THE EFFECTS OF PHYSICAL ACTIVITY CHOICE ON PHYSICAL FITNESS OF
NORTHERN MISSISSIPPI MIDDLE SCHOOL STUDENTS

by

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Liberty University

A Dissertation Proposal Presented in Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

Liberty University
October, 2011
The Effects Of Physical Activity Choice On Physical Fitness Of Northern Mississippi Middle School Students

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Liberty University, Lynchburg, VA
October, 2011

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ABSTRACT

Jerry Wayne Floate II. THE EFFECTS OF PHYSICAL ACTIVITY CHOICE ON PHYSICAL FITNESS OF NORTHERN MISSISSIPPI STUDENTS. (Under the direction of Dr. Grania Holman, Course Professor) School of Education, Liberty University, October, 2011.

The purpose of this study was to investigate the possible effects of physical activity scheduling of middle school students on their overall physical fitness. This quantitative causal comparative design was utilized to determine if significant differences existed in the FITNESSGRAM® subtests performances of 529 middle school students based on their enrollment in show choir, marching band, athletics, or physical education? Archival data was pulled from the school’s physical education department. The results concluded that significant differences existed among the four physical activity classes on the seven FITNESSGRAM® subtests (1-mile run, push-ups, curl-ups, BMI, Trunk Lift, Left-Side Sit and reach, and Right-Side Sit and reach).

Keywords: Physical Fitness, Marching Band, Physical Education, and Show Choir
DEDICATION

I would like to dedicate this to my Lord and Savior Jesus Christ for the price he paid for my salvation. I would also like to thank my sweet wife Tonya for her support and patience over these past few years.
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CHAPTER ONE: INTRODUCTION

In order for students to reach their full potential in life, schools must realize that education is more than teaching the three Rs. They must address the needs of the whole child; among these critical needs are health and fitness. Students who attain adequate health and physical fitness are more prepared physically, socially, emotionally, and behaviorally for the challenges of the present and the future. In recent years, there has been increased interest in the rising obesity rates among school-age children and adolescents in Mississippi. In 2006, all middle schools in Mississippi were required to offer at least 150 minutes of physical education per week (Mississippi Department of Education, 2006b). The new mandate allowed schools to offer options in which certain electives such as marching band and show choir would count towards the 150 minutes, providing that the electives were among those sanctioned by the Mississippi High School Activities Association. There have been concerns, however, whether these electives provide an adequate amount of moderate vigorous physical activity (MVPA) to effectively contribute to the overall physical fitness of students.

In recent years, research has shown that Mississippi’s child and adolescent populations are among the unhealthiest in the United States (MSDOE-OHS, 2009). Research has shown that adequate physical fitness is a key fundamental in the overall lifestyle of students; in fact, positive associations between fitness has been discovered in the areas of achievement (Coe, 2006), cognition (Hillman, 2005), and attention (Hillman, 2009), among others. There is a need for research that investigates the possible...
effectiveness of these electives in order to provide the best possible physical fitness instruction and to inspire positive school reform in the areas of health, fitness, and academic instruction. With the recent adoption of the Common Core Curriculum, now is a great time to provide such data.

Mississippi has the highest rates in America of child and adult obesity (National Initiative for Children’s Healthcare, 2007). Educational leaders need to know the effectiveness of the physical activity choices they offer. The Mississippi Department of Education requires at least 150 minutes of physical activity per week of middle school students, with show choir, marching band, and physical education all counting as physical activity electives. This quantitative causal comparative study gathered data from the physical fitness test scores of 529 seventh- and eighth-grade students enrolled in one of four physical activity choices: show choir, marching band, athletics, or physical education. Information from this study will be valuable to educational leaders at the state and local levels in making scheduling and curricular decisions.

With the full adoption of the Common Core Curriculum (CCC) in 2014, now is a great time for Mississippi educational leaders to incorporate best practices through comprehensive school reform efforts that incorporate more physical activity into the curriculum. Research has shown that physical activity can stimulate brain development (Jensen, 2008) and increase learning outcomes (Mahar, Murphy, Rowe, Golden, Shields, & Raedeke, 2006). In contrast to the beliefs held by many school leaders, students’ academic success depends on more than teaching the three Rs. Schools have to address the needs of the whole child—socially, physically, emotionally, and behaviorally—to help students reach their full potential (Blank & Berg, 2006).
Many schools’ out-dated curriculum does not address the needs of America’s high-tech, highly skill-oriented work force (Wagner, 2008). Non-academic influences such as sports, music, community involvement, and the arts are also instrumental in a student’s overall well-being. Providing all students—advantaged and disadvantaged—with opportunities that meet the social, emotional, and physical needs is an essential aspect of a 21st-century education (The Trevor Romain Company, 2007). Given that social, emotional, behavioral, and physical well-being are all related to achievement, it behooves schools to find ways to address all these needs (Blank & Berg, 2006).

Academic achievement is but one element of student growth and development. School leaders at the state and national levels must create a curriculum that incorporates research-based best practices which includes increased amounts of physical activity and addresses the individual needs of every child. When students have all of their basic needs met, they are more likely to be more engaged in their classes, follow school rules, develop adequate social skills, make positive contributions to the school and community, and achieve at their highest level (California Department of Education, 2005). Therefore, school leaders must develop a better understanding of the possible effects of physical activity electives such as show choir and marching band and their contributions to students’ levels of physical fitness. A great example has been proposed by the Association for School Curriculum and Development (ASCD), a new concept of learning that involves both the school and community working in unison to provide a curriculum that promotes the development of children to be safe, healthy, engaged, challenged, and supported. The goal is to create an essential curriculum that will prepare students for the 21st century (McCloskey, 2007).
Background

With the current trend of local and state education agencies shifting their focus toward federally mandated high-stakes testing, many school districts are making the decision to cut many elective courses from their curricula. These cuts are partially attributed to the enactment of NCLB. NCLB requires all schools to meet adequate yearly progress (AYP). AYP measures the progress of schools and school districts toward meeting their state’s academic achievement goals. Since NCLB, a number of school districts that were previously considered “successful” based on their state’s guidelines were labeled unsuccessful and charged with finding ways to show yearly academic growth. Many school districts were forced to add such academic enhancement courses as remedial math and reading to their curriculum. This led to cuts in electives such as health and physical education to keep budgets balanced. Even school officials who understand and value the benefits of physical fitness have been forced to make trade-offs. Studies such at this one can contribute to a deeper understanding of what is at stake with these cuts, and perhaps lead to positive changes in the overall curriculum that addresses the comprehensive needs of all children.

Although Mississippi does require middle schools to offer physical education, schools are allowed to offer certain electives in lieu of the traditional physical education classes. Even though these classes have to be sanctioned by the Mississippi High School Activities Association (MHSAA), their contributions to students’ physical fitness remains, in many cases, unproven. Electives such as show choir and marching band can be taught by teachers who may know music but may have little or no physical activity training. This makes it possible for schools to utilize the faculty and staff already
available, thus requiring little change in regards to scheduling, finances, or professional
development. Generally speaking, there is no specific mention in the curriculum for these
classes of physical activity or fitness.

The current slow economy has negatively affected Mississippi schools. Much of
the funding for schools in Mississippi comes from sales tax collections. According to the
Mississippi Parents’ Campaign (MS-TPC, 2009), low sales-tax collections recently
forced Governor Haley Barbour to slash funding to all school districts in Mississippi. For
example, based on information from Paul Chrestman (personal communication, July 10,
2010), an administrator in Desoto County, Mississippi, his district enacted a “reduction in
force” policy that allowed their district to lay off employees for reasons of insufficient
funding. Many teachers and teacher assistants were laid off, some administrators
returned to the classroom, and every employee in the district took a 4–8% reduction in
salary. Almost every school district in Mississippi has been negatively affected by budget
cuts (MS-TPC, 2009). These cuts could negatively affect students’ overall health and
wellness. Fewer teachers mean higher student-to-teacher ratios. Since the enactment of
NCLB, more emphasis has been placed on core academic subjects, while courses that
promote health and fitness have suffered the largest cuts (MS-TPC, 2009). School
officials and politicians need to be made aware of the overall benefits that come from
providing students adequate amounts of physical activity. For example, a national study
in 2006 analyzed over 12,000 adolescents. Participants who reported either participating
in school-based physical activities, such as sports or PE, or playing sports outside of
school were up to 20% more likely than their nonparticipating peers to earn an A in
English or math (Nelson & Gordon-Larson, 2006).
Although there is some recent research that investigates the effectiveness of physical education on overall fitness, there is no known research that investigates the effectiveness of show choir or marching band on overall fitness. There is no recent research that investigates all four courses (show choir, marching band, PE, and athletics) involving student populations at any level. Information from the proposed research will help educational leaders better understand the ability these courses have to provide adequate fitness instruction. The results could be used in making more informed curricula and funding decisions for schools leaders in Mississippi and possibly other states. Information from this study could spark further research and eventually lead to a paradigm shift in the way schools educate students, changing the narrow academic-only definition of success in education to meet the needs of the whole child, so that all children can reach their full potential.

**Childhood Obesity**

Childhood obesity is both a global and national problem. Globally, childhood obesity has reached epidemic proportions; there are over 42 million obese children under the age of five worldwide (World Health Organization, 2010a). Obesity rates among youth and adults are also on the rise throughout the United States. Childhood obesity has tripled in the United States over the past three decades, and about 70% of obese children have at least one risk factor for heart disease (Ogden, et al., 2010; National Center for Health Statistics, 2004). According to the Centers for Disease Control and Prevention (CDC, 2010b), the people of Mississippi have the highest obesity rates in America. Over 40 percent of Mississippi’s children are either obese or overweight (National Initiative for
Children’s Healthcare, 2007). The time to act is now, before the problem reaches future generations. School leaders must have a holistic approach to education.

Many obese children suffer from low self-esteem, poor academic performance, and a higher number of absences in school; they also have a greater number of incidents of behavioral issues in school (Judge & Jahns, 2007). Additionally, obese children have an increased chance of developing type II diabetes and high blood pressure. Lastly, obese children have a greater chance of becoming obese adults (United States Department of Health and Human Services–Surgeon General (USDHHS-SG), 2007b).

To battle the rising occurrence of child and adolescent obesity, schools must provide adequate supports, especially in states like Mississippi. However, due to pressures from the NCLB to achieve AYP, many school districts are eliminating physical activity electives from the curriculum in favor of academically based electives. Traditionally, Mississippi schools rank near the bottom in almost every educational category. In recent years, the slow economy has slashed the state’s sales tax collections, the major source of funding for Mississippi public schools. This lack of funding and focus on AYP has forced many school districts to eliminate electives that do not generate funding or promote AYP such as physical education and athletics (Estabrooks, Lee, & Gyrucsik, 2003).

School reform is necessary; leaders must initiate a paradigm shift and be cavalier in their efforts to seek funding. One potential source of school funding is the Race to the Top Fund, a competitive grant program offered by the United States Department of Education (USDOE). The program provides significant funding to states that lead the way in ambitious, effective, and comprehensive education reform (USDOE, 2010).
Students in Mississippi are faced with many adversities: poor health and fitness as well as obesity are among these. Bringing the big picture into focus is critical to creating a school curriculum that meets the needs of every child regardless of race, socioeconomic status, ability, or other characteristics.

As children get older, their vigorous physical activity declines sharply. Examining the ramifications of this global problem, an international study of 32 countries found that children’s moderate to vigorous physical activity (MVPA) decreased as they became older, especially during the teenage years. The drop in MVPA was especially high among females (Borraccino et al., 2009). American children appear to decrease their MVPA sooner than other countries. The National Institute of Health reported that American children’s activity begins to decrease by age 9 (National Institute of Health, 2008). The United States Department of Health recommends that children have at least 60 minutes of MVPA per day. According to a recent study, the average American child fully drops below this recommendation before reaching age 14 (NIH, 2008). Schools need physical activity programs that address the drop in vigorous physical activity and the corresponding rise in obesity. These programs will improve students’ health, which in turn will positively affect academics and overall lifestyle. Obesity does not just affect a child’s physical quality of life; it can also affect a child’s academic life.

Recent research both globally and nationally suggests an association between physical activity and improved classroom behavior (Dwyer, Blizzard, & Dean, 1996; Shephard, 1997; Miller, Melnick, Barnes, Farrell, & Sabo, 2005). Other studies have noted a positive association with improved self-esteem (Nelson & Gordon-Larsen, 2006; Kirkcaldy, Shephard, & Siefen, 2002) and body image (Hausenblas & Symons-Downs,
2001) among students who participate in school physical activities. Some studies have reported positive associations between school physical activity electives and improved cognitive function in students (Brisswalter, Collardeau, & Rene, 2002; Sibley & Etnier, 2003; Tomporowski, 2003).

One important study in 2007 compared physical fitness scores of 259 third- and fourth-grade students to overall achievement in math and reading. The results revealed a positive association with fitness and overall achievement (Castelli, Hillman, Buck, & Erwin, 2007). Students who are physically fit are better equipped to tackle the challenges of daily life. Studies such as these are encouraging; however, there is a need for more research that investigates the levels of MVPA and fitness outcomes of students in physical activity electives.

School officials must be made to realize the importance of physical fitness and the positive associations with academics, particularly in middle school populations. One particular study in 2004 and 2005 conducted by the California Department of Education analyzed fitness scores of students in grades 5, 7, and 9. They found that there was a strong correlation between fitness and achievement in math and language (California Department of Education, 2005). An enhanced curriculum that incorporates more physical activity across the disciplines could have positive holistic benefits for all students.

**Theoretical Concept: Social Cognitive Theory**

Social Cognitive Theory (SCT) is based around the premise that students learn from watching others—that seeing others do well motivates students to perform well. Students are influenced by both personal and environmental variables. Alfred Bandura,
the first social cognitive theorist, proposed that environment, behavior, and cognitive abilities are all factors that influence a person’s development (Bandura, 1986).

SCT also includes a triadic reciprocal determination—namely, that people’s personal and environmental variables influence their behavior. The triadic reciprocal determination includes three basic factors: behavioral factors, personal factors (cognitive, affective, and biological), and external factors (environment, culture, and surroundings) (Bandura, 1986). These factors are evident in student behaviors. Efforts to improve students’ well-being should be aimed at improving social, emotional, and cognitive processes. Such efforts will increase and improve social conditions at home and/or school (Motl, 2007).

Children are motivated to exercise based on their own personal and environmental variables (Grim & Pazmino-Cevallos, 2008). A well run physical activity course with strong social supports from physical education teachers, students, and parents can help students to acquire healthy-living habits. A recent study of inner city African-American children ages 10 to 14 found that social cognitive factors such as social support from friends, enjoyment of activities, and time outside were major factors in predicting children’s physical activity (Martin & McCaughtry, 2008). Physical activity instruction is more than just exercise; it teaches students to make proper health, nutritional, and social decisions. Students who participate in a well organized physical activity course can improve their physical fitness and overall health, which can have positive associations with academics (Coe, 2006; Castelli, 2007), cognition, and depression (Suitor & Kraak, 2007).
Problem Statement

In recent years, the United States has seen a significant increase in child obesity. Many state departments of education have adopted a required physical education curriculum for grades K–8. Mississippi is one of these states. The Mississippi Department of Education requires all students in grades 6 through 8 to receive at least 150 minutes of physical education per week and at least 45 minutes of health education per week. Middle school students enrolled in marching band, show choir, or physical education are within compliance as long as the students also receive the required amount of health instruction (MSDOE, 2006a). However, the music curriculum that both show choir and marching band utilizes places little to no emphasis on physical activity or fitness objectives. Whether participation in marching band or show choir significantly contributes enough MVPA to improve student health and/or fitness levels is unknown. School officials need research that validates each course’s ability to provide adequate amounts of physical activity in order for students to receive the best physical fitness outcomes.

Purpose of the Study

The purpose of this study is to investigate the possible effects that physical activity enrollment has on physical fitness levels of seventh- and eighth-grade middle school students in Mississippi. Physical activity electives such as marching band and show choir are relatively new to middle schools in the state. A literature review in the field reveals a lack of research that validates the ability of these courses to provide an adequate amount of physical activity to replace traditional proven physical activity electives. There is also little mention of physical activity in either of the music
curriculums that show choir and marching band utilizes (Bennett, 2003). The research from this study could be used to make needed adjustments to all physical activity courses at the elementary, middle, and high school levels. Research has shown that students’ daily moderate vigorous physical activity has significantly declined over the years (National Institute of health, 2008). The United States Department of Health and Human services (2008) recommends that children receive at least 60 minutes of moderate vigorous physical activity per day. For many children, schools may be their only opportunity to make this happen.

**Significance of the Study**

Research has shown that incorporating more physical activity into the school day does not hinder achievement (Coe, 2006) and can have positive impacts in education-related areas such as cognition (Davis et al., 2007) and behavior (Vail, 2006). Improved physical fitness has shown to improve students’ overall health and wellness by controlling weight, reducing risks of developing high blood pressure, reducing chances of developing diabetes, helping maintain healthy bones, muscles, and joints (USDHHS, 1999), and improving self-esteem (Huston, 2003). Students who are overweight or obese are much more likely to become overweight or obese as adults (USDHHS-SG, 2007a), which makes adequate physical fitness all the more important.

Discovering the effects of physical activity choice on physical fitness would be valuable to educational leaders in making curricula decisions involving health and fitness. The goal is to determine if show choir and marching band are making a positive difference in students’ health and fitness. The information provided from this study could be used to make necessary changes to one or all of the four electives examined in this
study. The state department could elect to create a show choir and marching band curriculum that addresses the physical activity demands as well as the traditional music-based objectives. Teacher accountability is based upon the curriculum they are required to teach. If there are no fitness-based objectives in their curriculum, how can they be held accountable? If Mississippi really wants to improve student health and reduce child and adolescent obesity, it must offer adequate physical activity programs that provide the required amount of daily MVPA.

**Research Question**

The following research question guided the study: Will there be significant differences in the FITNESSGRAM® subtests performances of seventh- and eighth-grade students based on their enrollment in show choir, marching band, athletics, or physical education?

**Null Hypotheses**

\( H_0 \) 1

There will not be statistically significant differences in linear combinations of the dependent variables based on middle school students enrollment in physical activities.

\( H_0 \) 2

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in Body Mass Index (BMI) on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

\( H_0 \) 3
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the 1-mile run time on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

$H_0 4$

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of push-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

$H_0 5$

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of curl-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

$H_0 6$

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the trunk-lift measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

$H_0 7$

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the left side back-saver sit and reach measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

$H_0 8$

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the right side back-saver sit and reach measurements on the
FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

**Identification of Variables**

**Athletic Electives:** Electives that involve organized sports such as football, basketball, and volleyball.

**Back Saver Sit and Reach:** A test that measures the flexibility of the back and hamstring muscles (Meredith & Welk, 2005).

**Body Mass Index (BMI):** A measure of weight in relation to height (Cooper Institute for Aerobics Research, 1992).

**Curl-Ups:** A test in which participants flex their knees 140° and place their feet flat on the ground. A measuring strip is placed under the knees at the edge of the participants’ extended fingers. The participants keep their hands stretched out at their sides with palms down. As the participants curl up, they slide their hands all the way across the strip; this constitutes one repetition (Cooper Institute for Aerobics Research, 1992).

**Marching Band or Instrumental Performance:** A physical activity that involves small or large groups of musicians performing while moving in unison while utilizing a variety of movements.

**90° Push-Up:** The 90° push-up assesses upper body strength, which includes the muscles in the upper back, chest, shoulders, and arms. This is an un-timed test. The object is to perform as many push-ups as possible. Participants lay flat on the ground at start, hands placed flat and palm-down slightly wider than shoulder width apart. Participants push off the floor until their arms are straight; then lower their bodies
until their elbows are at a 90° angle. This movement is repeated as many times as possible (Cooper Institute for Aerobics Research, 1992).

**One-Mile Run:** A timed test in which students are required to complete four laps around a quarter-mile track (Cooper Institute for Aerobics Research, 1992).

**Physical Education:** Instruction in the growth and fitness of the body ranging from simple calisthenics exercises to a course of study providing training in hygiene, gymnastics, and the performance and measurement of athletic games.

**Physical Fitness:** The ability of the body to carry out everyday activities with little fatigue and enough energy left for emergencies (Hinson, 1995). Physical fitness will be measured using the FITNESSGRAM® physical fitness instrument. The instrument consists of seven subtests.

**Show Choir or Choral Performance:** An elective course that seeks to introduce students to the art of vocal literature, including ethnic culture, music from various seasons, patriotic music, religious music, folk music, and music from various historical periods, while incorporating movement and dance (Mississippi High School Activities Association, 2010).

**Trunk-Lift:** This test was developed to assess participants’ trunk strength, extension, and flexibility. In this test, participants lay flat on the ground with arms extended down each side; they lift their upper bodies as far off the ground as possible using only the back muscles (Cooper Institute for Aerobics Research, 1992).

**Definitions of Key Terms**

**Adequate Yearly Progress (AYP):** Measures the progress of schools, and school districts towards meeting their state’s academic achievement standards. AYP gives special
attention to data gathered from subgroups based on race, ethnicity, and other factors.

**Aerobic Capacity (VO2max):** The highest amount of oxygen attainable during extreme physical activity (Welk & Meredith, 2008).

**Cardiovascular Endurance:** The ability to endure high intensity exercise over an extended period of time (Graham, Holt-Hale, & Parker, 2004).

**FITNESSGRAM ® Physical Fitness Test:** A physical fitness test that assesses fitness using several subtests (Cooper Institute for Aerobic Research, 1992).

**Flexibility:** The ability to move and stretch joints (Hinson, 1995).

**Healthy Fitness Zone (HZ):** A healthy level of fitness that is sufficient enough to prevent diseases that are a result of sedentary lifestyles (Cooper Institute for Aerobic Research, 1992).

**Muscular Endurance:** The muscles’ ability to produce power for an extended period of time (Graham, Holt-Hale, & Parker, 1993).

**Muscular Strength:** A measure of a muscle’s power (Graham, Holt-Hale, & Parker, 1993).

**Obese:** Obesity is defined as a BMI at or above the 95th percentile for children of the same age and sex (CDC, 2009).

**Overweight:** Having a BMI at or above the 85th percentile and lower than the 95th percentile (CDC, 2009).

**Physical Activity (PA):** Movement of the body that expends energy and increases heart rate (MSDOE, 2010b).

**Sedentary:** A state void of physical activity.
Social Cognitive Theory (SCT): Theory developed by Alfred Bandura it states that people learn and are motivated by personal and environmental experiences (Bandura, 1986).

School Reform

Based on the evidence provided, schools may benefit from a comprehensive activity-based school reform. Schools need to realize that increased time on physical activities does not hinder academic performance (Coe et al., 2006). Recent research even suggests that increased levels of fitness enhance achievement (California Department of Education, 2005). Schools must be creative and encourage teachers to use proven differentiated instruction strategies that intertwine physical activity and movement into their lessons (Hall, Strangman, & Meyer, 2011). Research has shown that all children learn differently and in many cases movement and physical activity actually stimulate brain development and improve multiple areas of cognitive function (Sibley & Etnier, 2003).

Schools must create physical activity electives that provide the required 60 minutes of moderate vigorous physical activity (MVPA) recommended by the United States Department of Health & Human Services (USDHHS, 2008). A majority of America’s children spend a large part of their day in public schools, which makes public schools an obvious location to provide health and fitness interventions. Studies have shown that children who are overweight or obese have an increased chance of carrying their weight issues into adulthood (USDHHS-SG, 2007b). They also have a much higher chance of having fitness-related health problems as adults (Baker, Olsen, & Sorensen, 2007). Each year, there are millions of dollars spent across the United States on obesity-
related health problems (MSDOE-OHS, 2009). Increasing students’ knowledge of health and fitness could be a great way to combat these medical issues in the future and thus reduce overall medical costs. Schools play a vital role in this process.

**Organization of Study**

Chapter One introduces the purpose and significance of this study. This study used archival data from a population of 529 middle school students in grades 7 and 8. Students’ demographic data and fitness score data were attained from the school’s guidance counselor and physical education department chairman. Students’ names were not given.

Chapter Two reviews the literature relevant to physical fitness, physical education, and other related topics touched on in this study. Chapter Three reviews the methods used to conduct the research. Chapters Four and Five cover the results and a discussion of the findings. Chapter Five also includes recommendations for future practice in regards to physical education, show choir, and marching band.
CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

Throughout the course of this literature review, topics were chosen that investigate the theoretical views of this study. Some of these include socioeconomic status (SES), poverty, health and fitness, dietary habits, sedentary behaviors, costs of obesity, and academic achievement. The researcher used journal databases, educational research databases, and the Internet to collect data using such keywords in searches as physical fitness and achievement, middle school fitness, and physical fitness and academic achievement.

With the recent focus on standardized test scores due to the *No Child Left Behind Act of 2001*, many school officials and leaders may not have offered every possible opportunity for students to participate in physical education. More emphasis has been placed on academic classroom instruction while courses that affect instruction in other areas such as physical education, art, and music have been cut or significantly reduced in many school districts across America.

Although the Mississippi Department of Education (2010b) did enact mandatory PE as part of the state’s middle school curriculum, it allowed schools the option of substituting unproven physical activity alternatives such as show choir and marching band for the traditional physical education class. The United States Department of Health (2008) recommends that children in this age range receive at least 60 minutes of moderate vigorous physical activity every day. It remains uncertain if classes such as show choir and marching band are able to provide this level of activity. Currently, there is no known research that investigates the fitness levels of students who participate in
these courses. Research in these areas would be valuable to educational leaders in order to guarantee students are receiving the required health and fitness benefits, particularly the required amount of daily moderate vigorous physical activity.

**Physical Activity Electives**

Middle school students in Mississippi have a variety of physical activity electives available to them. The most popular are athletics and physical education. In 2006, the Mississippi Department of Education incorporated mandatory physical education in middle schools as well as other grades. Middle schools are now required to offer at least 150 minutes per week of physical activity and 45 minutes of health instruction. The Mississippi Department of Education allows middle schools to count electives such as show choir and marching band as physical activity as long as students receive the required amount of health instruction (MSDOE, 2010b).

**Show Choir**

Show choir as known today originated in 17th-century England. It first gained popularity in the United States through universities like Harvard, Yale, and Cornell in the late 1800s (Weaver, 2001). Traditionally called “glee club,” modern-day show choir incorporates song and dance from ethnic cultures, music from various seasons, patriotic music, religious music, folk music, and music from various historical periods while incorporating movement and dance (Mississippi High School Activities Association, 2010). To date, there is no research that indicates the effectiveness of show choir’s ability to improve students’ fitness levels.

Below are the chorus content strands and competencies adopted by the Mississippi Department of Education (Bennett, 2003):
MIDDLE SCHOOL CHORAL PERFORMANCE

CONTENT STRANDS:

Creating/Performing (CP) Critical Analysis (CA)

History/Culture (HC) Aesthetics (A)

Connections (C)

COMPETENCIES

1. Sing a varied repertoire of choral music selections alone and in groups using correct vocal technique. (CP)

2. Create and perform original choral music within specified guidelines. (CP)

3. Listen to, analyze, and describe a varied repertoire of choral music. (CA)

4. Develop and apply criteria for evaluating choral performances. (CA, CP)

5. Recognize and identify increasingly complex music notation and symbols. (CA, HC, A, C)

6. Demonstrate awareness of the role and function of music and musicians in cultures, times, and places. (HC)

7. Recognize and appreciate individual perceptions of the diverse meanings and value of music. (A, CA, C)

8. Compare and contrast choral music to the other arts and other subject areas. (C)

9. Understand the role of choral music in everyday life. (C)

Although this is not the entire choral curriculum, the competencies reveal that little to no emphasis is placed on health or physical activity. Northern Middle School’s show choir uses these competencies and their objectives.

Benefits of show choir. Show choir offers many benefits to its students. They have the opportunity to gain advanced understanding of music through various experiences and engagements. They also have opportunities to express themselves
creatively. Show choir gives students an opportunity to build positive relationships with their peers (Murphy, 2009). Show choir competition also gives students the opportunity to work cooperatively. In recent years, more colleges and universities have adopted competitive show choirs which have opened the door for more scholarships to students (Lawrence, 2011).

**Effects of dance.** A major component of show choir is dance. Although there is little evidence that suggests enrollment in show choir positively or negatively affects fitness, there are some fitness-related studies that involve dancers or dance instruction. For example, a study by Redding, Irvine, Quin, and Rafferty (2009) utilized pre-test and post-test fitness scores as well as a vertical jump test in male and female undergraduate dance students. The results revealed that all students improved their aerobic capacity after one year of instruction. Female students’ vertical jump increased while the males did not. The positive results may have been due to a 90 minute weekly fitness class that utilized plyometric training and upper body strength exercises. Students in public school show choir do not have the time to receive additional fitness training or the same amount of dance instruction as a full-time dance major. However, there are potentially some cardiovascular benefits to dance if there is enough time and emphasis placed in that area. Show choir also includes singing. There is a need for research to show if 50 minutes of dancing and singing instruction per day is enough to improve student fitness.

**Marching Band**

Marching bands have been around for many years. They began as a way for soldiers to march many miles and to stay in step and in formation. The ideals of the marching band have expanded over the generations. Marching band offers mental and
physical benefits that are unique and different from any other activity. It requires the ability to march in step and to function as a team (Italia Marching Show Bands, 2004). Although there are some physical requirements of being a member of a marching band, there is no known research that validates its replacement of traditional physical education.

Below are the middle school instrumental competencies and benchmarks adopted by the Mississippi Department of Education (Bennett, 2003):

**MIDDLE SCHOOL INSTRUMENTAL PERFORMANCE**

(Beginner and Intermediate)

**CONTENT STRANDS:**

Creating/Performing (CP) Critical Analysis (CA)

History/Culture (HC) Aesthetics (A)

Connections (C)

**COMPETENCIES**

1. Perform a variety of instrumental selections alone and/or in groups. (CP)

2. Create original instrumental music within specified guidelines. (CP)

3. Listen to, analyze, and describe a varied repertoire of instrumental music. (CA)

4. Evaluate instrumental music performances. (CA)

5. Recognize and identify increasingly complex music notation and symbols. (CA)

6. Understand music in relation to diverse cultures, times, and places. (HC)

7. Recognize and appreciate individual perceptions of the diverse meanings and value of music. (A, CA, C)

8. Understand relationships between instrumental music, the other arts, and subject areas outside the arts. (C)
9. Understand how music affects one’s quality of life. (C) (Bennett, 2003, p. 81–83)

Although this is not the entire instrumental curriculum, the competencies do reveal that little emphasis is placed on health or physical activity. The Northern Middle School marching band utilizes these competencies and their objectives.

**Marching band participation.** There are certainly many academic, social, and material benefits of participating in marching band, but there is very little research to determine the amount of physical fitness benefits that students receive from participating in marching band. However, one study in 2006 utilized daily pedometer readings from 49 university marching band students over a one-week period. Results from the study indicated that steps on marching band practice days were significantly higher than on days the members did not have practice (Cowen, 2006).

Another study utilized 16 members from a different university marching band. Each member’s heart rate was recorded in five second intervals using heart rate monitors. The results indicated that members who carried large instruments obtained only 9.5 minutes of moderate daily physical activity, and members who carried light instruments only received 8.3 minutes (Strand & Sommer, 2005). This is far below the recommended daily amount of moderate daily physical activity. These mixed results indicate a need for further research, particularly at the grade-school levels.

**Benefits of music education.** Over the years, there have been various studies that attempt to investigate the overall effects that music has on students’ cognition, achievement, or other education related variables. For example, a study by Glen Schellenberg (2004) found that students who participated in music classes yielded higher
IQs than students who did not. He concluded that participation in music education could help students in the development of higher order thinking skills.

Another study by Davidson and Powell (1986) concluded that background music in the classroom can help with student concentration and on-task performance. Soft music can be helpful in drowning-out noises that could affect concentration. The addition of music in the classroom during independent practice time could benefit students’ ability to stay on-task and thus improves the chances of retaining information.

**Advantages of music.** Although there is little research that investigates music’s ability to improve physical fitness, studies have shown positive relationships in the areas of academics, mood, and spatial ability. A study by Thompson, Schellenberg, and Husain (2001) utilized music composed by Mozart. After short periods of listening to Mozart, students out-performed students who did not listen to music on a test of spatial ability.

**Physical Education**

Physical Education (PE) has been a part of American schools for approximately 200 years. It includes instruction on human growth and development, instruction in callisthenic exercises, and also lessons in providing training in hygiene, gymnastics, and the performance and measurement of athletic games. California was the first state to implement a formal physical education curriculum in 1866 (Bishop, 2005). Since its early beginnings, physical education has evolved to address the specific needs of students in relation to fitness and health. In the last ten years, there has been a great need for a curriculum that addresses both physical and cognitive needs of students in all grades, particularly middle school. Recent studies have reported that children’s physical activity
significantly declines between ages 9 and 15, and a majority of the children in this age group attend middle schools (National Institute of Health, 2008). Physical activity interventions are vital to maintain a healthy lifestyle for children; schools are a good location to provide this service.

Below is a list of the seventh- and eighth-grade physical education strands and competencies that were adopted in 2006 by the Mississippi Department of Education:

**7th Physical Education Content Strands**

- Gross Motor Skills Development (GM)
- Fine Motor Skills Development (FM)
- Social Skills (S)
- Personal Skills (P)
- Cognitive Development (C)
- Lifelong Learning/Participation (L)
- Fitness (F)
- Adapted Physical Education (AP)

**COMPETENCIES**

1. Demonstrate competency in motor skills and movement patterns needed to perform a variety of physical activities. (GM, FM, C)
2. Demonstrate understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities. (C, GM, FM, S)
3. Exhibit a physically active lifestyle. (F, L, C)
4. Achieve and maintain a health-enhancing level of physical fitness. (F, L, C, GM, FM)

5. Exhibit responsible personal and social behavior that respects self and others in physical activity settings. (S, P)


8th Physical Education Content Strands

Gross Motor Skills Development (GM)

Fine Motor Skills Development (FM)

Social Skills (S)

Personal Skills (P)

Cognitive Development (C)

Lifelong Learning/Participation (L)

Fitness (F)

Adapted Physical Education (AP)

COMPETENCIES

1. Demonstrate competency in motor skills and movement patterns needed to perform a variety of physical activities. (GM, FM, C)

2. Demonstrate understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities. (C, F, L, GM)

3. Exhibit a physically active lifestyle. (C, GM, P, L)

4. Achieve and maintain a health-enhancing level of physical fitness. (L.C.)
5. Exhibit responsible personal and social behavior that respects self and others in physical activity settings. (S, P, L)


**Athletics**

A majority of the public schools in Mississippi compete in the Mississippi High School Activities Association (MHSAA). MHSAA is a private organization that sanctions a variety of activities, which are listed below:

- Archery
- Band and Choral
- Baseball
- Basketball
- Bowling
- Cheer/Dance
- Cross Country
- Football
- Golf
- Power Lifting
- Soccer
- Slow-Pitch Softball
- Fast-Pitch Softball
- Speech and Debate
- Swimming
Northern Middle School offers cheer (girls only), football (co-ed), basketball (boys and girls), track (boys and girls), and soccer (boys and girls). These particular activities do not have a designated curriculum that is adopted by the Mississippi Department of Education. Middle school students are allowed to enroll in these activities in lieu of traditional physical education.

Over the years, there has been an abundance of research that investigates the importance and overall advantages of participation in athletic teams. A study by Malina and Cummings in 2003 suggested benefits in the areas of growth and development, increased fitness, socializing, morality, and self-esteem. In recent years, there has been research that reveals a relationship between academic success and participation in athletics. For example, Cathey (2008) conducted a study using quantitative data from over 1200 eighth-grade students in a Tennessee school district. Results from the study revealed that athletes had significantly higher scores on state testing in the areas of reading, math, and science than students who were not athletes.

Another study in 2007, utilizing quantitative data of eighth-grade students from nine middle schools, revealed that students who participated in athletics performed higher in the areas of academic achievement, had lower behavior issues, and had better attendance than students who did not participate in athletics (Zoul, 2007). Studies such
as these give little doubt in athletic participation’s ability to provide adequate levels of physical activity.

**Factors that Lead to Poor Health and Fitness**

Socioeconomic status (SES) is usually measured by using a combination of three factors—education, income, and occupation—to describe a person’s or family’s class or social status. According to the American Psychology Association (2009), power, privileges, and some form of control traditionally accompany various levels of SES. It is well accepted that people from high SES backgrounds enjoy financial comforts that are more accommodating to mental and physical health than those available to people from lower socioeconomic classes. Their living arrangements are comfortable, safe, and adequate. They receive adequate healthcare, nutrition, and physical activity. In contrast, children and adolescents from low SES environments are more likely to be exposed to higher levels of daily stress, including hunger, financial instability, and physical violence. A 2001 study of 307 children between the ages 6 and 16 found that children from a low SES environment secreted higher levels of salivary cortisol, a hormone secreted by the adrenal glands during times of stress (Lupien, King, & McEwen, 2001). Low SES mothers have reported higher levels of depression as well as other unhealthy behaviors such as smoking, drug abuse, and poor eating habits. Increased levels of stress can negatively impact children physically, mentally, as well as academically (Lupien et al., 2001).

**Poor Healthcare**

The United States is still the wealthiest country in the world; however, many American children lack decent healthcare. A 2009 study by the United States Federal
Census found that the median household income in America decreased between 2008 and 2009 while both the poverty and uninsured rates rose. The statistics in Table 1 from the United States Census reveal the number of individuals without health insurance.

Table 1

*People with No Health Insurance*

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 18</td>
<td>10%</td>
</tr>
<tr>
<td>Under 6</td>
<td>9.1%</td>
</tr>
<tr>
<td>Whites</td>
<td>12%</td>
</tr>
<tr>
<td>African Americans</td>
<td>21%</td>
</tr>
<tr>
<td>Asians</td>
<td>17.2%</td>
</tr>
<tr>
<td>Hispanics</td>
<td>32.4%</td>
</tr>
<tr>
<td><strong>Southerners</strong></td>
<td><strong>19.7%</strong></td>
</tr>
</tbody>
</table>

Overall, the percentage of Americans who do not have health insurance increased from 15.4% in 2008 to 16.9% in 2009 (United States Census, 2009). This explains why many children and adolescents suffer through treatable illnesses such as ear infections, asthma, diabetes, and allergies (Berliner, 2006). Compared with children who do not live in impoverished family, poor children are only two-thirds as likely to be in excellent health and almost half as likely to be in either fair health (Dawson, 1991).

**Global Poverty**

Global poverty is an issue of epidemic proportions. Approximately 80% of humanity lives on less than ten dollars per day (Shah, 2010). There are approximately 2.2 billion children in the world, and about 1 billion of those are living in poverty. According to the United Nations Children’s Fund Innocenti Research Centre (2010) (UNICEF), 22,000 children die each day due to poverty. Poverty is a major cause of health problems in children. For example, 2.2 million children die each year worldwide
due to lack of basic immunizations, and about 15 million children are orphaned each year due to AIDS/HIV (Shah, 2010).

**Poverty in America**

Of the 23 wealthiest nations in the world, the United States tops the list in regards to poverty and the amount of time families remain in poverty. In many cases, poverty spans multiple generations (Dahl & Lochner, 2005). Medical problems such as anemia, obesity, and diabetes affect many impoverished children. Poor healthcare, unstable living conditions, and a poor diet are daily concerns for children who live in poverty (Berliner, 2006).

Poverty has become a major issue in America. With the poverty line of a family of four set at $22,050, it is estimated that 14 million children live below the poverty line in the United States. Many experts believe this poverty line is too low. A family of four needs about $48,000 to survive, so the real poverty level could be as high as 41%. About 55% of these parents work full time, and 51% of them are single mothers (Cottrell, 2010). All of these factors have a significant impact on students’ lives in regards to health, academics, social life, life style, and physical fitness.

In the United States, poverty is associated with lower health consciousness, lower life expectancies, and poor health decisions. Obesity and low SES status are closely related in American society. Interestingly, it appears to be the opposite in developing nations (Gearhart, Gruber, & Vanta, 2008). The United States has an inverse relationship with obesity and sedentary behavior in relation to SES. The amount of daily vigorous physical activity has shown to be lower among low SES children and adolescents, particularly among girls (Inchley, Currie, Todd, Akhtar, & Currie, 2005).
Financial problems are often a contributing factor to higher obesity rates and sedentary behaviors in low SES families. Many families cannot afford gym memberships and are unable to afford or allow their children to participate in extracurricular activities such as baseball, tennis, and gymnastics (Hinkley, 2008). There is a higher rate of single-parent families among low SES populations, which makes it difficult for the children to participate in extracurricular activities (Salmon, 2005). High SES families have more time and financial capabilities that allow them more opportunities for their children. Parents are also able to exercise, purchase healthy meals, and spend more quality time with their children. Low SES children are at a major disadvantage when it comes to health, physical fitness, and academics (The Trevor Romain Company, 2007).

Educational leaders need to divert resources to schools that serve low SES populations to provide supplemental extracurricular programs to these students such as physical education, after-school exercise programs, and fitness equipment accessible by students and the community.

Impoverished families often do not have the financial capabilities to purchase more expensive groceries such as fresh fruits and vegetables, and lean meats. Diets of low-SES adults often include processed and packaged foods, and foods that are high in saturated fats, eggs, fatty meats, and refined sugar (Bolton-Smith, Smith, Woodward, & Tunstall-Pedoe, 1991). Children who live in these households often have diets that mirror those of their parents, with higher consumptions of soft drinks, fried foods, oils, and sugars (Shahar, Shai, Vardi, Shahar, & Fraser, 2005).

Mississippi and the District of Colombia have the highest child poverty rates, which are above 25%. Nationwide, about 11% of white children are below the poverty
line, 34% of African American, 31% of Hispanic, and 31% of Native American (Cottrell, 2010). These are staggering statistics given the resources available overall in this nation.

**Poverty in Mississippi**

According to 2009 data from the National Center for Children in Poverty, 53% of Mississippi’s children under 18 are classified as coming from low-income families. A family is classified as low income if its income is less than twice the federal poverty line. Based on race in Mississippi, 34% of low-income children are white, and 73% are African American. About 55% of these children are under 6 years old. Educational leaders at both the state and federal levels need to realize the connection between poverty, academics, and physical fitness.

**The Plague of Obesity**

**Global Obesity**

Obesity has become a dangerous issue. According to the World Health Organization (WHO, 2010b), there are over 1 billion overweight adults worldwide and over 300 million of them are obese. It is also estimated that over 42 million children under the age of 5 are overweight (WHO, 2010a). A study published in 2006 collected school-age population data from 25 countries and preschool data from 42 countries. The data revealed that childhood obesity is growing in practically every industrialized nation and in many low-income countries (Wang & Lobstein, 2006).

**National Obesity**

According to statistics from Ogden, Carroll, Curtin, Lamb, and Flegal (2010) as well as the National Center for Health Statistics (2004) and cited on the CDC’s website (2010a), childhood obesity has tripled in the United States since 1980. Obesity in
children between ages 6 and 11 increased 13.1% from 1980 to 2008. Among adolescents, obesity rates also increased by 13.1% during that same time period. Statistics also reveal that children from the Southeastern United States have the highest risk of becoming overweight or obese (Davy et al., 2004). Mississippi and its surrounding states comprise the leading region in regards to adult and childhood obesity (CDC, 2010c). The map shown in Figure 1 gives a picnic-graphical view of the prevalence of obesity in America.

*Figure 1. Nationwide Obesity Map*

![Nationwide Obesity Map](http://www.cdc.gov/obesity/data/trends.html#county)

**Mississippi Obesity**

In Mississippi, there appears to be a great need for both health and physical interventions for children of all ages. In March 2001, a pediatric cardiologist reported treating a 200-pound four-year-old child in Mississippi (Davis & Davis, 2008). Obese children are thirteen times more likely to acquire diabetes and nine times more likely to develop hypertension than average-sized children. One in three Caucasian children and one in two minority children are labeled as obese in Mississippi (Davis & Davis, 2008).
Mississippi leads the nation in adult and childhood obesity; 2009 marked the fifth year in a row that the state led the nation in adult obesity. It is estimated that about 40% of the children in Mississippi are either overweight or obese (MSDOE-OHS, 2009). Approximately 31.4 % of high school students in Mississippi are overweight or obese compared to 28.9% nationally (CDC, 2004). Educational leaders need to realize that factors such as these can have adverse affects on children and adolescents that can affect success both inside and outside the classroom.

**Major Causes of Obesity**

**Poor Diet and Eating Habits**

According to the World Health Organization (2010b), there has been a global shift in the consumption of high-energy, high-fat, high-calorie, and high-sugar foods and beverages among children, adolescents, and adults. Proper diets for children and adolescents should include multiple daily servings of fruits, vegetables, lean meats, whole grains, and nuts (WHO, 2010b). These proper diets provide the essential vitamins and minerals needed to sustain and develop children’s growing minds and bodies.

A major factor of obesity in the United States is poor dietary habits. America’s fast-paced culture has caused many families to rely on fast foods. The Centers for Disease Control (2011b) recently reported that consumption of large portions of high-energy foods along with sugar sweetened beverages are a major cause of weight gain among children and adolescents.

Obesity appears to be most prevalent in the Southeastern United States, and poor dietary habits are a major contributing factor. A survey of 4,452 students in grades 6
through 8 from 73 school districts in Florida investigated middle school students’ physical activity and dietary intakes in 2003, with the following results:

- Less than ¼ met the recommended daily fruit and vegetable intake
- About 26% drank two or more sodas per day
- Only 39% reported they spent most of their time playing outside after school
- Only 17.8% knew the proper daily intake of fruit and vegetables. (Zapata, Bryant, McDermott, & Hefelinger, 2008)

The statistics reveal a definite need for direct intervention at the middle school level for nutrition and physical fitness. School districts have an ethical responsibility to address the needs of their student population’s physical, behavioral, cognitive, and social well-being. Doing so will help preserve the health and success of future generations. Mississippians have poor eating habits. This is partly attributable to local culture in which the favored diet includes a wide range of fried foods as well as dishes high in sodium and calories. Mississippians have the second lowest rate of fruit and vegetable consumption in the nation (Blanchard & Lyson, 2006). These poor eating habits have contributed to the state’s high obesity rates.

A 2004 study that investigated middle school students in a small Mississippi town revealed a great need for further research with respect to eating habits and daily physical activity. Of the total of 252 students, who completed the study, 59% were African-American, 34% were Caucasian, and 6% were Hispanic (Davy, Harrell, Stewart, & King, 2004). Among the subjects, 32% were classified as overweight; 22% were at risk of being overweight. The dietary intake of these children was high in saturated fats as well as sodium. There was also a high consumption of sodas, particularly among Caucasian
children. Fruit and vegetable intakes were well below the recommended levels (Davy, Harrell, Stewart, & King, 2004). Dietary intake is a major factor in overall health and physical fitness. School leaders need to create programs that will teach healthy eating habits and incorporate better dietary practices at school. Also, schools that serve low-income communities need additional funding in order to purchase higher quality foods to serve in their cafeterias.

Schools are a great venue for children and adolescents to be introduced to healthy alternatives; however, many improvements need to be made. During the 2008–2009 school-year Mississippi’s lunch program served 404,694 students a total of 68,147,157 lunches; 8% of these were reduced price, and 58% were free (MSDOE-OHS, 2009). Sadly, meal planning is often guided more by budgetary guidelines than nutritional guidelines, and many school districts in Mississippi serve lunches that students may enjoy (e.g., French fries, chicken tenders, and other unhealthy fried foods) but that are not part of a healthy diet. Although the state has made many improvements, many school districts still follow this policy (MSDOE-OHS, 2009). Educational leaders must be made aware of the importance of dietary habits and its overall affect on student health and wellness.

Behavioral and Environmental Factors

Although certain genetic factors contribute to child and adolescent obesity, environmental and behavioral factors appear to have the highest impact on weight gain. Many low-income families lack the knowledge or finances to maintain a healthy diet. Many low-income neighborhoods lack access to affordable healthy foods. In many cases, fast foods are the only convenient options available.
Many low-income neighborhoods lack adequate safe sidewalks for children to walk or bike to school (Churchman, 1980; Dobson, 2004), which contributes to a lack of regular physical activity. Due to consolidation efforts, many students live too far to walk or ride a bike to school even if they wanted (MSDOE-OHS, 2009). Lastly, many low-income neighborhoods have crime rates that limit children and adolescents’ ability to play outside or at local parks (Hillman, 1999). Educational success and healthy living are a direct result of a combination of environmental, behavioral, and social factors that affect children and adolescents. Since a majority of the students in Mississippi and the United States between the ages of 5 and 19 years of age attend public schools, schools appear to be the obvious choice for interventions in order to serve the largest population.

**Sedentary Lifestyle**

There is a global decrease in physical activity among adults and children (WHO, 2010b). Children worldwide are increasingly more interested in such passive activities as video games and television watching than in the traditional active vigorous outside play normally associated with youth. This trend is especially dominant among American children and adolescents.

Activity declines an average of 40 minutes per day each year from the time children turn 9 until they turn 15. At age 9, children spend about three hours per day engaged in moderate vigorous physical activity. By age 15, they only spend about 49 minutes per weekday and 35 minutes on weekends. The United States Department of Health (2008) recommends at least 60 minutes of moderate vigorous physical activity per day for students in this age range. Girls dropped below this amount on average at age
13.1 years while the boys dropped on average at age 14.7 years (NIH, 2008). These statistics alone reveal a need to increase children’s physical activity.

Researchers at the University of Georgia have conducted several studies that support the theory that time spent on physical activity enhances learning and does not hinder student performance. Research from studies of over 200 children between the ages 7 and 11 revealed that routine exercise reduces body fat and increases bone density in overweight children. Researchers also indicated that regular exercise increases executive function and math achievement. Also, while exercise may not increase overall IQ, it appears to help children and adolescents to function better (Baker & Shepard, 2007).

Another study from the University of Georgia measured insulin levels of overweight children and found that among children who participated in 20 minutes of daily exercise, insulin levels dropped 15%, and among children who exercised 40 minutes, insulin levels dropped 21% (Baker & Shepard, 2007). A 2004 study in a small Mississippi community used pedometers to measure students’ physical activities and found that the participants’ activity levels were far below the recommended daily amount of physical activity for adolescents (Davy et al., 2004). In 2000, a national study by the National Institute at Wellesley College investigated the after-school activities of students. They reported that nationwide, there were are an average of 3.5 million children ranging from ages 5 to 7 who spend about 47 minutes at home alone every day, and that between ages 11 and 12 that time increased to an hour and 15 minutes. They studied 8 million children, recording their after-school activities, and reported the following activities: 26% eating, 15% watching television, 13% doing homework, 19% personal care (wash hair,
take a bath, etc.), and only 9% physical activity (Jacobson, 2000). The picture is clear: children and adolescents are not physically active, and the trend increases with age. A logical place for physical interventions is our public schools since most children are not receiving an adequate amount of exercise at home.

**Costs of Obesity**

**Economic Costs**

Obesity has become a major health and financial issue worldwide. A review of literature published in 2008 by RTI Health Solutions presented data that indicate direct health costs in the billions for most of the 29 countries in the study. The report’s summary indicated that due to the association of obesity and chronic diseases, increased disability claims, absenteeism (work and school), and premature deaths, obesity has a substantial negative financial economic impact. The report estimates that obesity accounts for 0.7% to 7.0% of national health costs globally (Barrett, 2008). Obesity accounts for about 9% of the total healthcare costs in the United States, or over $3 billion annually. The cost in Mississippi alone was $757,000,000 in 2008. About 8% of private medical claims are due to weight issues. From 1987–2001, approximately 27% of all medical costs were due to obesity. Medicare and Medicaid spending would be reduced by 8.5 % to 11.8% respectively if obesity were eliminated (MSDOE-OHS, 2009). Less money spent on healthcare would allow more money to be spent on education.

**Physical, Social, and Behavioral Costs**

Besides economic costs, there are many other negative costs in relation to obesity. Judge and Jahns (2007) examined the relationship between children being overweight and their education. They found that overweight children had lower math and reading
scores than non-overweight children. The study also found that overweight girls had significantly higher internal and external problems as well as poorer self-control compared to non-overweight girls.

A study from Missouri Western University (Huston, 2003) found a strong correlation between weight and self-esteem: overweight children tended to have lower self-esteem. Low self-esteem has shown to negatively impact achievement. A study published in 2000 examined the relationship between physical activity, BMI, self-esteem, and math and reading achievement, and found that self-esteem was positively related to achievement and participation in vigorous physical activity (Tremblay, Williams, & Inman, 2000).

A study by Baker, Olsen, and Sorensen (2007) indicated that obese adolescents have significantly greater risks of developing and dying from chronic diseases in adulthood. Obese children suffer from a variety of health and social issues; they have an increased risk of developing heart disease, having a stroke, and developing type II diabetes. They also suffer from depression. Many are teased by their peers. On average, obese children miss more days of school than non-obese children. Finally, obese children have an 80% chance of becoming obese adults (United State Department of Health and Human Services-Surgeon General, 2007; CDC, 2011a).

**Need for Interventions**

Taken together, the aforementioned studies serve as a dire warning that the United States cannot afford to continue down this road. The future of the nation is in the hands of today’s educators. Schools are a great place for children of all ages to learn about and develop healthy lifestyles. America needs to be proactive rather than reactive in dealing
with its problems. Interventions in health and fitness would increase the quality and length of life of future generations, and public schools are an ideal starting point.

**Fitness Testing in Schools**

One form of intervention that has become more popular in recent years has been the use of fitness testing in public schools. Many fitness instruments use Body Mass Index (BMI) as an indicator of body-fat levels. According to a study by the University of Michigan and the Saginaw Valley State University, BMI may not be an accurate measurement of physical fitness. The main issue is that BMI standards are the same for a young person as an elderly person. BMI does not distinguish between body fat and muscle. According to the CDC (2009), there is not enough evidence to recommend or not recommend the use of BMI in schools as a means of preventing childhood obesity. They recommend using BMI as part of a comprehensive approach that measures several aspects of fitness and health. BMI alone is not an accurate indication of individual health. Aerobic capacity in relation to body fat percentage is considered to be the best measurement of a person’s overall cardio respiratory capacity (Cooper Institute for Aerobics Research, 1992). BMI alone should never be an indication of student physical health, thus demonstrating the importance of a comprehensive program that assesses both body fat, aerobic capacity, and other aspects such as upper body strength and flexibility. The FITNESSGRAM® offers two tests that measure aerobic capacity: the one mile run/walk and the Progressive Aerobic Cardiovascular Endurance Run (PACER).

**Physical Fitness**

There are many positive associations between physical fitness and one’s quality of life. Most people are aware of the health benefits such as maintaining a healthy weight,
healthy blood pressure, lower stress levels, and overall better health. However, there are also positive associations with academic performance, socialization, and improved behavioral issues. Physically fit students tend to have higher levels of focus and concentration. A recent study by Chomitz (2009) studied children in grades 4 through 8 from an economically and racially diverse urban school district. Results revealed that the odds of students passing their math and English achievement tests increased as the number of fitness tests passed increased, revealing a positive correlation between fitness and achievement. The American Heart Association (n.d) has suggested that focusing more on physical education would result in happier, smarter, and healthier students. Educational leaders can no longer afford to deny the positive associations of physical fitness to the overall health and wellness of children.

The Link Between Physical Activity/Fitness and Academics

Cognition

Over the years, there have been several studies that attempt to link physical activity and physical fitness with cognitive functions of the brain. Cognitive tests evaluate mental function at a more molecular level than IQ tests (Tomporowski, 2003). In 2007, Davis et al. (2007) conducted a study of 94 overweight children between the ages of 7 and 11. Children were randomly assigned to three conditions: no exercise, 20 minutes of exercise five days per week, and 40 minutes of exercise five days per week. Exercise included moderate activities such as running, jumping rope, soccer, and other athletic games. The goal was for students to get their heart rates above 150 beats per minute each day for a majority of class time. Researchers administered the Cognitive Assessment System (CAS) before and after treatment. This instrument measured four
cognitive scales: planning (executive function), attention (ability to stay focused), simultaneous (spatial and logical processing of verbal and non-verbal examples), and successive (the ability to process sequential information). The researchers used an ANCOVA on the post-test scores and revealed that exercise influenced the planning scale significantly, especially the group that received the higher amounts of daily exercise. However, there were no associations with the other scales. Given that executive function is an important aspect of daily life and education, the researchers suggested that increasing the amounts of vigorous physical activity is warranted among students (Davis et al., 2007).

In 1993, 85 eighth-grade students were randomly assigned to an 8-week aerobic running class (moderate vigorous activity) or a 5-week physical education class (mild vigorous activity) (Hinkle, 1993). Students were given pre-test and post-test instruments that measured both physical and mental functions. Results revealed that students in the running class outperformed students in the traditional exercise class, both physically and on the Torrance Test of Creative Thinking. It was concluded that sustained moderate vigorous exercise enhances creative thinking (Hinkle, 1993).

Tuckman and Hinkle (1986) had previously conducted a similar study in which 154 randomly chosen students ages 9 to 12 were either assigned to a 12-week aerobic running class or a traditional physical education class that included less vigorous daily activities. Students in the running class participated in activities such as sprinting, relays, and distance runs, with the intensity gradually increasing throughout the class. As before, post-test scores revealed that students in the aerobic running class achieved higher creativity scores.
Creative thinking is an important aspect of writing. Many states have included a writing assessment as part of their standardized testing. Mississippi administers a writing test to its fourth and seventh graders yearly (MSDOE, 2009). These studies indicate that our data-driven educational system would benefit from the introduction of more rigorous physical activity programs in schools.

In a study (Hillman, 2005) using electroencephalography (EEG) and reaction times measures to contrast the mental function of low-fit and high-fit children (mean age 9.6) and adolescents (mean age 19.3), researchers used the EEG to measure brain functions while participants performed visual discrimination tasks. Physically fit participants were found to have quicker response times than non-fit participants. The EEG recorded faster cognitive processing and better attention among high-fit participants (Hillman, 2005). In a follow-up study, Hillman (2006) found that physically fit participants had greater cortical activation and cognitive performance than participants who were not physically fit.

**Achievement**

Probably the most abundant amount of research in relation to physical activity revolves around its connection with academic achievement. The literature offers mixed results, although a predominance of the research leans towards a positive relationship. In one of the earliest studies, researchers investigated whether students who were placed in an enhanced physical education class had positive improvements in achievement on intelligence tests compared to a control group. The results were inconclusive, but a small positive relationship (ES = .43) was found among students enrolled in the enhanced physical education class on the Stanford Achievement Test (Ismail, 1967).
Coe (2006) investigated the effects of physical activity on 214 sixth graders. The sample was split into two groups: one group attended a physical education class, and the other group attended an academic elective. The results revealed that additional attention to physical education did not adversely affect student academic grades. This speaks directly to an assumption often made by school officials, especially since the initiation of NCLB. The study also stated that students who reported chronic moderate physical activity levels achieved greater academic success than did their peers who reported sedentary behaviors. Coe (2006) concluded that vigorous physical activity did not lead to improved performance on standardized tests, but it was positively associated with higher academic grades. Importantly, increased time in PE did not adversely affect academic achievement (Coe, 2006). Shepherd (1984) conducted a study of 546 elementary students in grades 1 through 6. Students in the experimental group were assigned to five hours of weekly physical activity; these students achieved higher class grades than the control group in grades 2 through 6. Interestingly, the greatest increases were among girls.

In 1999, another study by Sallis examined 759 students over a two-year period. Students in grades K–5 were placed in a physical education class that met three times per week for 30 minutes. Compared to the control group, the results indicated that time spent in physical education classes did not negatively affect academic achievement (Sallis, 1999). Although positive results were not found, it is important for educational leaders to realize that time spent in physical education does not have a negative impact on academics.
The California Department of Education conducted a study in 2004 and 2005 using over 1 million students, examining physical fitness test scores with scores from the California Standardized test in grades 5, 7, and 9. The results revealed a strong positive correlation of fitness test scores with both math and language scores (California Department of Education, 2005). In 2007, a similar study of 259 third and fifth graders revealed that aerobic fitness was positively associated with reading achievement ($\beta = .40$) as well as math achievement ($\beta = .42$). There was also a positive association with total academic achievement ($\beta = .43$) (Castelli, 2007).

Finally, in 2001, a study was conducted in Australia on over 8,000 students aged 7 to 15 in 109 schools. The study used a comprehensive physical fitness test that measured all aspects of fitness as well as a general activity questionnaire. When both instruments were correlated with scholastic achievement, the results revealed small but significant gains that associated school achievement with fitness and general activities (Dwyer, 2001).

Physical activity promotes health, fitness, and achievement in all students who participate. It is a necessary educational tool that is needed in order for school officials to educate the whole child (socially, emotionally, physically, and cognitively). If school administrators want to make Annual Yearly Progress (AYP), strong consideration needs to be given to the implementation of physical activity electives. Given the overall state of children’s health in Mississippi, that state in particular needs to be made aware of the benefits of a comprehensive physical education program and how it can improve students’ academic achievement and overall quality of life.
Intelligence

Over the years there have been few studies that examined the relationship between physical activity/fitness and academic performance of students with mental disabilities. Corder (1966) investigated the effects of physical activity on students with mental retardation. In the study, 24 children ranging aged 12 to 16 were randomly assigned to a control group or exercise group. Participants in the exercise group were given 60 minutes of exercise for 20 days. The WISC full-scale IQ test was administered at the end of the 20 days. The exercise group had significantly higher full-scale improvements (ES = .92) compared to the control group (ES = .30). Students in the exercise group also had significantly higher improvements on the verbal scale section (ES = 1.22 exercise, ES = .02 control). There were no differences in performance IQ. Unfortunately, the results were inconclusive, as the researchers acknowledged that gains obtained by the exercise group could have been a result of the extra attention children obtained and not a result of the physical exercise (Corder, 1966). Despite inconclusive results, the information provided is enough to warrant further research.

The following year another study investigated the effects of physical activity on the intelligence of 12-year-old boys with mental retardation (mean IQ 35). The boys were randomly chosen to a 6-week isometric exercise program or a control group that received no exercise. The Stanford Binet Intelligence test and the Vineland Social Maturity Scale were administered before and after treatment to both groups. Boys in the exercise group outperformed the control group on both instruments. The results are shown in Table 2. The researchers concluded that mental demands of the exercise program accounted for much of the boys’ improvements on both scales (Brown, 1967).
Table 2

*Exercise and Control Group Test Score*

<table>
<thead>
<tr>
<th></th>
<th>Exercise</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
<td>$d = .54$</td>
<td>$d = .13$</td>
</tr>
<tr>
<td>Social Scale</td>
<td>$d = .86$</td>
<td>$d = .08$</td>
</tr>
</tbody>
</table>

To improve academics and the overall quality of life among the student population, school leaders and politicians must begin to widen the scope of their thinking beyond AYPs and standardized testing and assimilate the latest innovative practices based on recent research. Research supports the ideas that there is more to enhancing a child’s life than improving standardized achievement scores and that the educational system would only be enhanced by recognizing and acting upon the positive relationship among physical fitness, overall health, and academics.

**Standardized Test Scores**

Despite statistics that reveal a sharp rise in obesity and a decline in the amount of moderate daily vigorous physical activity among the nation’s youth, school districts continue to reduce and even eliminate physical education in schools. Much of the declines are due to recent budget constraints and pressure to improve standardized test scores in response to the requirements of NCLB. However, evidence reveals a link between student fitness and physical activity with higher standardized test scores. For example, a recent California study of 1,989 ethnically diverse students found that students whose run/walk times exceeded the California FITNESSGRAM® standards and/or whose BMI was above the normal limits had lower standardized test scores in math, language, and reading. The study concluded that low aerobic fitness was associated with low standardized test scores (Roberts, Freed, & McCarthy, 2010).
A 2007–2008 study in Texas analyzed scores on the FITNESSGRAM® physical fitness instrument and standardized test scores from 2.4 million students in grades 3 through 12. This study found significant school-level correlations between physical fitness and their performance on standardized tests. The study also noted that higher physical fitness was also associated with fewer disciplinary issues and better school attendance (Welk, 2009).

There is a common belief among many school leaders that increased time in the classroom equals increased standardized tests performance; however, there is no research-based evidence to support this belief. On the other hand, there is evidence to show that increased time dedicated to physical activity does not hinder standardized test scores and that positive associations can be made. One example includes a Canadian study of 287 fourth and fifth graders in which participants were exposed to 10 minutes of daily physical activity in the classroom as well as 80 minutes of physical education per week. The results revealed that the students who participated in the additional physical activity time had standardized test scores that were similar to the control group that only received the normal amount of PE each week (Ahmed, McDonald, Reed, et al., 2007). Thus, additional time in PE did not hinder standardized test achievement. An earlier study in California found that students in an advanced PE program who significantly dedicated more time out of the regular class did not adversely affect standardized test scores and that many who spent more time in PE actually performed better than the control group (Sallis, 1999).
Related Theory: Social Cognitive Theory

Social Cognitive Theory was officially introduced by Albert Bandura in 1986, but he spent many years of research prior to writing his first book Social Foundations of Thought and Action: A Social Cognitive Theory. SCT states that human behavior is triadic; it is a result of personal, behavioral, and environmental factors. Learning occurs vicariously through life experiences. Students involved in physical education or other physical activities learn through observing others and by participating. Students who have positive experiences while participating in physical activities will gain valuable insight in relation to health, fitness, lifestyle, self-esteem, and academics (Grim & Pazmino-Cevallos, 2007). Students are a product of their environment; their culture, values, and beliefs have a major impact on their future. Schools that implement a comprehensive physical activity program that teaches the values of healthy living while involving the whole community can have a positive impact on their students, their families, and the community as a whole. Students acquire healthy living habits through engaging experiences and support from the people in their lives.

Benefits of Being Physically Fit

Mental and Physical Benefits

Society reaps many benefits from having a physically fit populous. The overall quality of life is improved, people are happier, and there is a sharp reduction of illnesses and diseases (CDC, 2011c). Individuals who are physically fit enjoy a variety of life enhancements, including improved mental functions and better social adjustment. People who are physically fit usually have healthy bones, joints, and muscles, and have less chance of developing high blood pressure or becoming obese. Since exercise releases
natural endorphins, many health-conscious people experience better moods than non-healthy individuals (CDC, 2011c).

**Behavioral Benefits**

Children who are physically fit typically exhibit fewer behavior problems; they also tend to have higher achievement scores. Research has shown that physical activity prepares students for learning (Vail, 2006). Hillman (2009), a professor of kinesiology at the University of Illinois has gathered evidence that physical activity increases students’ cognitive control—that is, their ability to pay attention. His research revealed positive outcomes that linked physical activity, attention, and achievement. In Hillman’s study, 9-year-old students (8 girls and 12 boys) performed a series of stimulus discrimination tests to assess their inhibitory control. Students were tested after a 20-minute resting period and another day after 20 minutes on the treadmill. Participants were monitored using an electroencephalogram (EEG) during testing. Testing revealed that students performed better after the 20 minutes of walking. Researchers also administered an academic achievement test and found similar results. The biggest effect was in the area of reading comprehension: researchers found that exercise improved students’ p3 amplitude, which improved their ability to use attention resources. Hillman suggested that schools need to include physical education in their school routines. Although it would not be feasible in all settings, he suggested a school-wide exercise routine to begin the school day, as well as implementing a formal physical education program into the curriculum, outdoor recess, and integrating physical activity into the classroom (University of Illinois at Urbana-Champaign, 2009).
School Reform

Mississippi schools could benefit from a comprehensive school reform that incorporates physical activity and greater attention to health into the classroom. Evidence has shown that students benefit from small non-academic breaks throughout the day (Wagner, 2008). Providing physical activity electives such as PE that offer the required 60 minutes of moderate vigorous physical activity would be a one way to offer these breaks, and one with proven benefits. Research has shown that physical activity sparks brain development, and moderate physical activity has been shown to spark neurogenesis or growth of brain cells and lead to lower stress levels, improved mood, and improved cognitive functions (Jensen, 2008). Increased physical activity also improves blood flow, oxygenation, and the development of nerve connections, brain tissue volume, and much more. These physiological changes are believed to be associated with improved attention, memory processing, storage, enhanced coping skills, and improved behavior (CDC, 2010b). These factors have a positive effect on the overall well-being of students.

Incorporating physical activity and movement into the classroom has also been shown to benefit both instruction and achievement (CDC, 2010b). Applying the latest differentiated instructional practices that accommodates various students’ learning styles offers options to students who learn through movement (Hall, Strangman, & Meyer, 2011). All children are different and teachers must be trained to incorporate as many learning style options as possible based on their students’ needs.

Many states, including Mississippi, have adopted the new Common Core Curriculum (MSDOE, 2010a). This is a new curriculum that has been adopted by state
governors. Its content, based on proven practices, was created to help American students to become more competitive with students from other parts of the world. Mississippi is currently in the process of deciding how to best implement this new curriculum. Incorporating more physical activity and movement could be the catalyst that initiates increased levels of learning at all age levels.

Summary

This chapter revealed evidence of the links between socioeconomics, physical fitness, health, and academics. Physical fitness has been shown to stimulate and grow the brain; students who are physically fit perform better academically than their counterparts. There is also research that suggests that music-based activities such as marching band and show choir offer benefits in the areas of academics, cognition, brain development, behavior, and social support. However, there is very little research that investigates these courses’ ability to provide the required amount of moderate vigorous physical activity or the required levels of fitness for students in k-12 schools. This gap in research needs to be addressed if schools in Mississippi and other states are going to continue the process of allowing courses such as marching band and show choir to be counted as a physical activity alternative to physical education or athletics.

For schools to best serve the interests of their students, they must provide services that address these issues. Proper fitness training is essential for living a balanced life. While schools should never replace parents as the primary source of responsibility, schools do have an obligation to provide the best possible education for their students. This means educating the whole child, providing not just academic instruction but also addressing social, emotional, physical, and behavioral issues. Students who receive
adequate physical fitness are more prepared for the daily stresses of life; they are able to learn and make the most of the educational experiences. Providing a well-balanced curriculum is an essential element in 21st century schools. The research suggests that schools must provide a thorough, well balanced, well run physical education program for students to be at their best and that doing so will benefit all stakeholders—especially the children.
CHAPTER THREE: METHODOLOGY

Introduction

This study was designed to investigate the possible effects that physical activity choices may have on middle school students’ overall physical fitness levels. The Mississippi Department of Education allows middle schools to substitute show choir and marching band in lieu of the traditional athletics and physical education classes, and it requires no special physical education training for the teachers who lead these elective courses, whereas physical education teachers are highly trained and qualified to teach physical activity-based subjects. The Mississippi Department of Education does not even provide a specific curriculum for show choir or marching band that relates to physical activity (Bennett, 2003). However, there is a comprehensive physical education curriculum for each grade (MSDOE, 2006b).

Research Design

This is a quantitative causal comparative design using archival data. Quantitative research is useful when the researcher wishes to gather numeric data that is used to answer predetermined research questions or hypotheses. Causal comparative research is useful when the researcher seeks to investigate possible cause and effect relationships between variables. It is mainly used in situations when manipulation and randomization of the independent variable/s is not possible. When done correctly, quantitative causal comparative studies can be seen as unbiased and provide useful statistical data that strongly suggests causation (Ary, Jacobs, & Sorenson, 2010).
Research Participants

The convenience sample for this study includes approximately 529 seventh- and eighth-grade students (13-14 years old), which is more than the sample size of 384 students that is required using a confidence interval of 95%. The students attend Northern Middle School in northern Mississippi. Demographic data was attained from the school’s guidance counselor. Appendix A includes an example of the data sheets that were used. Table 3 includes the samples’ racial makeup broken down into percentages.

Table 3
7th and 8th Grade Racial Demographics

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Percentage</th>
<th>N</th>
<th>District %</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>79</td>
<td>529</td>
<td>64</td>
</tr>
<tr>
<td>African-American</td>
<td>15</td>
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</tr>
<tr>
<td>Hispanic</td>
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<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Asian</td>
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<td>4</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Table 4
7th and 8th Grade Free and Reduced Lunch Percentage

<table>
<thead>
<tr>
<th>Grade</th>
<th>Free or Reduced Lunch</th>
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<th>Total District %</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 &amp; 8</td>
<td>34%</td>
<td>235</td>
<td>50</td>
</tr>
</tbody>
</table>

Setting

Northern Middle School is located within the largest school district in the state of Mississippi, which includes over 30,000 students. The district has 8 high schools, 8 middle schools, and 33 elementary schools. The selected site’s demographics are similar to the other schools in its district and of schools in the surrounding area (DCS School Report Card, 2009). The setting for each activity choice is described below.
Athletics

Students who participate in athletics receive 50 minutes of instruction per day in their sport. Northern Middle School offers football, basketball, track and field, and soccer for both boys and girls. They also offer volleyball and cheerleading for girls. The athletic courses are instructed by certified physical education teachers who also teach the physical education classes. Athletic coaches supplement the required 45 minutes of health instruction in the students’ weekly schedule.

Physical Education

Physical education is offered in all grades at Northern Middle School. Seventh and eighth graders take classes together, which include both boys and girls. Each physical education class has at least one certified physical education teacher and one trained physical education assistant, although some classes have two physical education teachers. Students receive 200 minutes of physical education per week and 50 minutes of health instruction.

Show Choir

Show choir is offered in all grades at Northern Middle School. Seventh and eighth grade classes are mixed together and include both boys and girls. Each show choir class is taught by a certified music teacher. Students in show choir receive 250 minutes of instruction per week. Health objectives are not covered as part of the music curriculum (Bennett, 2003).

Marching Band

Marching band is offered in all grades at Northern Middle School. Seventh and eighth grade classes are separated by grade, but the classes include both boys and girls.
Each class is instructed by three certified band directors. Currently, marching band is not required to teach health or fitness objectives as part of the curriculum (Bennett, 2003).

**Instrumentation**

**FITNESSGRAM® Instrument**

Archival data from the FITNESSGRAM® physical fitness instrument was used to assess students’ levels of physical fitness. The FITNESSGRAM® was created in 1982 by the Cooper Institute for Aerobic Research. Its mission was to assist in evaluating and promoting physical fitness in elementary, middle, and secondary grade students. The Institute’s goal to develop a tool that could help participants develop healthy habits and improve overall health with benefits that would carry over into adulthood (Cooper Institute for Aerobics Research, 1992).

The FITNESSGRAM® physical fitness instrument, one of the most commonly used physical fitness instruments in the United States, was designed to assess five areas: aerobic capacity, body composition, muscular strength, muscular endurance, and flexibility. The FITNESSGRAM® has proven to be highly reliable after many years of testing using several different methods, such as test/re-test and intra/inter-rater reliability (Welk & Meredith, 2008). Reliability for each subtest follows in the next section.

Validity, a vital credential for any assessment tool, means the assessment measures what it is supposed to measure to be deemed valid (Welk & Meredith, 2008). Physical fitness assessments based on norms may or may not be representative depending on when the research was completed and the size as well as the representation of the sample. The Cooper Institute use criterion-referenced standards based on years of scientific research.
Its objective was to tie levels of fitness to healthy outcomes. Its research is highly regarded and considered valid (Welk & Meredith, 2008).

The Cooper Institute used its extensive research to create healthy fitness standards, a range of scores called the Healthy Fitness Zone (HFZ), for each subtest of the FITNESSGRAM® physical fitness instrument. Students who attain a passing score on a particular subtest fall within the Healthy Fitness Zone for that test. Students who do not attain a passing score on the BMI subtest fall within the Needs Improvement Zone with Some Risk (NIZSR) or the Needs Improvement Zone High Risk (NIZHR) (Meredith & Welk, 2005).

**The FITNESSGRAM® Subtests**

Each subtest was administered by a certified physical education teacher. Before administering the instrument, all physical education teachers were trained in the proper techniques and scoring methods by watching the FITNESSGRAM® instructional video and by studying the administration manual. Before assessing students, the physical education teacher allowed each class to watch the instructional video on proper technique the day before testing. The day of testing, the physical education teacher instructed and modeled the proper technique to the participants one last time before administering each subtest. Below is a description of each subtest and its reliability.

**Body mass index (body composition).** The FITNESSGRAM® offered several methods of measuring body composition. Some of these included skin-fold measures, body mass index (BMI), and bioelectrical impedance. Although not considered the most accurate method, body mass index was used for this section of the physical fitness study because it is less invasive and requires less equipment. Each of the body composition
tests has a measurement error of about 2-3%. BMI is measured by using a formula based on the participant’s height and weight. Correlations between BMI and percentage of body fat reported in the literature range from .70 to .82 for adults (Lohman, 1992). Students in the 7th and 8th grade to be within the FITNESSGRAM’s® HFZ should have BMI scores that fall between 15.1 and 24.5 for males and 15.9 and 25.0 for girls (Going, Lohman, & Falls, 2008).

**One-mile run (aerobic capacity).** Aerobic capacity is an important aspect of physical fitness. It is a measure of the body’s ability to perform strenuous exercise for an extended amount of time. The FITNESSGRAM® offers three different aerobic capacity tests: the PACER, the one-mile run, and the walk test (Cureton & Plowman, 2008). For this study, the one-mile run test was administered. A study conducted in 1991 yielded high interclass reliability results ($r = .93$) for students in the eighth grade (Bono, 1991). Cureton and Warren (1990) found reasonable validity results in their 1990 study of 578 children between the ages of 7 and 14. Times were measured to the nearest second using stopwatches.

The test was administered on a quarter-mile track. Students were allowed to wear comfortable clothing of their own choosing. The physical education teachers guided the students through a series of stretches before starting the run to ensure that students were loose and to prevent cramping and injuries. The test was administered by three physical education teachers. Each evaluator observed and kept times for five students; fifteen students were assessed at one time. For males to be within the HFZ on the 1-mile run, they must have run times between 7:30 and 9:30; females should have run times between 8:30 and 11:30 (Welk & Meredith, 2008).
**Curl-ups (abdominal strength).** Abdominal strength is an important aspect of overall health and physical fitness. Abdominal strength was assessed using the Cadence curl-up test in which participants flex their knees 140° and place their feet flat on the ground. A measuring strip is placed under the knees at the edge of the participants’ extended fingers. The participants keep their hands stretched out at their sides with palms down. As the participants curl up, they slide their hands all the way across the strip; this constitutes one repetition. The PE teacher holds each participant’s feet and keeps a count of the number of correctly performed curl-ups. This is an un-timed test in order to assure students do not reach fatigue too early and that each repetition is performed correctly. A study conducted in 1997 revealed moderately high reliability (R = .70) for the curl-up test for children ranging from 6 to 10 years old (Anderson, Zang, Rudisil, & Gaa 1997). There are few tests that measure the validity of the curl-up test; however, it is still highly regarded as an accurate test of abdominal strength due to anatomical analyses and through electromyography studies. For 7th and 8th grade males to be within the healthy HFZ, they must complete between 21-45 curl-ups; 7th and 8th grade females must be able to complete 18-32 curl-ups (Welk & Meredith, 2008).

**Trunk-lift (flexibility).** The trunk extensor test was developed to assess participants’ trunk strength, extension, and flexibility. In this test, participants lay flat on the ground with arms extended down each side; they lift their upper bodies as far off the ground as possible using only the back muscles. The maximum score for this test is 12 inches. Studies have shown that the trunk extensor test can predict initial and chronic back pain (Plowman, 1992). The trunk extensor has been found to be a reliable single measure test for both male and female subjects (r = .998) (Hannibal, Plowman, Looney,
Low-back health is an important aspect of healthy living. To be within the HFZ for this subtest, 7th and 8th grade males must lift up at least 9 to 12 inches while 7th and 8th grade females must lift up at least 9 to 12 inches as well (Welk & Meredith, 2008).

90° push-up (upper body strength). The 90° push-up assesses upper body strength, which includes the muscles in the upper back, chest, shoulders, and arms. This is an un-timed test. The object is to perform as many push-ups as possible. Participants lay flat on the ground at start, hands placed flat and palm-down slightly wider than shoulder width apart. Participants push off the floor until their arms are straight; then lower their bodies until their elbows are at a 90° angle. This movement is repeated as many times as possible. Participants must keep their backs and legs straight. Every participant was observed by the trained physical education teacher. The 90° push-up has been found to be a very reliable measure of upper body strength when performed properly. A study in 2001 revealed reliability measures of .99 for male and .91 for female subjects (Saint Romain & Mahar, 2001). Validity measures are mixed; there is need for further research on teens. For 7th and 8th grade males to fall within the HFZ, they must complete between 12 and 30 push-ups. For 7th and 8th grade females to fall within the HFZ, they must complete 7 and 15 push-ups (Welk & Meredith, 2008).

Back saver sit and reach (flexibility). Flexibility is an essential element of healthy living. Lack of flexibility is commonly attributed to sedentary habits. The back-saver sit and reach was developed to measure flexibility of the hamstrings and lower back. As with the traditional sit and reach test, students are assessed one leg at a time. Assessing one leg at a time helps prevent participants from hyper-extending the knees.
Assessing one side at a time also helps measure each hamstring individually. The back-saver sit and reach has yielded high interclass reliability correlations as much as .99 (Gilbert & Plowman, 1993). Students were given two opportunities for each side. Students were allowed to stretch and move around for several minutes before their first attempts. They made their second attempt at their own pace. For 7th and 8th grade males to fall within the HFZ, they must reach at least 8 inches; 7th and 8th grade females must reach at least 10 inches (Welk & Meredith, 2008).

All subtests were conducted according to the FITNESSGRAM®/Activitygram® test administration manual. Students were encouraged to give their best effort on every subtest. Students were monitored at all times by trained physical education teachers to ensure proper technique and procedures.

**Procedures**

**Preliminary Procedures**

Institutional Review Board approval from Liberty University was obtained before the research began. Before collecting data, the researcher attained permission from the Northern Middle School principal in order to attain support and cooperation. Parental permission was not deemed necessary since archival data was used and none of the students’ names were available to the researcher; fitness testing is already part of the school’s testing protocol since the Mississippi Department of Education recommends fitness testing of middle school students (Mississippi Department of Education, 2010b). Only the gender, grade, physical activity class, and fitness scores from the FITNESSGRAM® physical fitness instrument were attained from the school’s physical education department.
Data Collection Procedures

All data was collected at the conclusion of the 2010–2011 school year. To maintain anonymity, the guidance counselor and the physical education department chairman and PE faculty worked together and assigned each child a number. Next, they filled out the score sheets (see Appendix A) that included each child’s number, gender, fitness scores, grade, and physical activity choice. The physical education chair gave this data to the researcher; however, students’ names were not included. Students were identified by number only at all times. Much effort was taken in order to protect student privacy.

All physical fitness tests were administered by the physical education department, which includes three certified physical education teachers and one trained physical education assistant. The fitness tests were given according to the guidelines set forth in the FITNESSGRAM® administration manual.

Research Question

The following research question guided the study: will there be significant differences in the seventh and eighth graders’ overall physical fitness scores based on their choice of enrollment in show choir, marching band, athletics, or physical education?

Null Hypotheses

$H_0 \ 1$

There will not be statistically significant differences in linear combinations of the dependent variables based on middle school students’ enrollment in physical activities.
$H_2$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in Body Mass Index (BMI) on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

$H_3$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the 1-mile run time on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

$H_4$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of push-ups on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

$H_5$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of curl-ups on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

$H_6$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the trunk-lift measurements on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

$H_7$  
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the left side back-saver sit and reach measurements on the
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the right side back-saver sit and reach measurements on the FITNESSGRAM physical fitness test for seventh and eighth grade students when controlling for gender.

**H₀ 8**

Data Analysis

The FITNESSGRAM® includes six subtests: Body Mass Index (BMI), push-ups, curl-ups, one-mile run, trunk lift, and the back saver sit and reach (left and right). All 529 students were administered the entire test. The students were categorized based on their physical fitness electives in which they were enrolled (show choir, marching band, PE, and athletics). These were the independent variables. The dependent variables were their performances on each subtest. The researcher used a MANCOVA analysis at the .05 significance level to analyze each of the four group’s performances on the six FITNESSGRAM® subtests. Based on calculations using a confidence interval of 95%, the sample size needed to be 384 students; the actual sample size included 529 middle school students. A MANCOVA was chosen to determine if significant differences existed in the physical fitness subtests among the four groups. The MANCOVA was chosen for its ability to allow the researcher to compare differences in means between two or more groups and its ability to control for covariates such as sex that affect the dependent variables. MANOVAs and MANCOVAs are useful in studies where at least some of the independent variables are manipulated. They are highly regarded for their ability to
measure several dependent variables which improves the chances of discovering which variable has the most influence. They are less susceptible to type one errors than if several ANOVAs were conducted (Tabachnick & Fiddell, 1996). SPSS 18 software was used to conduct all statistical calculations. A post hoc comparison was made using the Bonferroni correction \((\alpha/n)\). The desired significance level for the whole family of tests was .05, so the actual significance level for each test was \(.05/7 = .007\). SPSS 18 software will be used to conduct all statistical calculations.

**Summary**

This chapter reviewed the methods that were used by the researcher in this study to determine if differences existed among middle school students’ fitness scores based on their physical activity enrollment. The research questions and hypotheses were also discussed. A description of the testing instrument was also given.
CHAPTER FOUR: RESULTS

This chapter reviews the results of the MANCOVA analysis that was run using the FITNESSGRAM® subtests. The purpose of this study was to determine if significant differences in fitness scores existed among the four physical activity electives in order to determine the possible effects of enrollment in these classes on physical fitness. There is virtually no research that investigates the possible effects of enrollment in physical activity electives such as marching band and show choir on middle school students’ physical fitness.

Participants

The original sample consisted of $N = 529$ students in the seventh and eighth grades. After assessing the data for univariate and multivariate normality, four data points were removed. So that all statistics are computed on the same sample of participants, all descriptive statistics were computed on the final sample of $N = 525$ participants.

As can be seen in Table 5, the overall percentage of females was 42.5%, and the overall percentage of males was 57.5%. However, these percentages varied greatly when examining each of the four classes separately. In sum, larger percentages of females were enrolled in Marching Band (61.5%) and Show Choir (87.2%), whereas larger percentages of males were enrolled in Athletics (83.3%) and PE (70.8%). The chi-square test of independence indicated that the breakdown by biological sex differed significantly across the four classes, $\chi^2(3) = 168.44, p < .001$. Thus, it was important to control for sex in subsequent analyses.
Table 5

Percentages of Males and Females by Class (N = 525)

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>$\chi^2$(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletics</td>
<td>31 (16.7%)</td>
<td>155 (83.3%)</td>
<td>186</td>
<td>168.44***</td>
</tr>
<tr>
<td>Marching band</td>
<td>48 (61.5%)</td>
<td>30 (38.5%)</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>42 (29.2%)</td>
<td>102 (70.8%)</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Show choir</td>
<td>102 (87.2%)</td>
<td>15 (12.8%)</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>223 (42.5%)</td>
<td>302 (57.5%)</td>
<td>525</td>
<td></td>
</tr>
</tbody>
</table>

***$p<.001$.

Table 6 presents descriptive statistics for each of the dependent variables including the skewness and kurtosis values for each variable. Skewness and kurtosis values of zero are indicative of a normal distribution, and values between -2 and +2 are usually considered to signify no problematic deviations from normality, although some researchers prefer to use values between -1 and +1 as indicators of acceptable normality, and some prefer even more stringent values (Balanda & MacGillivray, 1988; De Carlo, 1997; Groeneveld & Meeden, 1984; Hopkins & Weeks, 1990; Kendall, Stuart, Ord, & Arnold, 1999). All measures of skewness and kurtosis were between the values of -2 and +2, and all of them except for BMI were between -1 and +1.

Because the metric of the variables was meaningful in this study, a data transformation to correct for deviations from normality was not preferable as it would change the metric so that it would no longer be meaningful. However, to explore whether the deviation from normality for the BMI variable had an effect on the results, BMI was transformed using the natural log transformation. After transformation, the skewness and kurtosis values were between -1 and +1, and the variable’s distribution appeared more
normal. The MANCOVA was then computed first using the original BMI variable and then again using the transformed BMI variable. The conclusions remained unaffected. Therefore, the BMI variable was kept in its original raw score form so that the metric would retain its meaning.

Table 6

*Descriptive Statistics for Seven Dependent Variables (N = 525)*

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>23.04</td>
<td>5.53</td>
<td>15 – 45</td>
<td>1.16</td>
<td>1.20</td>
</tr>
<tr>
<td>Mile/sec</td>
<td>707.89</td>
<td>161.06</td>
<td>404 – 1260</td>
<td>0.50</td>
<td>-0.18</td>
</tr>
<tr>
<td>Push-ups</td>
<td>22.72</td>
<td>13.83</td>
<td>0 – 70</td>
<td>0.65</td>
<td>0.14</td>
</tr>
<tr>
<td>Curl-ups</td>
<td>50.70</td>
<td>24.94</td>
<td>0 – 140</td>
<td>0.32</td>
<td>-0.62</td>
</tr>
<tr>
<td>Trunk</td>
<td>9.49</td>
<td>1.98</td>
<td>4 – 13</td>
<td>-0.39</td>
<td>-0.69</td>
</tr>
<tr>
<td>Back L</td>
<td>9.25</td>
<td>2.88</td>
<td>1 – 18</td>
<td>-0.40</td>
<td>0.10</td>
</tr>
<tr>
<td>Back R</td>
<td>9.25</td>
<td>3.00</td>
<td>0 – 17</td>
<td>-0.41</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Table 7 presents descriptive statistics (means and standard deviations) for the seven dependent variables for the four classes separately as well as for the total sample.
Table 7

Descriptive Statistics for Seven Dependent Variables by Class (N = 525)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Athletics (n = 186) M (SD)</th>
<th>Marching band (n = 78) M (SD)</th>
<th>Physical education (n = 144) M (SD)</th>
<th>Show choir (n = 117) M (SD)</th>
<th>Total (n = 525) M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>23.19 (5.30)</td>
<td>23.62 (5.79)</td>
<td>22.05 (4.76)</td>
<td>23.65 (6.44)</td>
<td>23.04 (5.53)</td>
</tr>
<tr>
<td>Mile/sec</td>
<td>599.47 (108.00)</td>
<td>729.46 (153.12)</td>
<td>748.42 (139.02)</td>
<td>815.97 (161.90)</td>
<td>707.89 (161.06)</td>
</tr>
<tr>
<td>Curl-ups</td>
<td>60.16 (23.71)</td>
<td>34.03 (18.97)</td>
<td>55.17 (22.65)</td>
<td>41.27 (24.43)</td>
<td>50.70 (24.94)</td>
</tr>
<tr>
<td>Trunk</td>
<td>9.89 (1.97)</td>
<td>9.90 (1.66)</td>
<td>8.88 (2.05)</td>
<td>9.35 (1.93)</td>
<td>9.49 (1.98)</td>
</tr>
<tr>
<td>Back L</td>
<td>10.73 (2.00)</td>
<td>7.12 (2.91)</td>
<td>8.76 (2.93)</td>
<td>8.95 (2.81)</td>
<td>9.25 (2.88)</td>
</tr>
<tr>
<td>Back R</td>
<td>10.92 (1.90)</td>
<td>6.90 (3.00)</td>
<td>8.71 (3.13)</td>
<td>8.83 (2.83)</td>
<td>9.25 (3.00)</td>
</tr>
</tbody>
</table>

To test the seven hypotheses, a multivariate analysis of covariance (MANCOVA) was computed to compare mean scores on the seven dependent variables (BMI, mile run, push-ups, curl-ups, trunk, back left, and back right) simultaneously across the four classes (Athletics, Marching Band, PE, and Show Choir) while controlling for biological sex (coded 0 = female, 1 = male). Because the breakdown by sex varied so greatly across the different classes, it was important to include sex as a covariate in the analysis.

Before computing the MANCOVA, the seven dependent variables were assessed for multivariate normality by computing Mahalanobis’ distance on the seven variables. The critical value for seven variables using the conventional significance level for Mahalanobis’ distance of $p < .001$ was 24.32. There were four values that were greater than the critical value: one in the Athletics group, two in the Marching Band group, and
one in the PE group. Therefore, those four participants were removed, thus reducing the original sample size of \( N = 529 \) to the final sample size of \( N = 525 \). Correlations among the dependent variables were found to be acceptable. There were some assumptions violations for homogeneity of variance covariance matrix according to the Box M test (\( F = 3.39, M = 292.72, p < .000 \)). However, this test should be interpreted cautiously because it is a highly sensitive test of the violation of the multivariate normality assumption, especially studies with large sample sizes. Due to large sample size (\( N = 525 \)), the analysis is still robust even though assumptions are violated (Tabachnick & Fidell, 1983). Also, according to Olson (1976), Pillai’s Trace is the most robust criteria for violations of assumptions regarding the variance co-variance matrix. Pillai’s Trace for the group was \( F = 18.76 \), which is significant at the \( p < .001 \) level. Further discussion of the dependent variables will be covered later in this chapter.

There were also assumption violations for several dependent variables \( F (3, 525) \) \( p < .05 \) for BMI, 1-mile run, push-ups, and back saver right on the Levene’s test of homogeneity of variance. However, the MANCOVA/MANOVA is also very robust to these assumptions as well. When violations regarding homogeneity of variance occur, it is recommended to use more conservative critical alpha levels such as .025 or .01 rather than the usual .05 level (Tabachnick & Fidell, 1983). According to results from the Wilk’s Lambda test, all dependent variables were significant at the \( p < .001 \) level except for BMI (\( p < .05 \)). Furthermore, the Levene’s test can be too conservative and is sensitive in studies with unequal group sizes. Tabachnick and Fiddell (2001) suggested using the \( F_{\text{max}} \) test to determine homogeneity of variance among the groups as long as group sizes are not more than a 4:1 ratio. Upon conducting the \( F_{\text{max}} \) test, group variances
were found to be homogenous. Further discussion of the significance levels of each dependent variable will be later in this chapter.

The covariate and dependent variables were found to be linear, but correlations among the BMI and back saver dependent variables were somewhat low. Small correlations among the covariate and dependent variables may lead to reduced power; however, it also leads to more conservative findings (Tabachnick & Fiddell, 1996). Gender differences in regards to BMI and the back saver dependent variables are most likely due to natural growth and development. Chances of a type II error are low due to significant findings among all dependent variables; six were at the .01 level and one, BMI, was significant at the .05 level. Furthermore, after post hoc testing, six dependent variables were significant at the .001 level; only BMI did not yield significant differences among the dependent variables.

The overall effect of class was significant; Wilk’s lambda was 0.48, $F(211,476.48) = 20.28, p < .001$, with an effect size (partial eta squared) of $\eta^2_p = 0.22$. Table 8 presents the estimated marginal means ($M$) and standard errors ($SE$) of each dependent variable by class. Estimated marginal means represent the mean of each group adjusted by the covariate of biological sex so that the differences in the means can be assessed while holding sex constant (here, sex was held constant at a value of 0.58). Thus, when the estimated marginal means were compared to the actual measured means from Table 7, some differences were noted.

Table 8 also presents the $F$ statistics from the between-subjects effects for each of the seven dependent variables used in the MANCOVA. As can be seen in Table 8, the MANCOVA indicated that each dependent variable differed by class. BMI showed
differences at the $p < .05$ level, whereas the other six dependent variables showed
differences at the $p < .001$ level. These significant $F$ statistics indicate that there exists at
least one significant difference between means for the four classes for that variable. To
determine specifically which means were significantly different from which other means,
post hoc comparisons were computed.

Table 8

_Estimated Marginal Means and MANCOVA Results across Classes for Seven Dependent
Variables Controlling for Sex (N = 525)_

<table>
<thead>
<tr>
<th>Variable</th>
<th>Athletics ($n = 186$) M (SE)</th>
<th>Marching band ($n = 78$) M (SE)</th>
<th>Physical education ($n = 144$) M (SE)</th>
<th>Show choir ($n = 117$) M (SE)</th>
<th>$F(3, 520)$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>23.03 (0.43)</td>
<td>23.73 (0.63)</td>
<td>21.97 (0.47)</td>
<td>23.93 (0.57)</td>
<td>2.73*</td>
<td>.02</td>
</tr>
<tr>
<td>Mile/sec</td>
<td>603.41 (10.73)</td>
<td>726.56 (15.75)</td>
<td>750.45 (11.58)</td>
<td>809.15 (14.26)</td>
<td>49.32***</td>
<td>.22</td>
</tr>
<tr>
<td>Push-ups</td>
<td>26.61 (0.91)</td>
<td>17.99 (1.33)</td>
<td>25.01 (0.98)</td>
<td>16.87 (1.20)</td>
<td>16.03***</td>
<td>.08</td>
</tr>
<tr>
<td>Curl-ups</td>
<td>54.67 (1.66)</td>
<td>38.08 (2.44)</td>
<td>52.34 (1.80)</td>
<td>50.79 (2.21)</td>
<td>10.67***</td>
<td>.06</td>
</tr>
<tr>
<td>Trunk</td>
<td>10.31 (0.14)</td>
<td>9.59 (0.21)</td>
<td>9.09 (0.15)</td>
<td>8.63 (0.19)</td>
<td>19.14***</td>
<td>.10</td>
</tr>
<tr>
<td>Back L</td>
<td>11.23 (0.19)</td>
<td>6.74 (0.28)</td>
<td>9.02 (0.21)</td>
<td>8.07 (0.26)</td>
<td>60.09***</td>
<td>.26</td>
</tr>
<tr>
<td>Back R</td>
<td>11.46 (0.20)</td>
<td>6.50 (0.29)</td>
<td>8.99 (0.21)</td>
<td>7.89 (0.26)</td>
<td>72.07***</td>
<td>.29</td>
</tr>
</tbody>
</table>

* $p < .05$. *** $p < .001$. 

**Tests of Hypotheses**

Post hoc pairwise comparisons with Bonferroni correction were computed to
assess which groups differed from which other groups and were used to counteract the
problem of multiple comparisons. The Bonferroni correction tests each of the individual
tests at a significance level of $\alpha/n$. For this analysis, the significance level was $0.05/4 =$
The Bonferroni is a conservative test that controls for the chances of false positives, thereby reducing the chance of a Type I error. It is often used in conjunction with analysis such as MANOVAS and MANCOVAS (Dunn, 1961).

The results of null hypotheses are as follows:

H₀ 1

There will not be statistically significant differences in linear combinations of the dependent variables based on middle school students enrollment in physical activities.

Results of H₀ 1.

The overall MANCOVA was significant indicating there were significant differences among all of the dependent variables.

H₀ 2

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in Body Mass Index (BMI) on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

Results of H₀ 2.

After applying the Bonferroni correction, there were no significant differences in BMI. Post hoc power was high (.99).

H₀ 3

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in the 1-mile run time on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.
Results of \( H_0 3 \).

For the mile run, the Athletics group had a significantly faster mean time than each of the three other groups (all \( p \) values < .001) and Show Choir had a significantly slower mean time than Athletics, Marching Band (both \( p \) values < .001), and PE (\( p < .05 \)). PE and Marching Band did not differ significantly from each other in the mile run.

\( H_0 4 \)

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of push-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

Results of \( H_0 4 \).

The Athletics group did significantly more push-ups than Marching Band and Show Choir (\( p \) values < .001), and the PE group did significantly more push-ups than Marching Band and Show Choir (\( p \) values < .001), but Athletics did not differ from PE, and Marching Band did not differ from Show Choir with regard to push-ups.

\( H_0 5 \)

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in number of curl-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

Results of \( H_0 5 \).

For curl-ups, Marching Band did significantly fewer curl-ups than the other three groups (all \( p \) values < .001), but the other groups did not differ from each other.
H₀ 6

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in the trunk-lift measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

Results of H₀ 6.

Athletics had significantly higher trunk scores than Marching Band ($p < .05$), PE ($p < .001$), and Show Choir ($p < .001$). Show Choir had significantly lower trunk scores than Athletics ($p < .001$) and Marching Band ($p < .01$). PE did not differ from Show Choir or Marching Band in trunk scores.

H₀ 7

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in the left side back-saver sit and reach measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

Results of H₀ 7.

For back left, Athletics had significantly higher scores than the other three groups (all $p$ values < .001). Marching Band had significantly lower back left scores than PE ($p < .001$) and Show Choir ($p < .01$). PE had significantly higher back left scores than Show Choir ($p < .05$).

H₀ 8

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Show Choir) in the right side back-saver sit and reach measurements on
the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

**Results of H₀ 8.**

For back right, Athletics had significantly higher scores than the other three groups (all $p$ values < .001). Marching Band had significantly lower back right scores than the other three groups (all $p$ values < .001). Show Choir had significantly lower back right scores than PE ($p < .05$).

**Summary**

This chapter gave the results of the statistical analysis used in this study. Based on the results of the MANCOVA, there were significant differences found across the groups on six of the seven null hypotheses. Chapter five includes a summary of the results, a discussion of the findings and the implications in relevance to the current literature, an outline of the study, the limitations of the study, and recommendations for further research.
CHAPTER FIVE: DISCUSSION

With the full adoption of the Common Core standards to be implemented over the next few years, school reform has become a major topic among school boards across America. School leaders have become increasingly data-driven and have begun to rely more on the latest research findings. Over the years, there has been an abundance of evidence that reveals a correlation between physical activity, physical fitness, and academic achievement (Castelli, 2007; Coe, 2006; Davis et al., 2007; Hillman, 2005; Sallis, 1999; Tomporowski, 2003). Increased fitness and physical activity have also been shown to improve students’ cognition (Tomporowski, 2003), achievement (Coe, 2006), self-esteem (Grim & Pazmin-Cevallos, 2008) and more.

Across America, many school districts have taken note of these findings and initiated mandatory physical education courses in many grades. Several years ago, Mississippi made physical education a mandatory course for grades K through 12. Students in grades K through 8 are required to have at least 150 minutes of physical activity and 45 minutes of health instruction per week. In addition, any activity that is sanctioned by the Mississippi High School Activities Association (2010) can be counted as a PE credit. Courses such as show choir and marching band fall under these sanctions. However, there is little or no mention of physical activity or health in the curricula for those electives (Bennett, 2003). The purpose of this study was to evaluate the fitness levels of the students in these elective courses as well as students in PE and athletics to determine if significant differences in fitness levels existed among these students based
on their activity choices. The following research question was asked, and the seven hypotheses were analyzed in this study.

**Research Question**

Will there be significant differences in the FITNESSGRAM® subtests performances of seventh- and eighth-grade students based on their enrollment in show choir, marching band, athletics, or physical education?

**Null Hypotheses**

**H₀₁**

There will not be statistically significant differences in linear combinations of the dependent variables based on middle school students’ enrollment in physical activities.

**H₀₂**

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of push-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

**H₀₃**

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in number of curl-ups on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

**H₀₄**

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the 1-mile run times on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.
There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the trunk-lift measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the left side back-saver sit and reach measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in the right side back-saver sit and reach measurements on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

There will not be significant differences across classes (i.e., Athletics, Marching Band, PE, and Slow Choir) in Body Mass Index (BMI) on the FITNESSGRAM® physical fitness test for seventh and eighth grade students when controlling for gender.

**Summary of the Findings**

After applying the Bonferroni correction, there were no significant differences in BMI. For the mile run, the Athletics group had a significantly faster mean time than each of the three other groups (all \( ps < .001 \)), and Slow Choir had a significantly slower mean time than Athletics, Marching Band (both \( ps < .001 \)), and PE (\( p < .05 \)). PE and Marching
Band did not differ significantly from each other in the mile run. The Athletics group did significantly more push-ups than Marching Band and Show Choir ($p < .001$), and the PE group did significantly more push-ups than Marching Band and Slow Choir ($p < .001$). However, Athletics did not differ from PE, and Marching Band did not differ from Show Choir with regard to push-ups. In the curl-ups test, Marching Band did significantly fewer curl-ups than the other three groups (all $p < .001$), but the other groups did not differ from each other. The athletes had significantly higher trunk-lift scores than Marching Band ($p < .05$), PE ($p < .001$), and Show Choir ($p < .001$). Show Choir had significantly lower trunk-lift scores than Athletics ($p < .001$) and Marching Band ($p < .01$). PE did not differ from Show Choir or Marching Band in trunk-lift scores. For back saver left, the Athletes had significantly higher scores than the other three groups (all $p < .001$). Marching Band had significantly lower back saver left scores than PE ($p < .001$) and Show Choir ($p < .01$). PE had significantly higher back saver left scores than Show Choir ($p < .05$). For back saver right, the athletes had significantly higher scores than the other three groups (all $p < .001$). Marching Band had significantly lower back saver right scores than the other three groups (all $p < .001$). Show Choir had significantly lower back saver right scores than PE ($p < .05$).

**Discussion of Results**

**Results of $H_{01}$: Rejected**

The results of the MANCOVA revealed that significant differences were found among the dependent variables. Thus, further testing was warranted.
Results of H0 2: Retained

Although PE group had the lowest BMI scores, there were no other significant differences in BMI among the groups. Based on the results, there was not enough evidence to reject the null hypothesis. Physical education students had an average BMI of 21.97, which is well within the acceptable range in the FITNESSGRAM® Healthy Fitness Zone. The students in the population are between the ages of thirteen and fourteen years of age. According to the FITNESSGRAM’s ® standards, a females’ BMI for this age group should be between 15.9 and 25, while the males’ BMI should be between 15.1 and 24.5 (Cooper Institute for Aerobic Research, 2008, p. 19). It is encouraging to note that all four group’s averages fell within these ranges, but it is important to note that the PE student’s yielded the best results. A majority of the PE students fell below the 75th percentile for BMI set by the CDC (2009). One thing that should be taken into consideration is that many of the male athletes were also football players. Football players lift weights the entire school-year, thus the higher BMI averages. Show choir’s BMI average was 23.93, which still within the Healthy Fitness Zone, but very close to the unhealthy overweight status. Marching Band students had the worst BMI average of 23.73.

According to the CDC’s BMI growth chart for children and adolescents between the ages of two and twenty years, students whose BMI falls above the 85th percentile are considered overweight, and students who are above the 95th percentile are considered obese (CDC, 2009). Obesity is a major issue among children and adolescents in today’s society. Mississippi leads the nation in child and adolescent obesity (MSDOE-OHS, 2009). One disturbing fact is that 32% of the students in this study were either
overweight or obese. This is higher than the national average of 31.7% for this age group (National Conference of State Legislatures, 2010), although it is lower than the state average of 40% (MSDOE-OHS, 2009).

**Results of H₀ 3: Rejected**

The athletic group had the best run times that averaged 603.41 seconds or around 10:05. Marching Band was a distant second with an average of around 12:11, and PE was third with an average of about 12:50. These were disappointing times for both groups (Marching Band and PE). However, show choir had the worst run times with an average of 13:49. This is a possible indication that more emphasis needs to be placed on aerobic capacity in all three courses. The middle school PE curriculum set forth by the Mississippi Department of Education (2006) places much emphasis on activity-based instruction. Activity-based instruction incorporates moderate vigorous physical activity into fun and engaging activities such as flag football, soccer, kick ball, and many other activities that are fun for youth. However, neither the show choir nor marching band curriculums place any emphasis on aerobic capacity (Bennett, 2003). Aerobic capacity is a vital aspect of overall health and fitness. Students who are not in adequate aerobic condition are in danger of acquiring health related issues such as high blood pressure, heart problems, weight issues, and others. They are also likely to carry these issues into adulthood (CDC, 2009).

**Results of H₀ 4: Rejected**

The Athletics group average number of push-ups was 26.61, which were significantly more than Marching Band (17.99) and Show Choir (16.87). The PE group’s average was also significantly higher than Marching Band and Show Choir with an
average of 25.01. Upper body strength is an important aspect of fitness. Students who participate in athletics at Northern Middle School spend a majority of their off-season in the weight room; their coaches also place much emphasis on stretching and calisthenics the entire school year. Students who are enrolled in PE also receive an adequate amount of daily exercise and stretches such as push-ups and sit-ups. The physical education curriculum adopted by the Mississippi Department of Education (2006) places much emphasis in these areas. Students at Northern Middle School spend the first ten minutes of PE every day on basic stretches and calisthenics. The curriculums that show choir and marching band utilizes does not place emphasis on calisthenics or stretching (Bennett, 2003).

**Results of H₀ 5: Rejected**

For curl-ups, Marching Band did significantly fewer curl-ups than the other three groups (all ps < .001), but the other groups did not differ from each other. Athletics, PE, and Show Choir yielded averages of 54.67, 52.34, and 50.79 respectively. These are encouraging statistics which are all within the FITNESSGRAM’s® healthy fitness zones for children in these age brackets. Abdominal strength is an important aspect of health and fitness. Abdominal strength and endurance is important for maintaining posture and proper function and development of the back (Cooper Institute for Aerobics Research, 1992, p. 41). Marching band’s poor performance in this area could be an indication that more emphasis needs to be placed on abdominal strength and condition.

**Results of H₀ 6: Rejected**

Athletics had significantly higher trunk scores (10.31) than Marching Band (9.59), PE (9.09), and Show Choir (8.63). Show Choir had significantly lower trunk-lift
scores than Athletics ($p < .001$) and Marching Band ($p < .01$). PE did not differ from Show Choir or Marching Band in trunk-lift scores. The trunk lift test is an indication of low back strength, an important aspect of overall health and fitness. Back strength is an important aspect of correct posture, which can reduce future incidents of low back pain (Cooper Institute for Aerobic Research, 2008, p. 20). Poor performance on this test is a possible indication that more emphasis needs to be placed on back strength and flexibility. Although the marching band and PE classes were significantly lower than athletics, their averages were still within the FITNESSGRAM’s® healthy fitness zone for the trunk lift test. However, show choir did not meet the healthy fitness zone standards.

**Results of $H_0 7$: Rejected**

For back saver left, Athletics (11.23) had significantly higher scores than the other three groups (all $ps < .001$). Marching Band had significantly lower back saver left scores (6.74) than PE (9.02) ($p < .001$) and Show Choir (8.07) ($p < .01$). PE had significantly higher back saver left scores than Show Choir ($p < .05$). The back saver sit and reach is a reliable indication of flexibility. Although most adolescents do not have a problem in this area, it is important for students to know that flexibility is an important area of need as they get older (Cooper Institute for Aerobic Research, 2008, p. 26). Low scores among the marching band and show choir are a possible indication that more emphasis needs to be placed in this area.

**Results of $H_0 8$: Rejected**

For back saver right, Athletics (11.46) had significantly higher scores than the other three groups (all $ps < .001$). Marching Band had significantly lower back saver right scores (6.50) than the other three groups (all $ps < .001$). Show Choir had
significantly lower back saver right scores (7.89) than PE (8.99) \( p < .05 \). Again, poor performances in these areas could be an indication that more emphasis needs to be placed on flexibility in these classes.

**Group Assessments**

**Athletics**

Overall, the athletics group out-performed the other three groups on six out of the seven subtests. The percentage of athletes who scored within the healthy fitness zone of the FITNESSGRAM® were as follows: 1-mile (68%), push-ups (96%), curl-ups (97%), trunk lift (75%), back saver left (93%), and back saver right (93%). Although the Mississippi Department of Education has not adopted a physical fitness curriculum that is specific to athletics, many athletic programs already incorporate health and fitness-related aspects in their daily routine in regards to aerobic capacity, muscular strength, and flexibility.

**Physical Education**

Although the PE group only had the best results on the BMI assessment, they did perform very well on six out of the seven subtests. They were significantly outperformed by the athletes on several subtests (trunk-lift, back saver left, and back saver right). However, the PE students fell within the healthy fitness zone at a high percentage on the push-ups (92%), curl-up (98%), back saver left (68%), and back saver right (63%). The one-mile run is the only test in which they performed poorly; only 35% scored within the healthy fitness zone. Much of their success could be attributed to the PE curriculum’s emphasis on activity-based instruction and the daily emphasis placed on stretching and
calisthenics at Northern Middle School. Poor performances on the 1-mile run could be an indication that more emphasis needs to be placed on aerobic capacity.

**Show Choir**

The Show Choir group performed significantly lower than one or more of the other groups on five of the seven subtests (1-mile, push-ups, trunk-lift, and back saver left and right). Also, the Show Choir group’s means were below the FITNESSGRAM’s® minimum standards on the 1-mile run, the trunk lift, and the back saver sit and reach (left and right). Poor performances on the trunk lift and back saver sit and reach could be an indication that emphasis needs to be placed on core strength and flexibility. The group’s poor performance on the 1-mile run could also be an indication that time needs to be spent on aerobic capacity. The group’s BMI (23.93) scores were marginal and dangerously close to the overweight category. Lastly, only a small percentage of the show choir students fell within the healthy fitness zones for back saver left (49%), back saver right (46%), and the mile run (24%). Based on evidence from this study, show choir student may benefit from increased time spent in a variety of areas of physical fitness.

**Marching Band**

The Marching Band group had significantly lower performances than one or more of the other groups on all of the subtests except BMI. The Marching Band group underperformed on the 1-mile run and the back saver sit and reach (left and right). Poor performances in these areas could be an indication that students in marching band could benefit from instruction in the areas of aerobic capacity and flexibility. The group’s BMI scores (23.73) were dangerously close to the overweight category. Also, a majority of the
band students did not fall within the healthy fitness zones for the mile run (61%), the back saver left (73%), and back saver right (75%). These results indicate that marching band students may benefit from increased time spent on fitness objectives.

**Study Limitations and Cautionary Efforts**

Some limitations to consider involving this study are differences in programming among such physical activity electives such as PE, show choir, and marching band may not be consistent with practices utilized at Northern Middle School even though all schools in Mississippi utilize the same curriculum. Although the population of Northern Middle School is very similar to most districts in Mississippi, the population may not be representative of all districts across the United States; similar testing on a state and national level would be beneficial.

To reduce error, all weight measurements of students were carried out by two trained PE professionals on a calibrated scale. Although BMI was a reliable option for researchers, body-fat composition using skin-fold measures may be a more reliable option; however, testing must be conducted by a seasoned trained technician (Mueller & Nichols, 2009). A statewide body-fat analysis would yield accurate results that would give educational and political leaders better data to develop programs to combat obesity, as Mississippi leads the nation in both childhood and adult obesity (Cottrell, 2010).

Some of the students may participate in activities outside of school. It is uncertain if participation in these activities had an effect on testing results.

Studies have shown that BMI may not be the best indicator of body fat among children and adults (CDC, 2009; Michigan State University, 2007). Therefore, it is recommended that a more precise method such as skin fold measures be used when
possible. BMI alone should never be used as a sole method for measuring overall health or fitness. It is better used in conjunction with a battery of other assessments (CDC, 2009).

Lastly, in order to increase reliability, all students were encouraged to give their best effort during testing by the school’s physical education faculty. However, there is a chance than some students did not put forth 100% effort.

Recommendations for Further Research

In order to best serve the physical fitness needs of students at all levels, further research is warranted to determine the best possible practices. The United States Department of Health and Human Services (2008) recommends at least 60 minutes of MVPA per day for children and adolescents. Although Northern Middle School provides 250 minutes of physical activity instruction per week, it is still well below the USHHS requirements. Also, the Mississippi Department of Education (2006) only requires the minimum of 150 minutes of physical activity instruction per week; this is half of the USDHHS recommendation. There appears to be a need for research that investigates the amount of time spent in physical activity electives and their impact on student health and fitness. Below are further recommendations for future research.

Suggested Qualitative Studies

The goal of education is to serve the needs of every child. Proper health and fitness begins at an early age. Schools must do their best to provide an adequate amount of physical activity instruction in order to improve their current health and to prepare them for the future. Physical activity electives such as show choir and marching band have not proven they can provide an adequate amount of MVPA in order for students to
benefit physically. Qualitative research by trained physical fitness professionals who can observe these electives and also interview stakeholders is warranted in order to make necessary changes to their curriculums. Further research at the elementary levels may be necessary to determine if students’ develop poor health habits prior to entering middle school. Such research can be used to prevent unhealthy practices before they even develop. Research on both the national and state level would be invaluable to educational leaders.

School officials need to become proactive in finding ways to make physical education more fun. Sports and calisthenics may not be a viable option for all students. Research that is geared toward finding additional physical activities that students enjoy would be a great way to encourage fitness. Some examples might be Zumba, spin classes, aerobics, or Wii Fit games. For example, Wilkinson and Bretzing (2011) found that 74% of girls in their study preferred fitness-related activities such as aerobics and dance over sports-related activities. It is important for educators to realize that all students are different and that schools must provide activities they can enjoy and carry into adulthood in order to maintain proper fitness.

**Suggested Quantitative Studies**

Physical activity courses such as the ones investigated in this study could benefit from several additional quantitative studies. Electives such as show choir and marching band could benefit from studies that investigate MVPA. Some examples might include using pedometers or heart rate monitors on students over a designated period of time. Traditional PE classes could also benefit from such studies, especially PE classes in Mississippi schools that only provide the minimum 150 minutes of physical activity
instruction per week. Such studies would be helpful on a national level in order to
determine if American youth are receiving an adequate amount of aerobic, strength,
flexibility, and overall physical fitness instruction.

Additional fitness testing studies from a larger population and from a wider age
range would be of great benefit to educational leaders. Studies that involve pre-test and
post-test fitness testing would be valuable to educational leaders and physical fitness
experts in designing and creating a physical activity curriculum.

The small town in which Northern Middle School is located has 23 fast-food
restaurants but only two grocery stores. A recent study ranked Mississippi as the
unhealthiest state in the union based on such data as the number of grocery stores per
1,000 residents (0.21), gallons of soft-drinks purchased per capita (82), and the fact that
Mississippi has the third highest level of food insecurity (Stockdale, McIntyre, & Sauter,
2011). Further research on food purchasing habits in economically depressed areas would
be helpful for government officials in making necessary improvements in the areas of
health and fitness in relation to dietary habits.

**Recommendations for Further Practice**

Below is a list of recommendations for stakeholders in Northern Middle School’s
district and for school districts in Mississippi.

Health and physical fitness standards need to be created and implemented into the
show choir, marching band, and athletic curriculums. Requiring 150 minutes of physical
activity instruction per week is useless if there are no standards for instructors to follow;
there has to be some accountability. Pre-test and post-test physical fitness testing that
requires all students to attain adequate yearly progress (AYP) in the areas of physical
fitness has become a necessary option for students in today’s society, especially in states such as Mississippi whose student overweight and obesity populations are above 40% (MSDOE-OHS, 2009). Although it may be an unpopular idea among parents and school officials, mandatory physical fitness remediation and summer school for students whose fitness scores do not meet AYP standards may become a viable option in order to improve overall health among student populations. Providing additional fitness interventions during the summer months could be a great way to help struggling students attain proper fitness levels.

Alternatively, if show choir, marching band, and athletic curricula are to remain unchanged, the possibility of requiring all middle school children to participate in the traditional PE programs in addition to participation in show choir, marching, band, and/or athletics may be a better option. Adequate physical fitness is too important to neglect, especially during the middle school years.

According to the United States Department of Health (2008), school-age children should engage in at least 60 minutes of moderate physical activity per day. Based on evidence from this research, the 150 minutes of required physical activity instruction per week is either not enough or not being met. It is recommended that school districts double this amount to 300 minutes per week to comply with United States Department of Health recommendations. Research has shown that daily MVPA declines sharply as student get older (NIH, 2008). Students at all levels must be given daily opportunities to play and exercise. Maintaining proper health and fitness during the child and adolescent years is a great way to make sure those healthy habits carry over into adulthood. It is
every educator’s responsibility to make sure all students are adequately prepared for the future.

School districts should place more emphasis on healthy eating habits and weight management at all levels. Also, schools should encourage assistance from parents and community stakeholders in these endeavors. Annual mandatory fitness testing should be administered for all grades with student reports sent home to parents. Also, annual standardized testing by grade based on that grades health objectives could be a useful way to make sure schools are covering the adopted health curriculum. School officials must realize that educating children is more than just reading, writing, and arithmetic. Maintaining proper health throughout the school years can help students academically as well as socially and behaviorally. Students who maintain proper weight are exposed to fewer social strains such as teasing and bullying (CDC, 2011a). Studies have also shown that students with healthy weight miss fewer days of school (Hitti, 2007), which in turn can have positive effects on achievement.

School district dieticians must strive to improve the quality of foods available in public school cafeterias. Schools must steer away from offering cheap fast-food options to students. Efforts must be made to research ways to incorporate healthier foods that students enjoy into the cafeteria menus. In many cases, school lunches may be the only meal that many students eat during the day, making proper nutrition even more important. Research that utilizes taste-testing of healthy food options over a large research sample would be valuable in finding healthy food options for students at all levels.
Research has shown that incorporating physical activity into the classroom can improve achievement, and it can also spark growth of dendrites and brain development (Jensen, 2008). School districts must provide professional development for teachers in order to train them to incorporate more engaging instruction that implements research-based best practices into the classroom.

Over the years, there has been increased interest in the brain and its functions in relation to many aspects of growth and development. A pioneer in this area of research, Jensen (2001) has developed a brain-based theory of learning. Brain-based learning involves utilizing all parts of the brain. A big part includes the use of movement in the classroom. Movement is a vital aspect of the way humans think. All humans enjoy interacting with each other through the use of movement and touch; we learn naturally by utilizing all five senses. The cerebellum plays an important role in cognitive processes such as attention, memory, and movement (Strick, 2009). Movement plays an important role in learning. When people move, even small movements such as standing, it cause synapses in the brain to fire. Movement even promotes the growth of dendrites in the brain (Tate, 2004). There is a great need for further research that investigates the role of physical activity and its relation to brain development. A better understanding in this area would be valuable to educational leaders in developing new physical activity courses. The information could also be used to develop best practices that will improve classroom instruction in all disciplines of education. Administrators could use this information to improve faculty and staff development; teachers could be trained in the latest methods of instructional practices.
Conclusion

This study investigated the possible effects of physical activity choice enrollment on middle school student’s overall physical fitness. The Mississippi Department of Education (2006) requires all middle schools to provide at least 150 minutes per week of physical activity instruction. Certain elective classes can be counted as physical activity electives in lieu of traditional PE as long as they are sanctioned by the Mississippi High School Activities Association. This study investigated three of these courses: show choir, marching band, and athletics as well as traditional PE. The sample included 529 middle school students who chose one of the four electives. Archival data from Northern Middle School in Mississippi was used. The data included physical fitness scores from the FITNESSGRAM® physical fitness test. The test included seven assessments: BMI, 1-mile run, curl-ups, push-ups, the back saver sit and reach (left and right), and the trunk lift. Overall, the athletics groups outperformed the other three groups on six of the seven sub-tests. The PE group was second and performed within the FITNESSGRAM’s® healthy fitness zone on five of the seven sub-tests. The show choir and marching band groups performed poorly on a majority of the sub-tests. Poor performances by the show choir and marching band groups could be a good indication that more emphasis needs to be placed health and physical fitness as part of their curriculums, schools might need to disallow these courses to be counted as physical activity electives.
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Welk, G. (2009). Cardiovascular fitness and body mass index are associated with academic achievement in schools. Dallas, TX: Cooper Institute.


APPENDIX A

Documentation Sheet

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APPENDIX B

Dissertation Timeline

- January 16: Defend Proposal
- March 1–April 30: Gather Data
- May 1–May 30: Complete Analyses
- June 1–30: Develop Chapter 4
- July 1–15: Chapter 4 revisions
- July 15–30: Develop Chapter 5
- August 1–30: Chapter 5 Revisions
- September 1–30: Total Revisions
- October 17: Defend Dissertation
APPENDIX C

Curl-Ups: FITNESSGRAM®

PHOTO 7.1 Starting position for the curl-up test.

PHOTO 7.2 Position of the student in the "up" position for the curl-up test.
APPENDIX D

90° Push-Up: FITNESSGRAM®

PHOTO 7.7  Starting position for the 90° push-up test.

PHOTO 7.8  Student in the “down” position for the 90° push-up test.
APPENDIX E

Back Saver Sit and Reach: FITNESSGRAM®

PHOTO 7.15 Starting position for measuring the right side.

PHOTO 7.16 Back-saver sit and reach stretch for the right side.
APPENDIX F

Trunk-Lift: FITNESSGRAM®