITNESSGRAM TESTING SCORE SHEET

SCHOOL ____________________________  TEACHER ____________________________
GRADE _____________  TEST DATE _____________

AEROBIC CAPACITY TEST USED  ___________Pacer  ___________One-Mile Run/Walk  ___________Mile Walk
MUSCULAR STRENGTH AND ENDURANCE – UPPER BODY TEST USED
   ___________Push-Up  ___________Modified Pull-Up  ___________Flexed Arm Hang
FLEXIBILITY TEST USED  ___________Sit and Reach  ___________Shoulder Stretch

<table>
<thead>
<tr>
<th>STUDENT ID</th>
<th>SEX</th>
<th>AGE</th>
<th>Aerobic Capacity</th>
<th>Body Composition</th>
<th>Muscular Strength &amp; Endurance</th>
<th>Flexibility</th>
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APPENDIX D

APPLICATION TO USE HUMAN RESEARCH SUBJECTS
Liberty University
Committee On The Use of Human Research Subjects

1. Project Title: The Effects of Single-Gender Classes on Student Physical Fitness Test Performance

2. Full Review □ Expedited Review X

3. Funding Source (State N/A if not applicable): N/A

4. Principal Investigator:
Zachary Wilson, doctoral candidate 706-936-3333, zwilson2@liberty.edu, 9 Turner Chapel Rd Rome, GA 30161

Faculty Sponsor (if student is PI), also list co-investigators below Faculty Sponsor, and key personnel:

Dr. Rick Bragg School of Education, (404) 934-8727, rbragg2@liberty.edu

5. Non-key personnel:
Dr. Judy Sandlin School of Education, (434) 582-2000, jsandlin@liberty.edu
Dr. Catherine King Georgia Highlands College, Dept. of Phys. Ed., 678.872.8092, cking@highlands.edu

6. Consultants:
Dr. Scott Watson School of Education, 434-582-2127, swatson@liberty.edu

7. The principal investigator agrees to carry out the proposed project as stated in the application and to promptly report to the Human Subjects Committee any proposed changes and/or unanticipated problems involving risks to subjects or others participating in approved project in accordance with the Liberty Way and the Confidentiality Statement. The principal investigator has access to copies of 45 CFR 46 and the Belmont Report. The principal investigator agrees to inform the Human Subjects Committee and complete all necessary reports should the principal investigator terminate University association. Additionally s/he agrees to maintain records and keep informed consent documents for three years after completion of the project even if the principal investigator terminates association with the University.

Zac Wilson 4/8/11

Principal Investigator Signature Date

Dr. Rick Bragg 4/8/11

Faculty Sponsor (If applicable) Date

Submit the original request to: Liberty University Institutional Review Board, CN Suite 1582, 1971 University Blvd., Lynchburg, VA 24502. Submit also via email to irb@liberty.edu
APPLICATION TO USE HUMAN RESEARCH SUBJECTS

10. This project will be conducted at the following location(s): (please indicate city & state)
   ☐ Liberty University Campus
   ☒ Other (Specify): Bartow County Schools, Cartersville, GA

11. This project will involve the following subject types: (check-mark types to be studied)
   ☐ Normal Volunteers (Age 18-65) ☐ Subjects Incapable Of Giving Consent
   ☐ In Patients ☐ Prisoners Or Institutionalized Individuals
   ☐ Out Patients ☒ Minors (Under Age 18)
   ☐ Patient Controls ☐ Over Age 65
   ☐ Fetuses ☐ University Students (PSYC Dept. subject pool ___)
   ☐ Cognitively Disabled ☐ Other Potentially Elevated Risk Populations ___
   ☐ Physically Disabled
   ☐ Pregnant Women

12. Do you intend to use LU students, staff or faculty as participants in your study? If you do not intend
    to use LU participants in your study, please check “no” and proceed directly to item 13.
    ☐ YES ☐ NO ☒ X

    If so, please list the department and classes you hope to enlist and the
    number of participants you would like to enroll.

    __________________________________________________________

    In order to process your request to use LU subjects, we must ensure that you have contacted the
    appropriate department and gained permission to collect data from them.

    Signature of Department Chair:

    __________________________________________________________

    Department Chair Signature(s) Date

13. Estimated number of subjects to be enrolled in this protocol: ______300____

14. Does this project call for: (check-mark all that apply to this study)

   ☐ Use of Voice, Video, Digital, or Image Recordings?
   ☐ Subject Compensation? Patients $_____ Volunteers $_____ 
   ☐ Participant Payment Disclosure Form
   ☐ More Than Minimal Risk?
   ☐ More Than Minimal Psychological Stress?
   ☐ Confidential Material (questionnaires, photos, etc.)?
   ☐ Extra Costs To The Subjects (tests, hospitalization, etc.)?
   ☐ The Exclusion of Pregnant Women?
   ☐ The Use of Blood? Total Amount of Blood _____
   ☐ Over Time Period (days) _____
   ☐ The Use of rDNA or Biohazardous materials?
   ☐ The Use of Human Tissue or Cell Lines?
   ☐ The Use of Other Fluids that Could Mask the Presence of Blood (Including Urine and Feces)?
   ☐ The Use of Protected Health Information (Obtained from Healthcare Practitioners or Institutions)?
15. This project involves the use of an **Investigational New Drug (IND)** or an **Approved Drug For An Unapproved Use**.

- [ ] YES  
- [X] NO  

Drag name, IND number and company:  

16. This project involves the use of an **Investigational Medical Device** or an **Approved Medical Device For An Unapproved Use**.

- [ ] YES  
- [X] NO  

Device name, IDE number and company:  

17. The project involves the use of **Radiation or Radioisotopes**:

- [ ] YES  
- [X] NO  

18. Does investigator or key personnel have a potential conflict of interest in this study?

- [ ] YES  
- [X] NO  

**EXPEDITED/FULL REVIEW APPLICATION NARRATIVE**

**A. PROPOSED RESEARCH RATIONALE** (Why are you doing this study? [Excluding degree requirement])

The purpose of this research is to contribute to the understanding of the influence of gender grouping in physical education by measuring the influence of a single-gender physical education setting on the perceptions and physical performances of sixth-grade students. This understanding will help educators identify methods to improve student effort and performance in physical education for both genders. This study will make a significant contribution to the current research on single-gender physical education by assessing its impact on student performance regarding physical fitness testing. This research will benefit physical educators by providing them insight into variables that can affect student performance and overall student health and fitness.

**B. SPECIFIC PROCEDURES TO BE FOLLOWED**

- In a step-by-step manner, using simple, nonscientific language, provide a description of the procedures of the study and data collection process. Also, describe what your subjects will be required to do. (Note: Sections C and D deal with type of subjects and their recruitment. That information does not need to be included here.)

The purpose of this experiment is to see how gender grouping affects student performance specifically on physical fitness assessment. Student performances during other facets of physical education instruction are not being considered. Four physical education instructors will teach sixth-grade classes near the end of the school day. The one-mile run will be measured by all instructors. Each instructor will conduct one of the remaining field tests for all of the participants. Baseline data on the FitnessGram assessment will be collected from the participants prior to the formation of experimental and control groups. A sample of the FitnessGram Score Sheet can be found in Appendix C. Students will complete the FitnessGram test to establish physical fitness baselines. This initial data collection process will take approximately two to three class meetings. Once baseline data has been collected, students will resume regular physical education instruction for the next four weeks.
At the end of the four weeks, participants will be reassigned to different groups. A single-gender female group and a single-gender male group will be the experimental groups. The remaining participants will be assigned to a coeducational group, which will serve as the control group for the experiment. The coeducational group will be divided in half so that the physical education teachers may conduct the same FitnessGram field test as they did in the pretest.

The study will require the posttest FitnessGram assessments for each group to take place in three separate areas of the school: the gym, the auxiliary gym, and the track. Groups will rotate locations throughout the assessment to complete each component. These test results will be recorded by hand by the instructors and later transcribed into electronic data to be placed into a statistical analysis program.

Students will anonymously complete the Physical Fitness Attitudinal Scale as a posttest in their experimental groups. These survey responses will be transcribed into electronic data to be placed into a statistical analysis program.

C. SUBJECTS
Who do you want to include in your study? Please describe in nonscientific language:

! The inclusion criteria for the subject populations including gender, age ranges, ethnic background, health status and any other applicable information. Provide a rationale for targeting those populations.

! The exclusion criteria for subjects.

! Explain the rationale for the involvement of any special populations (Examples: children, specific focus on ethnic populations, mentally retarded, lower socio-economic status, prisoners)

! Provide the maximum number of subjects you seek approval to enroll from all of the subject populations you intend to use and justify the sample size. You will not be approved to enroll a number greater than this. If at a later time it becomes apparent you need to increase your sample size, you will need to submit a Revision Request.

! For NIH, federal, or state funded protocols only: If you do not include women, minorities and children in your subject pool, you must include a justification for their exclusion. The justification must meet the exclusionary criteria established by the NIH.

The participants in the study will consist of sixth-grade students enrolled in middle-school physical education for the 4th 9 weeks grading period of 2010-2011. Subjects will only be excluded from the research if documented physical or mental disabilities do not allow them to fully participate. There will be approximately 300 students total, with the students split into a coeducational control group, a single-gender male experimental group, and a single-gender female experimental group.

D. RECRUITMENT OF SUBJECTS AND OBTAINING INFORMED CONSENT

! Describe your recruitment process in a straightforward, step-by-step manner. The IRB needs to know all the steps you will take to recruit subjects in order to ensure subjects are properly informed and are participating in a voluntary manner. An incomplete description will cause a delay in the approval of your protocol application.

Subjects will participate in the study as part of their regular physical education curriculum. A request to waive informed consent is being made as part of this application. By informing students of the study’s nature, Students might change the results of the experiment through a change in their level of participation and perceptions of the activities.

E. PROCEDURES FOR PAYMENT OF SUBJECTS

! Describe any compensation that subjects will receive. Please note that Liberty University Business Office policies might affect how you can compensate subjects. Please contact your
department’s business office to ensure your compensation procedures are allowable by these policies.

*Subjects will not be paid for their participation.*

**F. CONFIDENTIALITY**

- Describe what steps you will take to maintain the confidentiality of subjects.
- Describe how research records, data, specimens, etc. will be stored and for how long.
- Describe if the research records, data, specimens, etc. will be destroyed at a certain time.

Additionally, address if they may be used for future research purposes.

*Surveys will be answered anonymously with only general demographic data of age, gender, and ethnic background given by the participants. Student physical fitness test data will also be coded by the physical education instructors with the same general demographic data of age, gender, and ethnic background. A notation of which control or experimental group the participant belongs will also be made.*

**G. POTENTIAL RISKS TO SUBJECTS**

- There are always risks associated with research. If the research is minimal risk, which is no greater than every day activities, then please describe this fact.
- Describe the risks to participants and steps that will be taken to minimize those risks. Risks can be physical, psychological, economic, social, legal, etc.
- Where appropriate, describe alternative procedures or treatments that might be advantageous to the participants.
- Describe provisions for ensuring necessary medical or professional intervention in the event of adverse effects to participants or additional resources for participants.

*Students will be subject to the same physical, psychological, and social risks normally associated with the middle school physical education class in which they are enrolled. Any medical issues will be handled by the school nurse.*

**H. BENEFITS TO BE GAINED BY THE INDIVIDUAL AND/OR SOCIETY**

- Describe the possible direct benefits to the subjects. If there are no direct benefits, please state this fact.
- Describe the possible benefits to society. In other words, how will doing this project be a positive contribution and for whom?

*Participants may gain an increased understanding of how single-gender groups behave differently for coeducational groups. This research will benefit physical educators by providing them insight into variables that can affect student performance and overall student health and fitness. Increases in student health can translate to improved quality of life for the students and increased happiness and productivity for society.*

**I. INVESTIGATOR’S EVALUATION OF THE RISK-BENEFIT RATIO**

Here you explain why you believe the study is still worth doing even with any identified risks.

*This study involves no risk to the subjects that is greater than their normal participation in their physical education course. The findings of this research are likely to prove beneficial to students, teachers, and researchers as they seek to improve student physical fitness and teaching methods. There is a current gap in research regarding the effect of single-gender groups on physical fitness assessment performance.*
J. WRITTEN INFORMED CONSENT FORM  *(Please attach to the Application Narrative. See Informed Consent IRB materials for assistance in developing an appropriate form. See K below if considering waiving signed consent or informed consent)*

K. WAIVER OF INFORMED CONSENT OR SIGNED CONSENT

Waiver of consent is sometimes used in research involving a deception element. Waiver of signed consent is sometimes used in anonymous surveys or research involving secondary data. See Waiver of Informed Consent information on the IRB website. If requesting either a waiver of consent or a waiver of signed consent, please address the following:

1. For a Waiver of Signed Consent, address the following:
   a. Does the research pose greater than minimal risk to subjects (greater than everyday activities)?  *No, survey completion is the only part of the research that is abnormal for the class.*
   
   b. Does a breech of confidentiality constitute the principal risk to subjects?  *Yes, only by requiring informed consent forms could subjects be linked to the research.*
   
   c. Would the signed consent form be the only record linking the subject and the research?  *Yes.*
   
   d. Does the research include any activities that would require signed consent in a non-research context?  *No, the activities are part of normal physical education lesson plans.*
   
   e. Will you provide the subjects with a written statement about the research (an information sheet that contains all the elements of the consent form but without the signature lines)?  *Yes, after completing the research.*

2. For a Waiver of Consent Request, address the following:
   a. Does the research pose greater than minimal risk to subjects (greater than everyday activities)?  *No, the activities in the research are common physical education requirements.*
   
   b. Will the waiver adversely affect subjects’ rights and welfare? Please justify?  *No, students will have the same opportunity to abstain from participation as in any other activity.*
   
   c. Why would the research be impracticable without the waiver?  *Students might change their level of participation and perceptions if the true nature of the study were known prior to participating. Awareness of the research would contaminate student efforts in the study.*
   
   d. How will subject debriefing occur (i.e., how will pertinent information about the real purposes of the study be reported to subjects, if appropriate, at a later date?)  *Participants will be debriefed by their physical education teachers during class at the completion of the post-test survey.*