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The purpose of this research study was to examine levels of physical activity participation in elementary-aged school children who participated in at least a weekly 40-minute physical education class. In doing so, the contribution of physical education classes to daily accumulated physical activity levels among children was determined. More specifically, this research study examined the amount of time children were physically active within 40-minute physical education class sessions. This research study also described the types of activities in which children were involved in during and after school. Finally, the link between BMI and physical activity levels were examined.

Conclusions

Based on this study's findings the following conclusions were made:

1. Overall, it was found that students spent less than half of their instructional time in being physically active. Much of the inactive time was spent listening to the teacher and waiting to engage in an activity. However, when grade level was considered the amount of motor activity somewhat increased.

2. Teachers differed in terms of the way they organized their instructional time. Woodson's teacher instructional time was organized in a way that more than half of the time was spent in non motor engaged activities. Students at Mercy and Richmond Elementary School spent the higher amounts of instructional time performing motor activity.

3. The third-graders at Richmond Elementary School spent the highest amount of instructional time in performing motor activity, while the fourth graders spent the least amount of time in performing motor activity. The third-graders and fifth-graders at Woodson Elementary School spent the highest amount of time in performing motor activity. The fifth-graders at Mercy Elementary School had the highest amount of time in performing motor activity.

4. Females at Richmond Elementary School spent the same amount of instructional time as males in performing motor activity. However, differences between male and females were more prevalent when examining individual schools. At Woodson Elementary School males spent a higher amount of instructional time in performing motor activity than females. Lastly, at Mercy Elementary School females spent more instructional time than males and they both spent over half the instructional time in performing motor activity.

5. It was found that males took more average steps per minute than females. It was found that third graders took more steps per minute than the fourth- and fifth-graders. Lastly, it was found that students at Mercy received the highest among of steps per minute, while Richmond received the lowest.

6. It was found that a grade by school interaction was significant ($p < .05$). It was reported that third-graders at Richmond were greater than fourth- and fifth-graders at Richmond. It was reported that fifth-graders at Woodson were greater than third- and fourth-graders at Woodson. Lastly, it was reported that fifth-graders at Mercy were less than third- and fourth-graders at Mercy.

7. When ranking the preferences for physical activity outside of physical education classes for all schools and all grades it was found that students spent their average time in this ranking order: (a) Jogging, (b) Walking, (c) Dancing, (d) Playing Tag, and (e) Skipping.

8. When correlating the physical activity level and BMI for all 120 subjects, an inverse correlation was found to be significant at ($p < .05$). It indicated that the higher the levels of physical activity, the lower the BMI scores. When compared across gender, the relationship was different in males and females. In males the linear inverse relationship between BMI and physical activity was much stronger. However in males, BMI and levels of physical activity did not appear to be significantly related.

9. There was also an inverse relationship between BMI and physical activity levels at each of the three schools in this study. The correlation was significant only at Richmond Elementary School. This was because of the artifact of a smaller sample size at the other two schools.

10. There was an inverse linear relationship between BMI and physical activity at each of the three grade levels. Although statistically significant in grade five the inverse relationships in the other two grades were weak and non significant.

ASSESSMENT OF STUDENT ENGAGEMENT, PHYSICAL ACTIVITY LEVELS, AND BODY COMPOSITION IN THIRD-, FOURTH-, AND FIFTH-GRADE PHYSICAL EDUCATION CLASSES

by

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A Dissertation Submitted to
the Faculty of The Graduate School at
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Approved by

_____
Committee Chair

This dissertation is dedicated to

Allen Fuller, Pauline Fuller, Kisha Fuller and the Late William Carter

for uplifting my spirits and giving me support

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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"I can do all things through Christ who strengthens me."

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CHAPTER I

INTRODUCTION

Introduction to the Study

> "Open your window on a sunny afternoon, and what do you hear? The chirping of singing birds? The yelling of playing children? Odds are these days that you'll hear the birds but not the children. As kids spend more time in front of the television, computer and video screens, their physical activity levels have decreased. And their body weight has increased. (Togan, 2002)

Today's children live in a social and physical society that makes it effortless for them to overeat, easy to be sedentary, and inconvenient to be physically active (Staveren & Dale, 2004). As a result, many children are living sedentary lifestyles (Yaussi, 2005). Years ago, such children were referred to as "couch potatoes" because they laid on the couch and watched hours of television. Today we continue to see children spending numerous hours at a time playing video games, talking on cell phones, watching DVD's, eating and then sleeping. Similarly, Saelans (2003) noted that today's children leisure pursuits in technological gadgets have resulted in a decrease in their physical activity levels.

Support for the Saelans' claim that technology has been a main culprit for the increase in sedentary lifestyle of children come from various studies. One study by Chmelynski (2006) showed that children 8 to 10 years of age tend to spend an average of six hours a day using computers, playing video games and watching television. The unfortunate consequence posed by these electronic distractions for children is that high

levels of physical inactivity and obesity can be almost as severe as several well-known CHD risk factors, such as high blood pressure, cigarette smoking, and high blood cholesterol (Spain & Franks, 2001).

In another study Shann (2001) found that over 1500 students in four urban middle schools spent the highest percentage of their time outside of school watching television and playing video games. In particular, children reported spending more time watching television after school than engaging in any other types of activities such as: (a) working outside the home, (b) doing chores, (c) doing homework, (d) hanging out, (e) going shopping, (f) going to movies, (g) going to church, (h) playing sports, (i) taking lessons, and (j) playing music (Shann, 2001).

Overall, these studies have concluded that while technological advances have made daily activities easier and more interesting, they have played a negative role in attributing to the obesity epidemic among children. That is, the sedentary lifestyles of children and youth have lead to a subsequent rise in childhood obesity (Pietrobelli & Steineck, 2004; Rushovich et al., 2006).

Indeed, childhood obesity has been identified as one of most serious problems affecting individuals and public health today (Budd & Volpe, 2006). According to the National Alliance for Nutrition and Activity (2005), obesity rates among children have nearly doubled and have tripled in adolescents over the last two decades. Relative to the former, childhood obesity rates have reached epidemic proportions in the United States, and are still continuously ever-increasing (Cline, Spradlin, & Plucker, 2005). Therefore, a logical approach to combating childhood obesity is through increased physical activity

engagement (Krisberm, 2006). Consequently, there has been an urgent call to encourage kids and families to seek more active lifestyles.

The Role of School Physical Education Programs

Advocates and even political pundits have called upon school physical education programs to provide the necessary opportunities to engage youngsters in vigorous physical activity experiences during the school week. While weekend sport programs do this to some extent, the majority of time spent during the week by kids is in their schools.

According to Cook (2005) unlike other curricular areas within schools, physical education is the one curricular area that can effectively address the decline of physical activity levels in children. One main reason for this is that physical educators possess the ability and knowledge to involve children in wholesome activity participation. The other reason is the children inherently love to be physically active.

It seems, therefore, that allotting more time in physical education would be a great response to the call for getting children more physical active. But simply having more time does not always guarantee more physical activity for kids. For example, Dartor and Sturm (2004) analyzed data from a kindergarten class over a five year period. The two researchers focused on physical education instructional time and the body mass indices (BMI). They found that adding one additional hour of physical education in first grade compared with the same time allowed for physical education in kindergarten children only reduced the BMI of girls. There was no effect for the boys in either grade. They concluded that the type of activities provided in allocated instructional time was more important than the increase of time itself.

So increasing instructional time may not be enough to insure that children will be physically active enough to enhancement fitness levels, and in particular, control of weight gain. That is, one could argue that learning tasks must not only be activity-based but must be at a level of intensity where fitness gains are realized for all kids (Beauchamp, Darst, & Thompson, 1990). Therefore, the allocation of more instructional time in physical education classes does not guarantee essential physical activity for children—an point made earlier by Dartur and Sturm (2004).

In fact, it has been shown that physical activity levels can be actually lower in physical education classes than in other contexts of the child's school. For example, when comparing physical education class to recess and lunchtime on levels of activity, Tudor-Locke and her colleagues (Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006) found that physical education classes did not fare very well. When they examined the sex-specific patterns of eighty-one children by daily pedometer readings during physical education, recess, and lunch time, they found that both girls and boys took more steps during lunchtime than during recess or physical education. Such findings would suggest the types of activities, management of instructional time, and, in some cases, class size may all impact the level and types activities offered during classes.

The Concern in Guilford County

According to the North Carolina Department of Health and Human Services (2006) the state average for obesity is at 62.6 percent and continuously increasing. In Guilford County, the percentages of obesity among children have increased, which confirms that there is a concern. From 2-4 years of age, 5-11 years of age, and 12-18

years of age there has been a significant increase of obese children. In 1995 there was an average of 14.68% of children who was considered obese in Guilford County ages 5-11. The percentage has increased every year for the past thirteen years, with the last percentage (2006) being 25.24% (Eat Smart & Move More, 2006).

With children's obesity rates increasing in Guilford County there is a concern that physical activity levels among children are decreasing. When looking at national research on physical activity levels it was found that the majority of research was conducted at the high school level and when looking at studies in Guilford County it was once again based on high school students. When looking at what's going on in North Carolina Gyms and in particularly Guilford County there have been no systematic studies to describe the activity levels of kids during physical education nor has there been research conducted outside the gym walls. Thus, it is necessary for research to be conducted in Guilford County that examines the physical activity levels of youth. Therefore, two important research questions that have yet to be specifically addressed are: (a) How much vigorous physical activity are children getting within and outside of their physical education classes? and (b) Do their levels of physical activity participation have a significant impact on their levels of body mass index? Answering these two research questions would provide the State of North Carolina professionals and policy makers with more information to advocate for physical education programs in the public schools, and for having quality physical education programs that effectively address the child obesity epidemic.

Purpose of the Study

The purpose of this research study is to examine levels of physical activity participation in elementary-aged school children who participate in at least a weekly 40 minute physical education class. In doing so, the contribution of physical education classes to daily accumulated physical activity levels among children can be determined. More specifically, this research study examines the amount of time children are physically active within forty-minute physical education class sessions. This research study also intends to describe the types of activities in which children are involved in during and after school. Finally, the link between BMI and physical activity levels will be examined. In particular, this study is guided by the following questions:

1. How is instructional time used in third-, fourth-, and fifth-grade physical education classes across three schools? Specifically, what are the mean percentages of time spent in (a) performing activity, (b) receiving information, (c) giving information, (d) waiting, (e) relocating, and (f) other.
2. What are the grade, school, and gender differences in physical activity levels and body mass indices of third-, fourth-, and fifth-grade students across three schools?
3. What are the various types of physical activities that third-, fourth-, and fifth-grade students engage in outside of physical education classes across three schools?

4. What is the relationship between physical activity level and body mass index for third-, fourth-, and fifth-grade male and female students across three schools?

Definitions of Terms

The following are the operational definitions of the main term words that are in this study:

Physical Activity Level: The average number of steps per minute (recorded by pedometers) that students took in physical education classes among three classes.

Body Mass Index: A measure of relative body weight that takes height into account and is highly correlated with more direct measures of body fat. It is calculated by dividing total body weight in kilograms by the square of height in centimeters (Insel & Roth, 2006).

Instructional Time: The amount of time allocated for instruction in physical education classes.

Student Behavior Engagement: Students' activities were coded in physical education classes according to the following categories: (a) performs motor activity; (b) receives information, (c) gives information, (d) waits, (e) relocates, and (f) other.

Assumptions

The following assumptions are made by the investigator:

1. The content and activities in the physical education classes are representative of other schools in the state of North Carolina.
2. The pedometer is a valid and reliable measure of physical activity.

3. The Student Behavior Engagement measure gives an overview of how participants spend their instructional time during physical education classes.
4. Student description of activity engagement outside of physical education class as shown by a self-report is accurate.

Limitations/Delimitations

Limitations:

Thirty-minute physical education class periods are set in the daily school schedule, but may not represent those classes that have more or less time allotment.

Delimitations:

This study is restricted to third-, fourth-, and fifth-grade students attending three local elementary schools in the Guilford County School District. The results may not be generalizable to children in other public schools or grades.

Significance of the Study

The study will provide insight to the body mass index levels and physical activity levels of girls and boys in third, fourth, and fifth grades in three elementary schools in the Guilford County Schools System. The results of the study will contribute to the quality of physical education programming in Guilford County with its focus being on health and physically active lifestyles. Because research in physical activity time and body composition has been limited in Guilford County, this study will bring fourth data that will allow physical educators to be aware of how time is used in physical education and the body mass indices of the elementary aged children. This research study will also allow physical education teachers to know the various activities that students participate

in outside of school. With this knowledge they could develop interventions to keep students more active in school and after school.

As a means to effectively address the obesity epidemic; every child that is in school today should have access to daily physical education involving moderate to vigorous physical activity participation. With this in mind, physical education programs have to change (Green & Reese, 2006). With the majority of schools in the United States continuing to consider physical education as a minor priority in the school curriculum, it must become a priority. Even if physical education becomes a priority, it is important to understand how students are spending their instructional time in physical education classes.

CHAPTER II

REVIEW OF LITERATURE

> Oh, to be a child in America: Morning cartoons with a breakfast of sugar coated cereal, hours on the sofa munching chips and playing video games, matinee movies enjoyed with mega-sized servings of soda and popcorn, frozen dinners followed by more hours surfing computer chat rooms, and finally bed. In all, this combination of inactivity and gluttonous feeding, which is shared by millions of American children, fuels one of the country's most alarming pediatric problems: obesity. (Schmidt, p. 700)

Childhood obesity has become one of the most important health challenges and public health concerns today (Fowler-Brown & Kahyati, 2004). According to Onis (2004) during the past two decades, the prevalence of obesity in children has increased worldwide. An important dimension of obesity is its relationship to specific health problems. Because of being overweight, children may be obliged to live a less healthy and ultimately shorter life than their parents, making this epidemic a crucial public health concern (Daniels, 2006). Kral (2004) adds that obesity is actually eroding the increased length and quality of life in spite of the many advances in medical research and public health in our nation. Indeed, some obesity related conditions are having immediate and chronic long term health effects like diabetus (Waldman & Perlman, 2007), asthma, (Gilliland, Bertane, Islan, McConnell, Gauderman, Gilliland, Avol, & Peters, 2003), early puberty (Slyper, 1998), and heart disease (Massey-Strokes, 2002).

Obesity has also been found to not only affect physical wellness, but emotional wellness (Fahey, Insel, & Roth, 2007; Lynn-Garbe & Hoot, 2004). Children that are

obese often encounter many different types of emotional abuse in the classrooms and on the playground. They are often a target of discrimination that is highly emotional and many times socially damaging. Indeed, being discriminated among their peers because of size can readily lead to such psychological problems like depression, anxiety, and low self-esteem (Fahey, Insel, & Roth, 2006).

The unfortunate consequence of such psychological problems is low attendance at school. In fact, obese children tend to miss more days of school for medical reasons along with psychological reasons. Increased absences from school means that students will fall behind in school work and thus have a more a difficult time comprehending additional assignments given by the teacher. When in class these children will also lack the energy to uphold the concentration needed to process new information, in which may in return keep the teachers from advances others (Yaussi, 2005).

For example, the effect of obesity on classroom performance was substantiated by Judge and Jahns (2007) who examined 13,680 third grade children. They found that overweight children had lower math and reading test scores than children who were not overweight. It was also found that overweight girls had significantly more external and internal problems and more issues with self-control than non overweight girls (Chmelynski, 2006).

With obesity becoming an alarming trend in our nation's children it is vital to examine those factors that contribute to this health issue. One factor that has proven to be a significant predictor of childhood obesity is low physical activity levels (Lucker, 1999; Parents and adults agree that children today are less active than when they were as

children (Lueker, 1999). They often reminisce of the time when they walked long distances to school**.** Children today are now picked up by buses and taken to school. When children today become teenagers, they drive to school in which increases their level of inactivity.

Recently researchers have begun to examine the deterrents of physical inactivity among children and how it relates to the obesity epidemic. One major deterrent to physical activity engagement among children is the enticement of electronic entertainment gadgetry (e.g., television, video games, DVD players, (Vandewater, Shim, & Caplovitz, 2004; Jordan, Hersey, Devitt, & Heitzler, 2006). Chmelynski (2006) reported that children 8 to 10 years of age tend to spend an average of six hours a day using computers, playing video games and watching television.

Francis, Lee, and Birsh (2003) found that television watching is the main deterrent to physical activity. They examined elementary-aged girls and the time they spent watching television, eating snacks. Their goal was to find if changes in body mass indices (BMI) were influenced by these time variables. Francis et al.'s findings suggest that excessive television viewing and snacking patterns were positively correlated thus becoming health-risk factors for children.

Physical Activity and Instruction in Physical Education

Given the above findings, health experts began to look at school programs as a vehicle for augmenting physical activity levels in kids. In particular, these experts, along with some political pundits, pushed for more physical education time during the school day. Unfortunately, researchers found that just increasing the amount of time students

spend in physical education class is no guarantee that they are physically active (Hellmich, 2000; Simons-Morton, Tayler, Snider, & Huang, 1993). For example, Simons-Morton and his colleagues examined physical activity among fifth grade students during physical education classes in one large county in Texas. Findings showed that students spent 11.9% of time moving from one location to another, 8.5% of the time in moderate to vigorous motor activity, 23.3% of their time in minimal motor activity and 68.5% of the time in nonmotor activity. In another study, Lacy, LaMaster and Tommaney 1996) found that students only spend 21% to 38% of their time in motor activity. Similarly, Simons-Morton, Taylor, Snider and Huang (1993) found in an earlier study that students spent 8.5% percent of class time in moderate to vigorous physical activity and 23.3% of the time in minimal activity. In a similar study, Lacy, Willison, and Hicks (1998) looked at student and teacher behaviors in an exemplary elementary PE Program for 1st graders. They found that students engaged in motor appropriate activity 49% of the time, received information 24% of the time, waited 15% of the time, they transitioned 24% of the time and were off-task 3% of the time.

Coker (1999) believes that low levels of activity time could be a result of poor management routines, low impact activities, and excessive lecturing by the teacher Even for classes taught by seasoned instructors, the activity time in these classes often remain low. For example, Lacy, Willison, and Hicks (1998) examined an exemplary elementary program by a veteran instructor of 22 years of teaching, it was found that the teacher spent (25%) of the time in pre-instruction, followed by (21%) of the time in management, (17%) of the time in cue/correction and (14%) of the time in praise skill.

Lastly, Kanan and Gzagzah (2007) examined children of 5th grade to 7th grade physical education classes at ten different schools with ten teachers. The results of the study indicated that the average time spent by children being engaged in physical activity was 9.5% of the entire lesson. It was also found that teachers spent an average of 31.9% of lesson on explanation, 18.2% of the lesson on class management and 11.9% on organizing activities. The above results were similar to studies in other settings which showed high levels of management, waiting, and off-task activity time. This resulted in lower time spent in practicing physical skills.

Ironically, when one looks at the activity levels of children outside of their physical education class, the picture doesn't appear much better. Lopes and his colleagues examined activity time during recess of 271 children ages 6 to 10 years of age. They found that the girls and boys spent only about 50% of recess being physical active (Lopes, Vasques, Pereira & Maia, 2006). Another study also examined 270 children in the third, fourth, and fifth grade while using pedometers to access their step counts for a 15-minute recess period. The study was conducted on four consecutive days. The researchers found that boys were active 78% of the recess period and girls were active 63% of the recess time (Beighle, Morgan, Le Masurier, & Pangrazi, 2006). With this in mind, it is important to understand the many ways that physical activity can be assessed both in and outside of physical education.

Given the above findings it appears that while most schools require physical education, it is clear that the instructional time allotted has been used ineffectively in providing students with the recommended levels of physical activity (Lee & Solmon,

2007). Consequently, it may be more important to closely examine what actually goes on in physical education classes, especially as it relates to activity engagement, rather than simply advocating more class time. In addition, it is helpful to know the types of physical activity kids participate in outside of schools. The first step in doing this is to examine ways in which physical activity is assessed.

Ways of Assessing Physical Activity

There are many different ways to examine physical activity levels in and outside of school. The following sections will give insight on the several ways that researchers have assessed physical activity. The types of assessments are organized into three general types of assessments: (a) questionnaires, (b) observational tools, and (c) accelerometers/ pedometers.

Questionnaires

According to Ridley, Olds, and Hill (2006) self-report questionnaires are commonly used in measuring physical activity, energy expenditure and time use in children and adolescents. According to Kowalski, Crocker, and Donen (2004), various levels of physical activity participation are important to assess as well as having valid tools for assessing physical activity at various ages.

A well-known method of measuring physical activity is by the use of a physical activity checklist. The Self-Administered Physical Activity Checklist (SAPAC) is an example of the activity check list. It is intended to assess intensity, duration, and the various types of physical activity that children are involved in before school, during

school and after school. The Self-Administered Physical Activity Checklist has been developed and validated with a multi-ethnic fifth-grade sample.

The SAPAC consists of one column of physical activities to choose from along with three more separate columns that are listed as (a) before school, (b) during school, and (c) after school. Within each column, there is space for participants to write the number of minutes they were involved in each activity, with whom they were with and where the activity took place. There is also a section that allows participants to log in hours of television use, video watching, computer time, and the hours and minutes of talking on the phone (Ward, Sanders, & Pate, 2007).

According to Sallis et al. (1996), the SAPAC has been carefully developed and has shown to be acceptable levels of validity for fifth grade girls and boys based on their study of 55 boys and 70 girls from four regions of the United States. It was found in their study that the measures were moderately valid, but they produced inaccurate estimates of absolute minutes of physical activity.

The Physical Activity Questionnaire for Older Children (PAQ-C) provides a general measure of physical activity for youth approximately ages 8-14. The PAQ-C is a questionnaire that is appropriate for elementary school-aged children who are enrolled in school and have recess as a part of their school week. The PAQ-C is a self-administered, 7-day recall instrument. It has been developed to assess the general levels of physical activity for students in grades 4 to 8 and approximately 8 to 14 years of age (Kowalski et al., 2004). According to Voorhees et al. (2005), the PAQ-C questionnaire assesses a child's physical activity during various situations and times such as during school, recess,

after school, evenings and weekends. It also helps to describe the types of physical activities that kids engage in outside of school. The PAQ-C is administered in the classroom setting and provides a summary physical activity score derived from nine items, each scored on a 5-point scale (Kowalski et al., 2004).

Using the PAQ-C, Rigas-Shiman et al. (2001) examined self reports among youth. They compared self-reports of physical activity using the seasonal format questionnaire in comparison to the annual format questionnaire. In this large sample of 6,782 girls and 5,110 boys, it was found that pre-adolescents and adolescents reported less physical activity when using the seasonal format than when using the annual format. The seasonal questionnaire was divided by fall, winter, spring and summer while the annual format was expressed by one full year. Because the seasonal variability in activity patterns it was difficult, children had a hard time recalling activity over the course of one year. Overall the results of this research showed the importance of using or developing questionnaires that are user friendly.

Observational Tools

When recalling the many times students have been asked to wait their time in physical education have begun researchers to look at the amount of the students' "engaged time." A student's engaged time is defined as the time students spend actually participating in physical activity or sport. For example, in many physical education classes, students have waited over half the class time for one opportunity to bounce a ball or jump on a trampoline. They have also stood and waited on the sidelines or on the

bleachers while others played a sport such as volleyball or basketball (Hoffman and Harris, 2000).

According to Lacy and LaMaster (1996) there are various factors that can affect student engagement in physical education classes. Some of these factors include the size of the class, the type of activities taught during class, the facility and equipment and also the skill levels of the students. It has also been hypothesized that the type and frequency of teaching behaviors have a strong relationship with the amount of academic learning time that occurs in physical education classes.

One construct of engaged time is Academic Learning Time (ALT). Academic Learning Time is defined as the amount of time a leaner spends with the content at an appropriate level of difficulty (Rink, 2006). Academic Learning Time-Physical Education (ALT-PE) is an instrument that has been designed to measure the portion of the lesson that a student is engaged involved in motor activity. The instrument is capable of describing the context of physical education lessons in which the class is involved within motor activity of a selected sample of students (Rink, 2006)

Observers use short recordings to assess one student or an alternating sample of students (typically three students are used) level of motor engagement. The observations can be done by interval recording, and duration recording (Rink, 2006).

When observing using interval recording, an audiotape is employed to signal the beginning and the end of a six-second observation-record period. During the observation interval, the observer watches one student. If the student is physically active or engaged in motor activity, the observer classifies the engagement into being motor appropriate

(MA), motor inappropriate (MI), or supporting (MS). If the student is not engaged in motor activity, their behavior is coded as interim (I), waiting (W), off-task (OF), on-task (ON), or cognitive (C) (Rink, 2006).

An example of how interval coding recently was used was illustrated in a study by Derri, Emmanouilido, Vassiliadou, and Kioumourtzoglou (2007). They coded 36 elementary students behavior with (ALT-PE) and found that a total of 5,544 intervals were recorded. With respect to the context level, 48.12% of intervals were coded as "subject matter motor." At the learning involvement level, 80.44% were coded in "not motor engaged" and in the "waiting" subcategory (M = 38%). Of "motor engaged" subcategories, "motor appropriate" was with the higher intervals (11.22%). In addition, 5.95% were coded as "academic learning time" (ALT-PE). In this study it was concluded that teachers had a difficult time managing and organizing the lesson and designing activities in which students experienced success.

While observing using duration coding, the observer monitors one student using a timeline to categorize observations into the four categories of what the student had done during the entire lesson. Using duration coding, Lacy and LaMaster (1996) conducted an ALT-PE study that looked at teacher behaviors and student academic time in elementary school. After looking at seven experienced elementary physical teachers and their classes of third-, fourth-, and fifth-graders, it was found that the mean percentage of ALT was 20.1%. According to Silverman and Zotos (1987) duration recording should be expected to show lower percentages than interval recording. For event recording, the observer

counts the number of practice trials student gets an appropriate level of difficulty. The data is then presented as motor appropriate trials per minute (Rink, 2006).

Another technique for coding student behavior is by “spot-checking.” This technique involves quickly scanning the behavior of several or all students during a short interval (10 to 20 seconds) and classifying the behavior of each student in one, two or three categories. There are a variety of ways this technique can be applied. One way is to spot-check the behavior of the whole class at fixed intervals or to spot check a selected group of students throughout the class. Other ways include spot-checking a student’s behavior at a small station, or spot-checking to check a student’s behavior at several stations on a rotating basis. Since spot-checks involve only momentary perceptions of each individual student, the classification of their behavior must be kept simple, such as actively performs motor activity and not performing motor activity(Anderson, 1980).

A final observation tool entitled, “Time Sampling of a Single Student’s Behavior” was used in this study. In order to use this instrument a coding form had to be developed. The coding form in this study was entitled the “Student Behaviors Engagement Form.” After the form had been developed one of the coders had to indicate when to start and end coding, when to observe (first five-second interval) and when to record the behavior. The “observe-code” sequence continued for five three-minute intervals with a three-minute rest period between each interval (Anderson, 1980).

The student’s behavior would was coded according to the following six categories: (a) performs motor activity, (b) receives information, (c) gives information, (d) waits, (e) relocates and (f) other. There was another column included for notations.

The column was used to identify the specific events that happened while coding a student's behavior. At the conclusion of each observation, coders calculated the sum total of tallies and percentages of occurrence for each category (Anderson, 1980). This observation tool was used because it's user friendly format, and descriptive thoroughness.

Accelerometers/Pedometers

Studies have incorporated the use of both accelerometers and pedometers to see the level of activity that students get in physical education. Accelerometers are similar to pedometers except accelerometers record intensity, frequency, and duration of the activity (Rowlands & Easton, 2005). Pedometers are small electronic devices that attach to the waistband of a pair of pants or shorts and measure the number of steps a person takes (Morgan, Pangrazi, & Beighle, 2003).

Rowlands and Eston (2005) used an accelerometer and a pedometer to measure the physical active levels of boys and girls ages 8 to 10. They wanted to compare total physical activity time and the amount of time spent in moderate and vigorous intensity in boys and girls. The relationship between daily pedometer counts and accumulation of moderate physical activity were determined using the accelerometer. The children wore both instruments for waking hours for five weekdays and one weekend day. It was found that physical activity was 25% higher in boys than in girls. It was also found that boys spent 34% more time in moderate to vigorous intensity physical activity and 85% more time in vigorous intensity physical activity than girls (Rowlands & Eston, 2005).

A study by Pate, Pfeiffer, Trost, Zieglar, and Dowda (2004) used accelerometers to measure the physical activity levels of 281 children attending nine

preschools. The participants wore an Actigraph accelerometer attached to adjustable elastic belts and worn over the right hip for an average of 4.4 hours per week for an average of 6.6 days. It was found that children participated in only seven minutes of moderate to vigorous physical activity per hour of attendance during preschool. It was found that physical activity levels were higher for boys than girls and black children were found to be more active than white children.

Hands, Parker, and Larking (2006) did a comparison of the use of accelerometers, pedometers, direct observation and the use of a video to check the reliability of direct observation. This research was administered among 24 children attending three preprimary centers in the Perth metropolitan area. The researchers examined activity patterns over five consecutive days during 30 minutes of free play. It was important to know that each day an accelerometer and a pedometer were attached around each child's waist before they exited into outdoor area. After free play was over, an event marker was recorded against the accelerometer data, the pedometer was reset, and the stopwatch started. The observers stood around the outdoor area to observe and code the child's activity for the next 30 minutes of free play.

Eaton, Rowlands, and Ingledew (1998) compared heart rate monitoring, pedometry, and accelerometry for 30 Welsh children that walked, ran on a treadmill, played catch, played hopscotch, and sat and crayoned pictures. They found that a triaxial accelerometer provided the best assessment of activity, but pedometry offered a greater potential for larger populations of children. The triaxial accelerometer assesses activity in

three dimensions, giving output measures in mediolateral, anteroposterior, and vertical as well as the vector magnitude.

With the urgent need to provide simplistic healthy physical activities to the growing number of inactive children, the measure of steps counts by pedometers has been widely accepted as a useful way to ascertain activity levels in children (and adults) (Zizzi, Vitullo, Rye, & O'hara-Tompkins, 2006). According to Morgan, Pangrazi, and Beighle (2003), pedometry is one practical method that physical educators can use to measure physical activity. The greatest benefits of pedometry over other methods are objectivity, cost, immediate feedback, unobtrusiveness, and feasibility. It is also one that is not just restricted to physical education classes but can be worn during and after school. Ronspies (2006) agrees that the pedometers can be worn during school and at home, but also confers that they can be used to motivate students to be more active in their daily lives.

Because of their utility, pedometers are now becoming well known in physical activity research on clinical interventions, community-wide interventions, surveillance, along with international comparisons. They have been used in several cases such as distinguishing between individuals who vary based on the number of steps taken each day, measuring increases in physical activity within interventions, cross-study comparisons of various populations and lastly the comparing of time trends in physical activity (Schneider, Crouter, & Bassett, 2003).

For example, Louie and Chan (2003) used pedometry to evaluate the physical activity levels among young children in Hong Kong. In comparing the number of steps taken by preschools at three preschools in Hong Kong, two being urban areas, and one

being rural, it was found that the children in urban areas had smaller pedometer counts as compared to the rural areas. It was noted that schools in the urban areas had smaller physical play areas for which subsequently affected their physical activity levels. They spent more time standing in lines to participant in activities, while in rural areas students had larger space to be active. It was also found that boys were more active than girls.

Another study by Loucaides, Chedzoy, and Bennett (2004) examined differences in physical activity levels among urban and rural primary school children by having them wear pedometers for four weekdays in the winter and four weekdays in the summer. Of the 256 children in their sample with 144 representing two urban schools and 112 representing three rural schools, it was found that urban children were significantly more active during the winter than rural school children. Rural school children were significantly more active in the summer.

Various Types of Pedometers

Shneider, Crouter, and Basset, Jr. (2004) examined thirteen types of pedometers to compare their step values of a 24 hour period. The following pedometers were assessed: Accusplit Alliance 1510 (AC), Colorado on the Move (CO), New-Lifestyles NL-2000 (NL), Oregon Scientific PE316CA (0R), The 345 (SL345), the Yamax Skeletone EM-180 (SK), Yamax Digi-Walker SW 200 (YX200), the Yamax Digi-Walker (SW-701), Freestyle Pacer Pro (FR), Kenz Lifecorder (KZ), Omron HJ-105 (AC), Omron HJ-105 (OM), and Sportline 330 (SL330). Ten males and ten female adults ranging in Body Mass Index from 19.8 to 35.3 volunteered to participate in the study. All participants wore the Yamax SW-200 (criterion) on the left side of the body and a

comparison model on the right side of the body for a 24 hour period, except when sleeping or showering. Each participant was tested for 13 days, and the order of tests was randomized for the various pedometer models.

A two-way repeated measure ANOVA was used to determine whether there was a significant difference between the mean difference scores of the thirteen pedometers. It was found that five (KZ, YX200, NL, YX701 and SL330) of the 13 pedometers tested yielded mean values that were not significantly different from the Yamax SW-200 (YX200). Five (FR, AC, SK, CO and SL345) pedometers significantly underestimated steps and three (WL, OM and OR) significantly over estimated steps (Shneider, Crouter, & Basset Jr., 2004).

This research gave reference to the significance of the Yamax SW-200 and how the SW series pedometer has performed superbly and was used as the criterion against other pedometers. In future research it would be important to keep the Yamax SW-200 in mind. The KZ, YX200, NL and YX701 all seem to be appropriate for most research purposes (Shneider, Crouter, & Basset Jr., 2004).

The Assessment of Obesity

In the past, many people relied on height-weight charts to evaluate obesity levels. They were easy to use because there was always a list of ideal or recommended weight associated with lowest mortality for people of a particular age, sex and height. Although very easy to administer, height weight charts were known to be highly inaccurate for some people (Insel & Roth, 2004).

According to Fahey et al. (2007), there are many ways of assessing levels of obesity. These ways include underwater weighing, skin fold measurements, using the Bod Pod, Bioelectrical Impedance Analysis (BIA) and Dual-energy X-ray absorptiometry along with Body Mass Index (BMI).

Hydrostatic (underwater) weighing is one method in which an individual is submerged and weighed under water. In this method the percentages of fat and fat-free weight are calculated from body density (Fahey et al., 2007). When using this method most obese people tend to float and weigh less under water, and lean people tend to sink and weigh more under water. This is because of the fact that muscle has a higher density and fat has a lower density than water (Insel & Roth, 2004).

The skin fold measurement technique is a simple, inexpensive, and practical way to assess body composition. It assesses body composition by linking the thickness of skin folds at various sites of the body by the use of a caliper. A caliper consists of a pair of spring-loaded, calibrated jaws in which can be made of metal and sometimes plastic (Fahey, Insel, & Roth, 2007). A technician simply grips a fold of skin by a prearranged location and measures it using the caliper (Insel & Roth, 2004). This method requires patience, experience, and considerable practice. One negative component of the skin fold technique is that because of the amount of water in a person's body changes during the day, skin fold measurements taken during the day and evening often differ (Fahey et al., 2007).

With the Bod Pod being a small expensive chamber containing computerized sensors, measures body composition by air displacement rather than water displacement.

The technical name for the technique is plethysmography. This technique determines the percentage of fat by calculating how much air is displaced by the person sitting in the chamber. Many people prefer this five-minute test over underwater weighting (Fahey et al., 2007).

The bioelectrical impedance analysis (BIA) is a technique that works by sending a small electrical current through the body and measuring the body's resistance to it (Fahey et al., 2007). The electrical current is harmless and is transmitted from electrode to electrode. A computer must be available to calculate fat percentages from the current measurements (Insel & Roth, 2004)

The dual-energy X-Ray apsorptiometry (DEXA) works by measuring the tissue absorption of high and low energy X-ray beans, while the total body electrical conductivity (TOBEC) estimates lean body mass by passing a body through a magnetic field. With the DEXA and TOBEC being very expensive and sophisticated, they have often been seen in some fitness centers and sports medicine research facilities (Fahey et al., 2007).

A study by Eisenmann, Heelan, and Welk (2004) examined the inter-relationships of body composition of seventy-five children (31 girls and 34 boys) ages 3 to 8 years old with several methods: Skin fold Measurements, Bioelectrical Impedance Analysis, Dual Energy X-Ray along with Body Mass Index (BMI) in young people. This research provided evidence of convergent validity for the various methods and predicted equations of body composition across the age range of the adiposity rebound, in which is a substantial period for the development of obesity.

The results of the study indicated that the Body Mass Index (BMI) and skinfold measurement seem to be more practical in estimating body composition during the adiposity rebound. These results were noted to be of practical value for clinicians and researchers working with young children who require precise measures of body composition in studies of obesity (Eisenmann, Heelan, & Welk, 2004).

According to Nihisher et al. (2006), body mass index measurement has attracted attention across the nation from schools, researchers, legislators, and the media as an approach to measuring obesity among youth. Doctors have also been included in the use of this approach by differentiating between being overweight and being obese by calculating body mass index. The Body Mass Index (BMI) is determined by a person's height and weight, and then comparing it to the BMI of other people of the same age and gender (Yauss, 2005).

Most BMI measurement programs in schools today are conducted for surveillance and screening purposes only (Nihisher, Lee, Wechsler, McKenna, Odom, Reinold, Thompson, & Grummer-Strawn, 2006). The public health community needs childhood obesity statistics in order to recognize the scope of the obesity epidemic. It will allow them to develop data for knowing the prevalence of obesity in different geographic areas and among various subgroups, to monitor trends, and to test the impact of interventions implemented to address obesity (Must & Anderson, 2006). These programs facilitate in assessing the weight status of a particular population to ascertain the percentage of youth who are potentially at risk for obesity (Nihiser et al., 2006).

There are various goals for having BMI screening programs in schools. One goal is to present to parents and children raw information about the child's body mass index. Secondly, this will in term prevent and decrease obesity in a setting or population. This would be done by motivating parents to live healthy and safe lifestyles and to encourage them to get medical care guidance and treatment if needed. Lastly, it would increase awareness of the teachers, administrators and other staff of the importance of addressing obesity (Nihiser et al., 2006).

The information collected is anonymous and can be used for many purposes: (a) it can be use to explain trends in weight status over time among various populations in a classroom, school, school district, state or nationwide; (b) it can be used to promote awareness among school and health personnel; (c) it can help in improving policies, practices, and interventions for obese children; and (d) it can identify when demographic or geographic areas are at the greatest risk for being obese (Nihisher, Lee, Wechsler, & McKenna, 2006).

A study was done that allowed nurses in the East Pen School District to become proactive on the issue of childhood obesity in K-12. They felt that the earlier a child was identified as being obese, the sooner a medical evaluation could be performed and interventions could be developed to decrease the increasing number of obesity rates. In 2000, the school nurses began a Body Mass Index (BMI) screening program for kindergarten through 12 grades. The goal was to realistically identify students that were overweight, at risk of overweight, or underweight and to raise community awareness about their health risks. The support of the school district and community involvement

helped make the BMI screening a positive tool. After 5 years of the program, it was found that the status of overweight children in their district had remained below the national average (Johnson & Ziolkowski, 2006).

A similar study in Arkansas examined body mass index of 345,000 students at all grade levels in 93% of the state's public schools by the use of a comprehensive survey targeting body-mass index. Based on the data, 21% of students were overweight and 17% were at risk of becoming overweight. It was also noted that 39% of boys and 37% of girls were considered overweight or at risk for overweight. Lastly, African-American girls and Hispanic boys had the highest risk of being overweight. The breakdown of this weigh-in initiative left Arkansas with ideal numbers (Hurst, 2004).

Another study researched the Body Mass Index (BMI) of the 17,000 elementary and middle school participants in Florida, approximately 30% of the kindergarten children were found to be overweight and African American children were most likely to be overweight when entering kindergarten (Johnson, Pilkington, Deeb, Jeffers, He, & Lamp, 2007).

Similarly, findings from a study in New York City public elementary schools showed that 1 in every 4 children are obese. Of the 2681 elementary aged students that participated in their study, it was found that thirty-one percent of Hispanic children were obese, with 23% being black children and 16% of white children being obese. This study was done based on BMI (body mass index) in which also showed that nearly half of the elementary school children measured at the 85 percentile of BMI (Thorpe et al., 2004).

Lastly, Johnson et al. (2007) examined the BMI of more than 17,000 children in one north Florida school district elementary and middle schools demonstrated that Hispanic boys and African American girls were more likely to be overweight than any other ethnic group. It was found that Asian girls were least likely to be overweight.

CHAPTER III

METHOD

The study is an analysis of the levels and types of physical activity that elementary aged school children experienced during 40 to 45 minute physical education classes and the children's body mass indices. The four major goals of the research study were to describe: (a) how instructional time was used in third-, fourth-, and fifth-grade physical education classes across three schools; (b) the mean grade, school, and gender differences in physical activity levels and body mass indices of third-, fourth-, and fifth-grade students across three schools; (c) the various types of physical activities that third-, fourth-, and fifth-grade students engage in outside of physical education classes across three schools; and (d) the relationship between physical activity level and body mass index for third-, fourth-, and fifth-grade students across three schools. The following sections included in this chapter are the description of the school system and participants, individual school information, instrumentation, procedures for collecting data, and analyses of data.

Guilford County School System

The Guilford County School System is the third largest district in North Carolina serving more than 71,000 students and is the second largest employer in a 12-county area hiring more than 10,000 full and part-time employees. The mission of Guilford County Schools is to have students graduate as responsible citizens prepared to succeed in higher

education, or in the career of their choice. Their core values include diversity, empathy, equality, innovativeness, and integrity (About Guilford County, 2008).

Of the district's 119 schools located in both urban and rural areas, 68 are elementary schools serving grades K through 5, and in some instances, Pre-K through 5. The district also has twenty-one middle schools as well as twenty-five high schools. In addition to those schools there are also two special education schools known as Gateway Education Center and McIver Education Center. There are two other schools which provide an alternative to long-term suspensions and a Saturn Academy, which offers high school students a flexible schedule to complete graduation requirements. In addition, the district now has the High School Ahead Academy and the Guilford County Newcomers School (About Guilford County, 2008).

According to a recent report from the Guilford County Schools (Guilford County Schools by the Numbers, 2007) the student ethnic composition is quite diverse. The population breakdown is as follows: (a) the American Indian population make up is 0.5% of the total population, (b) the Asian population is at 4.8%, (c) the Black population is at 40.9%, (d) the Hispanic population is at 7.6%, (e) the White population is at 41.8%, and (f) the Multi-Racial population is at 4.3% of the total population.

Individual School Information

The three schools included in the research study were Richmond Elementary School, Woodson Elementary School, and Mercy Elementary School. The original names of the schools, the principals, and teachers were replaced with pseudonyms to insure the confidentiality of each school, the principals, and teachers. The schools were chosen

because of the researcher's great rapport with faculty and students along with their proximity to one another. In addition each school possessed unique demographic features.

Richmond Elementary School

The mission statement of Richmond Elementary School describes the school as being committed to providing a standard of educational excellence within a nurturing environment which will ensure personal and academic success for all students. The school has a school with a traditional calendar and curriculum. The school serves 848 students and the school's body is comprised of 548 White students, 11 Asian/pacific islander, 46 Hispanic, 234 Black students, and 9 American Indian students.

The physical education teacher has been teaching at Richmond for nineteen years. The physical education classes were held on one side of a full-size gymnasium. The other side of the gym was utilized for science and book fairs. The average number of students is 21 in kindergarten, 22 in the first grade, 22 in the second grade, 23 in the third grade, 23 in fourth grade, and 26 in the fifth grade (Guilford County School Directory, 2008).

Woodson Elementary School

The mission statement of Woodson Elementary School describes the school as one that provides an environment where there are opportunities for all children to reach their maximum potential and to become productive citizens in an ever-changing world. Like Richmond Elementary School, it is a school with a traditional calendar and curriculum. The school serves 482 students, in which 82.5% is Black, 4% Caucasian, 6.5% Hispanic, 2.4% Asian, .2% American Indian, and 4.4% Multi-Racial.

The physical education teacher has been teaching at Woodson Elementary for four years and has been teaching children for more than seventeen years. The classes were held in the school auditorium on stage and in limited space of the auditorium floor. The average number of students in kindergarten is 13, 14 in first grade, 16 in second grade, 20 in third grade, 23 in fourth grade, and 25 in fifth grade (Guilford County School Directory, 2008).

Mercy Elementary School

The mission statement of Mercy Elementary School describes the school to be one that maintains a caring, positive student-centered learning environment emphasizing academic and social achievement. Mercy Elementary School is a school with an extended year calendar that uses a Montessori curriculum. The school serves 193 students. The information containing ethnicity was not included in the directory of Guilford County Schools (Guilford County School Directory, 2008).

The physical education teacher has been teaching at Mercy Elementary School for two years. The classes were held in a medium sized multi-purpose room and outside on the basketball court. The average number of students in kindergarten was 20; 16 in the first grade, 14 in the second grade, 14 in the third grade, 15 in the fourth grade, and 24 in the fifth grade (Education First NC School Report Cards 2007-2008). Figure 3.1 gives shows the distribution of participants by school, gender and grade.

Instruments

This section provides descriptions of the various instruments that were used in the study. The instruments included an observational tool entitled “Student Behaviors

Engagement" (SBE), pedometers, a metric weighing scale, a metric stadiometer, and a modified physical activity questionnaire for children (i.e., PAC-C).

Table 3.1. ***Distribution of Participants by School, Gender, and Grade***

Schools	Richmond			Woodson			Mercy		
	M	F	Total	M	F	Total	M	F	Total
Third-Grade	4	16	20	9	12	21	1	2	3
Fouth-Grade	10	18	28	7	4	11	3	6	9
Fifth-Grade	7	11	18	2	2	4	3	3	6
School Totals			66			36			18

Student Behaviors Engagement (SBE)

The SBE form was used to describe the way that instructional time was used. Specifically, the SBE form was used to code what a student was doing during a physical education class. The student's behavior was coded according to six categories: (a) performs motor activity, (b) receives information, (c) gives information, (d) waits, (e) relocates, and (e) other (Anderson, 1980). There was also another column included for notations. The column was used to identify the specific events that happened while coding a student's behavior. At the conclusion of each observation, coders calculated the sum total of tallies and percentage of occurrence for each category.

The SBE form used for coding purposes is provided in the Appendix A. Table 1.1 provides a description of the six categories. The SBE coders of this study had diverse backgrounds. They were the researcher, a retired Deputy Sherriff from the Guilford County Sheriff Department, an assistant softball coach at a local university, and two

students. They all received compensation for their work at a rate of $10.00 per hour with the exception of one student.

Table 3.2. ***Category Definitions***

Category Definitions	
1	Performs motor activity: Actively engages in motor tasks normally considered to be the subject matter of physical education, including: playing game or sport, practicing skill, performing exercise or calisthenics, and exploring solutions to movement problems.
2	Receives information: Listens to teacher or other student; attends to demonstration, audiovisual aid, or written material.
3	Gives information or assists: Talks to other student or teacher (includes asking questions); demonstrates, manually assists, or spot for others.
4	Waits: Engages in "holding" behavior-e.g., waiting his turn, and waiting for game to begin, etc. It not performing motor activity or gives or receiving information.
5	Relocates: Moves from one place to another, such as walking from one activity area to another, or walking to get on line. Is not giving or receiving information.
6	Other: Engages in activity other than those mentioned above, such as obtaining equipment, getting drink of water, tying shoes, etc. (Anderson, 1980).

Their primary purpose was to code students in physical education using the SBE observation tool. Before they were hired the researcher met with them individually to discuss the study and give an overview of the SBE observation tool. This was done so that the coders would know what their role was and to determine their coding schedule.

Activity Level

Yamax Digi Walker SW 200 (YX200) pedometers were utilized for this study to measure the number of steps that third-, fourth-, and fifth-graders took during physical education classes on three separate class periods. An additional class period was also scheduled as a make-up day.

Each pedometer was approximately 1 inch by 1 inch and was enclosed in a small case. After removing the pedometers from each case, there were numbers from one to twenty taped on the back of each pedometer for identification purposes. A set of twenty pedometers were placed in each of the three boxes. If a class had more than twenty students the researcher used a pedometer from another box. After each class the pedometers were placed back in the box.

The pedometers weighed less than twenty grams and could be tied comfortably to a child's waist without adding weight or causing discomfort. The validity and reliability of using pedometry in assessing children's daily physical activity has been examined in the United Kingdom, and in the Hong Kong (Louie & Chan, 2003).

The primary function for the pedometer was to record a step count and rest period. Because this study was concentrating on the amount of steps, the stride length was not calculated. The pedometers were hand checked for calibration at the beginning of the study by continuous shaking in the lateral plane at different rates for one minute. Also, reliability of the pedometer was determined by having 5 randomly chosen participants wear a pedometer on both sides of the hip during class. Appendix B has information about the pedometers used in the study.

Types of Physical Activity

The instrument used to identify the various types of "outside" activities that students were involved in was a modified form of the Physical Activity Questionnaire for Children (PAQ-C) (Kowalski, Croker, Dosen, 2004). The PAQ-C questionnaire was originally developed to assess the general levels of physical activity throughout the elementary school year (Kowalski, Crocker, Donen, 2004).

According to Voorhees, Murray, Welk, Birnbaum, Ribisl, Johnson, Pfeiffer, Saksvig and Jobe (2005) the PAC-Q questionnaire assesses a child's physical activity during various situations and times such as during school, recess, after school, evenings and weekends. It is administered in the classroom setting and provides a summary physical activity score derived from nine items, each scored on a 5-point scale (Kowalski, Crocker, Donen, 2004). See Appendix B for the PAC-Q questionnaire.

Because the research question leaned toward describing the various types of physical activities that participants were involved in outside of school the entire questionnaire was not needed. Instead, only the first section of the PAC-Q was used. The first page of the questionnaire only pertained to the types of activities that students did outside of physical education. The other parts of the questionnaire pertained to boundaries that were not a part of the study.

Participants were asked if they had participated in any of the following activities in the past seven days: (a) Skipping, (b) Rowing/canoeing, (c) In-line skating, (d) Tag, (e) Walking for exercise, (f) Bicycling, (g) Jogging or running, (h) Aerobics, (i) Swimming, (j) Baseball/Softball, (k) Dance, (l) Football, (m) Badminton, (n) Skateboarding,

(o) Soccer, (p) Street hockey, (q) Volleyball, (r) Floor hockey, (s) Basketball, (t) Ice skating, (u) Cross-country skiing, and (v) Ice hockey/ringette. There was another space at the end of the page for the participant to write in any other activities that they had participated in during the past seven days.

The students were also asked to circle the number of times they participated in the designated activity during the week. The response set to choose from was no participation, 1-2 days of participation, 2-4 days of participation, 5-6 days of participation, and 7 days of participation. The score is the mean of each item.

Body Mass Index

According to Nihiser, Lee, Wechsler and McKenna (2007) school-based body mass index (BMI) has been used across the nation by researchers, school officials, the media and legislators as a measure to assess obesity among youth today. They also claim that implementing school-based BMI measurement for surveillance purposes has been widely accepted. However, using BMI measurement for screening purposes to assess the weight status of individuals has been somewhat debatable.

In this study, the BMI served as indicator of obesity levels of students. BMI was determined by first obtaining a person's height and weight (Yauss, 2005). The height of each student using a standometer was recorded in centimeters and the weight was measured in kilograms using a digital scale (Health of Meter). The BMI was then determined by using the following formula: $BMI=KM/M^2$.

Procedures for Collecting Data

Data collection for this study took place over a three month period. The schedule for data collection is provided in Appendix C. Several processes were involved with the conduct of this study. These included approval of human subjects, the collection of the various types of data, and the analyses used to interpret the study's findings. The following sections describe each of these processes.

Human Subjects Review

After selecting the schools that would be part of the study, the researcher contacted the principals and physical education teachers at Richmond, Woodson, and Mercy Elementary Schools. The contact was made either by phone, on-site visitation, or by e-mail.

Each principal was provided with approval letters to conduct research at her school. A standard "approval letter" was provided to the principals explaining the nature of the study along with a study timeline. The researcher told the principals that the letters would be collected after written approval was granted from Guilford County School's Research Review Committee, and by the Institutional Review Boards of the University of North Carolina at Greensboro and North Carolina A & T State University. The signed approval letters were then collected from the principals of each school. The copies of the letters that were signed by the principals are located in Appendix D. A copy of the Guilford County School's Research Review approval letter is located in Appendix E and the copy of the Institutional Review Board at North Carolina Agricultural & Technical

State University is located in Appendix F and the copy of the Institutional Review Board of the University of North Carolina at Greensboro is located in Appendix G.

After receiving approval letters from the principals, the researcher and the classroom teacher sent consent letters to parents by the students. The consent letters approved by Guilford County School and the Institutional Review Boards of the University of North Carolina at Greensboro and North Carolina A & T State University. The two consent letters are located in Appendix H.

Coding of SBE Data

Coder training. Before SBE data were collected a training regime was implemented to insure coder (observer) accuracy. Training for the coders included two phases. First, the Research Compliance Officer at North Carolina A&T State University conducted a one hour workshop that focused on ethical issues related to conducting research with children. Following the workshop, each coder received a certificate indicating successful completion of the training session. An example of a training certificate is located in Appendix I.

The second part of training focused on the use of SBE. The researcher gave each of them a copy of the observation tool and reviewed it with them. The researcher then described various scenarios to help them identify whether a student was performing activity, receiving information, giving information, waiting, relocating, or something other.

Ground rules were also included in this part of the training session to further insure coder accuracy and reliability. For instance, the observers had to know what to

record when two or more types of behaviors occurred during a 3-second interval. The ground rules for this was to record the behavior that consumed the greater portion of the interval. For example, if “Kimberly” had “waited” for 2 seconds and practiced for 3 seconds, it had to be coded as “performs motor activity”. Another example would have been if “Allen” “waited” for 4 seconds and “relocated” for 1 second, thus “waited” would have been recorder.

The observers also had to know that when two behaviors occurred simultaneously for the major portion of an interval that they had to code both behaviors on the form. For example, if a student was jumping rope for five seconds while the teacher was giving information the coder would code it as performing motor activity and receiving information. This was a situation that did not happen frequently, but had to be understood.

Lastly, an observer also had to code performing motor activity when a student was either executing a movement, or in a “ready position” or was completing a follow through or was participating in a game. An example would be if “Wanda” was bouncing a basketball as she was getting ready to shoot it in the basket. In this circumstance, the student was coded as “performing motor activity”. Another example would be if “Rodney” was playing in a game of soccer and was following through on a kick, he would be coded as performing activity as well.

Inter-coder reliability. Following the training sessions several pilot observations were made to determine inter-coder reliability. The reliability measures were taken by having the researcher code a student’s behavior standing beside one of three observers

who also coded the same student. This was done to make sure that the observer and the researcher coded the same behaviors of the student at the same time on two different sheets. This was done once at each school. For observer one at Richmond Elementary School, the percentage of agreement with the researcher was 97% for performs motor activity, 94% for receives information, 100% for gives information, 95% for waits, 50% for relocates, and 100% for other. For observer two at Woodson Elementary School, the percentage of agreement with the researcher was 97% for performs motor activity, 95% for receives information, 100% for gives information, 88% for waits, 100% for relocates, and 92% for other. Lastly, for observer three at Mercy Elementary School the percentage of agreement with the researcher was 100% for performs motor activity, 100% for receives information, 100% for gives information, 97% for waits, 100% for relocates, and 100% for other.

Coding SBE behaviors. After receiving the class schedules from each physical education teacher three observers were assigned to one of the three schools. The researcher was always part of the three-person observation team. The observers and researcher went to Richmond Elementary School's third-, fourth-, and fifth-grade classes on six separate occasions because there were two groups. Group one consisted of one third-grade class, one fourth-grade class, and one sixth-grade class. Their observations were done on November 17, December 4, and December 11. Group two also consisted of one third-grade class, one fourth-grade class, and one sixth-grade class. Their observations were done on November 18, November 25 and December 5.

At Woodson Elementary School the third-, fourth-, and fifth-grade classes were observed on three separate days (November 12, November 17, and November 25). At Mercy Elementary School, the third-, fourth-, and fifth-grade classes were observed on six occasions. The reason was because fifth-graders originally had physical education on Monday. It was later changed to Tuesday. The third- and fourth-graders had physical education on Wednesdays. The dates for third- and fourth-graders were January 14, January 21, and February 4, and the dates for fifth-graders were January 12, February 3, and February 10 (see Table 3.3)

Table 3.3. ***SBE Collection Schedule***

Richmond Elementary School (*n* = 18)
Group: First group of third-, fourth-, and fifth-graders (*n* = 9) **Dates:** November 17, December 4, and December 11 **Group:** Second group of third-, fourth-, and fifth-graders (*n* = 9) **Dates:** November 18, November 25 and December 5
Woodson Elementary School (*n* = 9)
Group: Third-, fourth-, and fifth-graders (*n* = 9) **Dates:** November 12, November 17, and November 25
Mercy Elementary School (*n* = 9)
Group: Third- and fourth-graders (n = 6) **Dates:** January 14, January 21, and February 4) **Group:** 5th Graders (n = 3) **Dates:** January 12, February 3, and February 10)

Observations for all coders took place simultaneously. The coders remained unobtrusive during coding periods. Three students were randomly chosen by the

researcher for each class. Neither the physical education teachers nor the students knew who was being observed during each class period. One of the coders would indicate when to start and end coding, when to observe (first five-second interval) and when to record the behavior. The "observe-code" sequence would continue for five three-minute intervals with a three-minute rest period between each interval. Table 3.3 provides a summary of these coding procedures.

Table 3.4. ***Coding Procedures***

1. Select a target student.
2. Select an appropriate starting point. Code the student's behavior for three minutes; then rest for three minutes; and so on.
3. Code behavior at the end of every 5-second interval by placing a check in the category that best describes the type of behavior the student engaged in during that interval.
4. At the end of each 3-minute interval use the "notations" column to record any comments that will help you to recollect specific events in the coding segment.
5. At the conclusion of the period, total the checks in each column and calculate the percentage of time spent in each type of activity. Make appropriate entries under Summary Comments and Evaluation (Anderson, 1980).

Converting tallies into percentages. At the conclusion of the class period the total number of checks in each column had to be added and placed at the bottom of each

category. After the observer added the total check marks in each category, all the categories had to be added. This total was placed on the right side of the paper.

After three classes, the researcher had three separate SBE forms for each student. The researcher looked at all three activity forms and added the tallies for each SBE category. For example, if a student had 40 tallies under “performs motor activity” on one sheet and 50 on another and 70 on another sheet; the total number of tallies would be 160. After all categories were done the researcher added all tallies from all three pages. This total was then used to determine the percentage of occurrences of each of the five SBE categories. This was done by dividing tally total for each category by the total number of tallies recorded across all the categories.

Measuring Activity Levels

When arriving to the gym, the researcher checked each pedometer to make sure they were ready for the participants to wear. When the entire class arrived in the gym, the researcher asked students to line up in front of her. At that time she put the pedometer on each participant. She also instructed them not to open it during class. The student will either clip it to the belt (for boys) or the band of the shorts (for girls) close to anterior portion of the iliac crest.

After the class the researcher took the pedometer off the children and read their number of steps to them individually. The readings were immediately recorded on the data sheet, following that pedometers were reset for the next class. In the event of suspected erroneous reading on the pedometer, the researcher recorded the data and replaced the pedometer with a spare, and hand checked the suspected pedometer at the

end of the day. The steps were not recorded if the pedometer had malfunctioned. All physical education classes took place in either an air conditioned multi-purpose room or an outside facility. Lastly, if the participant was absent on one day, the researcher gave a make-up day to get their missed reading. The make-up day took place during the next scheduled class of the student.

Inter-reliability of measures. Following the training sessions several pilots were made to determine inter-coder reliability. The reliability measures were taken by allowing three students from Mercy Elementary School wore two pedometers, one on each hip. All three students wore it for an entire class period. Comparisons of readings were made for each student. Percentage of agreement between the two readings indicated that for student 1 was at 97%, student 2 was at 96% and student three was at 99%.

Collecting BMI Data

The participants at all three schools were asked to take off their shoes, coats, and belts to get an accurate measure of height and weight. Each student was examined privately and the information collected was confidential. The weight was measured in kilograms and the height was obtained in centimeters. The participants' measurements were recorded on an excel sheet. Each participant was assigned an ID number to insure confidentiality. The BMI measures were taken twice for the third-, fourth-, and fifth-grade classes at each school, once as a pre-test and once as a post-test.

The research team went to Richmond Elementary School on four separate occasions because there were two groups of third-, fourth-, and fifth-grade classes. Their height and weight were collected on November 7 for the pre-test BMI and on December

18 for the post-test BMI for one group. Their height and weight were collected on October 29 for their pre-test BMI and on December 12 for their post-test BMI for the other group.

At Woodson Elementary School the third-, fourth-, and fifth-grade classes BMI measures were acquired on two separate days. The pre-test was conducted on November 6 and the post-test was conducted on December 3. At Mercy Elementary School the third-, fourth-, and fifth-grade classes BMI was on January 9 for the pre-test and on February 10 for the post-test.

Types of physical activity. After all the students' height and weight data were recorded on the excel sheet the researcher explained and administered the PAQ-C Questionnaire. The researcher also provided pencils for the participants. After she passed out the pencils and questionnaires, she gave the participants information about the questionnaire.

She emphasized that the questionnaire was not a test and that she was only interested in the type and amount of physical activity that the student had participated in during the past seven days. She then read aloud each question to the participants to make sure they had an understanding of each one. She did not allow them to move to another question until everyone completed their response. Immediately, after the questionnaires were completed, the researcher glanced through them to make sure all of them were completed in their entirety. If they were not completed she simply asked the participant to complete the unanswered question(s). She then collected the pencils and placed the questionnaires in a binder.

The researcher took the responses from part one of the PAQ-C and weighed each of the student's responses. The response "no" was scored "1," 1-2 was scored "2," 3-4 was scored "3," 5-6 was scored "4," and 7 times was scored "5."

Design and Analysis

All data were entered and analyzed with a Statistical Package for the Social Sciences entitled (SPSS) 11.0. Descriptive and inferential statistics along with graphic profiling was used to answer each of the five research questions. Specifically, the analyses for each of the research questions are described below.

Research Question 1: How is instructional time used in third-, fourth-, and fifth-grade physical education classes across three schools. Specifically, what are the mean percentages of time spent in (a) performing activity, (b) receiving information, (c) giving information, (d) waiting, (e) relocating, and (f) other.

This question was answered by using graphs and descriptive statistics to describe percentage grade, gender, and school across all three schools. Graphic comparisons were also used to further highlight how these activity levels differed between and among groups.

Question 2: What are the mean grade, school, and gender differences in physical activity levels and body mass indices of third-, fourth-, and fifth-grade students across three schools?

This question was answered by using two 2 (gender) X 3 (grade) X 3 (school) ANOVAs to identify significant grade and school differences in physical activity and BMI

measures. First and second order interactions were also determined. The alpha level was set at the .05 probability level for all analyses.

Question 3: What are the various types of physical activities that third-, fourth-, and fifth-grade male and female students engage in outside of physical education classes across three schools.

This question was answered by using descriptive statistics to describe the types and frequency of physical activities that students were involved in during the school week outside of physical education classes. These frequencies were analyzed according to grade, school, and gender.

Question 4: What is the relationship between physical activity levels and body mass index for third-, fourth-, and fifth-grade students across three schools?

This question was answered by conducting a correlation analysis (via Pearson Product-moment analysis) between BMI and activity levels for each grade. In addition, multiple regression analysis was further conducted to determine the predictive ability of gender, grade, and activity level on BMI scores. Analyses were conducted across all schools with the alpha level set at .05.

CHAPTER IV

RESULTS OF DATA AND DISCUSSION

The study examined the levels and types of physical activity that elementary school-age children experienced during 40 to 45 minute physical education classes and the children's body mass indices. The four major goals of the research study were to show: (a) how instructional time is used in third-, fourth-, and fifth-grade physical education classes across three schools, (b) the grade, school, and gender differences in physical activity levels and body mass indices of third-, fourth-, and fifth-grade students across three schools, (c) the various types of physical activities that third-, fourth-, and fifth-grade students engage in outside of physical education classes across three schools, and (d) the relationship between physical activity level and body mass index for third-, fourth-, and fifth-grade students across the three schools. The results of the analyses are presented for each research question.

Instructional Time

SBE for All Three Schools and Grades

When getting a picture of how instructional time was spent among all three schools and grade levels, a total of 18, 852 tallies for all categories were found. Percentages for each category were then determined by dividing the total number of tallies into the number of tallies of each category.

Overall, the students spent 48% of their time performing motor activity (9,099 tallies), 24% of the time receiving information (4,441 tallies), 0% giving information (79 tallies), 21% of the time waiting (4,016 tallies), 2% of the time relocating (343 tallies) and, 5% of the time during other things (874 tallies). Figure 4.1 illustrates the percentages among categories. The following sections present results by grade, gender, and school.

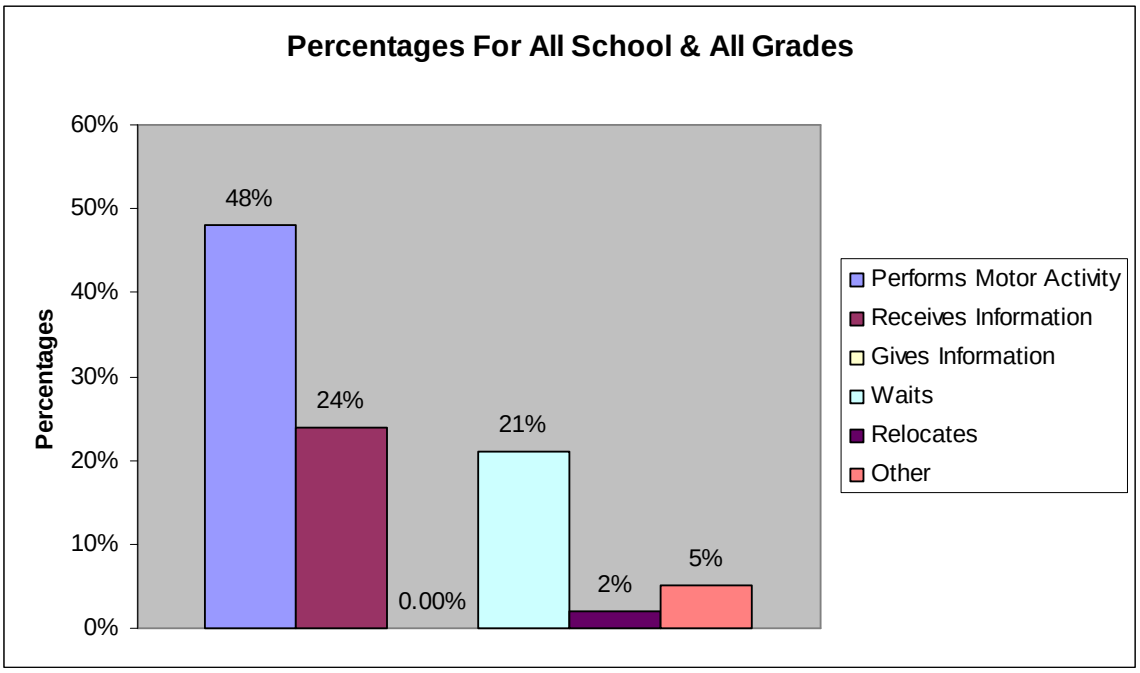


Figure 4.1. ***Percentages for All School and All Grades***

SBE for Each Grade

There were a total of 6,263 tallies for all third grades classes. For the third grade the students spent 51% of their time performing motor activity (3,196 tallies), 23% of their time receiving information (1,454 tallies), 1% of their time giving information (57 tallies), 21% of their time waiting (1,315 tallies), 2% of their time relocating (118 tallies), and 2% of their time doing other things (123 tallies).

There were a total of 6,281 tallies for all fourth-grade classes. For the fourth grade the students spent 43% of their time performing motor activity (2,711 tallies), 27% of their time receiving information (1,691 tallies), 0% of their time giving information (2 tallies), 20% of their time waiting (1,271 tallies), 2% of their time relocating (102 tallies), and 8% of their time doing other things (504 tallies).

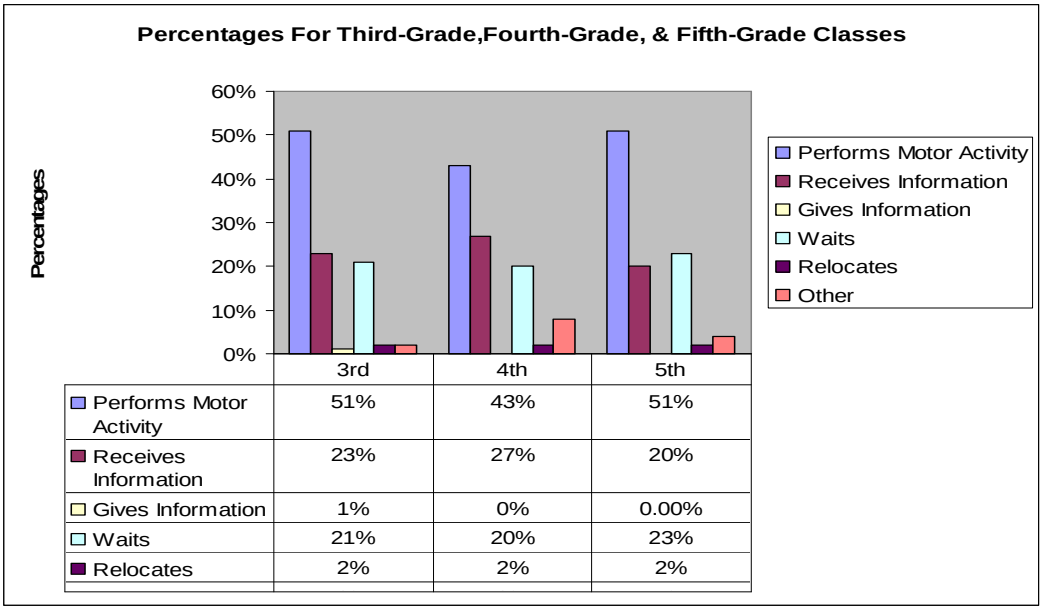
There were a total of 6,308 tallies for all fifth grade classes. For the fifth grade, the students spent 51% of their time performing motor activity (3,192 tallies), 20% of their time receiving information (1,296 tallies), 0% of their time giving information (20 tallies), 23% of their time waiting (1,430 tallies), 2% of their time relocating (123 tallies), and 4% of their time doing other things (249 tallies).

Among the third, fourth, and fifth grades, the highest amount of instructional time was spent in performing motor activity. These data show that the third- and fifth-grade classes spent 51% of the time performing motor activity, while the fourth-grade class spent 43% of the time performing motor activity. Overall, the highest percentage of instructional time was spent performing motor activity. Figure 4.2 illustrates how time was spent among third-, fourth-, and fifth-grade classes.

When getting a picture of the instructional time among the three schools, Richmond Elementary School had a total of 9,444 tallies for all categories, Woodson Elementary School had a total of 4,548 tallies for all categories, and at Mercy Elementary School had a total of 4,860 tallies for all categories.

At Richmond Elementary School, the students spent 46% of their time performing motor activity (4,345 tallies), 32% of their time receiving information (3,017 tallies), 0%

of their time giving information (20 tallies), 16% of the time waiting (1,549 tallies), 2% of their time relocating (152 tallies) and 4% of their time doing other things (361 tallies).



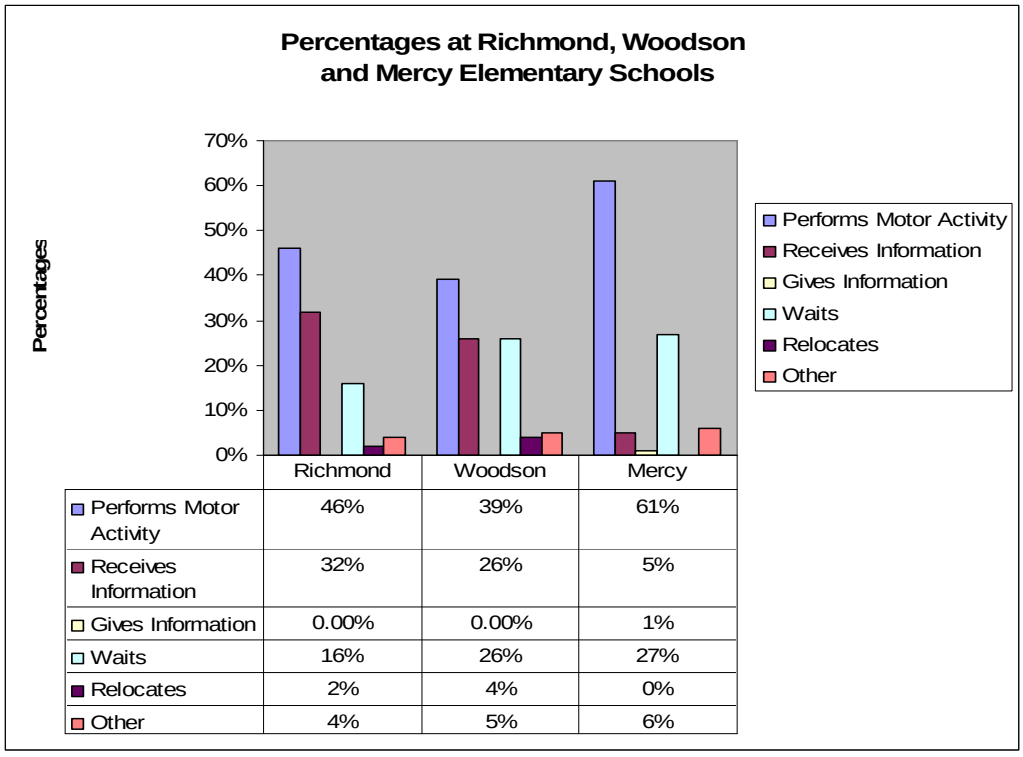
	3rd	4th	5th
Performs Motor Activity	51%	43%	51%
Receives Information	23%	27%	20%
Gives Information	1%	0%	0.00%
Waits	21%	20%	23%
Relocates	2%	2%	2%

Figure 4.2. ***Percentages for Third-, Fourth-, and Fifth-Grade Classes Total SBE Time across Each School***

At Woodson Elementary School, the students spent 39% of their time performing motor activity (1,770 tallies), 26% of their time receiving information (1,179 tallies), 0% of their time giving information (6 tallies), 26% of their time waiting (1,176 tallies), 4% of their time relocating (180 tallies), and 5% of their time doing other things (237 tallies).

At Mercy Elementary School the students spent 61% of their time performing motor activity (2,984 tallies), 5% of the time receiving (245 tallies), 1% of their time giving information (53 tallies), 27% of their time waiting (1,291 tallies), 0% of their time relocating (11 tallies), and 6% of their time doing other things (276 tallies). Figure 4.3

shows the percentages among SBE categories for Richmond, Woodson, and Mercy Elementary School.



	Richmond	Woodson	Mercy
Performs Motor Activity	46%	39%	61%
Receives Information	32%	26%	5%
Gives Information	0.00%	0.00%	1%
Waits	16%	26%	27%
Relocates	2%	4%	0%
Other	4%	5%	6%

Figure 4.3. ***Percentages at Richmond, Woodson, and Mercy Elementary School SBE Grade Comparisons for Each School***

Overall, it was found that the highest percentage of instructional time was used for performing motor activity. Mercy Elementary School spent the highest amount of time in performing motor activity and Woodson Elementary spent the least among of time performing motor activity.

For Richmond's third-graders, the total number of tallies was 3,128. The third-grade the students spent 51% of their time performing motor activity (1,604 tallies), 33% of their time receiving information (1,018 tallies), 0% of their time giving information

(10 tallies), 12% of their time waiting (371 tallies), 2% of their time relocating (48 tallies) and 2% (77 tallies) of their time doing other things (77 tallies).

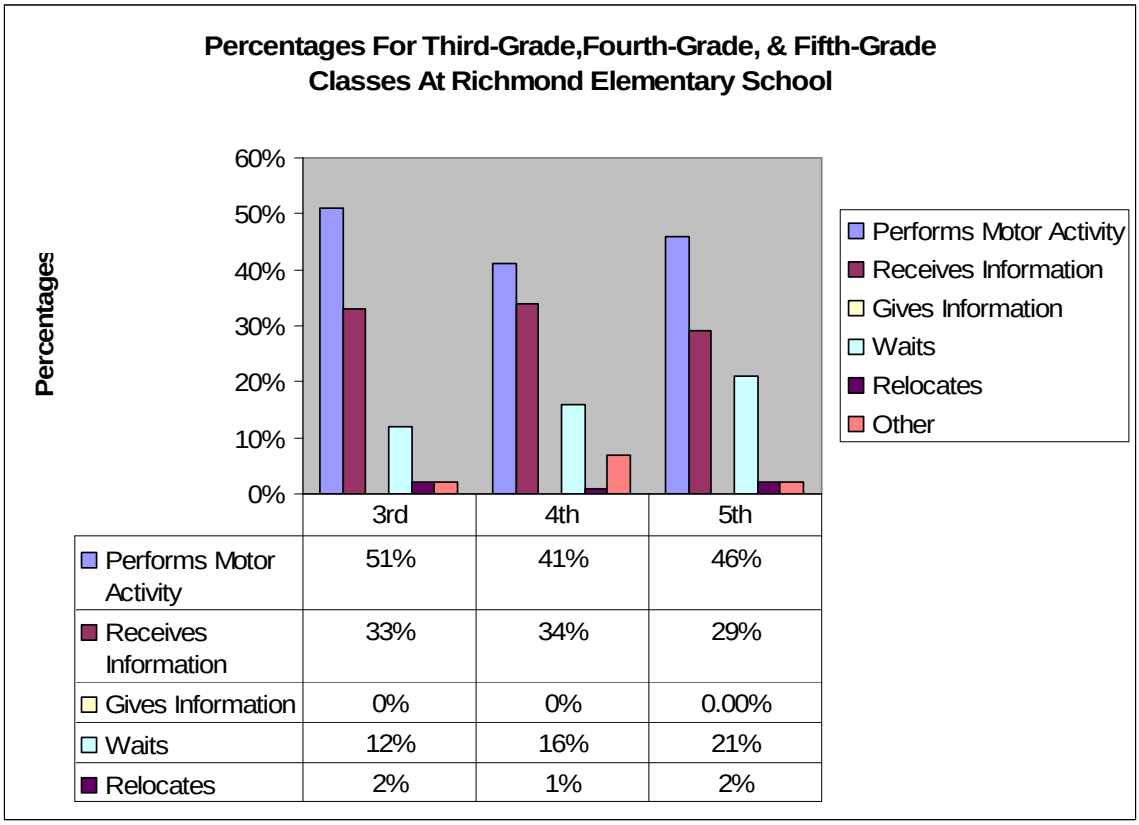
For Richmond's fourth-graders, the total number of tallies was 3,128. For the fourth grade, the students spent 41% of their time performing motor activity (1,280 tallies), 34% of their time receiving information (1,079 tallies), 0% of their time giving information (1 tallies), 16% of their time waiting (515 tallies), 1% of their time relocating (37 tallies) and 7% of their time doing other things (216 tallies).

For Richmond's fifth-graders the total number of tallies was 3,188. For the fifth grade the students spent 46% of their time performing motor activity (1,461 tallies), 29% of their time receiving information (920 tallies), 0% of their time giving information (9 tallies), 21% of their time waiting (663 tallies), 2% of their time relocating (67 tallies), and 2% of their time doing other things (68 tallies). Figure 4.4 illustrates the percentages among SBE categories for third, fourth, and fifth-grade classes at Richmond Elementary School.

For Woodson's third-graders the total number of tallies was 1,515. For the third grade, the students spent 43% of their time performing motor activity (644 tallies), 23% of their time receiving information (350 tallies), 0% of their time giving information (5 tallies), 28% of their time waiting (430 tallies), 4% of their time relocating (67 tallies), and 1% of their time doing other things (19 tallies).

For Woodson's fourth-graders, the total number of tallies was 1,533. For the fourth grade, the students spent 31% of their time performing motor activity (481 tallies), 32% of their time receiving information (492 tallies), 0% of their time giving information

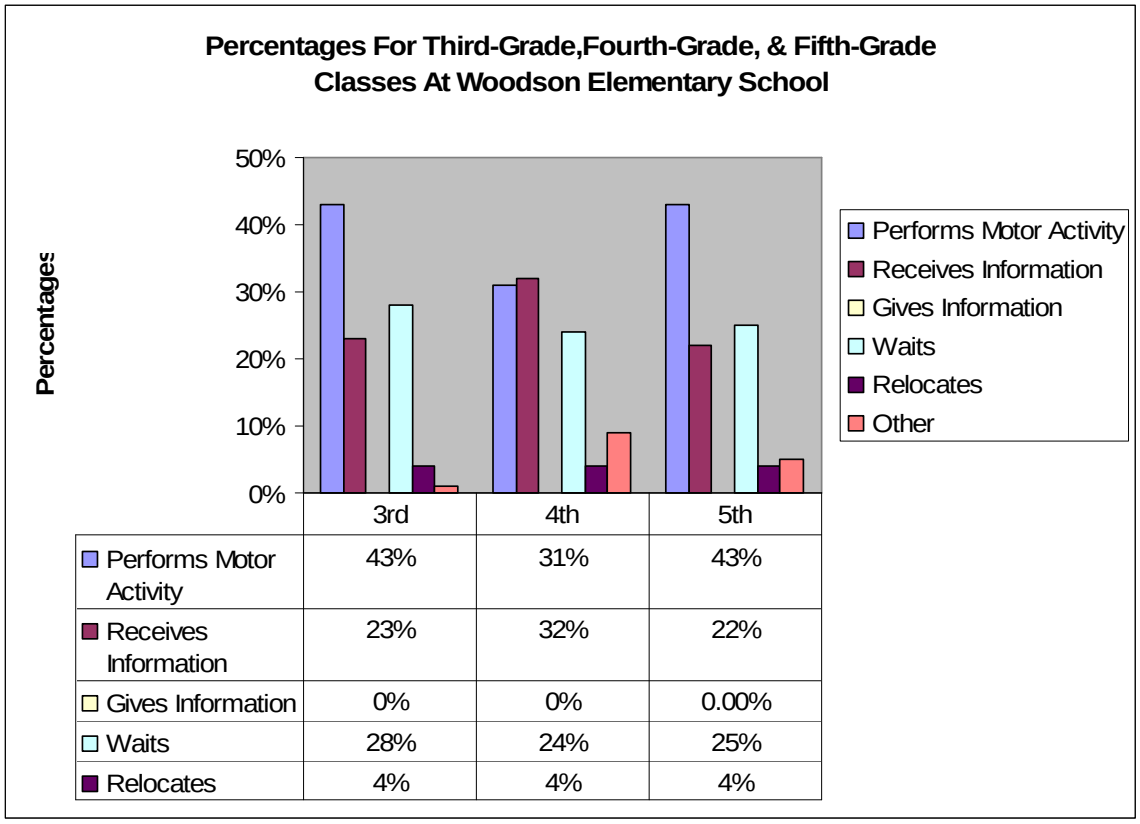
(0 tallies), 24% of their time waiting (366 tallies), 4% of their time relocating (57 tallies), and 9% of their time doing other things (136 tallies).



	3rd	4th	5th
Performs Motor Activity	51%	41%	46%
Receives Information	33%	34%	29%
Gives Information	0%	0%	0.00%
Waits	12%	16%	21%
Relocates	2%	1%	2%

Figure 4.4. ***Percentages among SBE Categories for Third-, Fourth-, and Fifth-grade Classes at Richmond Elementary School***

For Woodson's fifth-graders the total number of tallies was 1,500. The fifth-grade students spent 43% of their time performing motor activity (645 tallies), 22% of their time receiving information (337 tallies), 0% of their time giving information (0 tallies), 25% of their time waiting (380 tallies), 4% of their time relocating (56 tallies) and 5% of their time doing other things (82 tallies). Figure 4.5 illustrates the percentages among SBE categories for third, fourth, and fifth-grade classes at Woodson Elementary School.



	3rd	4th	5th
Performs Motor Activity	43%	31%	43%
Receives Information	23%	32%	22%
Gives Information	0%	0%	0.00%
Waits	28%	24%	25%
Relocates	4%	4%	4%

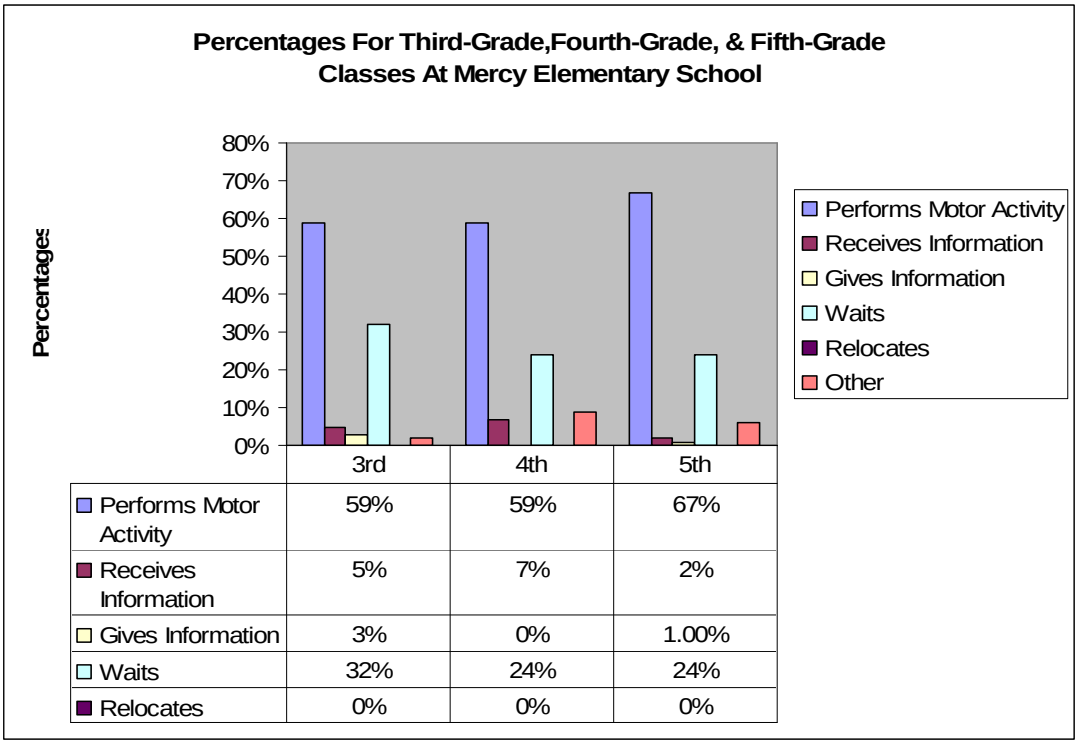
Figure 4.5. ***Percentages among SBE Categories for Third-, Fourth-, and Fifth-Grade Classes at Woodson Elementary School***

For Mercy's third-graders the total number of tallies was 1,620. For the third grade, the students spent 59% of their time performing motor activity (948 tallies), 5% of their time receiving information (86 tallies), 3% of their time giving information (42 tallies), 32% of their time waiting (514 tallies), 0% relocating (4 tallies), and 2% of their time doing other things (27 tallies).

For Mercy's fourth-graders, the total number of tallies was 1,620. For the fourth grade the students spent 59% of their time performing motor activity (950 tallies), 7% of their time receiving information (120 tallies), 0% of their time giving information (0

tallies), 24 % of their time waiting (390 tallies), 0% of their time relocating (8 tallies) and 9% of their time doing other things (152 tallies).

For Mercy's fifth-graders, the total number of tallies was 1,620. For the fifth grade, the students spent 67% of their time performing motor activity (1,086 tallies), 2% of their time receiving information (39 tallies), 1% of their time giving information (11 tallies), 24% of their time waiting (387 tallies), 0% of their time relocating (0 tallies), and 6% of their time doing other things (97 tallies). It was found that Mercy's third-, fourth-, and fifth-grade classes spent the most amount of time performing motor activity. Figure 4.6 illustrates the percentages among SBE categories for the third, fourth, and fifth-grade at Mercy Elementary School.



	3rd	4th	5th
Performs Motor Activity	59%	59%	67%
Receives Information	5%	7%	2%
Gives Information	3%	0%	1.00%
Waits	32%	24%	24%
Relocates	0%	0%	0%

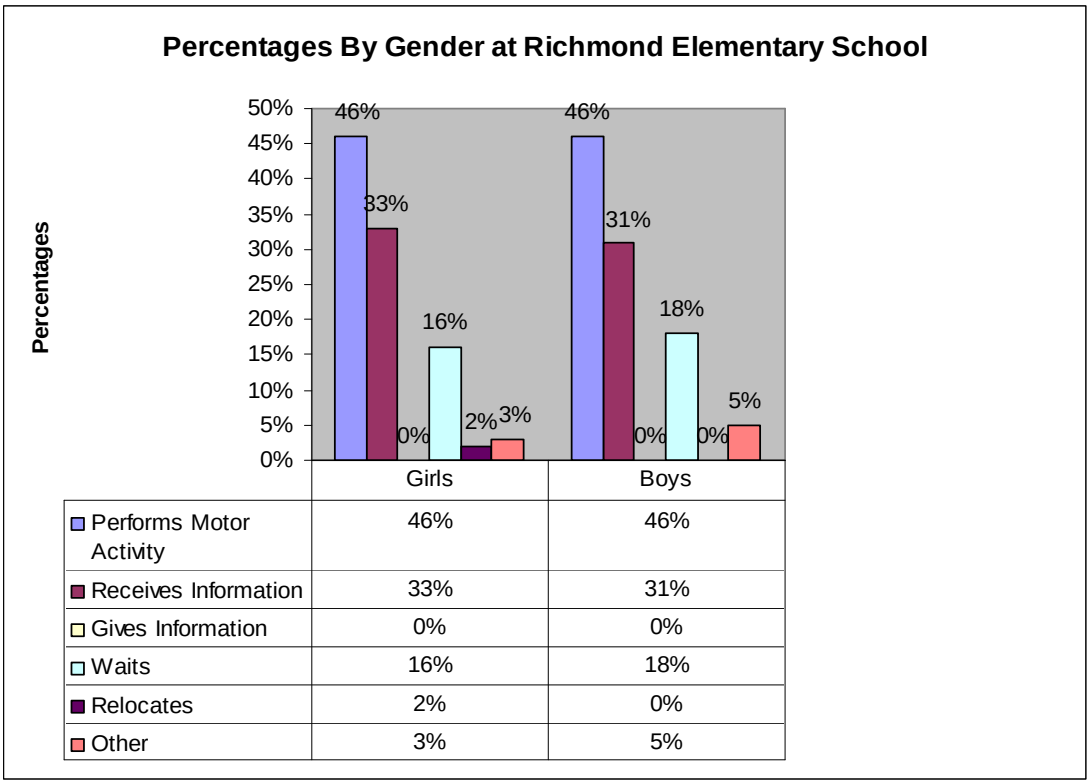
Figure 4.6. ***Percentages among SBE Categories for Third-, Fourth-, and Fifth-Grade Classes at Mercy Elementary School***

There were a total number of 6,321 tallies for girls at Richmond Elementary School. The girls spent 46% of their time performing motor activity (2,913 tallies), 33% of their time receiving information (2,064 tallies), 0% of their time giving information (18 tallies), 16% of their time waiting (994 tallies), 2% of their time relocating (121 tallies), and 3% of their time doing other things (211 tallies).

There were a total number of 3,123 tallies for boys at Richmond Elementary School. The boys spent 46% of their time performing motor activity (1432 tallies), 31% of their time receiving information (953 tallies), 0% of their time giving information (2 tallies), 18% of their time waiting (555 tallies), 0% of their time relocating (31 tallies), and 5% of their time doing other things (150 tallies).

When comparing the girls to boys, it was found the girls and boys spent the same amount of time performing motor activity. The girls spent more time receiving information than girls. Either the girls or boys gave information in classes. The boys spent more time waiting and relocating than girls. Figure 4.7 illustrates the percentages across all SBE categories for all girls and boys at Richmond Elementary School.

There were a total number of 2,540 tallies for girls at Woodson Elementary School. The girls spent 36% of their time performing motor activity (924 tallies), 27% of their time receiving information (681 tallies), 0% of their time giving information (4 tallies), 25% of their time waiting (635 tallies), 4% of their time relocating (99 tallies), and 8% of their time doing other things (197 tallies).

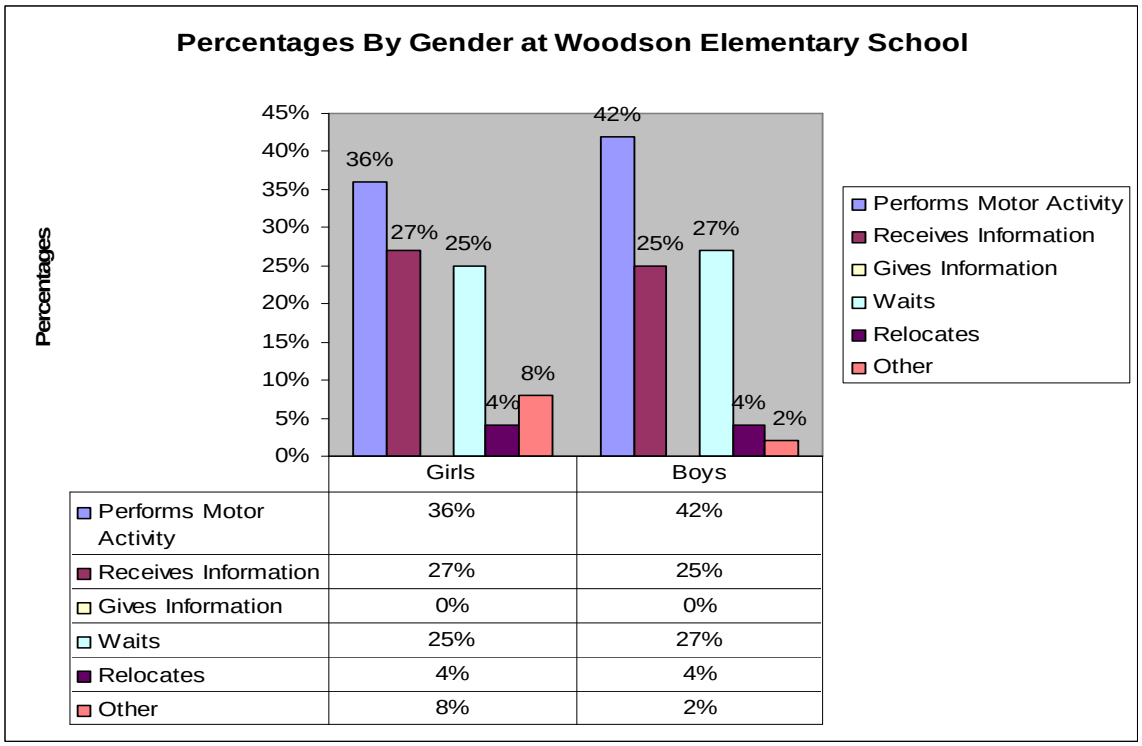


	Girls	Boys
Performs Motor Activity	46%	46%
Receives Information	33%	31%
Gives Information	0%	0%
Waits	16%	18%
Relocates	2%	0%
Other	3%	5%

Figure 4.7. ***Percentages by Gender at Richmond Elementary School***

There were 2,020 tallies for boys at Woodson Elementary School. The boys spent 42% of their time performing motor activity (856 tallies), 25% of their time receiving information (498 tallies), 0% of their time giving information (2 tallies), 27% of their time waiting (541 tallies), 4% of their time relocating (81 tallies), and 2% of their time doing other things (42 tallies).

When comparing girls to boys spent more time performing motor activity during classes. The girls spent more time receiving information. The boys spend more time waiting and relocation, while girls spent more time during other things. Figure 4.8 illustrates the percentages across all SBE categories for girls and boys at Woodson Elementary School.



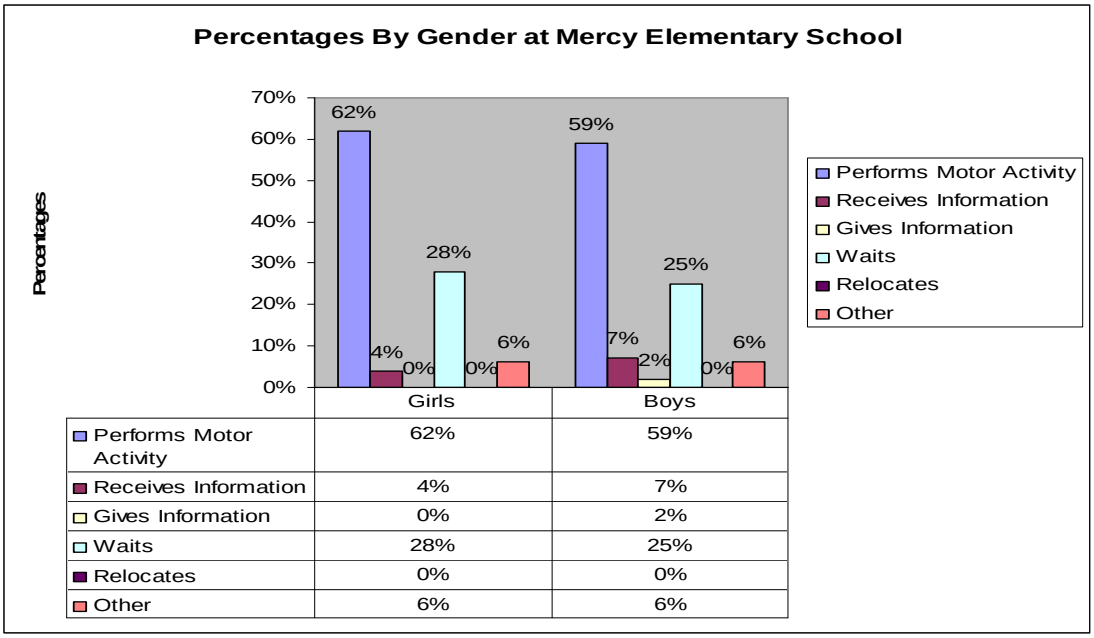
	Girls	Boys
Performs Motor Activity	36%	42%
Receives Information	27%	25%
Gives Information	0%	0%
Waits	25%	27%
Relocates	4%	4%
Other	8%	2%

Figure 4.8. ***Percentages by Gender at Woodson Elementary School***

There were a total number of 2,700 tallies for girls at Mercy Elementary School. The girls spent 62% of their time performing motor activity (1,692 tallies), 4% of their time receiving information (103 tallies), 0% of their time giving information (5 tallies), 28% of their time waiting (720 tallies), 0% of their time relocating (6 tallies), and 6% of their time doing other things (164 tallies).

There were a total number of 1,620 tallies for boys at Mercy Elementary School. The boys spent 59% of their time performing motor activity (960 tallies), 7% of their time receiving information (121 tallies), 2% of their time giving information (40 tallies), 25% of their time waiting (404 tallies), 0% of their time relocating (3 tallies), and 6% of their time doing other things (90 tallies).

When comparing girls to boys at Mercy Elementary School it was found that girls were more active than boys. It was found that boys received information and gave more information during class than girls. It was also reported that girls waited more than boys. Figure 4.9 illustrates the percentages across all SBE categories for girls and boys at Mercy Elementary School.



	Girls	Boys
Performs Motor Activity	62%	59%
Receives Information	4%	7%
Gives Information	0%	2%
Waits	28%	25%
Relocates	0%	0%
Other	6%	6%

Figure 4.9. ***Percentages by Gender at Mercy Elementary School***

Physical Activity Levels and BMI

Two 2 X 3 X 3 analyses of variance were used to identify significant gender, grade, and school differences in physical activity levels and BMI. First and second order interactions were also determined. In order to determine the location of differences among the grades and schools a Scheffe post hoc test was used. The alpha level was set at the .05 probability level for all analyses.

Gender, Grade, and School Differences in Physical Activity Level

The mean physical activity level scores for male and female were:

Male	136.05 steps/min	(n = 46)
Female	123.38 steps/min	(n = 74)

The F ratio derived from the analysis of variance for gender's main effect was found to be non significant, F (1, 119) = 3.51, p>.05. Appendix (J) provides a summary of the analysis for gender differences in physical activity levels.

The mean physical activity level scores for the three grades were:

Third	136.15 steps/min	(n = 44)
Fourth	126.90 steps/min	(n = 48)
Fifth	126.10 steps/min	(n = 28)

The F ratio derived from the analysis of variance for grade differences was found to be non significant, *F* (2, 119) = .822, p > .10. Appendix (K) provides a summary of the analysis for grade differences in physical activity levels.

The mean physical activity level scores for the three schools were:

Richmond	94.41 steps/min	(n = 66)
Woodson	130.62 steps/min	(n = 36)
Mercy	164.11 steps/min	(n = 28)

The F ratio derived from the analysis of variance on school differences was found to be significant, *F* (2, 119) = 40.07, *p* < .001. The Scheffe post hoc test indicated that all three schools were significantly different from each other (*p* < .001). Richmond was found to be significantly lower than both Woodson and Mercy. Woodson was found to be significantly lower than Mercy but higher than Richmond. Mercy was found to be

significantly higher than both Richmond and Woodson. Appendix L provides a summary of the analysis for school differences in physical activity levels.

First- and Second-Order Interactions for Physical Activity Levels

The F ratio derived for the analysis of variance of physical activity levels for the first order of interaction for gender and grade, and gender and school were found to be non significant, $p > .05$. However, a grade by school interaction was found to be significant ($p < .05$). It was reported that third-graders at Richmond were greater than fourth- and fifth-graders at Richmond. It was reported that fifth-graders at Woodson were greater than third- and fourth-graders at Woodson. Lastly, it was reported that fifth-graders at Mercy were less than third- and fourth-graders at Mercy. Figure 4.10 shows the interactions grade by school.

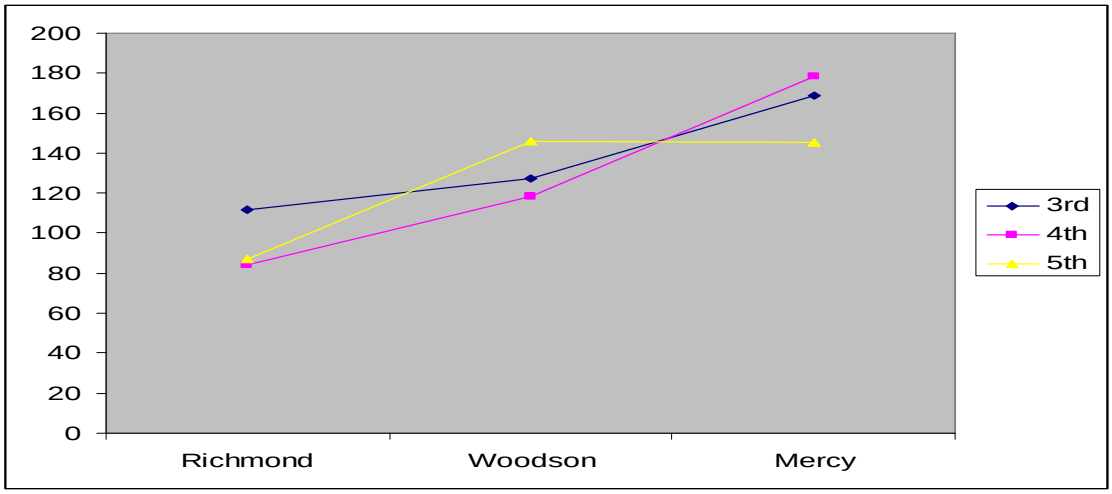


Figure 4.10. ***Interactions Grade by School***

The F ratio for second order interaction among gender, grade, and school was found to be non significant ($p > .10$).

Gender, Grade, and School Differences in BMI

The means for BMI scores for male and female were:

Male	21.05	(n = 46)
Female	19.05	(n = 74)

The F ratio derived from the analysis of variance between the mean was found to be non significant, F (1, 119) = 2.56, p>.10 Appendix (M) provides a summary of the analysis for gender differences in BMI.

The means for BMI for the three grades were:

Third	18.44	(n = 44)
Fourth	21.56	(n = 48)
Fifth	20.14	(n = 28)

The F ratio derived from the analysis of variance of the three means was found to be non significant, F (2, 119) = 2.27, $p < .10$. Appendix (N) provides a summary of grade analysis for differences in BMI.

The means for BMI for the three schools were:

Richmond	94.41	(n = 66)
Woodson	130.62	(n = 36)
Mercy	164.11	(n = 18)

The F ratio derived from the analysis of variance of the school's means was found to be significant, F (2, 119) = 1.67, $p > .10$. The Scheffe post test showed that Woodson had a lower BMI than Richmond and Mercy ($p < .05$). There was no significant difference between Mercy and Richmond ($p > .05$).

First- and Second-Order Interactions for BMI

The F ratio derived for the analysis of variance of BMI for the first-order interactions for gender and grade and grade and school were found to be non significant ($p > .10$). However, there was a significant gender by school interaction ($p < .05$). Figure 4.11 indicates that there were little differences between male and females in BMIs for Richmond Elementary School. However, males appeared to have higher BMIs than females in the other two schools.

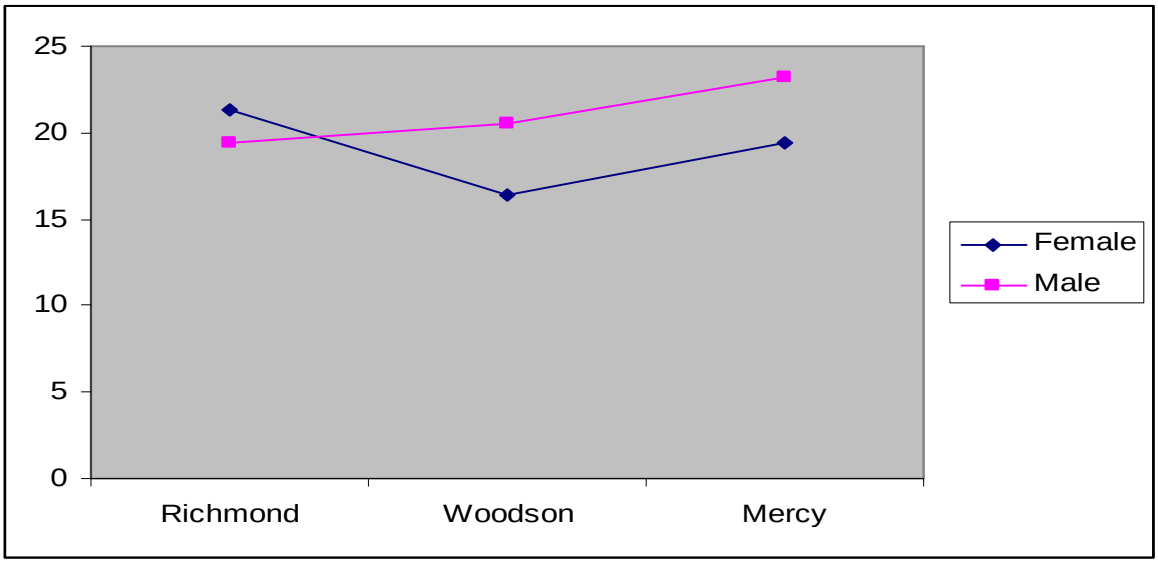


Figure 4.11. ***Interactions of Males and Females at Richmond, Woodson, and Mercy Elementary Schools***

The F ratio for second order interaction for gender, grade, and school was found to be non significant ($p > .10$).

Types of Physical Activities Spent outside Physical Education

The researcher took the responses from part one of the PAQ-C and weighed each of the student's responses. The response "no" was scored "1" 1-2 was scored "2", 3-4

was scored “3,” 5-6 was scored “4,” and 7 times was scored “5.” Student scores were totaled for week one for each activity. The same was done for week two. Then the mean for week one and the mean for week two were calculated for each activity. After getting the average each activity was ranked 1-5.

When ranking the preferences for physical activity outside of physical education classes for all schools and all grades it was found that students spent their time during week one and week two in this ranking order: (a) Jogging, (b) Walking, (c) Dancing, (d) Playing Tag, and (e) Basketball and Skipping. Table 4.1 illustrates the comparison of the five activities according to the top five rankings for total subjects.

Table 4.1. ***Comparison of the Five Activities According to the Top Five Rankings for Total Subjects***

Week 1 Activity	**M**	**SD**	**Week 2 Activity**	**M**	**SD**
Jogging or Running	1.92	1.548	**Jogging or Running**	1.68	1.490
Walking	1.65	1.612	**Walking**	1.70	1.549
Dance	1.58	1.638	**Dance**	1.54	1.550
Tag	1.55	1.389	**Tag**	1.43	1.401
Basketball	1.41	1.475	**Basketball**	1.41	1.192
Skipping	1.29	1.253	Skipping	1.04	1.492
Bicycling	1.21	1.401	Bicycling	1.02	1.381
Aerobics	0.85	1.307	Aerobics	0.73	1.268
Skateboarding	0.79	1.334	Skateboarding	1.01	1.542
Swimming	0.78	1.286	Swimming	0.79	1.289
Baseball	0.78	1.317	Baseball	0.94	1.330
In-Line Skating	0.77	1.150	In-Line Skating	0.98	1.312
Soccer	0.73	1.172	Soccer	0.68	1.174
Football	0.72	1.315	Football	0.97	1.322
Volleyball	0.46	1.076	Volleyball	0.66	1.126
Ice Skating	0.46	0.981	Ice Skating	0.77	1.242
Ice-Hockey/Ringette	0.44	1.067	Ice-Hockey/Ringette	0.52	1.263
Rowing/Canoeing	0.42	1.026	Rowing/Canoeing	0.44	0.977
Badminton	0.40	0.956	Badminton	0.79	1.302
Cross Country Skiing	0.40	1.003	Cross Country Skiing	0.73	1.235
Street Hockey	0.35	0.904	Street Hockey	0.71	1.260
Floor Hockey	0.34	0.874	Floor Hockey	0.71	1.260

Activities for Week 1	0 Times	1 to 2 Times	3 to 4 Times	5 to 6 Times	7 or More Times
Skipping	39	38	23	9	11
Rowing/Canoeing	99	6	6	4	5
In-Line Skating	72	23	11	9	5
Tag	34	33	25	9	14
Walking	45	18	20	9	27
Bicycling	53	26	17	8	15
Jogging or Running	32	20	25	13	29
Aerobics	75	16	10	10	9
Swimming	79	16	7	9	9
Baseball	80	14	9	6	11
Dance	51	14	17	10	28
Football	83	15	7	2	13
Badminton	96	12	4	4	4
Skateboarding	81	12	9	7	11
Soccer	75	22	10	6	7
Street Hockey	100	8	5	4	3
Volleyball	96	10	3	5	6
Floor Hockey	100	7	8	2	3
Basketball	44	33	14	8	21
Ice Skating	93	8	9	7	2
Cross Country Skiing	100	2	9	4	4
Ice Hockey/Ringette	99	4	8	3	6
Activities for Week 2					
Skipping	29	43	29	8	11
Rowing/Canoeing	97	2	15	3	3
In-Line Skating	68	14	20	9	9
Tag	42	29	10	15	15
Walking	38	24	20	10	27
Bicycling	68	14	16	11	11
Jogging or Running	36	28	17	17	22
Aerobics	82	13	9	7	9
Swimming	81	8	14	9	8
Baseball	72	11	18	10	9
Dance	47	19	19	12	23
Football	66	21	15	7	11
Badminton	81	9	13	8	9
Skateboarding	77	10	7	7	19
Soccer	81	16	9	8	6
Street Hockey	83	13	10	4	10
Volleyball	80	18	11	5	6
Floor Hockey	81	19	9	5	6
Basketball	71	13	11	7	17
Ice Skating	79	12	15	6	8
Cross Country Skiing	84	6	1	12	5
Ice Hockey/Ringette	95	6	11	3	4

Relationship between Physical Activity Level and BMI

The correlation between physical activity level (average steps per minute) and BMI for all 120 subjects was -.22. This negative correlation was found to be significant (p <.05). Higher levels of physical activity were associated with lower BMI scores.

When compared separately by gender, the relationship was different in males and females. In females the correlation between BMI and physical activity was stronger (r = -.44, p < .0001). However, in males, BMI and levels of physical activity do not appear to be related (r = .03, p > .10) (see Table 4.2).

Table 4.2. ***Physical Activity and BMI Correlations for Gender, Grade, and School***

Groups	N	Correlation Coefficient
Total	120	-0.22*
Gender		
Male	74	0.03
Female	46	-0.44***
Grade		
3rd	44	-0.17
4th	48	-0.15
5th	28	-0.41*
Schools		
Richmond	66	-0.38**
Mercy	18	-0.11
Woodson	36	-0.23

* = p < .05
** = p < .01
*** = p <.001

CHAPTER V

DISCUSSION

The purpose of this study was to describe: (a) how instructional time was used in third-, fourth-, and fifth-grade physical education classes across three schools; (b) the mean grade, school, and gender differences in physical activity levels and body mass indices of third-, fourth-, and fifth-grade students across three schools; (c) the various types of physical activities that third-, fourth-, and fifth-grade students engage in outside of physical education classes across three schools; and (d) the relationship between physical activity level and body mass index for third-, fourth-, and fifth-grade students across three schools.

Student Behavior Engagement

The first major goal of the study was to find out how instructional time was used in third-, fourth-, and fifth-grade physical education classes across three elementary schools. When extracting percentages from SBE forms, it appears that while all three schools required physical education, the instructional time was used ineffectively in providing students with the recommended levels of physical activity. Specifically, the students spent 48% of the time performing motor activity, 24% receiving information, 0% giving information, 21% waiting, 2% relocating and 5% being off-task or doing other things. Consequently, the three teachers in this study had their students physically active less than half of the instructional time.

Unfortunately, the picture has not improved from past studies (Lacy, Lamaster & Tommaney, 1996; Lacy, Wilson, & Hicks, 1998; Simons-Morton, Taylor, Sider, & Huang, 1993). Past studies have also shown that less than half of the class time was spent in motor appropriate behaviors. Interestingly, it was also found in all these studies that students spent over 20% of their time receiving information from the teacher, while lower percentages of instructional time was spent waiting, relocating or transitioning, and being off task. Therefore, all these studies indicate that activity levels for children have remained consistently low over time despite the national attention given to getting children and youth more physically active.

Coker (1999) indicated that many times the amount of activity time is lower than expected because of sub par management routines, low impact activities, and excessive lecturing by the teachers. Faucette and Patterson (1990) studied physical activity time of students of teachers who were specialists and non specialists with (TOS) Teacher Observation Schedule. It was found approximately 35% of the children taught by the specialist were physically active, while 16.5% of the children taught by the non-specialist were physically active. The difference in activity time was due to curricular choice. It was found that the non-specialist chose large-sided team games in which only a few children were active at any one time, while the specialist chose individualized activities or organized activities into stations to increase activity time.

According to Lacy and LaMaster (1996) there are also other factors that can affect levels of physical activity in physical education, such as the size of the class, and the facility and equipment along with the students' skill levels. The field notes taken during

observation periods in the current study indicated that teachers in this study spent a lot of time lecturing and in class management. Furthermore, when students weren't listening to their teacher they were either waiting in line for equipment or for the opportunity to be in a game. In addition to management issues, instructional time was impacted by context variables. That is, each school's instructional area had unique physical and class size issues. For example, at Richmond Elementary School the teacher taught in the auditorium, at Woodson Elementary School the teacher only had access to half of the gymnasium, and at Mercy Elementary School the teacher taught in a small multi-purpose room, but utilized outdoor space.

Teacher factors also appeared to influence how instructional time was allocated when examining each school. For instance, SBE data indicated that the possible reason the third- and fifth-grade physical activity levels were higher was because the third-grade classes at Richmond Elementary School spent 51% of instructional time performing a variety of motor activities and the third-grade class at Mercy Elementary School spent 59% of the time performing motor activity. Also, the teacher at Mercy, who was a first year teacher, kept the fifth-grade students very active (67%). When the students arrived to class they began with movement activities, such as ballistic stretching, jogging, running, and individual exercises. After warm ups they often participated in games that were focused on continuous physically activity. In the beginning of one class, students began jogging an entire soccer field and ended the class the same way. The field notes showed that these activities were not sport related games but were activities that required

continual movement through running, skipping, and traditional and modified low organized games.

Some game activities were modified to keep the kids active all the time. For example, when students played a game of dodge ball at Mercy, they were told to exercise on the sideline and then return to the game. The game was played continuously, throughout the class period. Another game that the teacher taught was entitled “Ball Drop.” The teacher emptied a large trash bag filled with scores of colorful balls (yarn balls) of various sizes on the floor. Students ran in pairs until all the balls were picked up and carried to their individual team areas. For that particular class the teacher allowed students to throw and catch frisbees for the entire class period. The teacher allowed students to throw frisbees with a partner the entire class time. This activity gave students many opportunities to be physically active.

At Richmond Elementary School, the students often participated in stations in which they rotated throughout the class time. There were stations on the floor and on the stage in the auditorium. Even though a few lessons were on basketball, the teacher also incorporated stations that included fitness activities, such as jogging, jumping, and skipping. The teacher ended many of the classes incorporating dance or some type of group activity. Because of the small instructional area (auditorium) and the application of independent work, management and discipline problems slightly diminished the activity time of Richmond’s students.

At Woodson, the level of activity was lower than the other two schools due to class size and inactive types of learning experiences. Field notes indicated that

Woodson's classes were very large. Therefore, the teacher spent a lot of time organizing various class routines and learning activities. Sedentary class activities also prevailed. On one occasion, for example, students were asked to get in groups of ten and stack cups on top of each other within a certain amount of time. This activity was all done while sitting. The classes also included a lot of skills test in which allowed many students to sit in long lines and wait their turn.

While activity time in both Richmond and Mercy appeared higher than Woodson, one has to understand the teacher's purposes in developing lessons. It would appear that overall the Richmond and Mercy teachers spent more time in just having their students physically activity rather than learning specific sport skill content (e.g., throwing, shooting, dribbling, dodging, etc.). Perhaps, then, more value was placed on physical activity for its own sake rather than on developing specific sport skills.

When looking at gender comparisons there was some variation among the three schools. For example, males and females at Richmond Elementary School spent the same amount of time in performing motor activity (46%). This was because many times both makes and females participated in partner drills or in stations. With this in mind, both males and females had the opportunity to be equally active. Even though they both spent less than half of their instructional time in motor activity, over 30% of their time was allocated to receiving information from the teacher (e.g., teaching kids content such as basketball terms, rules, bone, and muscle function).

At Woodson males were found to be more active than females. The males spent 42% of instructional time in performing motor activity while girls spent 36% of

instructional time in performing motor activity. This reason may be because when students were participating in game play, females were more reluctant to participate. This was also the case when they participated in skills testing.

At Mercy it was found that although females were more active than males, they both spent almost a third of instructional time in performing motor behavior. The females spent 62% of the instructional time in performing activity and the males spent 59% of instructional time in performing motor activity. They both spent over 24% of instructional time waiting and a limited amount of time receiving information from the teacher. With this in mind, both Mercy male and female students were equally active and also had information provided by the teacher in equal amounts.

Physical Activity Levels and Body Mass Index (BMI)

The second major goal of the study was to find out the levels of physical activity and BMIs for the third-, fourth-, and fifth-grade physical education students across the three schools. When looking at individual schools, all three schools were significantly different from each other ($p<.001$) with Richmond being the lowest and Mercy being the highest. With this in mind, it was found that the teacher at Mercy Elementary School gave students more opportunities to be physically active than the other schools. Even though the teacher was a first year teacher and taught in the smallest facility (multi-purpose) room for physical education, the teacher was focused on motor engagement. When it was warm the teacher began the class by having students run a lap around a large field.

The other two schools taught more content, therefore their students average steps per minute was sacrificed. For example, the teacher at Woodson had one lesson in which the kids sat in groups on the floor and stacked cups on top of one another. The tasks focused on eye hand coordination; however the kids were sitting a high a percentage of the time during this particular activity.

When looking at physical activity levels of males and females it was found that males took significantly more steps than females ($p<.05$). The males averaged 136.05 steps per minute and females averaged 123.38 steps per minute. Research shows that males tend to be more active than females during physical education. For example, Louie and Chan (2003) used pedometry to evaluate the physical activity levels among young children in a Hong Kong elementary school and found that boys acquired more steps than girls in physical education. Rowland and Easton (2005) also found that boys were 25% more active than girls in physical education.

When looking at physical activity levels across grades no significant differences were found ($p>.10$), the third-graders took the most steps per minute (136.16), while the fourth- and fifth-graders both averaged ten or less steps per minute. Research by Hovell, Sallis, Kolody, and McKenzie suggested that children's activity levels decreases as elementary aged children grade levels increases.

A grade by school interaction was found to be significant ($p<.05$). It was reported that third-graders at Richmond had greater levels of physical activity than fourth- and fifth-graders. The fifth-graders at Woodson had greater activity levels than third- and

fourth-graders at Woodson. Lastly, the fifth-graders at Mercy were less active than third- and fourth-graders at Mercy.

When looking at mean BMI mean scores for males and females, males were found to have only slightly higher mean BMI scores (21.05) than females (19.05). That is, there was only a 3% difference in mean scores which suggests that the males and females mean scores in third-, fourth-, and fifth-grade were the same in terms of their BMI levels. Similar conclusions were supported in other studies. For example, Guinn, Baxter, Litaker, and Thompson (2007) conducted a meta-analysis of five BMI studies. The studies represented 1,696 fourth-grade children from 14 public elementary schools. It was found that across all five studies that there was no significant difference found between males and females.

When looking at mean BMI scores for third-grade (18.44), fourth-grade (21.56), and fifth-grade (21.14) students, it was found that there was an increase from the third grade to the fourth grade; BMIs remained stable between the fourth and fifth grades. According to Eisenmannn, Heelan, and Welk (2004) there is an increase in BMI from birth to 1 year, a gradual decline from 1 year until 6 years old, and then an increase throughout childhood. In this study, the mean BMIs increased from the third to the fourth grade, but in the fifth grade there was a slight decrease.

When looking at the mean BMI scores across each school it was found that Richmond had 94.41, Woodson had 130.62, and Mercy had 164.11. Also, there was a significant gender by school interaction ($p<.05$). There was little difference between male

and female BMIs for Richmond Elementary School; however, males appeared to have higher BMIs at Woodson Elementary School and Mercy Elementary School.

Types of Physical Activities outside Physical Education

An important dimension of this study was to ascertain how students spend their time outside of school. More specifically, the third goal of the study was to find out what types of activities children participate in during a typical week. The intent was to place the findings of this study in a broader context of the students' lives. When listing the desirable for physical activity outside of physical education for all schools and all grades it was found that students spent most of their time (a) Jogging, (b)Walking, (c)Dancing, (d) Playing Tag, and (e) Basketball and Skipping. These findings are similar to those of Hovell, Sallis, Kolody, and McKenzie (1999) who assessed physical activity choices among fourth and six graders for weekdays, weekends, and summer vacations. They found that both boys and girls reported running/jogging and walking the two prime activities. These types of activities were found to occur mostly on weekends and during summers. Interestingly, the proportions tended to decrease somewhat by sixth grade. Such activity choices in the present study and Hovell et al.'s studies are encouraging. The choices reflect activities that are aerobic in nature with fitness values attached.

An interesting part of the present findings was that students chose jogging as their top activity outside of school. It was found that they really weren't as interested in traditional sport activities, such basketball, baseball, softball, football, and soccer. This could be because the students' have a low interest in sports or because of their lack to access to recreational opportunities. Perkins, Jacobs, Barber and Eccles (2004), that

looked at sports participation during childhood and adolescence and found adolescent sports participation to be a significant predictor of young adults' sports and physical fitness participation.

In third-grade the game of baseball was listed as their fifth choice of participation, in fourth-grade there weren't any sports listed and in the fifth-grade the game of Basketball also listed as their fifth choice of participation. Among all grades the most popular activities chosen by students were activities such as jogging, and walking. In the third grade the game of baseball was listed as their fifth choice, in fourth grade there weren't any sports listed, and in the fifth grade the game of basketball was listed. Among all grades the most popular activities chosen by students were activities such as jogging, and walking. With this in mind, students that love to jog during their spare time may continue during adulthood.

Jago, Anderson, Baranowski, and Watson (2005) examined gender differences in intensity and specific type of activity by the day of the week and time. It was found in diary entries, that boys spent more time engaged in electronic recreation and sports (team and individual sports), while girls spent more time in personal care (showering, bathing, hair, and make-up). Once again boys were interested in sports and girls were interested in lesser types of physical activity. When looking at males and females in this study, it was found that both males and females ranked jogging as their first activity, but for the second activity, basketball was ranked for males while walking was ranked second for females. The boys wanted more of a contact sport for activity, while females chose walking.

For boys the third activity was tag and for girls it was dancing. Once again males chose more of a fast contact activity while females chose dance. For males the fourth activity was walking while females chose skipping. Lastly, for boys the last activity was dancing and for girls it was tag.

Relationship between Physical Activity Level and BMI

The inverse correlation between physical activity levels (average steps per minute) and BMI were found to be significant ($p<.05$.) The inverse correction indicated that the higher levels of physical activity resulted in lower BMI scores. When compared to gender, the relationship was different in males and females. The linear inverse relationship between BMI and physical activity was much stronger in females, while the males do not appear to be related.

There was also an inverse relationship between BMI and physical activity at each of the three schools in the study. However, the correlation was only significant at Richmond Elementary School and other corrections were not significant. Lastly, there was a small inverse linear relationship between BMI and physical activity at each of the three grade levels. It was strongest and statically significant in grade five. The relationships of the other two grades were weak and clearly not statistically significant.

Conclusions

Based on this study's findings the following conclusions can be made:

1. Overall it was found that students spent less than half of their instructional time in being physically active. Much of the inactive time was spent listening to the teacher and waiting to engage in an activity. However, when grade level was considered the

amount of motor activity somewhat increased. The increase was especially evident in the third and fifth graders.

2. Teachers differed in terms of the way they organized their instructional time. Woodson's teacher instructional time was organized in a way that more than half of the time was spent in non motor engaged activities. Students at Mercy and Richmond Elementary School spent the higher amounts of instructional time performing motor activity.

3. The third-graders at Richmond Elementary School spent the highest amount of instructional time in performing motor activity, while the fourth graders spent the least amount of time in performing motor activity. The third-graders and fifth-graders at Woodson Elementary School spent the highest amount of time in performing motor activity. The fifth-graders at Mercy Elementary School had the highest amount of time in performing motor activity.

4. Females at Richmond Elementary School spent the same amount of instructional time as males in performing motor activity. However, differences between male and females were more prevalent when examining individual schools. At Woodson Elementary School males spent a higher amount of instructional time in performing motor activity than females. Lastly, at Mercy Elementary School females spent more instructional time than males and they both spent over half the instructional time in performing motor activity.

5. It was found that males took more average steps per minute than females. It was found that third-graders took more steps per minute than the fourth- and fifth-grade

students. Lastly, it was found that students at Mercy received the highest among of steps per minute, while Richmond received the lowest.

6. It was found that a grade by school interaction was significant ($p<.05$). It was reported that third-graders at Richmond were greater than fourth- and fifth-graders at Richmond. It was reported that fifth-graders at Woodson were greater than third- and fourth-graders at Woodson. Lastly, it was reported that fifth-graders at Mercy were less than third- and fourth-graders at Mercy.

7. When ranking the preferences for physical activity outside of physical education classes for all schools and all grades it was found that students spent their average time in this ranking order: (a) Jogging, (b) Walking, (c) Dancing, (d) Playing Tag, and (e) Skipping. The third- and fifth-graders ranked jogging as their top activity while the fourth-graders ranked walking as their top activity. Overall all grades were interested in aerobic activity. Girls and boys also chose jogging as their top activity, while the boys chose basketball as their second choice. Girls chose walking as their second choice. As far as schools were concerned, Richmond chose walking as their top, while Woodson Elementary School and Mercy Elementary School chose jogging as their top choice of physical activity.

8. When correlating the physical activity level and BMI for all 120 subjects, an inverse correlation was found to be significant at ($p<.05$). It indicated that the higher the levels of physical activity, the lower the BMI scores. When compared across gender, the relationship was different in males and females. In males the linear inverse relationship

between BMI and physical activity was much stronger. However in males, BMI and levels of physical activity did not appear to be significantly related.

9. There was also an inverse relationship between BMI and physical activity levels at each of the three schools in this study. The correlation was significant only at Richmond Elementary School. This was because of the artifact of a smaller sample size at the other two schools.

10. There was an inverse linear relationship between BMI and physical activity at each of the three grade levels. Although statistically significant in grade five the inverse relationships in the other two grades were weak and non significant.

Recommendations for Further Research

The following ideas are presented for consideration in future investigations:

1. Replicate this study among other schools in Guilford County to increase the generalizability of the findings of this study. This would give the researcher the opportunity to find out if other schools are in unison with Richmond, Woodson and Mercy Elementary School. It may be a situation in which other schools may present different findings.
2. Replicate this study but add the use of accelerometers instead of pedometers. This could be an opportunity of for the researcher to look physical activity levels instead of step counts.
3. Conduct a research study that uses entire PAC-Questionnaire. The questionnaire will allow the researcher to find out how students spend their

time outside of school and it will show activity time during school and during recess.

4. Conduct a research study that allows the researcher to use the (SBE) form to see who are more active from the first grade to the fifth grade. This will allow the researcher to see if the low activity time in this study began in the third grade or if it is among first grade to fifth grade.
5. Conduct a study that would look at physical activity levels of students in the third, fourth, and fifth grades within the school day but outside of physical education time (i.e., lunch, recess, hallway travel). This would allow the researcher to examine physical activity levels beyond physical education class time. Comparisons among the various contexts could also be made.

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Appendix A

SBE Form

SAMPLE CODING FORM AND RECORD

TIME SAMPLING OF A SINGLE STUDENT'S BEHAVIOR

RECORD A CHECK (✓) FOR EACH 5 SECONDS OF STUDENT ACTIVITY.

STUDENT'S NAME: Alice Smith

CLASS: Elementary Gymnastics

SEGMENT (3-min.)	PERFORMS MOTOR ACTIVITY	RECEIVES INFORMATION	GIVES INFORMATION OR ASSISTS	WAITS	RELOCATES	OTHER	NOTATIONS
I 9:00-9:03	✓✓✓ (3)	✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ (20)		✓✓✓✓✓ ✓✓✓✓✓ (10)	✓✓ (2)	✓ (1)	Waited for teacher to begin. Rec. info on class organization
II 9:06-9:09	✓✓✓✓✓ ✓✓✓ (8)	✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓ (22)		✓✓ (2)	✓✓✓ (3)	✓ (1)	End instruction / began tumbling and head stand
III 9:12-9:15	✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓ (17)	✓✓✓✓✓ (5)	✓✓✓✓✓ (5)	✓✓ (2)	✓ (1)	✓✓✓✓✓ ✓ (6)	Cont'd tumbling "Other" = replaced mats
IV 9:18-9:21	✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓ (22)	✓✓✓ (3)	✓✓✓ (3)	✓✓✓✓✓ (5)		✓✓✓ (3)	Performed on ropes
V 9:24-9:27	✓✓✓ (3)	✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ (25)		✓✓✓ (3)	✓✓✓ (3)	✓✓ (2)	Rec'd instruction on bars
VI 9:30-9:33	✓✓✓ (3)	✓✓✓✓✓ ✓✓✓✓✓ (10)		✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓✓✓✓✓ ✓ (21)		✓✓ (2)	Waits a turn on bars and performs
TOTALS	f = 56 % = 56/216 = 26%	f = 85 % = 85/216 = 39%	f = 8 % = 8/216 = 3%	f = 43 % = 43/216 = 19%	f = 9 % = 9/216 = 4%	f = 15 % = 15/216 = 7%	

SUMMARY COMMENTS AND EVALUATION (made by teacher of class)

Too much time spent waiting for teacher and getting organized.

Good activity levels on mats and ropes — too much waiting around on bars.

Overall, a greater proportion of time should be spent in performing activities.

Appendix B

PAQ-C Questionnaire

Sex: M_____ F_____ Grade:_____

Teacher:_____

We are trying to find out about your level of physical activity from ***the last 7 days*** (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

---

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	O	O	O	O	O
Rowing/canoeing	O	O	O	O	O
In-line skating	O	O	O	O	O
Tag	O	O	O	O	O
Walking for exercise	O	O	O	O	O
Bicycling	O	O	O	O	O
Jogging or running	O	O	O	O	O
Aerobics	O	O	O	O	O
Swimming	O	O	O	O	O
Baseball, softball	O	O	O	O	O
Dance	O	O	O	O	O
Football	O	O	O	O	O
Badminton	O	O	O	O	O
Skateboarding	O	O	O	O	O
Soccer	O	O	O	O	O
Street hockey	O	O	O	O	O
Volleyball	O	O	O	O	O
Floor hockey	O	O	O	O	O
Basketball	O	O	O	O	O
Ice skating	O	O	O	O	O
Cross-country skiing	O	O	O	O	O
Ice hockey/ringette	O	O	O	O	O
Other:					
_____	O	O	O	O	O
_____	O	O	O	O	O

Appendix C

Data Collection Schedule

Table 1—Richmond Data Collection Schedule

Group 1 of 3rd, 4th, and 5th Graders

October 27-Gave Out Consent Forms

October 28-November4-Collected Consent Forms

November 7-Collected Body Mass Index & Gave Out Questionnaire

November 17 Collected Data (Pedometers-Observation)

December 4 Collected Data (Pedometers-Observation)

December 11 Collect Data (Pedometers-Observation)

December 18- Collected Body Mass Index & Gave Out Questionnaire

Group 2 of 3rd, 4th, and 5th Graders

October 27-Gave Out Consent Forms

October 28-November 4-Collected Consent Forms

October 29-Collected Body Mass Index & Gave Out Questionnaire

November 18 Collected Data (Pedometers-Observation)

November 25 Collected Data (Pedometers-Observation)

December 5 Collected Data (Pedometers-Observation)

December 12- Collected Body Mass Index & Gave Out Questionnaire

Class Times

8:00-8:45 (Third- Graders) 8:55-9:40 (Fourth Graders) 1:45-2:30 (Fifth Graders)

Table 2—Woodson Date Collection Schedule

October 27-Gave Out Consent Forms

October 28 & November 4 -Collected Consent Forms

November 6th-Collect Body Mass Index & Gave Out Questionnaire

November 12th Collected Data (Pedometers-Observation)

November 17 Collected Data (Pedometers-Observation)

November 25 Collected Data (Pedometers-Observation)

Dec 3 - Collected Body Mass Index & Gave Out Questionnaire

Class Times

9:55-10:35 Fourth Graders

10:45-11:25 Fifth Graders

1:00-1:40 Third Graders

Table 3-Mercy Elementary Schedule

Mercy Elementary School

Montessori

January 5-Gave Out Consent Forms-Remember Christmas Break

January 9-Collected Consent Forms

January 9- Collect Body Mass Index & Gave Out Questionnaire

January 12- Collected Data (Pedometers-Observation) 5th Grade

January 14- Collected Data (Pedometers-Observation) 3rd Grade-4th Grade

January 21- Collected Data (Pedometers-Observation) 3rd Grade-4th Grade

February 3- Collected Data (Pedometers-Observation) 5th Grade

February-4 Collected Data (Pedometers-Observation) 3rd Grade- 4th Grade

February 10- Collected Data (Pedometers-Observation) 5th Grade

February 10- Collected Body Mass Index & Gave Out Questionnaire

Class Times

Class times changed weekly

Appendix D

Letters from Principals

Guilford County Schools

UNCG Institutional Review Board
Office of Research Compliance
203 Foust Building

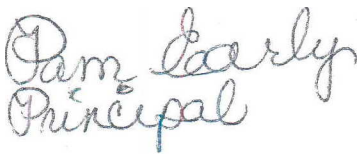
Dear Colleagues,

I am writing to inform you of my support for the Protocol entitled "Assessment of physical activity and body composition levels of 3rd, 4th, and 5th grade students in physical education: A means of decreasing obesity" which will be conducted by Tiffany Fuller, a doctoral student at the University of North Carolina at Greensboro.

We support the research proposed by Tiffany Fuller. We also agree with all procedures and believe that the data obtained will be beneficial for our school and the Guilford County School System.

Beginning Date: October 27, 2008; Completion Date: December 12, 2008.

Sincerely,
Alamance Elementary School



Guilford County Schools

UNCG Institutional Review Board
Office of Research Compliance
203 Foust Building

Dear Colleagues,

I am writing to inform you of my support for the Protocol entitled “Assessment of Physical Activity and Body Composition Levels Of 3rd, 4th, And 5th Grade Students in Physical Education: A Means of Decreasing Obesity” which will be conducted by Tiffany Fuller, a doctoral student at the University of North Carolina At Greensboro.

We support the research proposed by Tiffany Fuller. We also agree with all procedures and believe that the data obtained will be beneficial for our school and the Guilford County School System.
Beginning Date: October 27. 2008; Completion Date: December 12, 2008.

Sincerely,

Renee McKinnon, Principal

Guilford County Schools

November 20, 2008

UNCG Institutional Review Board
Office of Research Compliance
203 Foust Building

Dear Colleagues,

I am writing to inform you of my support for the Protocol entitled, “Assessment of Physical Activity and Body Composition Levels of 3rd, 4th, and 5th Grade Students in Physical Education: A Means of Decreasing Obesity” which will be conducted by Ms. Tiffany Fuller, a doctoral student at the University of North Carolina at Greensboro.

I feel this is an extremely valuable experience and support the research proposed by Ms Fuller. The planned procedures and data obtained will be beneficial for our students’ school community and the Guilford County School System.

Beginning Date: December 1. 2008; Completion Date: December 18, 2008

Please feel free to contact me for additional information if needed.

Sincerely,

Sharon Jacobs, Principal

Appendix E

Approval Letter from Guilford County Schools Research Review Committee

October 14, 2008

Tiffany Fuller
3692 McGinty Drive
Greensboro, NC 27406

Re: 080911

Dear Ms. Fuller:

The Research Review Committee has concluded that your proposal *Assessment of physical activity and body composition levels of 3rd, 4th, and 5th grade students in physical education: A means of decreasing obesity* meets the requirements of state legislation and the current research policy of the Guilford County Schools. The committee understands from your proposal that the identities of individuals and schools will be confidential at all stages of the project. Committee approval does not guarantee access to schools or to individuals. School principals have the final decision regarding the participation of the school in any research project. In addition, teachers and administrators decide individually whether they wish to participate.

We encourage researchers to provide direct feedback to the school community where they have conducted research. This could involve an open session for parents, teachers, and administrators; a summary of the research that is accessible to all members of the school community; or other accessible forms of direct feedback to the schools. In addition, you must provide the Research Review Committee with copies of any publications and presentations.

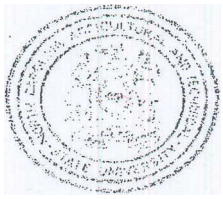
We hope that the project is successful in helping to achieve your goals. Please feel free to contact me at 336-370-2346 if you have any questions.

Sincerely,

Carolyn Gilbert
Co-Chair, Research Review Committee

Appendix F

Approval Letter from the Institutional Review Board from NC A&T State University



NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

RESEARCH AND COMPLIANCE OFFICE
DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT Date: October 24, 2008

Ms. Tiffany Fuller

Refer to: IRB # 08-0000-09-H26

Dear Ms. Fuller:

As required by University policy the Institutional Review Board (IRB) has given your protocol for a project entitled, “Assessment of physical activity and body composition levels of 3rd, 4th, and 5th grade students in physical education: A means of decreasing obesity" (1RB# 08-0000-09-H26) an audit review. Your protocol is approved under the expedited procedure from 45 CFR 46, categories #4and7, as it represents only minimal risk to subjects. As per A&T's Federal-Wide Assurance (FWA00000013) with the Office for Human Research Protections (OHRP) of the Department of Health and Human Services, all expedited research must be conducted in accordance with the Belmont Report DHEW Publication No. (OS) 78-0012) which requires voluntary, informed consent from research subjects. You are required to use only the stamped consent and other supporting documents and maintain originals for a period of 3 years. You should be aware that any changes in your protocol roust be submitted to the 3KB before they are implemented. Likewise, any problems or complaints involving human subjects must he promptly reported to tile IRB.

You must destroy the key linking the code assigned to each student on the first day after all data collection has been completed. Thank you for your cooperation on this matter and best wishes on your project.

Sincerely,

Dr. Karen Smith-Gratto, TRB Chair

Cc: Dr. N. Radhakrishnan, Vice Chancellor for Research and Economic Development

Appendix G

Approval Letter from the Institutional Board at the University of North Carolina at Greensboro

Dr. Martinek and Ms. Fuller:

I am writing to let you know that your submission for IRB Study # 0?i913l, entitled "Assessment of Physical Activity and Body Composition Levels of 3rd, 4th and 5th Grade Students in Physical Education: A Means of Decreasing Obesity" has been approved by the UNCG IRB. Please wait to begin study enrollment, until you receive the stamped consent and assent forms in your approval packet. The IRB approval stamp must appear on each consent and assent document that is used in the enrollment of participants. The approval packet is being sent to Dr. Martinek and should arrive within the next few days.

I understand that the NC A&T IRB is also reviewing the study. If any changes are made to the study or to study materials, such as consent and assent forms, in order to secure NC A&T IRB approval, these changes must also be approved by the UNCG IRB prior to their use with participants. A modification request would need to be submitted along with the revised documents. The modification form is available, on the ORC website at http://wvvw.uncg.edu/orc/irb.htm. This dual review process is necessary so that both IRBs will have seen and approved the appropriate version of (the materials to be used in the study).

Please contact me with any questions or concerns.

Best regards,

Joe

Joseph Andrews, Assistant Director
Office of Research Compliance
University of North Carolina at Greensboro
2718 Moore Humanities & Research Administration
Greensboro, NC 27402
Telephone: (336) 256-1482
Facsimile: (336) 256-1482

Appendix H

Consent Forms

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT FOR A MINOR TO ACT AS A HUMAN PARTICIPANT: LONG FORM

Project Title: Assessment of physical activity and body composition levels of 3rd, 4th, and 5th grade students in physical education: A means of decreasing obesity.

Project Director: Dr. Tom Martinek
Department of Exercise & Sport Science
University of North Carolina at Greensboro

Student Researcher: Tiffany Michelle Fuller

You are being asked to allow your child to take part in a research study. To join the study is voluntary. You may choose not to give your permission, or you may withdraw your permission for you child to be n the study at any time, for any reason. Details about the study are discussed below. It is important that you understand this information so that you and your child can make an informed choice about being in the study.

The Purpose of Study

The purpose of this research study is to examine levels of physical activity participation in elementary-aged school children who participate in a weekly 45 minute physical education class. More specifically, this research study will examine the amount of time children are physically active within the physical education class sessions and describe the types of activities in which children are involved during- and after-school. The link between BMI (Body Mass Index) and physical activity levels will also be examined.

Why are you asking my child?
The research study will be conducted among 3rd, 4th, and 5th grade students enrolled in physical education class at two local elementary schools in Guilford County. Your child's name and the name of their school will be kept confidential during and after the study. The study will be conducted from October (27) to December (12). This study will not interrupt the teacher or the student during their class time except for two days.
Your child will be asked to complete a questionnaire about the types of physical activity they take part in, wear a pedometer (a small device that counts the number of steps a person takes), and allow the researchers to measure his or her weight. We will get height

and weight measurements as the beginning of the study, an at the end in order to calculate his or her Body Mass Index (BMI). Your child will be asked to wear the pedometer during physical education class and complete class activities just as he or she would normally would. We will observe six or your child's physical education classes and take notes on the types of activities the children engage in. Participation in the study will take a total of 6 hours, including completing the questionnaire, height and weight measurements and the time wearing the pedometers.

Is there any audio/video recording of my child?
No, we will not audio or videotape your child.

What are the dangers to my child?
"The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants." When the researcher collects height and weight of your each child, he or she will be with the researcher across the gym away from other children (beside the bleacher) to minimize risks of embarrassment. Also the weight of each child will be recorded in kilograms.
If you have any concerns about your child's rights or how you are being treated, please contact Eric Allen in the Office of Research and Compliance at UNCG at (336) 256-1482. Questions about this project or benefits or risks associated with being in this study can be answered by [Tiffany Michelle Fuller] who may be contacted at (336) 908-0231 (Cell) (336) 334-7712 (Work) t_full@yahoo.com, tf984181@ncat.edu

Are there any benefits to my child as a result of participation in this research study?
Your child will learn what pedometers are and how they are used.

Are there any benefits to society as a result of my child taking part in this research?
The study will contribute to knowledge about children's physical activity levels during and after school.

Will my child get paid for being in the study? Will it cost me anything for my kid to be in this study?
"There are no costs to you or payments to you or your child as a result of participation in this study."

How will my child's information be kept confidential?
All information obtained in this study is strictly confidential unless disclosure is required by law. All data collected will be locked in a file cabinet at North Carolina A & T State University in the office of 214 Corbett.

What if my child wants to leave the study or I want him/her to leave the study?
"You have the right to refuse to allow your child to participate or to withdraw him or her at any time, without penalty. If your child does withdraw, it will not affect you or your

child in any way. If you or your child chooses to withdraw, you may request that any data which has been collected be destroyed unless it is in a de-identifiable state."

What about new information/changes in the study?
"If significant new information relating to the study becomes available which may relate to your willingness allow your child to continue to participate, this information will be provided to you."

Voluntary Consent by Participant:
By signing this consent form, you are agreeing that you have read it or it has been read to you, You fully understand the contents of this document and consent to your child taking part in this study. All of your questions concerning this study have been answered. By signing this form, you are agreeing that you are the legal parent or guardian of the child who wishes to participate in this study described to you by _____.

_____ Date: _____
Participant's Parent/Legal Guardian's Signature

_____ Date: _____
Participant's Parent/Legal Guardian's Signature

Study Title: Assessment of physical activity and body composition levels of 3rd, 4th, and 5th grade students in physical education: A means of decreasing obesity.

My name is _____ and I am a student at UCGC.

What is this about?
My advisor and I are conducting a research study about physical activity among 3rd, 4th, and 5th graders. We are trying to find out how active students are during physical education classes and other times. We also want to learn more about Body Mass Index or BMI. We measure this by finding out your height and weight.

Did my parents say it was ok?
Your parent(s) said it was ok for you to be in this study and have signed a form like this one.

Why me?
We would like you to take part because you are in physical education every school day and have good attendance at school.

What if I want to stop?
You do not have to say "yes", if you do not want to take part. We will not punish you if you say "no". Even if you say "yes" now and change your mind after you start doing this study, you can stop and no one will be mad at you.

What will I have to do?
We will ask you to do what you normally would do in your physical education classes. We will come take notes for our study at six of your physical education classes. We would also like for you to fill out a survey, wear a pedometer (a tiny machine that counts your steps). I will take you six hours to be in the study. This will only be six physical education classes.

Will anything bad happen to me?
No

Will anything good happen to me?
You will find out how tall you are and how much you weigh.

Do I get anything for being in this study?
No

What if I have questions?
You are free to ask questions at any time. You can also call my advisor, Tom Martinek, at 334-3034 or Eric Allen at 256-1482 if you have any questions.

If you understand this study and want to be in it, please write your name below.

_____ _____
Signature of child Date

Dr. Martinek and Ms. Fuller:

I am writing to let you know that your submission for IRB Study # 089131, entitled "Assessment of Physical Activity and Body Composition Levels of 3rd, 4th and 5th Grade Students in Physical Education: A Means of Decreasing Obesity" has been approved by the UNCG IRB. Please wait to begin study enrollment, until you receive the stamped consent and assent forms in your approval packet. The IRB approval stamp must appear on each consent and assent document that is used in the enrollment of participants. The approval packet is being sent to Dr. Martinek and should arrive within the next few days.

I understand that the NC A&T IRB is also reviewing the study. If any changes are made to the study or to study materials, such as consent and assent forms, in order to secure NC A&T IRB approval, these changes must also be approved by the UNCG IRB prior to their use with participants. A modification request would need to be submitted along with the revised documents. The modification form is available on the ORC website at http://www.uncg.edu/orc/irb.htm. This dual review process is necessary so that both IRBs will have seen and approved the appropriate version of the materials to be used in the study.

Please contact me with any questions or concerns.

Best regards,

Joe

Joseph Andrews, Assistant Director
Office of Research Compliance
University of North Carolina at Greensboro
2718 Moore Humanities & Research Administration
Greensboro, NC 27402
Telephone: (336) 256-1482
Facsimile: (336) 256-1482

Appendix I

Example of a Training Certificate from Research Compliance Officers at NC A&T State University

North Carolina Agricultural and Technical State University

Certificate of Attendance

The Institutional Review Board

certifies that

Stacey Jennings

has attended

Application of Ethical Principles for Research Assistants: Children As Research Participants

Deanna McNeill — Research Compliance Officer

11/6/08 — Date

Appendix J

Gender Differences in Physical Activity

Gender

Dependent Variable:stepTotal

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
F	5079.987	182.097	4718.799	5441.174
M	5611.873	217.495	5180.473	6043.274

Appendix K

Analysis of Grade Differences in Physical Activity

Grade

Dependent Variable: StepTotal

Grade	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
3	5632.414	270.770	5095.343	6169.486
4	5216.159	195.704	4827.981	5604.337
5	5189.216	263.487	4666.591	5711.842

Appendix L

Analysis of School Differences in Physical Activity Levels

School

Dependent Variable:stepTotal

School	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
M	6564.278	312.117	5945.195	7183.361
R	4248.631	160.121	3931.033	4566.229
W	5224.882	240.804	4747.249	5702.515

Appendix M

Analysis of Gender Differences in BMI Levels

Gender

Dependent Variable:BMIA

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
F	19.046	.803	17.453	20.638
M	21.045	.959	19.143	22.947

Appendix N

Analysis of Grade Differences in Body Mass Index

Grade

Dependent Variable: BMIA

Grade	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
3	18.440	1.194	16.072	20.808
4	21.556	.863	19.844	23.267
5	20.141	1.162	17.837	22.445