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# The Relationship between Middle Childhood Body Mass Index, Stress, Physical Activity, and Academic Achievement

Johnna Kellie Fox Thompson  
*Gardner-Webb University*

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The Relationship between Middle Childhood Body Mass Index, Stress, Physical Activity,  
and Academic Achievement

By  
Johnna Kellie Fox Thompson

A Dissertation Submitted to the  
Gardner-Webb University School of Education  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Education

Gardner-Webb University  
2013

## Approval Page

This dissertation was submitted by Johnna Kellie Fox Thompson under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Dennis Triplett, Ph.D.  
Committee Chair

---

Date

---

Jane King, Ed.D.  
Committee Member

---

Date

---

Scott Smith, Ed.D.  
Committee Member

---

Date

---

Jeffrey Rogers, Ph.D.  
Dean of the Gayle Bolt Price School  
of Graduate Studies

---

Date

## **Abstract**

The Relationship between Middle Childhood Body Mass Index, Stress, Physical Activity, and Academic Achievement. Thompson, Johnna Kellie Fox, 2013: Dissertation, Gardner-Webb University, Body Mass Index/Stress/Physical Activity/Academic Achievement

This study investigated the relationships between body mass index (BMI), stress, physical activity, and academic achievement among middle childhood students. The researcher used a mixed-methods research design. The general population for this study was composed of students at one of the district's intermediate schools.

The sample included 680 students from a small, suburban intermediate school (Grades 4 [N=231], 5 [N=218], and 6 [N=231], 337 males and 343 females). The school is located in a suburban area near a large city in the southeast. The students from the school described themselves as White (71%), African American (16%), Hispanic (7%), Asian/Pacific Islander (2%), Multi-Racial (4%), Economically Disadvantaged (39%), Limited English Proficient (2%), Students with Disabilities (17%), and Academically Gifted (26%).

Participants were weighed and measured to establish valid BMI. The physical education teacher took all of the measurements. Academic achievement was obtained using district benchmark test results and report card grades. Tardies, in-school suspensions, and out-of-school suspensions for the first quarter of the 2012-2013 school year were also used. Reading and math grades for the first 9-week grading period were collected by the school data manager. District benchmark data were collected by the assistant principal. Data from physical education classes measuring student stress and physical activity were collected and coded with each student's number by the physical education teacher. Data collection included interviews with teachers to determine teacher perceptions regarding childhood obesity, stress, physical activity, and the relationship these have with academic performance.

Based on BMI classifications for age and sex, nearly 40% were either classified as underweight (n=39), overweight (n=86), or obese (n=118). A significant correlation existed for academic achievement between BMI and language arts grades, math benchmarks, and science benchmarks (for fifth grade only). There was also a significant correlation between BMI and stress levels for students in fourth, fifth, and sixth grades. No other significant differences were discovered between BMI, academic performance, and physical activity levels.

## Table of Contents

	<b>Page</b>
Chapter 1: Introduction .....	1
Statement of the Problem .....	1
Background and Significance of the Problem .....	2
Purpose of the Study .....	2
Setting of the Study .....	3
Definitions of Terms .....	6
Chapter 2: Literature Review .....	8
Introduction .....	8
Research Questions .....	31
Chapter 3: Methodology .....	33
Introduction .....	33
Qualitative .....	34
Instruments .....	34
Data Analysis and Procedures .....	36
Research Questions .....	38
Limitations .....	39
Timeline and Anticipated Outcome .....	40
Chapter 4: Results .....	41
Introduction .....	41
Demographics Including Weight Status .....	41
Chapter 5: Discussion, Conclusions, Recommendations .....	58
Overview .....	58
Implications .....	65
Future Research .....	67
References .....	68
Appendices	
A BAM! Body and Mind-Head: Stress-O-Meter Quiz .....	75
B Motion Communication .....	78
C Interview and Focus Group Questions .....	80
Tables	
1 Weight Demographics .....	42
2 BMI and Reading Report Card Grades .....	44
3 BMI and Math Report Card Grades .....	44
4 BMI and Language Arts Benchmark Scores .....	45
5 BMI and Math Benchmark Scores .....	46
6 BMI and Science Benchmark Scores .....	47
7 Weight Groups and Tardies .....	48
8 Weight Groups and Absences .....	48
9 Weight Groups and Detentions .....	49
10 Weight Groups and Out-of-School Suspensions .....	50
11 Physical Activity Demographics .....	51
12 BMI and Physical Activity .....	51
13 Stress Demographics .....	52

14	BMI and Stress.....	53
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## **Chapter 1: Introduction**

The prevalence of overweight children in the United States has increased significantly over the past 50 years (Ogden et al., 2006). Fifteen percent of all children between the ages of 6 and 11 are overweight; some of this can be traced to advancing technology which has caused an increase in sedentary activities, as well as other environmental aspects of our current society. Weight gain has many adverse side effects on a person's psychological well-being (Berg, 2004). Self-esteem and body image are predominant struggles in overweight children as well as behavior and learning problems (Judge & Jahns, 2007).

Often obese children are bullied and teased by their peers. While these psychological problems may only be short-term consequences of childhood obesity, long-term consequences include social and economic disadvantages for these children as they approach adulthood (Latner & Stunkard, 2003).

### **Statement of the Problem**

Success for all children is important for the future of the United States. International testing shows that the United States is falling behind other countries worldwide in science, reading, and math (Organization for Economic Co-operation and Development [OECD], 2010). Education reform in the United States since the 1980s has been driven by the setting of academic standards for what students should know and be able to do. However, students are not keeping up with the countries that are going to be our major competitors in the future (Jennings, 2012). It is possible that the United States needs to examine health factors that may be associated with academic success. The problem is that there have been increasing numbers of overweight and obese children who are experiencing the physical and emotional consequences of the excess fat, and this

may be related to school performance.

### **Background and Significance of the Problem**

More and more children are struggling with their weight. The Centers for Disease Control and Prevention (CDC, 2010) stated that childhood obesity has more than tripled in the past 30 years, making it one of the most critical public health problems in the United States. Many children have high cholesterol levels and artery damage which are the first indicators that the child could one day be headed for a heart attack. According to the North Carolina Child Health Assessment and Monitoring Program (2009), more than one-third of the children in North Carolina are underweight, overweight, or obese. The Physicians Committee for Responsible Medicine (2010) attributed these changes for children to a sedentary lifestyle and improper diet. Even moderate undernutrition can have lasting effects on a child's cognitive development and school performance (Berg, 2004). By identifying the relationship between body mass index (BMI) and academic performance in elementary school students, educators can determine the need for promoting student health and proper nutrition. The researcher is a current teacher at an intermediate school in a suburban district in the southeast. The researcher has noted many students at the school are not at a healthy weight. After completing this study, it was presented to administrators, teachers, and health professionals who make decisions about programs and standards that promote student health.

### **Purpose of the Study**

The purpose of this study was to examine the relationships between BMI, stress, physical activity, and academic achievement. This study fills the gap in relevant research of the consequences overweight children face with academic achievement in middle childhood. This study was important because obesity for children from ages 6 to 11 has



tripled, and the 2009-2012 strategic plan for this county revealed that obesity ranked as the number one area of concern. Also, North Carolina Prevention Partners recently released the 2012 Report Card which assessed the state's health and found that both students and adults in North Carolina are not meeting recommended guidelines for physical activity or healthy eating. For this reason, the school leadership in a small, suburban district in North Carolina identified the need to reinstate the School Health Advisory Committee in an effort to address the childhood obesity levels in their district. One of the district's intermediate schools identified the need to assess health levels of approximately 680 students in order to implement adequate health and fitness programs. According to the school improvement plan, a home and school community partnership is vital for student success, and the leadership team wants to promote student health in order to boost student achievement. The problem being addressed in this study is that there appears to be a connection between body weight and achievement (Garcy, 2009), and the researcher has noted a number of students at the school who are not in the average weight range. The consequences that are associated with high BMI may be affecting academic achievement. Evidence shows that there is a relationship between BMI and academic achievement so interventions may affect educational outcomes for children in middle childhood.

### **Setting of the Study**

The setting of the study was a small, suburban intermediate school with approximately 680 students in Grades 4 through 6 in North Carolina. These students ranged in age from 9 to 12.

The school opened in 2005 bordering a rural community and served several older neighborhoods and apartment complexes representing the lower income levels of the city.

The free and reduced rate rose to 40% by 2010. However, substantial growth has occurred in the area surrounding the school and school district in the last 3 years, and it is now surrounded by large, upscale neighborhoods. This has resulted in a diverse socioeconomic population.

The school consisted of 24 general education classrooms including eight fourth-grade classrooms, eight fifth-grade classrooms, and eight sixth-grade classrooms. Disability services including inclusion and pull-out services were provided to approximately 65 students. All students who have been identified as academically gifted in Grades 4 through 6 received pull-out services for reading and math. Enrichment classes are provided to all students in the areas of music, art, physical education, health, media, and guidance once a week for 50 minutes.

The student population mirrored the demographics of the student population of the district. The student population sample included 680 students from a small, suburban intermediate school (Grades 4 [N=231], 5 [N=218], and 6 [N=231], 337 males and 343 females). The school was located in a suburban area near a large city in the southeast. The students from the school described themselves as White (71%), African American (16%), Hispanic (7%), Asian/Pacific Islander (2%), Multi-Racial (4%), Economically Disadvantaged (39%), Limited English Proficient (2%), Students with Disabilities (17%), and Academically Gifted (26%).

During the fall of 2007, the district started planning for a transformation called Digital Conversion. Since that time, over 4,500 laptop computers were deployed to students in Grades 4 through 12 and to all licensed staff across the district. Students have access to these computers at home and at school throughout the 185 day school year. In August 2009, each student at the intermediate school received a laptop computer. These

computers have been used since deployment by teachers and students as instructional tools to integrate technology throughout the school day and help the students develop the skills needed to succeed in a global community.

The intermediate school has experienced significant academic growth during this laptop initiative. Reading scores for the school have risen from 79.6% meeting standards in 2009, to 84.6% in 2012. Math scores have risen from 89.7% in 2009 to 92.6% in 2012. Science scores have risen from 67.9% in 2009 to 89.7% in 2012. This academic growth has been achieved through collaborative planning, remediation, enrichment, awareness of achievement goals, and the use of digital resources. The intermediate school continued to be recognized as a School of Distinction in 2012 and met expected growth as a school.

Relationships continue to be strong between staff and parents. The Parent Teacher Organization has always been a strong, interactive group for the school sponsoring curriculum night, student talent night, a student/faculty basketball game, mother/son movie night, father/daughter dance, and an Evening with the Arts program. The Parent Teacher Organization activities are successful in promoting parent and staff involvement. This organization fully supports the instructional program by helping to finance the tutoring program, allocating funds for teachers to purchase supplies, and providing resources for the digital program at the school.

The intermediate school has identified several areas of need for the 2012-2013 school year. These include making sure that all students from all cohorts are challenged and pushed to meet their academic potential due to the change to a growth model rather than proficiency model. Unfortunately, the school also has seen a spike in school discipline referrals, with 231 office referrals compared to 125 in 2010-2011 and 124 in

2009-2010.

The intermediate school set a goal to promote an atmosphere where students are physically active and making healthy choices. The objective was to expose students to healthy fitness components using fitness tests and lesson plans carried out by the physical education teacher. Some of the strategies for this plan included district-level physical education meetings during early release days to identify areas for improvement and creating a vertical plan for physical education among all levels of the physical education teacher team. The school planned to expose students to aerobic components, push-ups, sit-ups, and jump rope. Collaboration between regular education teachers and the physical education teacher was also planned so that activities can be integrated into recess time. School leadership also built a schedule that ensured all students receive daily recess time.

### **Definitions of Terms**

**Body mass index (BMI).** An indicator of body fatness calculated from a child's weight and height.

**BMI percentile.** A ranking of BMI for children and teens by plotting the BMI number on the CDC BMI-for-age growth charts. The percentile indicates the relative position of the child's BMI number among children of the same sex and age in the United States. The growth charts show the weight status categories used with children and teens (underweight, healthy weight, overweight, and obese).

**Underweight.** A percentile range of less than five.

**Healthy weight.** A percentile range of five to less than 85.

**Overweight.** A percentile range of 85 to less than 95.

**Obese.** A percentile range equal to or greater than 95.

**Academic achievement.** Includes standardized test scores in reading, math, and science subject areas; GPA; classroom test scores; and other formal assessments.

**Absence.** Student not attending school due to a documented personal illness.

**Tardy.** A student arriving to school after the designated school start time.

**Out-of-school suspension.** The temporary removal of a student from the school setting.

**Detention.** The temporary removal of a student from the classroom where the student remains in school in a separate setting for lunch, recess, part of the day, or the entire day.

**Stress.** A state of mental or emotional strain or tension resulting from adverse or very demanding circumstances.

**Middle childhood.** In the United States, most often defined as the period beginning at the approximate age of 5 or 6 and ending at the approximate age of 10 to 12.

**Physical activity.** Any body movement that works the muscles and requires more energy than resting.

Chapter 2 contains the review of literature regarding childhood obesity, academic achievement, stress, and physical activity.

## **Chapter 2: Literature Review**

### **Introduction**

The focus of this study was on the late middle childhood population from ages 9 to 12. Images of this time of middle childhood often include children who are physically active and intellectually curious, making new friends, and learning new things. However, middle childhood is actually filled with opportunities and challenges. For some children, it is a period of vulnerability. In fact, many associate learning challenges, emotional ailments, asthma, Attention Deficit/Hyperactivity Disorder, and obesity with this age range (Berger, 2009).

**History of obesity.** Prior to the 1960s, most of the food that people prepared and consumed was done by families who grew their own food, cooked it, and ate at home. As time passed, technological innovations including vacuum packing, preservatives, deep freezing, artificial flavors, and microwaves have enabled food manufacturers to cook food and ship it to consumers quite rapidly. These technological innovations have made it easy for people to consume more meals and more calories over the past several decades (Simons, 2011). Obesity across countries is higher in those with access to the new food technologies and processed food. Countries that regulate agriculture and delivery systems tend to have lower rates of obesity (Cutler, Glaeser, & Shapiro, 2003).

During the past 20 years, there has been a dramatic increase in childhood obesity statistics and general obesity in the United States. In 2008, only one state (Colorado) had a prevalence of obesity less than 20%. Thirty-two states had a prevalence of obesity equal to or greater than 25%; six of these states (Alabama, Mississippi, Oklahoma, South Carolina, Tennessee, and West Virginia) had a prevalence equal to or greater than 30%. The obesity rate for North Carolina in 2008 was 29% (United States Department of

Health and Human Services, 2011).

Childhood obesity statistics showed that the trend is spreading worldwide. The International Association for the Study of Obesity (IASO) shows that in Iceland, Spain, Estonia, Austria, Ireland, Czech Republic, Canada, Lithuania, Australia, Luxembourg, and Hungary the percentages for obesity are increasing. Portugal, Slovakia, Germany, UK, Mexico, Cyprus, and Malta have obesity rates of over 20%. Technology has made it easier to gather and report obesity statistics as well as show that obesity is growing around the globe (IASO, 2012).

**Significance of obesity.** The OECD (2010) reported that Americans are among the fattest people in the world. According to the CDC (2010), the Department of Health and Human Services launched Healthy People 2010 in January of 2000 as a comprehensive, nationwide health promotion and disease prevention agenda. Healthy People 2010 contained 467 objectives designed to serve as a framework for improving the health of all people during the first decade of the 21st century. The final review of Healthy People 2010 showed almost no progress was made toward the goal to promote health and reduce chronic disease associated with diet and weight. In fact, the review showed that obesity in the U.S. population has increased, moving away from the Healthy People 2010 targets (CDC, 2010). During the 1960s and 1970s, approximately 5% of children were above the 95th percentile for BMI which is defined as obese. The percentage of obese children has tripled in the past 30 years, creating a national epidemic that will likely have dire public health consequences for our country (Ogden et al., 2006; Rimm, 2004).

According to the United States Department of Health and Human Services (HHS, 2011), childhood obesity affects both boys and girls of all races and ethnic backgrounds.

In the United States, 18% of adolescents between the ages of 12 and 19 are obese, 20% of children aged 6 to 11 are obese, and 10% of children aged 2 to 5 years are obese.

Children who are overweight are much more likely to become overweight adults if they do not change their diet and exercise patterns. This weight gain due to poor diet and lack of exercise is responsible for 300,000 deaths each year, and the annual cost to society for obesity is estimated at nearly \$100 billion. Obesity is one of the easiest medical conditions to recognize but most difficult to treat (HHS, 2011).

**Causes of obesity.** Genetic factors make a big difference in size, shape, and weight. The strongest predictor of a child's weight is the weight of his or her parents. Just as one child in a family has blue eyes and another brown, one may have genes for fatness while another does not. Genetic factors affect metabolic rate, thermogenesis, endocrine function, fat storage, appetite and satiety signals, and other functions (Silverstein, Silverstein, & Silverstein, 1991). However, environmental factors such as eating too many calories and not using them in physical activity causes the fat to continue to increase (Berg, 2004). Americans have increased their calorie intake in recent years with *all you can eat* buffets, extra-large servings, jumbo sizes, and eating more meals outside of the home. High fat diets contribute to the epidemic along with snacking more during the day than 25 years ago. The death of family meal time, more highly processed foods, food advertising, eating out, ethnic influences, cookies for breakfast, snacking, and added sweeteners have all influenced the rise in obesity (Silverstein et al., 1991). People get heavier if they consume more calories than they expend. One pound is equal to 3,500 calories for the typical person. With all of the information available about the consequences of obesity and the solutions, it is surprising that people do not take proactive actions to avoid the condition. It seems that self-control and lack of motivation



are the most obvious reasons for not doing anything about the excess weight. Although approximately \$40-\$100 billion is spent annually on diets, the situation does not seem to be improving (Cutler et al., 2003).

Also, a change in lifestyles could be a factor in the rise of obesity. Children no longer walk or bike to school. Parents work longer hours and are too busy to supervise children. This decreases daily physical activity and can lead to children spending more hours watching television, using computers, playing video games, and viewing movies instead of engaging in physical activities (Berg, 2004).

Media was regularly listed as one of the reasons for the increase of obesity in the United States (Boyce, 2007; Cutler et al., 2003). Boyce (2007) cited Dietz and Gortmaker (2001) as the first to conduct a study demonstrating the link between obesity and media usage. This study concluded that the prevalence of obesity increased by 2% in 12-17 year olds for each additional hour of television viewed (Boyce, 2007). The Kaiser Family Foundation (KFF, 2004) reported that children spend an average of 5 1/2 hours a day using media. This is equivalent to a full-time job and more time that children do anything else besides sleeping (KFF, 2004). A study concluded that television watching is a risk factor for change in body fat not because the children watched more television but because the media limited their exercise time (Proctor et al., 2003). Pediatricians, child development experts, and media researchers have theorized that media may contribute to childhood obesity in other ways such as food advertisements that influence unhealthy choices, children snacking excessively while using media, and watching television and videos lowers children's metabolic rates below what they would be even if they were sleeping (KFF, 2004). Several studies have found that reducing a child's use of media has a positive influence on weight status (Epstein et al., 1995; Kohl, Fulton, &

Caspersen, 2000; Robinson, 1999).

**Consequences of obesity.** The leading cause of death in the United States is heart disease, and being overweight greatly increases the chances of suffering a heart attack (Silverstein et al., 1991). This same study indicated that obesity has also been linked to having a stroke, cancer, and diabetes and that children who are overweight suffer from more diseases caused by viruses and bacteria due to a lower immune system (Silverstein et al., 1991). Another study suggested that obese children may develop gallstones, hepatitis, sleep apnea, and increased intracranial pressure (Must & Strauss, 1999). The presence of unfused growth plates and softer, cartilaginous bones of children contributes to more orthopedic abnormalities in obese children (Must & Strauss, 1999). Of the children who enrolled in a hospital-based weight control program, approximately 30% of them suffered from asthma (Must & Strauss, 1999). The persistence of obesity present in childhood into adulthood is also another significant consequence of early obesity (Must & Strauss, 1999). Additionally, long-term consequences of childhood obesity include an elevated risk of adult morbidity and mortality (Must & Strauss, 1999).

Along with the physical consequences of obesity, obese children often suffer from mental diseases as well. These include depression, lower self-acceptance, feeling sad or worthless, and mental illnesses like schizophrenia (Silverstein et al., 1991). These students tend to have negative interpersonal interactions and low self-esteem (Must & Strauss, 1999). In an article by Michael Loewy (1998), he addressed the issues that pertain to the social and emotional experiences of overweight children in the United States. His findings concluded that overweight children are the target of prejudice, ridicule, and disgust by their peers and adults including their teachers, counselors, and parents who accepted stereotypes about overweight people and developed a prejudice

against them (Loewy, 1998). Due to the medical, psychological, and social impact of obesity, some children are exposed to weight-loss programs and behavior modifications that result in a short-term success, increase frustration, and lower self-esteem for children (Loewy, 1998). Research indicated that a relationship between overweight children and educational outcomes could have implications for the future psychological health in the United States (Judge & Jahns, 2007). The Early Childhood Longitudinal Study, designed and implemented through the United States Department of Education, examined data reported for 13,860 children in the third grade. Reading and math assessments were completed by students, and teachers reported how often certain social skills and behaviors occurred among these students. Results showed that overweight children had significantly lower math and reading scores than normal-weight children in third grade before socioeconomic and maternal education variables were included. The primary finding of the study was that being overweight had a significant effect on social and behavioral outcomes for overweight girls (Judge & Jahns, 2007). This study suggested that overweight girls argue and fight more as well as exhibit more loneliness and sadness than normal-weight girls (Judge & Jahns, 2007).

**Learning nutrition concepts.** Dietary habits are formed in early childhood so it is crucial that children acquire knowledge about what, when, and how much to eat. These habits play a huge role in their physical and social well-being (Wesslén, Sepp, & Fjellström, 2002). For this reason, schools are considered the primary setting in preventing obesity by supporting and promoting lifelong health and nutrition concepts (Kukulu, Sarvan, Muslu, & Yirmibeşoğlu, 2010). The school setting provides an opportunity to reach all children from any socioeconomic status (Kukulu et al., 2010).

A study to compare the dietary habits of children regarding physical

characteristics, socioeconomic background, and educational levels was conducted using 737 students in the sixth, seventh, and eighth grade at two different primary schools. A questionnaire was used to determine the dietary habits, and BMI was calculated for these students. During the study, obesity was found to be more frequent in the metropolitan region when compared with the non-metropolitan region. Obesity was more frequent in families with a lower number of children than those with a high number. Education level of the parents was not related to obesity. Finally, students living in the metropolitan areas consumed more snacks than the ones living in the non-metropolitan region. The study concluded that future longitudinal studies would be required to confirm the association between food consumption and academic performance among school children. These studies help determine the factors that influence or predict these differences in different regions (Kukulu et al., 2010). Another study conducted in 12 Swedish preschools used focus groups to investigate children's perceptions and experiences of food. A total of 103 children participated. The focus group interview method was judged to be a useful tool for exploring how children think about and jointly reflect on food. The children in the study felt that they were not allowed to make decisions about the food they ate at preschool. These students also talked much more about the foods they liked rather than disliked. Sweets were associated with holidays and the home environment and *real food* was served at the preschool. The study showed that children have positive attitudes about foods at an early age (Wesslén et al., 2002).

Policymakers proposed early childhood nutrition programs as a way to increase students' academic achievements (Glewwe, Jacoby, & King, 2001; Taras, 2005). One study revealed that a large sample of better nourished Filipino children performed significantly better in school because the nutrition program had a positive effect on their

health and allowed them to enter school at an earlier age. Although the study controlled heterogeneity in learning environments, home environments, and parental tastes, a positive relationship between nutrition and achievement persisted, supporting a link between nutrition and academic success (Glewwe et al., 2001). Another relevant study conducted in Turkey with 613 students in Grades 6, 7, and 8 concluded that there is a direct relationship between nutrition and academic achievement. This research suggested that nutrition information should be presented to children and that educational professionals along with mothers should attend various educational programs to learn to teach healthy dietary habits (Kayapinar, 2011). Governments at all levels should also be involved to strengthen efforts to improve children's health in order to increase educational output and enhance development potential in all children (Chen & Li, 2009). In order to successfully prevent and treat childhood obesity, good nutrition practices and physical activity should be key components of the prevention programs. One study investigated the relationship between physical activity, self-esteem, and academic achievement. The analysis of these 6,923 sixth-grade students revealed that both females and males who were more physically active had higher levels of self-esteem (Tremblay, Inman, & Willms, 2000). However, a comprehensive solution must also include social factors that impact the problem of being overweight (Kohn et al., 2006). This would include providing an educational curriculum to all children that includes nutrition education and physical activity, is free of negative stereotypes, and includes positive images of people of all ages (Loewy, 1998).

Breakfast has been labeled the most important meal of the day (Ramperasaud, Pereira, Girard, Adams & Metz, 2005). However, depending on the age group, breakfast skipping is highly prevalent in the United States. Children who reported eating breakfast

on a consistent basis tended to have better nutritional profiles than their peers who skipped breakfast. Studies suggested that breakfast consumption may improve cognitive function related to memory, test grades, and school attendance. Breakfast is an important part of a healthy diet and lifestyle and can positively impact children's health and well-being (Ramperasaud et al., 2005). Therefore, school breakfast programs have a positive effect on the nutritional status of children, school performance, attendance, and dropout rates. According to this same study, the effect of breakfast consumption on school performance depended on the interaction between the program, student characteristics, and the school organization (Cueto, 2001).

The focus of most nutrition research has been on hunger, malnutrition, micronutrient deficiency, and the effects of breakfast on cognition (Florence, Ashbridge, & Veugelers, 2008). For example, Taras (2005) and Rampersaud et al. (2005) found that having a healthy breakfast through school programs was effective in improving cognitive function and academic performance, especially among undernourished children. Another study examined the association between overall diet quality and academic performance of 5,200 fifth-grade students in Nova Scotia, Canada, as part of the Children's Lifestyle and School-performance Study. Various indicators of diet quality showed an association with academic performance. Students with decreased overall diet quality were significantly more likely to perform poorly on the assessment. This research supported Cueto (2001) in that implementing and investing in effective school nutrition programs will improve student access to healthy food choices, diet quality, and academic achievement (Florence et al., 2008). Most of the current studies regarding breakfast and body weight were entirely cross-sectional which means that more longitudinal studies are needed to determine the impact breakfast has on academic performance (Ramperasaud et al., 2005).

**Role of the caregiver, school, and community.** Measuring the BMI of students was one approach to address the obesity problem that continues to occur in the United States. Research on the effects of this approach is limited. However, some states, cities, and communities have established school-based BMI-measurement programs in recent years, and many others are considering the implementation. This approach could be useful in creating awareness among families, school and health personnel, community members, and policymakers (Murphy & Polivka, 2007; Justus, Ryan, Rockenbach, Katterapalli, & Card-Higginson, 2007). In an effort to address the epidemic of childhood and adolescent obesity, Arkansas enacted the Act 1220 of 2003. This act required each public school student to have his/her BMI assessed and annually reported to parents. The Arkansas Center for Health Improvement evaluated and validated the scales and stadiometers through research collaboration with nine schools to enhance the efficiency of the measurement and reporting process as Arkansas transitioned through this process. As a result of this statewide mandate, collaboration increased between health professionals, educators, students, and families. The states have been able to track progress for students, and obesity has not increased since Act 1220 was passed. Another relevant study was conducted to gain the perception of parents regarding childhood obesity, BMI, and the school's role in prevention and treatment of obesity. Of the 117 participants who were surveyed, more than 80% of the participants identified inactivity, poor eating behavior, lack of parental control in what children eat, and eating too much as the primary causes of childhood obesity (Murphy & Polivka, 2007). The researchers identified that 36% of parents felt that schools were not doing enough and strongly supported more education regarding nutrition and removal of junk food machines (Murphy & Polivka, 2007).

The current status of physical education programs across the nation reveals that only 3.8% of elementary schools, 7.9% of middle schools, and 2.1% of high schools provide daily physical education (Green, 2006). According to the North Carolina Department of Public Instruction (NCDPI, 2012) Healthy Schools Policy (2005) developed from the National Association for Sport and Physical Education (NASPE, 2012), all students should be required to take part in daily physical education and should receive a minimum of 150 minutes per week in vigorous activities. This active class time provides an opportunity for physical educators to talk with the entire class about individual differences. Recognizing these individual differences should be taught just as good sportsmanship is taught during elementary education programs to ensure children become sensitive to the thoughts and feelings of others (Green, Riley, & Hargrove, 2012). Obese and overweight children are mainstreamed into the regular physical education class, and teachers must become sensitive to the frustration of the obese child who tries unsuccessfully to accomplish physical skills, is chosen last for a team, or is chastised by peers and be prepared to help (Green et al., 2012).

Physical educators and quality physical education programs can be a major component in reducing childhood obesity (Green, 2006). The curriculum of the physical education program should include nutrition instruction, counseling, exercise classes, and eating control (Green, 2006). Quality physical education programs should focus on maximum participation with all students working at the same time on skills. Another indicator of a quality program would be that the class is focused on achievement and maintenance of physical fitness levels. Individual progress would determine success instead of group comparison (Green, 2006).

Facilities that enhance physical activity should be created and maintained as well



as quality physical education provided on a daily basis for all students (Green et al., 2012). To help with the mistreatment of obese children by family members, peers, and teachers would require the social network to be educated on this topic. This would help prevent the psychosocial consequences that overweight children face (Neumark-Sztainer et al., 2002). In a study regarding this type of mistreatment, overweight adolescents reported being teased about their weight and being bothered by the teasing. This teasing was associated with eating disorders and supports the need for educational intervention in order to stop weight-related mistreatment (Neumark-Sztainer et al., 2002).

**Physical activity and academic achievement.** Physical inactivity and low physical fitness are associated with metabolic risk factors such as insulin resistance, obesity, and blood pressure in school-age children (Andersen, 2011). Physical education programs in elementary and secondary schools have slowly been eroded during the past 2 decades despite the evidence linking physical activity during childhood to later health outcomes (Tremblay et al., 2000). With increasing pressure for children and adolescents to perform better in school, administrators and teachers have often responded by increasing classroom time. This often resulted in less time spent on physical activity and has been cited as one reason for the increasing prevalence of childhood obesity (Daniels, 2009). Academic learning per unit of class time was actually enhanced by physically active students (Trudeau & Shephard, 2010). In the study by Tremblay et al. (2000), the researchers examined the relationship between physical activity, self-esteem, and academic achievement in reading and mathematics scores. Data were collected from the entire population of sixth-grade students in New Brunswick, Canada, in 1996. This study concluded that physical activity had a negative relationship with BMI and academic achievement and a positive relationship with self-esteem. However, physical activity

could be indirectly related to academic achievement for those children who had enhanced academic performance by improving physical health and self-esteem (Sigfúsdóttir, Kristjánsson, & Allegrante, 2006; Tremblay et al., 2000). Another study which supports the idea that physical activity has a positive effect on academic achievement tested the effect of 3 months of regular aerobic exercise on executive function in sedentary, overweight children using cognitive assessments achievement measures and functional magnetic resonance imaging (Davis et al., 2011). The results were consistent with the previous study mentioned because increased prefrontal cortex activity was observed due to the exercise program (Davis et al., 2011). This study hypothesized that regular vigorous physical activity promotes children's development through the effects this activity has on the brain which controls cognition and behavior (Davis et al., 2011).

**Weight status and academic achievement.** While numerous studies exist that discuss the assessment and management of obesity, few studies exist to address children who are undernourished, and very little research is available related to the relationship of body weight and academic achievement.

Extreme nutritional deprivation is rare in the United States. Many believe that nutritional problems exist due to constraints on resources. A study conducted by Bhattacharya and Currie (2000) focused on nutritional deficiencies, obesity, overall dietary quality, and food insecurity. The National Health and Nutrition Examination Surveys (NHANES) conducted by the National Center for Health Statistics, CDC were used to measure 1,358 youths. The results showed that higher poverty is associated with higher BMI, and females were more likely to suffer from high BMI. Larger Hispanic households were more likely to be food insecure. The study also found that many youth suffer from nutrient deficiencies but are not sensitive to measures of resource constraints

and are unlikely to be nutrient deficient due solely to lack of food (Battacharya & Currie, 2000). Malnutrition is a serious problem with long-term effects on the performance of school children. The connection of this problem to the United States' population needs to be better understood (Taras, 2005).

The link between females with higher BMI and lower academic achievement is supported in a later study by Sabia (2007). This study used data from the National Longitudinal Study of Adolescent Health, and evidence was consistent with a significant negative relationship between BMI and grade point average for White females ages 14-17 (Sabia, 2007). Another study in West Virginia, where obesity rates for fifth graders are near 30%, found evidence that obesity negatively affected reading proficiency in high poverty districts (Gurley-Calvez & Higginbotham, 2010).

In addition to the above studies conducted in the United States, Alderman, Hoogeveen, and Rossi (2009) aimed to detect the impact that improved nutritional status in childhood would have on the children in the Kagera region of Tanzania. A full household questionnaire was administered in 1994 and again in 2004. This questionnaire collected information on a wide range of topics which included education and health. The researcher ascertained whether and to what extent malnourished children are more likely to show lower academic grades. The results of the Kagera study showed that the children who were malnourished had lower schooling and delayed their school entry (Alderman et al., 2009). Research was also performed in Ghana and Sri Lanka that addressed how poverty impacted nutrition, health, and schooling of children. Childhood malnutrition compromised the health of children and further impacted nutritional status which resulted in delayed school enrollment and poor school performance. This research defined nutritional status linked to poverty and stated that it

usually manifested in stunting, wasting, and underweight. The study related poor health to lower education attainment due to children missing more days of school. It suggested that students may also struggle to focus and handle emotions due to poorer health (Ashiabi, 2007; Cueto, 2001; Wisniewski, 2010).

The relationship between BMI and academic achievement was examined in one doctoral dissertation to support a hypothesis that childhood obesity is an educational handicap (Steiniger, 1997). This study looked at the relationship between BMI and academic achievement in 1,667 third-grade White females from Pinellas County, Florida. Academic achievement was determined by classroom grades and standardized achievement test scores. Teachers' predictions for school success and teachers' perceptions of student behavior were also assessed. The results indicated no statistically significant differences in classroom grades between groups of normal weight students and obese students. However, teachers predicted less school success for obese girls and the highest degree of school success for the normal weight girls. The mediating factors of teacher expectancies do link the variables of BMI and academic achievement and prove that a relationship does exist between the two (Steiniger, 1997).

Another study examined whether changes in overweight status were associated with poorer school outcomes during the first 4 years of school through test scores, teacher reports, and school records (Datar & Sturm, 2006). This study used a multivariate regression model with a nationally representative sample of U.S. children who entered kindergarten in 1998 with longitudinal data on BMI and school outcomes at kindergarten entry and the end of third grade. Results showed that moving from being not overweight to overweight between kindergarten entry and end of third grade had a positive and statistically significant association with adverse third-grade outcomes such as academic

achievement and social-behavioral outcomes among girls. However, this link was mostly absent among boys (Datar & Sturm, 2006).

Several studies in other countries have been conducted to analyze the relationship between health and academic achievement (Cho, Lambert, Kim, & Kim, 2009; Gurley-Calvez & Higginbotham, 2010; Kristjánsson, Sigfúsdóttir, Allegrante, & Helgason, 2009; Wisniewski, 2010). These studies found evidence that obesity affects academic achievement. These findings could be used to improve academic achievement and the general health status of children (Cho et al., 2009; Gurley-Calvez & Higginbotham, 2010; Kristjánsson et al., 2009; Wisniewski, 2010). Improving the general health status of children, which affects school performance and future education attainment, could result in a healthier adulthood for these children (Kukulu et al., 2010).

**Stress.** Stress occurs when a person is not able to cope with and resolve a problem (Pearlin, Schieman, Fazio, & Meersman, 2005). Many times children are not recognized as being prone to stress. However, childhood stress is on the rise in elementary school children (Vanaelst, De Vriendt, Huybrechts, Rinaldi, & De Henauw, 2012). Middle childhood is filled with transitions that can cause psychological stress (Washington, 2009). The stress that children experience can come from family life, school environment, health issues, and multimedia (Vanaelst et al., 2012). These potential stressors cause the adrenal and pituitary glands to work together to initiate the stress response (Washington, 2009). Accurately measuring stress is complicated due to the different definitions and interpretations of the word stress (Vanaelst et al., 2012). Vanaelst et al. (2012) reviewed and described questionnaires, interviews, and laboratory measurements that could be used as stress assessments for children. These could serve as a guide for researchers as they approach this new area of study (Vanaelst et al.).

Regardless, any effort to identify and reduce stress must recognize the causes of the condition (Pearlin et al., 2005).

**Stress among school-age children.** When children are stressed, nervous energy builds up in their bodies. Allowing the children play by running, chasing, climbing, riding, and rolling allows them to get the aerobic exercise they need to let off steam and relieve the stress. The researcher could not find any studies that linked the increasing rate of childhood obesity and stress-induced illnesses in children. However, it was the opinion of the researcher that the rise in the rate of obesity and rise in stress-induced illnesses in children are related. Obesity is related to plenty of other illnesses such as Type 2 diabetes, heart disease, stroke, several types of cancer, and osteoarthritis as well as psychological illnesses like poor self-esteem (Marks, 2002). Therefore, children who are seen repeatedly with physical or psychological complaints should be targets for a thorough examination for potential stress and poor coping mechanisms (Washington, 2009). Exercise is good for people's health regardless of their age and could reduce and prevent stress (Marks, 2002). Recognizing and treating childhood stress is essential for helping children pass through childhood and develop into responsible adults (Washington, 2009).

**Stress and childhood obesity.** The causes of obesity and medical implications have been studied extensively. However, there is a lack of studies that address being overweight and its relationship to stress (Horton, 2008). Society's view of obesity is leading the way to mental health problems for our youth because of the world's obsession with beauty and physical appearance (Horton, 2008). Childhood may be a vulnerable period for experiencing social adversities. Peer teasing is common in schools, not only from other students but also from teachers (Neumark-Sztainer et al., 2002). Many times,

teasing in middle childhood is associated with being overweight or obese (Neumark-Sztainer et al., 2002). Teachers, counselors, and other school employees should be sensitive to other children who are using harassing language, and it should not be tolerated (Loewy, 1998). Obesity creates a psychological burden, and this burden could be the greatest consequence of obesity.

**Student academic achievement.** Student success is gaged by academic achievement and is a consequence of many factors working together which include students, families, school, peers, and communities (Lucio, Rapp-Paglicci, & Rowe, 2011). Schools and teachers use report cards to show the knowledge or number of skills a student has mastered during a particular period. These assigned grades are generally a comparison of how one student performed against another student. Most schools use letter grades in which an A means superior performance, B means above average performance, C means average performance, D means below average performance, and F means failure (Friedman, 2000).

**Underachievement.** When students are tardy and absent, student achievement suffers. Each time a student misses a portion of class, they are missing instruction which impacts not only their performance but the class as well as the teacher pauses to repeat instruction. Teachers are then forced to catch students up, and this affects instruction for the rest of the class. High-stakes testing has many schools looking for ways to improve academic achievement, and attendance policies have become a target for many districts. Communication with parents and the community has become top priority as schools try to reduce tardies and absenteeism (Raising School Attendance, 2002).

**No Child Left Behind.** The No Child Left Behind Act (NCLBA) is a federal mandate enacted in 2002 which supports standards-based education to ensure that all

children have an opportunity to obtain a high-quality education and reach proficiency on the standards and assessments developed by each state (U.S. Department of Education, 2001). This act contains principles which include parent involvement and provides avenues for parents to become a part of their child's education (Amatea, 2013). Parental involvement is an important element of academic achievement. Therefore, this involvement should also be an element in the prevention and treatment of childhood obesity (Beckman, Hawley, & Bishop, 2006).

**Prevention of obesity.** Studies on prevention of childhood obesity identified the school as the primary remediation force for those students who are already obese (Dietz & Gortmaker, 2001; Green, 2006; Loewy, 1998). Treatment programs are being implemented in some school settings and are experiencing a great deal of success. These programs are combined efforts of administration, guidance counselors, nurses, teachers, food personnel, parents, and physical educators (Green et al., 2012). Bronwell and Kaye (1982) conducted a study that involved 63 obese children, ages 5 to 12 years, who participated in a 10-week program for behavior modification, nutrition education, and physical activity. This program involved educating the children and those in their social network and compared these students to obese children who were not in the program. The study also used the students as controls by analyzing their weight records for 3 years prior to the program. Ninety-five percent of the 63 students in the program lost weight compared to 21% of the control children. The program children also showed a mean decrease of 15.4% in their percentage overweight and lost an average of 4.4 kg. The students in this program reversed the steady weight gain that had occurred before the program. This study suggests that a comprehensive program in schools can produce significant weight losses (Bronwell & Kaye, 1982).



Another study analyzed effortful persistence in 246 fifth graders over a 4-year period who participated in a running program during their physical education class. Neither effortful persistence nor BMI was found to predict time to complete the 1-mile run. This study has implications that should be noted in obesity prevention due to the fact that running is often used in physical education classes because it does not require special equipment or facilities and it is easy to implement. The researchers noted that physical activity is an effective prevention or treatment method of overweight and obesity; however, running is not enough to help children learn physical activity habits without understanding motivational factors (Liew, Xiang, Johnson, & Kwok, 2011). Motivation is a key factor in helping children to sustain lifelong physical activity habits. Health educators could help foster students' self-regulatory efficacy for physical activity by stressing the importance and rewarding participation, effort, and persistence in physical education classes through a variety of physical activities (Liew et al., 2011). The schools offer a setting where obese children can be treated, large numbers can be reached, guidance can be continuous and concentrated, cost to families will be minimized, and the problem can be approached in an educational rather than medical setting (Bronwell & Kaye, 1982).

Television viewing, because it takes time away from physical activities, is one of the causes of childhood obesity that can be modified (Robinson, 1999). A study aimed at preventing childhood obesity focused on decreasing sedentary behavior and increasing activity. Obese participants ages 8 to 12 years old were recruited through announcements, television commercials, posters, and referrals from physicians and school nurses. Sixty-one families entered the treatment program, and data from 55 of these families showed that reducing access to television and other sedentary behaviors

may be important in treating childhood obesity (Epstein et al., 1995). This study revealed that children reinforced for reducing sedentary behaviors showed better changes in percentage overweight and percentage of body fat than children who were reinforced for exercising (Epstein et al., 1995). In order to prevent childhood obesity, children must be involved in the planning and choosing of activities as well as presented and educated concerning solutions to the problem (Green et al., 2012). Prevention of obesity in children and adolescents must focus on factors with the home, school, and community environments that affect food intake and physical activity (Dietz & Gortmaker, 2001; Dunton, Berrigan, Ballard-Barbash, Graubard, & Atienza, 2009). Reducing television and video game use may also be a promising, population-based approach to help prevent childhood obesity (Robinson, 1999).

Healthy vending programs directed at helping the childhood obesity epidemic are also means of prevention for the rising problem. Vending machines that offer healthier options could generate school profit and help prevent children from becoming overweight (Lefebvre, 2006). It is the opinion of the researcher that vending machines that contain unhealthy food and drink choices should be removed from schools in order to help with obesity prevention.

Other school-based interventions that could help prevent childhood obesity include reorganizing the physical education structure from one of competition to an orientation of lifelong fitness and nutrition (Wood, 2010). School nutrition programs would teach students the value of eating healthy foods at breakfast and including fruits and vegetables in the diet (Ramperasaud et al., 2005). For students who skip breakfast because of lack of time in the morning, these programs could advocate for students to eat breakfast as part of their program and teach them healthy breakfast foods that can be

consumed on the go (Ramperasaud et al., 2005). Salad bars would be placed in each school (Green et al., 2012).

The local parks and recreation departments have a role in helping to prevent childhood obesity by creating and maintaining safe neighborhoods, parks, and playgrounds (Green et al., 2012). Access to playgrounds and athletic facilities at schools and throughout the community can help combat childhood obesity. One research study found that more than a third of the schoolyards within a half-mile radius of participants in the Trial of Activity for Adolescents they visited in Maryland, South Carolina, Minnesota, Louisiana, California, and Arizona were not open to the public on Saturdays. The study which followed the physical activity of 1,556 girls in urban areas around the nation also found that adolescent girls, students who lived near locked facilities, had significantly higher BMIs than students who had access to facilities all week (Scott et al., 2007). School grounds are a potential resource that should not be closed on the weekend and could also offer organized recreational programs for children throughout the community (Scott et al., 2007).

A child's social network can be a critical factor in the prevention of obesity. It is up to this network of people to work with children to keep food diaries and educate them on food choices, use pedometers, and involve the whole family in planning physical activities as well as reinstating the family meal time. Food diaries can help children to observe their eating habits, count calories, and make decisions about food choices. By using a pedometer, children can be encouraged to walk. Children can count their number of steps and monitor their daily progress. The pedometer will challenge them to increase their walking (Green et al., 2012). When the entire family is involved in planning physical activities and food choices, a team will be created to demonstrate support by

working along with the child. This is a great time for the family to model food choices that are low in fat, sugar, sodium, and cholesterol (Green et al., 2012).

**Conceptual framework.** Behavior change is the goal for working with communities on the global epidemic of obesity. Those in the health field, educators, administrators, physical education teachers, and parents are all responsible for the design and implementation of programs or interventions that produce the desired behavioral changes to reduce childhood obesity. For this reason, it is important for all people involved in designing the interventions to bring about the behavior change by understanding the behavior change theory and putting it into practice (World Bank, 2012).

Albert Bandura (1977) developed one of these theories. It is a theory of personality development which described the social factors contributing to the development of one's sense of self-efficacy. Bandura argued that the social variables active in the home play a large role in the personality development of children. Families of high-achieving students help their children through life tasks and challenges using positive expectations and encouragement, take an active role in helping their children prepare for school, and believe that they should work with the school to develop their child's talents (Amatea, 2013). High-achieving students are encouraged by their families to be persistent and perform even when facing adversity which creates a sense of personal self-efficacy. These children are empowered to take charge of their lives (Amatea, 2013). Families of these children take time to teach their children to be determined when facing difficulty and evaluate their responsibility for their own actions and circumstances (Bempechat, 1998).

According to Bandura (1977), personal belief influences the choices that people

make, the effort they contribute when working toward a goal, how long the person will persist, and how they will feel during the entire process. Therefore, it is important that families and communities make every effort to provide students with emotional warmth and a sense of belonging as well as clear communication through frequent nurturing conversations. This will foster self-efficacy and a sense of togetherness which will enable children to solve problems in a collaborative environment (Amatea, 2013). By improving self-efficacy with the help of those surrounding the child, interventions to change health behaviors will be more successful (Beckman et al., 2006).

As children approach adolescence, they become more independent in self-management. This should include the child's health behaviors. According to Piaget's model of childhood cognitive development, children in middle childhood are entering the stage of formal operations (Berger, 2009). This stage of his cognitive theory is characterized by the development of abstract and hypothetical reasoning. Piaget believed that children in this stage can begin to think logically about abstract concepts, hypothetical ideas, and statements (Berger, 2009). Reasoning abilities begin to emerge at this stage which could help children to identify cause-and-effect relationships of health behaviors (McDevitt & Ormrod, 2013). Children at this cognitive stage can begin to imagine the potential positive and negative consequences of a given health behavior which will allow them to internalize and begin to control their health management choices (Beckman et al., 2006).

### **Research Questions**

1. What is the relationship between academic achievement and BMI?
2. To what extent is there a difference in the tardies and absences of obese, overweight, and underweight students when compared to healthy weight students?

3. To what extent is there a difference in detentions and out-of-school suspensions of obese, overweight, and underweight students when compared to healthy weight students?
4. To what extent is BMI related to physical activity?
5. To what extent is BMI related to stress in middle childhood?
6. Do teachers feel that a student's weight is related to a student's academic achievement?

Chapter 3 contains the methodology that was used to answer these research questions.

## **Chapter 3: Methodology**

### **Introduction**

The primary purpose of this study was to determine if a relationship exists between BMI, stress, physical activity, and academic achievement. This study used the mixed-methods design to examine these relationships in a student sample from one intermediate school Grades 4 through 6 in a suburban area of North Carolina. Creswell (2008) described mixed-methods research as a design with philosophical assumptions and methods of inquiry. These guided the researcher as data were collected and analyzed. By combining quantitative and qualitative data, the design provided the researcher with a better understanding of the relationship between the variables listed above (Creswell, 2008). The researcher answered the following questions:

1. What is the relationship between academic achievement and BMI?
2. To what extent is there a difference in the tardies and absences of obese, overweight, and underweight students when compared to healthy weight students?
3. To what extent is there a difference in detentions and out-of-school suspensions of obese, overweight, and underweight students when compared to healthy weight students?
4. To what extent is BMI related to physical activity?
5. To what extent is BMI related to stress in middle childhood?
6. Do teachers feel that a student's weight is related to a student's academic achievement?

The subjects for this study included 680 students from one small, suburban intermediate school (Grades 4 [N=231], 5 [N=218], and 6 [N=231], 337 males and 343 females) in a southeastern county who participate in physical education classes. The

students ranged in age from 8 to 12 years. The students from the school described themselves as White (71%), African American (16%), Hispanic (7%), Asian/Pacific Islander (2%), and Multi-Racial (4%), Economically Disadvantaged (39%), Limited English Proficient (2%), Students with Disabilities (17%), and Academically Gifted (26%).

### **Qualitative**

A random group of teachers from the intermediate school participated in a focus group and interviews.

### **Instruments**

The participants were classified as either underweight, healthy weight, overweight, or obese based on their BMI percentile gathered in physical education classes. BMI does not measure body fat directly. However, BMI is a reliable and inexpensive alternative for direct measures of body fat used by the CDC and the American Academy of Pediatrics (AAP). Student height (nearest inch) and weight (nearest pound) were measured with shoes removed. A stadiometer or cloth measuring tape was used to measure height and a digital scale to measure weight. These stations were set up by the physical education teacher. The physical education teacher assigned each student a number and recorded age, date of birth, height, and weight of each student. Percentiles were determined using the CDC BMI calculator (<http://apps.nccd.cdc.gov/dnpabmi/Calculator.aspx>), which takes age and sex into consideration when determining BMI. The growth charts of the CDC show the weight status categories used with children (obese, overweight, healthy weight, and underweight). Children with a BMI equal to or greater than the 95th percentile were placed in the obese category. Children with a BMI in the 85th percentile to less than the



95th percentile were placed in the overweight category. Children with a BMI in the 5th percentile through the 85th percentile were placed in the healthy weight category. Children with a BMI less than the 5th percentile were placed in the underweight category. These are the weight status categories established by the CDC.

Academic achievement was obtained using district benchmark test results and report card grades. Tardies, absences, in-school suspensions, and out-of-school suspensions for the first quarter of the 2012-2013 school year were also used. Participants completed the first quarter district benchmark test which was administered by the school district for students in Grades 3 through 8 during the 9th week of school. These tests served as notification to students, parents, teachers, and administration of student performance; they monitored individual student progress; and they were used to identify school effectiveness. The fourth- through sixth-grade students completed the district benchmark tests across a 3-day period including 30- to 45-minute testing sessions lasting up to 4 hours. Questions included multiple choice items in mathematics, reading, and science (fifth grade only). Reading and math grades for the first 9-week grading period were collected by the school data manager. It was not necessary to assign a point value for each letter grade due to the fact that grades were reported numerically. The number of tardies and absences were collected for each student by the school data manager along with the number of in-school and out-of-school suspensions. Point values for grades, tardies, and in-school and out-of-school suspensions were coded according to the assigned student number.

Students completed web-based surveys from the CDC website in enrichment classes and recorded their individual levels of stress and physical activity beside their student number (see Appendices A and B). Levels of stress were given a point value.

For example, students received 3 points for a high stress level, 2 points for medium stress level, 1 point for a low stress or a no stress level. Physical activity levels also received a point value. For example, students received 3 points for a high level of physical activity, 2 points for a medium level of physical activity, and 1 point for a low level of physical activity. These surveys were completed as a part of the physical education teacher's health curriculum during the student's enrichment class. Data from the surveys were recorded by the students on a reporting form provided by the student's physical education teacher. The results were placed in an envelope and returned to the researcher with no identifying information.

Data collection also included interviews with teachers (see Appendix C). These were used to determine teacher perceptions regarding childhood obesity, stress, physical activity, and the relationship these have with academic performance.

### **Data Analysis and Procedures**

As part of the students' normal physical education requirements, anthropometric measurements were collected, and student questionnaires were completed. Before beginning data collection, all procedures were approved by the Institutional Review Board (IRB) at Gardner-Webb University.

The BMI information and student questionnaires were coded for the researcher so that the researcher did not have access to any personally identifiable information. The researcher worked with the data manager and assistant who used coding for district benchmark data, grades, tardies, absences, and in-school and out-of-school suspensions from the NCWISE database. The researcher recorded common themes that surfaced during teacher interviews and focus groups.

A correlational analysis was used to determine relationships between BMI, stress,

and academic performance and achievement of the subjects. An analysis of variance was used to determine significant differences between BMI, tardies, absences, in-school suspensions, and out-of-school suspensions for the identified groups. Statistical analyses were completed using the SPSS statistical package and significance determined at the .05 level.

The primary focus of this study answered the quantitative question of whether obesity is related to stress in middle childhood, school attendance, physical activity, and academic achievement based on data collected from the physical education class at the intermediate school. This portion of the study used a correlational design. This nonexperimental, mixed-methods design was used to analyze data which included the BMI for students in Grades 4 through 6, report card grades, benchmark test data, tardies, absences, in-school and out-of-school suspensions, levels of stress, and levels of physical activity.

The secondary focus of the study answered the qualitative question of whether obesity is related to stress in middle childhood, school attendance, physical activity, and academic achievement as perceived by teachers at the intermediate school. This portion of the study used a qualitative research design. The inclusion of interviews added depth and validity to the study. The researcher conducted focus groups and interviews at the school site, and teachers were randomly selected to participate. Teachers were informed about the study through a notification letter and consented to participate in the study. The interviews were recorded through handwritten notes and a recording device to ensure accuracy in the transcription of teacher responses. Transcribed notes from the interviews and focus groups were coded into themes based on similar responses.

## Research Questions

**Research Question 1.** The first research question was “What is the relationship between academic achievement and BMI?” The researcher determined the answer to this question by collecting data from the first quarter district benchmark assessment and report card grades along with the BMI data gathered in physical education classes. The quantitative data were used to determine the relationship between academic achievement and BMI through the use of a Pearson  $r$  correlation.

**Research Question 2.** The second question was “To what extent is there a difference in the tardies and absences of obese, overweight, and underweight students when compared to healthy weight students?” The researcher collected the data for absences and tardies for each student from the school data manager and BMI data from the physical education classes. The quantitative data were used to determine the extent tardies and absences differed among the weight categories of students. A one-way analysis of variance was completed for the school tardies and for absences. The groups for the analysis of variance included obese, overweight, normal weight, and underweight.

**Research Question 3.** The third question was “To what extent is there a difference in detentions and out-of-school suspensions of obese, overweight, and underweight students when compared to healthy weight students?” The researcher collected the data from in-school and out-of-school suspensions for each student from the school data manager and BMI data from the physical education classes. The quantitative data were used to determine the extent detentions and out-of-school suspensions differ among the weight categories of students. A one-way analysis of variance was completed for the detentions and for out-of-school suspensions. The groups for the analysis of variance were obese, overweight, normal weight, and underweight.

**Research Question 4.** The fourth question was “To what extent is BMI related to physical activity?” The researcher used data collected on each student’s physical activity levels by the physical education teacher through a web-based survey by the CDC. The physical activity levels were converted from low to 1, moderate to 2, and high to 3. There was a range of 1 to 3 for student physical activity levels. The quantitative data were used to determine the extent that BMI was related to physical activity through the use of a Pearson r correlation.

**Research Question 5.** The fifth question was “To what extent is BMI related to stress in middle childhood?” The researcher used data collected on each student’s stress level by the physical education teacher through a web-based survey by the CDC. The stress levels were converted from no stress or low stress to 1, moderate stress to 2, and high stress to 3. There was a range of 1-3 for student stress levels. The quantitative data were used to determine the extent that BMI was related to stress levels through the use of a Pearson r correlation.

**Research Question 6.** The sixth question was “Do teachers feel that a student’s weight is related to a student’s academic achievement?” The qualitative data were used to determine if teachers felt that the weight status of their students had a relationship with the student’s academic achievement. The researcher used this qualitative data to look for common themes and then discuss any patterns that the researcher saw emerging.

### **Limitations**

Some parents denied their children permission to participate in the BMI portion of the health unit during physical education classes, decreasing the number of students in the overweight and obese category. The intermediate school being used in the study had a large White population. This limited data to a small population of students from various

ethnic and socioeconomic backgrounds.

### **Timeline and Anticipated Outcome**

This study began in the fall of 2012 and was completed after the first grading period for the school district. The researcher anticipated that students in the categories of obese, overweight, and underweight would have significant differences in stress and academic achievement scores as well as tardies, absences, and in-school detentions and out-of-school suspensions. The results from this study benefit schools in the district as they continue to make decisions about the best way to promote student health. It gives them information about the relationship between BMI, middle childhood stress, and academic achievement, allowing them to alter curriculum and programs relating to student health as needed.

Chapter 4 contains the results regarding the relationship between BMI, academic achievement, stress, and physical activity for the intermediate school.

## **Chapter 4: Results**

### **Introduction**

Although childhood obesity has become a recent theme in the media over the past several years, educators have continued to focus more of their efforts on standardized tests and less of their efforts on healthy minds and bodies. The purpose of this study was to examine the relationships between BMI, stress, physical activity, and academic achievement. This chapter presents the results and analyses of the relationship between BMI data, student stress survey data, physical activity data, and academic achievement data. First, a report on the weight status, stress levels, and physical activity levels is presented by grade level. Then, an analysis of the quantitative portion of study is reported, including the results of the correlation between BMI, language arts and math grades, benchmark scores for language arts, math and science (fifth grade only), stress, and physical activity. Finally, an analysis of the qualitative research question is presented as it relates to the research questions.

### **Demographics Including Weight Status**

During the time frame (fall semester of 2012-2013), a total of 594 students of the 680 enrolled at the intermediate school were weighed and measured with their shoes removed using a stadiometer and digital scale during their physical education class by the physical education teacher as part of a health unit. The remainder of students was removed due to incomplete data caused by absences on the day of measuring or refusing to be measured by the physical education teacher. Demographic data from students who participated in the measuring process can be found in Table 1.

Table 1

*Weight Demographics*

Grade	Healthy Weight	Underweight	Overweight	Obese
Four	121	2	38	41
Five	98	23	26	40
Six	131	14	22	37
Total	350	39	86	118

The demographics show the majority of students from all three grade levels.

There was a similar amount of fourth-, fifth-, and sixth-grade participants.

**Research Question 1: What is the relationship between academic achievement and BMI?** The participants were classified as either underweight, healthy weight, overweight, or obese based on their BMI percentile gathered in physical education classes. Student height and weight were measured with shoes removed. A stadiometer was used to measure height and a digital scale to measure weight. The physical education teacher assigned each student a number and recorded age, date of birth, height, and weight of each student. Percentiles were determined using the CDC BMI calculator (<http://apps.nccd.ede.gov/dnpabmi/Calculator.aspx>) which takes age and sex into consideration when determining BMI. The growth charts of the CDC show the weight status categories used with children (obese, overweight, healthy weight, and underweight). Children with a BMI equal to or greater than the 95th percentile were placed in the obese category. Children with a BMI in the 85th percentile to less than the 95th percentile were placed in the overweight category. Children with a BMI in the 5th percentile through the 85th percentile were placed in the healthy weight category.



Children with a BMI less than the 5th percentile were placed in the underweight category. These are the weight status categories established by the CDC.

Academic achievement was obtained using report card grades and district benchmark scores during the first quarter of the 2012-2013 school year. Reading and math grades for the 9-week grading period were collected by the school data manager. Grades were numerical so there was no need to assign a point value for letter grades. Participants completed the first quarter benchmark test which was administered by the school district for students in Grades 3 through 8 during the 9th week of school. These tests served as notification to students, parents, teachers, and administration of student performance; they monitored individual student progress; and they were used to identify school effectiveness. The fourth- through sixth-grade students completed the district benchmark across a 3-day period including 30- to 45-minute testing sessions lasting up to 4 hours. Questions included multiple choice items in reading, mathematics, and science (fifth grade only).

When the total group of students ( $n=594$ ) was examined, there was a significant correlation at the 0.05 level among the BMI categories and language arts report card grades ( $r = -.103$ ) for participants in fourth, fifth, and sixth grades combined. As expected, language arts grades were lower for participants as their BMI increased. However, there was no significant correlation at the 0.05 level among the BMI categories and math grades ( $r = -.077$ ) for these same participants in fourth, fifth, and sixth grades. As their BMI went up, their math scores tended to go down, but the correlation was not significant. The correlation between BMI and report card grades are shown in Table 2 for reading grades and Table 3 for math grades.

Table 2

*BMI and Reading Report Card Grades*

Correlations			
		bmi	la
bmi	Pearson Correlation	1	-.103*
	Sig. (2-tailed)		.012
	N	594	594
la	Pearson Correlation	-.103*	1
	Sig. (2-tailed)	.012	
	N	594	594

Note: \*Correlation is significant at the 0.05 level (2-tailed).

Table 3

*BMI and Math Report Card Grades*

Correlations			
		bmi	ma
bmi	Pearson Correlation	1	-.077
	Sig. (2-tailed)		.063
	N	594	590
ma	Pearson Correlation	-.077	1
	Sig. (2-tailed)	.063	
	N	590	590

The number of students used in the correlation among math grades and BMI was 590. This was due to missing math grades in the NCWISE database for four students

who were weighed and measured.

When the total group of students ( $n=594$ ) was examined, there was no significant correlation at the 0.05 level among the BMI categories and language arts benchmark scores ( $r = -.065$ ) for participants in fourth, fifth, and sixth grades combined. There were, however, significant correlations at the 0.01 level among the BMI categories and math benchmark scores ( $r = -.125$ ) for these same participants in fourth, fifth, and sixth grades combined. A significant correlation was found at the 0.01 level between BMI categories and science benchmark scores for fifth grade only ( $r = -.200$ ). As expected, math and science benchmark scores were lower for participants as their BMI increased. The correlation between BMI and benchmark scores in language arts, math, and science are shown in Table 4 for language arts benchmark scores, Table 5 for math benchmark scores, and Table 6 for science benchmark scores.

Table 4

*BMI and Language Arts Benchmark Scores*

Correlations			
		bmi	lab
bmi	Pearson Correlation	1	-.065
	Sig. (2-tailed)		.114
	N	594	593
lab	Pearson Correlation	-.065	1
	Sig. (2-tailed)	.114	
	N	593	593

Table 5

*BMI and Math Benchmark Scores*

Correlations			
		bmi	mab
bmi	Pearson Correlation	1	-.125**
	Sig. (2-tailed)		.002
	N	594	593
mab	Pearson Correlation	-.125**	1
	Sig. (2-tailed)	.002	
	N	593	593

*Note:* \*\*Correlation is significant at the 0.01 level (2-tailed).

The number of students used in the correlation among language arts benchmark scores, math benchmark scores, and BMI was 593. This was due to missing language arts benchmark scores and math benchmark scores in the Thinkgate database for one student who was weighed and measured.

Table 6

*BMI and Science Benchmark Scores*

Correlations			
		bmi	scb
bmi	Pearson Correlation	1	-.200**
	Sig. (2-tailed)		.006
	N	594	188
scb	Pearson Correlation	-.200**	1
	Sig. (2-tailed)	.006	
	N	188	188

Note: \*\*Correlation is significant at the 0.01 level (2-tailed).

The number of students used in the correlation among science benchmark scores was 188. This was due to the science benchmark test being administered to fifth-grade students only.

**Research Question 2: To what extent is there a difference in the tardies and absences of obese, overweight, and underweight students when compared to healthy weight students?** Tardies and absences for each student were collected by the school data manager from the NCWISE database and BMI calculations by the physical education teacher. The categories used for the analysis of variance included obese, overweight, healthy weight, and underweight. Obese, overweight, and underweight students were compared to healthy weight students. When the total group of students was examined, there was no significant mean differences among the obese, overweight, and underweight categories when compared to healthy weight students for tardies and absences. The mean differences for tardies and absences between and within groups of obese, overweight,

healthy weight, and underweight students in fourth, fifth, and sixth grades are shown in Table 7 for tardies and Table 8 for absences.

Table 7

*Weight Groups and Tardies*

Category	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.412	11	.856	1.095	.362
Within Groups	454.657	582	.781		
Total	464.069	593			

The number students used in the mean difference for the analysis of variance between and among categories for obese, overweight, and underweight students when compared to healthy weight students for tardies was 593. This was due to missing data in the NCWISE database for one student who was weighed and measured.

Table 8

*Weight Groups and Absences*

Category	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.536	10	.954	1.223	.273
Within Groups	454.533	583	.780		
Total	464.069	593			

The number of students used in the mean difference for the analysis of variance between and among categories for obese, overweight, and underweight students when compared to healthy weight students for absences was 593. This was due to missing data

in the NCWISE database for one student who was weighed and measured.

**Research Question 3: To what extent is there a difference in detentions and out-of-school suspensions of obese, overweight, and underweight students when compared to healthy weight students?** Detentions and out-of-school suspension data were collected by the school data manager from the NCWISE database and BMI calculations by the physical education teacher. The groups used for the analysis of variance included obese, overweight, healthy weight, and underweight. Obese, overweight, and underweight students were compared to healthy weight students. When the total group of students was examined, there was no significant mean difference among the obese, overweight, and underweight categories when compared to healthy weight students for detentions and out-of-school suspensions. The mean differences for detentions and out-of-school suspensions between and within groups of obese, overweight, healthy weight, and underweight students in fourth, fifth, and sixth grades are shown in Table 9 for detentions and Table 10 for absences.

Table 9

*Weight Groups and Detentions*

Category	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.059	4	.765	.977	.419
Within Groups	461.010	589	.783		
Total	464.069	593			

The number of students used in the mean difference for the analysis of variance between and among categories for obese, overweight, and underweight students when compared to healthy weight students for detentions was 593. This was due to missing

data in the NCWISE database for one student who was weighed and measured.

Table 10

*Weight Groups and Out-of-School Suspensions*

Category	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.224	1	.224	.286	.593
Within Groups	463.845	592	.784		
Total	464.069	593			

The number of students used in the mean difference for the analysis of variance between and among categories for obese, overweight, and underweight students when compared to healthy weight students for out-of-school suspensions was 593. This was due to missing data in the NCWISE database for one student who was weighed and measured.

**Research Question 4: To what extent is BMI related to physical activity?**

Students completed a web-based survey from the CDC website during their enrichment class as part of a health unit designed by the physical education teacher. Each student recorded their level of physical activity from the survey on a reporting form provided by the physical education teacher. Physical activity levels received a point value. For example, students received 3 points for a high level of physical activity, 2 points for a medium level of physical activity, and 1 point for a low level of physical activity. When the total group was examined, there was no significant correlation at the 0.05 level for BMI and physical activity. The breakdown of physical activity data for students by grade level who were weighed and measured is shown in Table 11. The correlation between



BMI and physical activity for fourth-, fifth-, and sixth-grade students is shown in Table 12.

Table 11

*Physical Activity Demographics*

Grade	High	Medium	Low
Four	58	70	46
Five	49	48	36
Six	60	35	49
Total	167	153	131

The demographics show the students from all three grade levels who successfully completed the physical activity survey. There were a similar amount of fourth-, fifth-, and sixth-grade participants.

Table 12

*BMI and Physical Activity*

Correlations			
		bmi	pa
bmi	Pearson Correlation	1	-.027
	Sig. (2-tailed)		.555
	N	594	465
pa	Pearson Correlation	-.027	1
	Sig. (2-tailed)	.555	
	N	465	465

The number of students used in the correlation among BMI and physical activity levels was 465. This was due to students being absent on the day that physical activity surveys were completed, incomplete surveys, and surveys being completed incorrectly.

**Research Question 5: To what extent is BMI related to stress in middle childhood?** Students completed a web-based survey from the CDC website during their enrichment class as part of a health unit designed by the physical education teacher. Each student recorded their level of stress from the survey on a reporting form provided by the physical education teacher. Stress levels received a point value. For example, students received 3 points for a high level of stress, 2 points for a medium level of stress, and 1 point for a low level or no level of stress. When the total group of students was examined, there was significance at the 0.01 level among BMI categories of obese, overweight, healthy weight, and underweight students and stress levels ( $r = .120$ ). The breakdown of stress data for students by grade level who were weighed and measured is shown in Table 13. The correlation for BMI and stress levels for fourth-, fifth-, and sixth-grade students is shown in Table 14.

Table 13

*Stress Demographics*

Grade	High	Medium	Low
Four	11	31	136
Five	3	33	129
Six	6	23	116
Total	20	87	396

The demographics show the students from all three grade levels who successfully completed the stress survey. There were a similar amount of fourth-, fifth-, and sixth-grade participants.

Table 14

*BMI and Stress*

Correlations			
		bmi	stress
Bmi	Pearson Correlation	1	.120**
	Sig. (2-tailed)		.008
	N	594	490
Stress	Pearson Correlation	.120**	1
	Sig. (2-tailed)	.008	
	N	490	490

*Note:* \*\*Correlation is significant at the 0.01 level (2-tailed).

The number of students used in the correlation among BMI and stress levels was 490. This was due to students being absent on the day that stress surveys were completed, incomplete surveys, and surveys being completed incorrectly.

**Research Question 6: Do teachers feel that a student's weight is related to a student's academic performance?** Interviews were conducted with five teachers at the intermediate school. Teacher responses were recorded, transcribed, and coded using Creswell's (2008) steps to qualitative data analysis and interpretation. Teacher responses were analyzed to generate general descriptive statements about each theme. Unique responses were left as they were originally stated by the teacher, and similar responses

were combined into one representative statement to create a concise subset of descriptions about each theme.

The first open-ended question teachers were asked was “Do you think that childhood obesity is a problem in our school? If so, do you think that our school should address the problem. If not, who should address the problem?”

Responses from Question 1 contained different perceptions about the prevalence of obesity in the intermediate school. Four of the five teachers perceived that there were overweight and obese students in the intermediate school. However, these four teachers perceived the numbers to be one, two, or three in each classroom. Only one teacher perceived obesity to be a problem in the intermediate school. All five of the teachers acknowledged that students were not getting help with obesity at home so it should be addressed by the school district. Two of the teachers felt that it was already being partially addressed by the nutrition department with students having to choose a fruit and a vegetable when ordering lunch.

Question 2 asked teachers what the consequences of childhood obesity are. Two of the five teachers perceived that a consequence of childhood obesity would be huge medical costs. These two teachers shared that children would likely continue on the path of obesity into adulthood. They would not be in good health as adults, require more medical care, and cause medical costs to rise. One teacher stated that the medical costs could be so high that she had no way of knowing what the consequences would be.

Question 3 asked teachers if they thought that childhood obesity or the consequences have an effect on academic achievement. All five teachers perceived that childhood obesity or the consequences have an effect on academic achievement. The primary reason that these teachers felt that way was that overweight and obese students

are less motivated. They perceived their overweight and obese students less motivated to come to school and to do quality work. Several of the comments included that students often appear sluggish and students do not rise to challenges. Also, three teachers commented that students are unable to focus or have enough energy due to not having proper nutrition.

Question 4 asked if teachers think that students of different weight statuses are treated differently in their school. All five of the teachers perceived that students in the intermediate school are treated equally. Teachers do not treat the overweight and obese students differently. However, one teacher commented that she does make an effort to encourage movement in the classroom from the overweight and obese students throughout the day.

Question 5 asked if teachers thought that stress among school-age children was a problem at their school. If so, do they think that the school should address the problem? If not, who should address the problem? All five of the teachers perceived stress to be a problem in the intermediate school. Each teacher commented that testing is a cause of stress for the students in the school. This stress is added to the stress from their home life and not having their basic needs met according to two of the teachers. Two of the five teachers felt that the school was already doing something to address the problem by initiating a check in/check out policy for select students who appeared to be struggling with behavior or stress-related issues. This process is helping students leave their home life stress at the door as they check in with their assigned mentor at the start of each day. One teacher perceived that there was an increase in 504 testing accommodations for students due to test anxiety.

Question 6 asked teachers what the consequences of childhood stress are. Two of

the five teachers perceived that stress could lead to obesity due to people reaching for food when they are stressed out. One of the teachers commented that stress would affect health more than being obese. Three of the five teachers felt that students would not do as well academically and that eventually there would be an academic decline due to students giving up on tests altogether.

Question 7 asked teachers if they thought that stress or the consequences of stress have an effect on academic achievement. Four out of five teachers felt that students were not focused on their academics. One of the five teachers commented that if something was not done to alleviate the stress that students feel during high stakes tests it would have a negative effect on academic achievement.

Question 8 asked teachers if children on average in the intermediate school get enough physical activity. If not, do they think that the school should address the problem? Each teacher had a different perception about the amount of physical activity the intermediate school students received during the day. One teacher commented that some teachers are more health conscious and will use any spare minutes in the day on physical activity. Two of the teachers perceived that the intermediate school did not get as much physical activity as other schools where they had taught previously. One felt that their school district did not place an emphasis on making sure that all students received enough physical activity each day. One teacher felt that students get the opportunity for enough physical activity due to daily recess and a weekly physical education class. However, this teacher noted that it is possible that students may not be using that recess and physical education time to the fullest extent. Students could be standing or sitting rather than moving and being physically active during those times.

Chapter 5 contains the discussion, conclusions, and recommendations made by

the researcher for the intermediate school regarding childhood obesity.

## **Chapter 5: Discussion, Conclusions, Recommendations**

### **Overview**

This chapter discusses the research questions, conclusions, significance, and recommendations of the study. The purpose of this study was to determine if a relationship existed between BMI, stress, physical activity, and academic achievement. The study utilized a mixed-methods design to examine these relationships in a student sample from one intermediate school Grades 4 through 6 in a suburban area of North Carolina. By using data collected from the physical education teacher regarding BMI, stress, and physical activity as well as grades, benchmark scores, tardies, absences, detentions, and out-of-school suspensions from the school data manager and assistant principal, the researcher answered six research questions. This chapter reflects upon the quantitative and qualitative data collected to determine the major conclusions of the study findings and makes recommendations for policy and future research on the implementation of programs to improve childhood obesity, stress, and physical activity in the intermediate school.

**Research Question 1: What is the relationship between academic achievement and BMI?** This question was analyzed using a Pearson  $r$  correlation. Students were weighed and measured by the physical education teacher in order to calculate their BMI. Grades for language arts and math as well as benchmark data for language arts, math, and science (fifth grade only) were collected from the school data manager and assistant principal. The demographic data from this study showed that the intermediate school has 41% of students who are not at a healthy weight. The data from this study showed that there was no significant correlation between math grades or language arts benchmark scores and BMI. However, the data from this study showed that



there was a significant negative correlation for language arts grades, math benchmark scores, and science benchmark scores (fifth grade only). These findings support the research conducted by the National Longitudinal Study of Adolescent Health which found a significant negative relationship between BMI and grade point average for White females ages 14-17 (Sabia, 2007) as well as a study in West Virginia that found evidence that obesity negatively affected reading proficiency in high poverty districts (Gurley-Calvez & Higginbotham, 2010). Even though a significant correlation did not exist for all data points, a correlation did exist for all three subjects including language arts, math, and science. The study also showed that science benchmark scores for fifth grade only and BMI had the most significant negative correlation. Demographic data showed that the fifth grade had the highest percentage of students who were not at a healthy weight. The percentage of students who were not at a healthy weight was 48%. Approximately 48 more students were found to be at the low end or high end of the healthy weight range (within .5). The researcher feels that it is likely that these students could become underweight or overweight as they get older and the negative impact would be more pronounced. These 48 students would cause the school percentage for children not at a healthy weight to reach nearly 50%. Therefore, should schools not focus some of their effort to raise student achievement on healthy minds and bodies?

**Research Question 2: To what extent is there a difference in the tardies and absences of obese, overweight, and underweight students when compared to healthy weight students?** This question was analyzed using a one-way analysis of variance for tardies and for absences. The researcher collected the data for BMI from the physical education teacher and the data for tardies and absences from the school data manager. This quantitative data showed that the tardies and absences did not differ among the

weight categories of students. Most of the current research regarding weight status and number of school days missed takes place outside the United States (Alderman et al., 2009). This was the only study found that linked poor health from malnutrition to children missing more days of school. Although the data showed that tardies and absences did not differ among the weight categories, the researcher might have obtained a different result if the data from tardies and absences would have come from the entire school year or included data for tardies and absences from previous school years. It is the opinion of the researcher that during the first 9 weeks of the school year, students and parents see it as a new beginning and are more likely to be on time and present for school. As the year progresses, students tend to have more absences due to colder weather and flu season. Therefore, using data for tardies and absences from the entire school year could show a different result.

**Research Question 3: To what extent is there a difference in detentions and out-of-school suspensions of obese, overweight, and underweight students when compared to healthy weight students?** This question was analyzed using a one-way analysis of variance for detentions and out-of-school suspensions. The researcher collected the data for BMI from the physical education teacher and the data for detentions and out-of-school suspensions from the school data manager. This quantitative data showed that the detentions and out-of-school suspensions did not differ among the weight categories of students. Once again, it is the opinion of the researcher that students tend to have fewer detentions and out-of-school suspensions during the first 9 weeks of the school year. Students and teachers are still getting to know one another, and classroom rules are being established. Teachers in the intermediate school are working with students using Response to Intervention and both detentions and out-of-school

suspensions are a last resort. Raising School Attendance (2002) revealed that communication with parents is a top priority, and this was the case at this intermediate school during the first 9 weeks. Therefore, using data from the entire school year or including previous years could show a different result.

**Research Question 4: To what extent is BMI related to physical activity?**

This question was analyzed using the Pearson  $r$  correlation. The students completed a web-based survey by the CDC obtained by the physical education teacher during their enrichment class. These data were collected from the physical education teacher along with BMI data to determine physical activity levels for each student. The demographic data breakdown of physical activity levels showed that 29% of the students who were weighed and measured reported a low level of physical activity. Thirty-four percent reported a medium level of physical activity. The data from the study showed that there was no significant correlation between physical activity and BMI. However, the percentage of students reporting low and medium physical activity levels is similar to the percentage of students who are not at a healthy weight. The literature showed that physical inactivity and low physical fitness are associated with metabolic risk factors such as insulin resistance, obesity, and blood pressure in school-age children (Andersen, 2011). Also, the research showed that physical education programs in elementary schools have slowly eroded despite the evidence linking physical activity during childhood to later health outcomes (Tremblay et al., 2000). Students at the intermediate school currently receive physical education from the physical education teacher for approximately 50 minutes 1 day per week. Students have 20 to 25 minutes for recess included in their daily schedules. This recess time is free time outdoors with no teacher-led activities. Although the data from this study showed that there was no significant

correlation between physical activity and BMI, it is the opinion of the researcher that increasing physical education time with the physical education teacher would increase the physical activity levels for the student population. The researcher has also noted that the school improvement plan included setting a goal to promote an atmosphere where students are physically active and making healthy choices. One of the strategies for this plan included collaboration between regular education teachers and the physical education teacher to integrate activities into recess time, and this has not taken place during the 2012-2013 school year. Other than the students completing their BMI calculations from the measurements taken by the physical education teacher, no other fitness tests have been carried out during the 2012-2013 school year. With 41% of the student population at the intermediate school not being a healthy weight, should the school not be more diligent about upholding the school improvement plan and implementing even more strategies to improve student health?

**Question 5: To what extent is BMI related to stress in middle childhood?**

This question was analyzed using the Pearson  $r$  correlation. The students completed a web-based survey by the CDC obtained by the physical education teacher during the enrichment class. The data were collected from the physical education teacher along with BMI data to determine stress levels for each student. The demographic breakdown of stress levels showed that 4% of the students who were weighed and measured reported a high level of stress. Seventeen percent reported a medium level of stress. The data from the study showed that there was a significant correlation between stress and BMI. Current research shows that stress is on the rise in middle childhood even though it is complicated to accurately measure (Vanaelst et al., 2012). This study used only a web-based survey to determine the stress level of each student. Stress levels in middle

childhood are a new area of study (Vanaelst et al., 2012), and the researcher feels that different types of data such as interviews and laboratory measurements done by qualified professionals would better determine stress levels. It is the opinion of the researcher that a significant number of students have indicated a medium to high level of stress and that the school should plan to investigate the stress levels of the intermediate students during the next school year to better determine its relationship with childhood obesity and other causes.

**Research Question 6: Do teachers feel that a student's weight is related to a student's academic performance?** This question was analyzed using open-ended interview questions with five teachers at the intermediate school. These questions support the data from the Pearson r correlation in Research Question 1 that BMI is related to academic performance. All five teachers responded that they believed that childhood obesity or its consequences have an effect on academic achievement. Four of the five teachers acknowledged that there were overweight and obese students at the intermediate school. However, they did not have a good perception of the percentage of students who were not a healthy weight. It is the opinion of the researcher that most people have not received proper health and nutrition education and do not realize what normal weight should be for different age groups according to height. The researcher believes that the rise in childhood obesity has gradually increased over the past 20 years and that the general population perceives that normal weight is much higher than the actual numbers set by the CDC.

Due to the fact that all five teachers responded that BMI is related to academic performance, they also agreed that the problem should be addressed by the school district. The teachers limited their discussion about what was currently being done to

address the problem to the nutrition department. This school year, teachers were informed at a staff meeting of the new dietary guidelines requiring students to choose a fruit and a vegetable when eating school lunch. These are federal guidelines rather than guidelines set by the district. It is the opinion of the researcher that much more work is needed in the area of school nutrition. For example, students are allowed to purchase ice cream, cookies, and chips each day from the school cafeteria as long as they have money in their lunch account. They are also able to double the portion sizes if they have the money. The researcher eats lunch in the school cafeteria 4 to 5 days each week. The researcher has noted students who go through the line and are permitted to take only one fruit or one vegetable rather than getting one of each. The researcher also feels that items that count as a fruit or a vegetable do not meet the dietary guidelines. For example, a trail mix consisting of raisins, marshmallows, and cheerios count as a fruit.

All five of the teachers interviewed perceived that stress among school-age children was a problem at their school, and two of these teachers agreed that it could contribute to the obesity problem. These two teachers perceived that adults reach for food when experiencing stress and assume that children probably handle stress the same way. Four of the five teachers perceived that students are not focused on their academics and listed low levels of motivation as well as stress as causes. After identifying the common themes of the teacher perceptions to analyze this research question, it is the opinion of the researcher that much more education is needed by the staff of the school in order to address this problem of obesity and stress in the intermediate school.

Dietary habits are formed in early childhood and play an important role in the physical and social well-being of children (Wesslén et al., 2002). The fact that teachers believe that the intermediate school should address the childhood obesity problem

supports the research that schools are considered the primary setting in preventing obesity (Kukulu et al., 2010). This research acknowledges that the school setting provides an opportunity to reach all children and teachers support that the school should try to reach the children since they are not getting help at home.

### **Implications**

This study took place in a suburban district near a large city in the southeast. To the knowledge of the researcher, research on BMI, physical activity, stress, and academic achievement in this location has never previously been conducted. About 40% of students receive free and reduced lunch, and the school qualifies for Title 1 funds. This represents a substantial number of students who must deal with some form of poverty and many other challenges that likely have contributed to the obesity rate and stress levels. The high variance among the correlations performed suggests that a child's weight, stress, and academic achievement scores are within the scope of this study. Further research on topics such as socioeconomic status, parental factors, stress, and self-efficacy might provide further insight into why the obesity rate and stress levels are high in this region of North Carolina. Further research would also help the school district to focus direct attention in the appropriate areas to prevent obesity and stabilize the weight status of children in middle childhood before they reach the obese category.

This study showed a significant correlation between BMI and academic achievement for all grade levels. While a relationship cannot imply causality, the results suggest that the situation needs to be examined. Interventions providing staff, parents, and students with health education that addresses nutrition, physical activity, and adoption of obesity preventive lifestyle choices could prove beneficial in reversing the obesity rate in this intermediate school and in turn raise academic achievement. It is the

opinion of the researcher that sequential, skills-based, and evidence-based curricula that includes family involvement should be selected and implemented during the next school year. Appropriate education on nutrition and physical activity should be provided to students, teachers, food service staff, coaches, nurses, and parents at low cost to no cost. Nutrition education will also help the school to ban food as a reward/punishment, adopt standards for the cafeteria, and develop guidelines for healthy fundraising.

Although there was not a significant correlation between BMI and physical activity, the school should adhere to the strategy set forth in the school improvement plan to collaborate with regular education teachers in order to increase physical activity at recess as well as integrate obesity prevention into the general education curriculum. Physical activity should be expanded beyond the state physical education requirements, and students should receive more than 50 minutes of instruction by the physical education teacher each week. Every classroom teacher should provide students with physical activity during the day to help children have at least 60 minutes of vigorous physical activity. It is the opinion of the researcher that this could help stabilize the obesity rate at the intermediate school, take some of the focus off of testing and academics, and help reduce stress levels for students.

Due to the significant correlation between BMI and stress levels for students at the intermediate school, administration should partner with agencies and healthcare providers to provide school-based counseling programs that address the emotional needs of the overweight students as well as the normal weight students. These programs could help to eliminate bullying and direct children and families to resources where they can set and meet nutrition and fitness goals to create sound minds and bodies.



## **Future Research**

Future research may include attempting to increase the sample size. While a considerable number of students took part in the current study ( $n = 594$ ), almost 100 potential students did not participate, mostly due to the physical education teacher not receiving parental consent or the student being absent on the day of one or more of the measurements or surveys. Future research should include the entire student population of the intermediate school as well as younger and older students to see if the effect is cumulative. Further insight into obesity, physical activity, stress, and their relationship to academic achievement could potentially be acquired if the sample size included both intermediate schools in the district. Of the students who did participate, completing BMI calculations on a yearly basis would provide an indication of any changes that may have occurred as these children progress to middle school and high school. In addition, testing of various groups, both older and younger than the current sample, might provide a better understanding of the BMI patterns of all children in the district.

## References

- Alderman, H., Hoogeveen, H., & Rossi, M. (2009). Preschool nutrition and subsequent schooling attainment: Longitudinal evidence from Tanzania. *Economic Development and Cultural Change*, 57(2), 239-260. Retrieved from EBSCOhost.
- Amatea, E. S. (2013). *Building culturally responsive family-school relationships*. Upper Saddle River, NJ: Pearson.
- Andersen, L. B. (2011), Physical activity, fitness and health in children. *Scandinavian Journal of Medicine & Science in Sports*, 21, 155-156. doi: 10.1111/j.1600-0838.2011.01302.x
- Ashiabi, G. S. (2007). Associations among poverty and children's nutritional health status and schooling in Ghana. *Western Journal of Black Studies*, 31(2), 11-21. Retrieved from EBSCOhost.
- Bandura, A. (1977). *Social learning theory*. Upper Saddle River, NJ: Prentice Hall Publishing.
- Beckman, H., Hawley, S. & Bishop T. (2006). Application of theory-based health behavior change techniques to the prevention of obesity in children. *Journal of Pediatric Nursing*, 21(4), 266-275. doi.org.prox.lib.ncsu.edu/10.1016/j.pedn.2006.02.012
- Bempechat, J. (1998). *Against the odds: How "at-risk" children exceed expectations*. San Francisco, CA: Jossey-Bass, Inc.
- Berg, F. M. (2004). *Underage & overweight America's childhood obesity crisis: What every family should know*. Long Island City, NY: Hatherleigh Press.
- Berger, K. S. (2009). *The developing person through childhood and adolescence*. New York, NY: Worth Publishers.
- Bhattacharya, J. & Currie, J. (2000). Youths at nutritional risk: Malnourished or misnourished? *NBER Working Papers* 7686, National Bureau of Economic Research, Inc.
- Boyce, T. (2007). The media and obesity. *Obesity reviews*, 8(s1), 201-205. doi: 10.1111/j.1467-789X.2007.00342.x
- Bronwell, K. D., & Kaye, F. S. (1982). A school-based behavior modification, nutrition education, and physical activity program for obese children. *American Journal of Clinical Nutrition*, 35, 277-283.
- Centers for Disease Control and Prevention. (2010). *Healthy People 2010*. Retrieved from [http://www.cdc.gov/nchs/healthy\\_people.htm](http://www.cdc.gov/nchs/healthy_people.htm)

- Chen, Y., & Li, H. (2009). Mother's education and child health: Is there a nurturing effect? *Journal of Health Economics*, 28(2), 413-426. doi: 10.1016/j.healeco.2008.10.005
- Cho, S., Lambert, D. H., Kim, H., & Kim, S. G. (2009). Overweight Korean adolescents and academic achievement. *Journal of Family and Economic Issues*, 30, 126-136.
- Creswell, J. W. (2008). *Educational research: Planning, conduction, and evaluating quantitative and qualitative research*. Boston, MA: Pearson.
- Cueto, S. (2001). Breakfast and dietary balance: The enKid study, breakfast, and performance. *Public Health Nutrition*, 4(6A):1429-1431.
- Cutler, D. M., Glaeser, E. L., & Shapiro, J. M. (2003). Why have Americans become more obese? *Journal of Economic Perspectives*, 17(3), 93-118. Retrieved from <http://faculty.chicagobooth.edu/jesse.shapiro/research/obesity.pdf>
- Daniels, S. R. (2009). Associations between physical activity, fitness, and academic achievement. *The Journal of Pediatrics*, 155(6), A1. doi: 10.1016/j.jpeds.2009.10.022
- Datar, A., & Sturm, R. (2006). Childhood overweight and elementary school outcomes. *International Journal of Obesity*, 30(9), 1449-1460. doi:10.1038/sj.ijo.0803311
- Davis, C. L., Tomporowski, P. D., McDowell, J. E., Austin, B. P., Miller, P. H., Yanasak, N. E., . . . Naglieri, J. A. (2011). Exercise improves executive function and achievement and alters brain activation in overweight children: A randomized, controlled trial. *Health Psychology*, 30(1), 91-98. doi:10.1037/a0021766
- Dietz, W. H., & Gortmaker, S. L. (2001). Preventing obesity in children and adolescents. *Annual Review of Public Health*, 22, 337-353. doi: 10.1146/annurev.publhealth.22.1.337
- Dunton, G. F., Berrigan, D. D., Ballard-Barbash, R. R., Graubard, B. B., & Atienza, A. A. (2009). Joint associations of physical activity and sedentary behaviors with body mass index: Results from a time use survey of US adults. *International Journal of Obesity*, 33(12), 1427-1436. doi:10.1038/ijo.2009.174
- Epstein, L. H., Valoski, A. M., Vara, L. S., McCurley, J., Wisniewski, L., Kalarchian, M. A., . . . Shrager, L. R. (1995). Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology*, 14(2), 109-108. doi: 10.1037/0278-6133.14.2.109
- Florence, M. D., Ashbridge, M., and Veugelers, P. J. (2008), Diet quality and academic performance. *Journal of School Health*, 78, 209-215. doi: 10.1111/j.1746-1561.2008.00288.x

- Friedman, S. A. (2000). Making report cards measure up. *Education Digest*, 65(5), 45. Retrieved from EBSCOhost.
- Garcy, A.M. (2009). The longitudinal link between student health and math achievement scores. *Journal of Education for Students Placed at Risk*, 14(4), 283-310. doi: 10.1080/10824660903448755
- Glewwe, P., Jacoby, H. G., & King, E. M. (2001). Early childhood nutrition and academic achievement: A longitudinal analysis. *Journal of Public Economics*, 81(3), 345-368. doi: 10.1016/S0047-2727(00)00118-3
- Green, G. A. (2006). Childhood obesity: A growing phenomenon. *Education*, 127(1), 121. Retrieved from EBSCOhost.
- Green, G., Riley, C., & Hargrove, B. (2012). Physical activity and childhood obesity: Strategies and solutions for schools and parents. *Education*, 132(4), 915-920. Retrieved from EBSCOhost.
- Gurley-Calvez, T., & Higginbotham, A. (2010). Childhood obesity, academic achievement, and school expenditures. *Public Finance Review*, 38(5), 619-646. doi:10.1177/1091142110375682
- Horton, L. N. (2008). *Childhood obesity and depression*. Marshall University. ProQuest Dissertations and Theses. Retrieved from <http://search.proquest.com/docview/304365439?accountid=12725>
- International Association for the Study of Obesity. (2012). Diet, nutrition, and the prevention of chronic diseases. Retrieved from [http://www.iaso.org/site\\_media/uploads/WHO\\_TRS\\_916\\_Diet\\_nutrition\\_and\\_the\\_prevention\\_of\\_chronic\\_disease.pdf](http://www.iaso.org/site_media/uploads/WHO_TRS_916_Diet_nutrition_and_the_prevention_of_chronic_disease.pdf)
- Jennings, J. (2012, January). *Reflections on a half-century of school reform: Why have we fallen short and where do we go from here?* Retrieved from <http://www.cep-dc.org>
- Judge, S., & Jahns, L. (2007). Association of overweight with academic performance and social and behavioral problems: An update from the early childhood longitudinal study. *Journal of School Health*, 77(10), 672-678. Retrieved from EBSCOhost.
- Justus, M. B., Ryan, K. W., Rockenbach, J., Katterapalli, C., & Card-Higginson, P. (2007). Lessons learned while implementing a legislated school policy: Body mass index assessments among arkansas's public school students. *Journal of School Health*, 77, 706-713. doi: 10.1111/j.1746-1561.2007.00255.x
- Kaiser Family Foundation. (2004). *The role of media in childhood obesity*. Retrieved from <http://www.reboot.fcc.gov/parents/media-and-childhood-obesity>

- Kayapinar, F.C. (2011). Body mass index, dietary habits, and nutrition knowledge among primary school students. *Egitim Arastirmalari-Eurasian Journal of Educational Research*, 42, 135-152. Retrieved from EBSCOhost.
- Kohl, H. W., Fulton, J. E., Caspersen, C. J. (2000). Assessment of physical activity among children and adolescents: A review and syntheses. *Preventive Medicine*, 31, S54-S76.
- Kohn, M., Rees, J., Brill, S., Fonseca, H., Jacobson, M., Katzman, D., . . . Schneider, M., (2006). Preventing and treating adolescent obesity: A position paper of the society for adolescent medicine. *Journal of Adolescent Health*, 38(6), 784-787. doi.org.prox.lib.ncsu.edu/10.1016/j.jadohealth.2006.03.001
- Kristjánsson, A., Sigfúsdóttir, I., Allegrante, J., & Helgason, A. (2009). Adolescent health behavior, contentment in school, and academic achievement. *American Journal of Health Behavior*, 33(1), 69-79. Retrieved from EBSCOhost.
- Kukulu, K., Sarvan, S., Muslu, L., & Yirmibeşoğlu, S. G. (2010). Dietary habits, economic status, academic performance and body mass index in school children: A comparative study. *Journal of Child Healthcare*, 14(4), 355-366. doi: 10.1177/1367493510380079
- Latner, J. D., & Stunkard, A. J. (2003). Getting worse: The stigmatization of obese children. *Obesity Research*, 11, 452-456. doi: 10.1038/oby.2003.61
- Lefebvre, J. (2006). Vending machine makeovers. *Food Management*, 41(13), 10-11. Retrieved from EBSCOhost.
- Liew, J., Xiang, P., Johnson, A. Y., & Kwok, O. (2011). Effortful persistence and body mass index as predictors of running achievement in children and youth: A longitudinal study. *Journal of Physical Activity and Health*, 8(2), 234-243. Retrieved from <http://journals.humankinetics.com.prox.lib.ncsu.edu>
- Loewy, M. I. (1998). Suggestions for working with fat children in the schools. *Professional School Counseling*, 1(4), 18. Retrieved from EBSCOhost.
- Lucio, R., Rapp-Paglicci, L., & Rowe, W. (2011). Developing an additive risk model for predicting academic index: School factors and academic achievement. *Child and Adolescent Social Work Journal*, 28(2), 153-173. doi: 10.1007/s10560-010-0222-9
- Marks, D. R. (2002). *Raising stable kids in an unstable world: A physician's guide to dealing with childhood stress*. Deerfield Beach, FL: Health Communications, Inc.
- McDevitt, T. M., & Ormrod, J. E. (2013). *Child development and education*. Upper Saddle River, NJ: Pearson.

- Murphy, M., & Polivka, B. (2007). Parental perceptions of the schools' role in addressing childhood obesity. *The Journal of School Nursing*, 23(1), 40-46. doi: 10.1177/10598405070230010701
- Must, A., & Strauss, R. (1999). Risks and consequences of childhood and adolescent obesity. *International Journal of Obesity & Related Metabolic Disorders*, 23(2). Retrieved from EBSCOhost
- National Association for Sport and Physical Education. (2012). Opportunity to learn standards for elementary physical education. Retrieved from <http://www.aahperd.org/naspe/standards/nationalGuidelines/PA-Children-5-12.cfm>
- Neumark-Sztainer, D., Falkner, N., Story, M., Perry, C., Hannan, P. J., & Mulert, S. (2002). Weight-teasing among adolescents: correlations with weight status and disordered eating behaviors. *International Journal of Obesity*, 26(1), 123-131. doi: 10.1038/sj/ijo/0801853
- North Carolina Child Health Assessment and Monitoring Program (NC CHAMP). (2009). *Questionnaire*. State Center for Health Statistics, Raleigh NC. Retrieved from [www.schs.state.nc.us/SCHS/champ/pdf/CHAMPQ09.pdf](http://www.schs.state.nc.us/SCHS/champ/pdf/CHAMPQ09.pdf)
- North Carolina Department of Public Instruction. (2012). North Carolina State Board of Education: Healthy active children (2005). Retrieved from <http://www.healthyschools.org/components/healthyactivechildrenpolicy>
- Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence and trends in overweight among us children and adolescents, 1999-2000. *JAMA*, 295(13), 1549-1555. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/16595758>
- Organization Economic Co-operation and Development. (2010). Lessons from PISA for the United States. Retrieved from <http://www.oecd.org/pisa/46623978.pdf>
- Pearlin, L. I., Schieman, S., Fazio, E. M., & Meersman, S. C. (2005). Stress, health, and the life course: Some conceptual perspectives. *Journal of Health and Social Behavior*, 46(2), 205-219. doi: 10.1177/002214650504600206
- Physicians Committee for Responsible Medicine. (2010). Fighting for America's children. Retrieved from <http://pcrm.org/media/commentary/fighting-for-americas-children>
- Proctor, M. H., Moore, L. L., Gao, D., Cupples, L. A., Bradlee, M. L., Hood, M. Y., & Ellison, R. C. (2003). Television viewing and change in body fat from preschool to early adolescence: The Framingham children's study. *International Journal of Obesity*, 27, 827-833. doi: 10.1038/sj.ijo.0802294

- Raising School Attendance. (2002). *Education Digest*, 67(6), 54. Retrieved from EBSCOhost
- Ramperasaud, G. C., Pereira, M. A., Girard, B. L., Adams, J., & Metz, J. D. (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association*, 105(5), 743-760. doi: 10.1016/j.jada.2005.02.007
- Rimm, S. B. (2004). *Rescuing the emotional lives of overweight children: What our kids go through-and how we can help*. Emmaus, PA: Rodale Press.
- Robinson, T. N. (1999). Reducing children's television viewing to prevent obesity: A randomized controlled trial. *JAMA*, 282(16), 1561-1567.
- Sabia, J. J. (2007). The effect of body weight on adolescent academic performance. *Southern Economic Journal*, 73(4), 871-900. Retrieved from <http://www.jstor.org.proxy.lib.ncsu.edu/stable/20111933>
- Scott, M. M., Cohen, D. A., Evenson, K. R., Elder, J., Catellier, D., Ashwood, J. S., Overton, A. (2007). Weekend schoolyard accessibility, physical activity, and obesity: The trial of activity in adolescent girls (TAAG) study. *Preventative Medicine*, 44(5), 398-403. doi.org.proxy.lib.ncsu.edu/10.1016/j.ypmed.2006.12.010
- Sigfúsdóttir, I. D., Kristjánsson, A. L., & Allegrante, J. P. (2007). Health behaviour and academic achievement in Icelandic school children. *Health Education Research*, 22(1), 70-80. doi:10.1093/her/cyl044
- Silverstein, A., Silverstein, V. B., & Silverstein, R. A. (1991). *So you think you're fat?* New York, NY: HarperCollins.
- Simons, R. (2011). *Bigger isn't always better: Choosing your portions*. Broomall, PA: Mason Crest Publishers Inc.
- Steiniger, L. (1997). *The relationship between body-mass index and academic achievement in third-grade white females*. The University of Arizona. *ProQuest Dissertations and Theses*, 101-101p. Retrieved from <http://search.proquest.com/docview/304332414?accountid=11041>
- Taras, H. (2005). Nutrition and student performance at school. *Journal of School Health*, 75, 1991213. doi: 10.1111/j.1746-1561.2005.tb06674.x
- Tremblay, M., Inman, J., & Willms, J. (2000). The relationship between physical activity, self-esteem, and academic achievement in 12-year-old children. *Pediatric Exercise Science*, 12(3), 312-323. Retrieved from EBSCOhost

- Trudeau, F., & Shephard, R. J. (2010). Relationships of physical activity to brain health and the academic performance of school children. *American Journal of Lifestyle Medicine*, 4(2), 138-150. doi: 10.1177/1559827609351133
- United States Department of Education, Elementary & Secondary Education. (2001). *Title I: Improving the academic achievement of the disadvantaged*. Washington, D.C. Retrieved from <http://www2.ed.gov/policy/elsec/leg/esea02/pg1.html#sec1001>
- United States Department of Health & Human Services. (2011). Childhood obesity and the impact of food marketing on children. Retrieved from <http://www.hhs.gov/asl/testify/2008/09/t20080923d.html>
- Vanaelst, B., De Vriendt, T., Huybrechts, I., Rinaldi, S., & De Henauw, S. (2012). Epidemiological approaches to measure childhood stress. *Pediatric and Perinatal Epidemiology*, 26, 280-297. doi: 10.1111/j.1365-3016.2012.01258.x
- Washington, T. D. (2009). Psychological stress and anxiety in middle to late childhood and early adolescence: Manifestations and management. *Journal of Pediatric Nursing*, 24(4), 302-313. doi: 10.1016/j.pedn.2008.04.011
- Wesslén, A., Sepp, H., & Fjellström, C. (2002). Swedish preschool children's experience of food. *International Journal of Consumer Studies*, 26, 264-271. doi: 10.1046/j.1470-6431.2002.t01-1-00227.x
- Wisniewski, S. (2010). Child nutrition, health problems, and school achievement in Sri Lanka. *World Development*, 38(3), 315-332. Retrieved from <http://dx.doi.org.prox.lib.ncsu.edu/10.1016/j.worlddev.2009.09.009>
- Wood, D. (2010). Global childhood obesity update. *Childhood Obesity*, 6(4), 221-224. doi: 10.1089/chi.2010.0423
- The World Bank. (2012). Communication for governance & accountability program. Theories of behavior change. Retrieved from <http://siteresources.worldbank.org/EXTGOVACC/Resources/BehaviorChangeweb.pdf>



## Appendix A

### BAM! Body and Mind-Head Strong: Stress-O-Meter Quiz

1. How's your social scene? Click on all the stuff that's true.

- You feel like you fit in.
- You get pushed around a lot.
- You feel a lot of pressure to do things you don't want to do.
- Kids are always gossiping about you.
- You're busy, but you still have enough time for yourself.
- You get super stressed about situations with your friends or other kids.

2. What's up at home? Click on all the stuff that's true.

- You just moved.
- Your brothers and sister drive you nuts!
- Your parents mostly listen to you.
- Your parents complain about their busy lives.
- After school, you eat, do homework, and go to bed around the same time most days.
- Your parents are separated or divorced.
- Your family fights 24/7.
- Your parents are always on your case.
- Money is tight at home these days.
- Somebody in your family is really sick.
- Someone you were close to died recently.
- You stay home alone for a while after school.
- You have new step brothers or sisters.
- You get super stressed about stuff going on at home.
- Your neighborhood feels safe.

3. What's up with school? Click on all the stuff that's true.

- You feel safe at school.
- You get super stressed about school.
- You feel sick on Monday mornings.
- You have a hard time getting it together for school each day.
- School's okay. You don't mind going.
- It's hard to keep your grades up.
- Test time=stress time.
- You're drowning in homework!
- You feel like you have all the stuff you need for school.
- You just started a new school.

4. What's up with you? Click on all the stuff that's true.

- You put lots of pressure on yourself.
- You like the way you look.
- You trust your judgement.
- You roll with life-it's okay to change your mind about stuff.
- You can laugh at yourself when you make mistakes.
- You feel revved up and ready to go when something big is going on.
- You try to see the good side even of bad situations.
- You figure out the answers to your problems by yourself.

- You wonder if your body is normal.
- You can stand up for yourself (and other people) and still keep your friends.

5. What's your bod say? Click on all the stuff that happens to you a lot.

- Headache.
- Upset stomach.
- Heart pounds and you breathe fast.
- Fall asleep easily and sleep until morning without any trouble.
- Not hungry or want to eat all the time.
- Feel tired.
- Muscles ache.
- Grind your teeth or have a tight jaw.
- Sweaty palms.

6. What's your head say? Click on all the feelings you have most of the time.

- Nervous and can't relax, hyper.
- Happy.
- Worried, think that something bad will happen.
- Frustrated.
- Grouchy or moody.
- Guilty, think people are disappointed in you.
- Zeo energy.
- Confused or want to get away and hide.

7. Do you.....? Click on all of the stuff you usually do.

- Only cry for a good reason.
- Take your bad feelings out on other people.
- Get freaked about stuff that didn't use to bother you.
- Get really upset if somebody criticizes you.
- Get overwhelmed with all the things you have to do.

8. What do you do to relax and chill?

- Talk to someone, like a friend or someone in your family.
- Do something fun.
- Pig out on junk food.
- Sleep more.
- Take time to chill out.
- Get into a physical activity, like a sport or just taking a walk.
- Stay away from what bugs you out.
- Write it out.
- Help others, participate in a program to do good things.
- Try to get your stuff in order.
- Give yourself a boost from drinking something with caffeine (like soda) or a sports drink.

Appendix B  
Motion Commotion

1. The kind of activities I like are risky and exciting. I like to move like lightning or change directions quickly.  
Absolutely  
Maybe  
Not Really  
No Way
2. What a move! I like to do physical activities that look incredible when others do them. I appreciate their moves and want to do them too.  
Absolutely  
Maybe  
Not Really  
No Way
5. For me, physical activities are major stress relievers. I can take a break from my problems not only by doing the activities, but also by watching others do them.  
Absolutely  
Maybe  
Not Really  
No Way
6. No pain, no gain! I like activities that are physically tough. Give me a long hard practice any day - even if I have to give up other things for it.  
Absolutely  
Maybe  
Not Really  
No Way

## Appendix C

### Interview and Focus Group Questions

### Interview/Focus Group Questions

1. Do you think that childhood obesity is a problem in our school? If so, do you think that our school should address the problem. If not, who should address the problem.
2. What do you think the consequences of childhood obesity are?
3. Do you think that childhood obesity or the consequences have an effect on academic achievement?
4. Do you think that students of different weight status are treated different in our school?
5. Do you think that stress among school-age children is a problem at our school? If so, do you think that our school should address the problem. If not, who should address the problem.
6. What do you think the consequences of the childhood stress are?
7. Do you think that the childhood stress or the consequences have an effect on academic achievement?
8. Do you think that children on average in our school get enough physical activity? If not, do you think that our school should address the problem?