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The Relationship Between Opportunity for Physical Activity and Classroom Behavior in School Aged Children.

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The Relationship Between Opportunity for Physical Activity and Classroom Behavior in School Aged Children.

By

Kortney L. Aeikens

A Thesis submitted in partial Fulfillment of the Requirements of the Degree of Master of Science In Health Education

Minnesota State University, Mankato
Mankato, Minnesota
May 2015
The Relationship between Physical Activity and Classroom Behavior in School Aged Children.
Kortney L. Aeikens

This thesis has been examined and approved by the following members of the student’s committee.

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Dr. Marlene Tappe

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Dr. Matthew Buns
Abstract
The Relationship Between Opportunity for Physical Activity and Classroom Behavior in School Aged Children.

By Kortney L. Aeikens
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The purpose of this study is to determine the relationship between physical activity and students’ classroom behavior. This descriptive study explored student classroom behavior. This study is to find answers to the following research question:

1. What is the relationship between negative classroom behavior and the amount of time spent in daily physical activity?

Understanding the effects of physical activity on student classroom behavior can help school teachers and administrators in their creation of school scheduling and policy. A sample of students from grades kindergarten thru second grade was used from Pine Island Public Schools. The data was analyzed using aggregate data analysis.
I’d like to thank my parents Mark and Karin Ihnen for instilling in me a love of learning and a drive to always do my best and never giving up. Thank you for teaching me to work hard because nothing is impossible, be humble because no one’s perfect and never give up, especially when the going gets tough. It’s through your love and support that I continue to reach for the stars because I know you’re behind me encouraging me to go on, celebrating my successes and picking me up after I fall. You are the example of kind, encouraging, hardworking, honest, and faithful people I can only hope to be. Your unending love is worth more than you know.

I’d like to thank my husband Eric, who has been my sounding board, my coach, my cheerleader and my shoulder to lean on. Without your love, support and patience I wouldn’t have been able to juggle all the tasks of work, marriage, family, and school. Thank you for your eternal optimism and encouragement to just keep going. I thank God daily for matching me with such an amazing man.

I’d like to thank my advisor and professors in the college of Health Education. Your encouragement through this whole process has been incredible and so greatly appreciated. I hope I can convey my love of learning to my students the way you have to me. The love you have for your topic area is unmistakable and made classes exciting. Thank you Dr. Murray - Davis for the extra time working through my paper and the explanations that made the terrifying seem possible.

Finally, I’d like to thank God through whom all things are possible.
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Chapter One: Statement of the Problem

Introduction

It is well accepted and acknowledged by the general population that there are many physical and emotional benefits to regular physical activity (Welk, Eisenmann, & Dollman, 2006). There is no shortage of scientific evidence that shows regular physical activity reduces the levels of obesity, and helps decrease likelihood of developing heart disease, type II diabetes, depression, anxiety, and some forms of cancer (Hillman, Erickson, & Kramer, 2008).

Researchers report that while they understand the importance of physical activity, 74% of American adults do not meet the recommended 30 min of moderate-intensity physical activity on most days of the week (Hillman et al., 2008). Even more alarming is that children are growing increasingly sedentary resulting in the likelihood that for the first time in United States history children will live less healthy lives than their parents (Hillman et al., 2008). Mahar (2011) identifies the following reasons for the increases in student sedentary lifestyle: increased screen time (tv, computer games, gaming systems) and inability to get outside to play either due to safety concerns or lack of proper supervision because of working parents.

To help counter the sedentary lifestyle of students and recognizing that physical activity is essential for student health the Society of Health and Physical Education (SHAPE) America (2014, p. 1) revised the national standards and made the following recommendation: “SHAPE America recommends that schools provide 150 minutes of instructional physical education for elementary
school children, and 225 minutes for middle and high school students per week for the entire school year.” Since children spend most of their day in school where equipment is more readily available and there are available staff who are trained in implementing physical education curriculum; schools provide an excellent opportunity for children to be physically active for most of those recommended minutes (Mahar, 2011).

**Statement of the Problem**

Barros, Silver, and Stein (2009) found that 40% of schools have eliminated at least 1 activity period from the school day. This study also found that students have lost an average of 12 hours per week of in school play time since 1970. Barros and associates and Pate and colleagues (2006) found that enrollment in high school physical education has decreased 13.2% in the time period between 1991 and 2003.

Schools cite the adoption of the No Child Left Behind Act of 2001 that put increased importance on student achievement in reading and math as the main reason for decreased Physical Education and recess time (Barros et al., 2009). With increased pressure to score high on standardized tests, many school districts have decreased the amount of physical activity students get by removing recess and / or physical education from the curriculum to create more time for tested subjects (Tompkins, Hopkins, Goddard, & Brock, 2012).
Significance of the Study

There are many benefits to physical activity especially for youth. Habits like exercise are developed when children are young and the evidence shows that children are becoming less physically active (Mahar et al., 2006). Since youth spend most of their time in school it’s important that schools take an active role in providing physical activity. Research published by Strong and associates (2005, p. 735) states that there is data that suggests that increased time in physical activity suggests a “relative increase in academic performance per unit of time.”

Research Question

1. What is the relationship between negative classroom behavior and the amount of time spent in daily physical activity?

Limitations

There are three limitations of this study.

1. The grade level’s scheduled time for physical activity.

2. The amount of historical data available for study from our Positive Behavior Intervention Strategies (PBIS) System.

3. The consistency of negative classroom behaviors reported by all classroom teachers may not be the same.

4. In using aggregate data analysis we lose the information of individuals in order to compare larger groups as a whole.
Delimitations

There are three delimitations for this study.

1. Sample was limited to students in grades kindergarten through fifth grade in the Pine Island School District.

2. Data was gathered from students enrolled in the district in 2013-2014 and 2014-2015 school years.

3. Data was gathered from the electronic PBIS System that is set up at school and will allow students to be tracked from one grade to the next.

Assumptions

There are two assumptions of this study.

1. It is assumed that all student behavior referrals and reports were entered into the PBIS system at the school.

2. It is assumed that all behavior reports are truthful.

Definitions of Terms

The definitions for the terms used in this study are provided in this section.

**Off - task behavior** - Any behavior that was not on task either motor off-task, noise off-task, or passive off-task (Mahr et al., 2006).

**On - task behavior** - Verbal or motor behavior that followed the class rules and was appropriate to the learning situation (Mahr et al., 2006).

**PBIS - Positive Behavior Intervention Strategies** – An electronic system used by the Pine Island School District to encourage positive behavior and reduce negative behavior in students. This system also records and
tracks positive and negative behavior incidences and notifies teachers, administrators, and parents.

**Opportunity for physical activity** – For the purpose of this study opportunity for physical activity is time spent in physical education, recess and SMART Gym.

**Recess** - A break during the school day that allows children the time for active free play (Barros et al., 2009).
Chapter Two: Review of the Literature

Introduction

The purpose of this study is to determine the relationship between physical activity and students' classroom behavior. The research reviewed focused on student’s on-task and off-task behaviors in relationship to the amount of time spent in physical education each day.

The Centers for Disease Control and Prevention (CDC) (2014) and SHAPE America (2014) both recommend that children and youth get a minimum of 60 minutes of vigorous physical activity daily. Because most children spend a majority of their day in school it would make sense that schools have a responsibility to provide opportunity for students to be physically active at school.

It is recommended by the National Association for Sport and Physical Education (NASPE) that students spend no more than two hours in stationary positions or at desks without a break that incorporates at least ten minutes of physical activity (Barros, 2009). The American Heart Association (AHA) recommends that students in elementary school receive 150 minutes of physical education each week and students in middle/junior and senior high receive 225 minutes of physical education each week (Pate et al., 2006).

This chapter includes reviews of literature regarding:

1. benefits of physical activity for children,
2. childhood physical activity recommendations,
3. reasons for reduced physical activity amongst children, and
4. support for classroom physical activity and a summary of the chapter.

**Benefits of Physical Activity for Children**

The reduction of cardiovascular disease, colon and breast cancer, obesity, depression and anxiety are listed as benefits that are associated with physical activity (Hilman et al., 2008). These researchers also stated that in 2000 the United States spent an estimated $76 billion in medical costs related to lack of physical activity. This is roughly 2.4% of total healthcare expenditures for the year (Hilman et al., 2008).

Strong and associates (2005) used archival data in an attempt to review the effects of physical activity on the health and behavior of youth and make recommendations based on that evidence. After looking at over 850 articles the Strong and associates (2005) agreed that children should participate in a minimum of 60 minutes of moderate to vigorous physical activity daily. (Strong et al., 2005) credited physical activity to better cardiovascular health, healthier body weight, musculoskeletal health, increased bone strength, and healthier self-concept. Strong and associates (2005) also noted that “the addition of physical education to the curriculum results in small positive gains in academic performance...allocating more curricular time to programs of physical activity does not negatively affect academic achievement… Some results also suggest a relative increase in academic performance per unit of time.” (p. 735).

Adding to the list of benefits of physical activity for children, Rasberry and associates (2011) found that healthy bones, muscles, improved muscular strength and endurance are accrued after participating in 60 minutes of physical
activity daily. In addition to the physical benefits of activity, the researchers also offer evidence that increased physical activity during the school day may enhance but certainly does not detract from academic performance (Rasberry et al., 2011).

In a study done by Mahar and colleagues (2006) they found that taking even 10 minutes to participate in developmentally appropriate physical activity classroom on-task behavior rose by 8% in the general population of students. This same study found that on-task behavior rose by 20% in those students who were identified as “least on-task” in the pre-study data (Mahar et al., 2006).

**Childhood Physical Activity Recommendations**

There are several professional organizations that have made recommendations for the intensity, duration, and frequency of physical activity for youth. In the official statement *Promoting Physical Activity in Children and Youth*, the AHA cites that physical education class enrollment between 1991 and 2003 decreased roughly 13%, transportation to school by walking or biking is down, and schools have reduced or eliminated recess for elementary students (Pate et al., 2006). This AHA sponsored study was prompted by the increase in childhood obesity and calls for schools to take an active role in student health (Pate et al., 2006). Results of this study led to the recommendation of the AHA that children and youth participate in at least 60 minutes of physical activity each day.

SHAPE America is another organization that has made recommendations for student physical activity. SHAPE America, formerly the American Alliance for
Health, Physical Education, Recreation and Dance (AAHPERD), is the national association for physical educators, health educators, and other health education related professionals. In their latest version of the National Standards and Grade Level Outcomes for K-12 physical education, they recommend at least 60 minutes of moderate to vigorous physical activity on at least three days a week. Students should also participate in muscle and bone strengthening activities (Couturier, Chepko & Holt/Hale, 2013).

Another group to add a recommendation about the amount of physical activity children should receive daily is the American Academy of Pediatrics. In their study of school recess and group classroom behavior, Barros and colleagues (2009) administered surveys of teachers at a variety of schools in a longitudinal study sponsored by the United States Department of Education. A Barros and associates (2009) study measured the amount of time students spent in recess each week and the amount of time students spent in physical education each week. They then asked teachers to rate the behavior of their students on a 1 to 5 scale. Barros and associates (2009) found that classes that had exposure to physical education and recess scored much higher on the teacher’s rating of classroom behavior survey. Barros and colleagues (2009) recommend that students ages 5 - 12 years of age should have at least 60 minutes of physical activity per day and inactivity for more than 2 hours at a time should be discouraged.

The CDC is one of the leading authorities on health and wellness in the United States. The latest version of the CDC (2014) guidelines regarding
physical activity and youth recommend a minimum of 60 minutes of physical activity daily. The CDC (2014) recommends that most of this time should be spent working on aerobic conditioning. Further, the CDC (2014) recommends that muscle strengthening and bone strengthening activities should be included a minimum of three days each week.

**Factors Contributing to Reduced Physical Activity Amongst Children**

The contributions to reduced physical activity for children in the past 20 years are confirmed by several studies, and include: being shortage of safe neighborhoods / play spaces, increased screen time, increased demands on schooling, lack of supervision due to the need for dual household incomes, and decreased physical education in schools (Mahar, 2011). In his study on the impacts of short bouts of physical activity, Mahar (2011) estimates that only 57% of school districts require regular recess for elementary school students and only 4% of elementary schools, 8% of middle schools and 2% of high schools provide daily physical education for their students. In his research, Mahar (2011) added short bouts of physical activity to classrooms either through energizer activities or through incorporating recess time into the daily schedule and found that physical activity can increase on-task behavior. This motivated the teachers in his study to incorporate more physical activity into their students’ daily schedules (Mahar, 2011.)

Most researchers site increased pressure by the government on standardized tests in math, science and reading as the major reason for reduced time in physical education classes. (Barros et al., 2009; Tompkins et al., 2012;
Trost 2009; Welk et al., 2006). Barros and associates (2009, p. 435) states that “many schools responded to the No Child Left Behind Act of 2001 by reducing time committed to recess, the creative arts, and even physical education in an effort to focus on reading and math mathematics.” This study was done by surveying school teachers about their students’ behavior. Barros (2009) found that 40% of schools have eliminated or are planning to eliminate at least one recess period from their school day. Barros (2009) also found that teachers reported students being more on-task and less fidgety after they had spent time in physical education or recess.

**Support for Classroom Physical Activity**

Mahar and colleagues (2006) studied the addition of classroom physical activity. The researchers introduced classroom “energizers” into all kindergarten through fourth-grade classes at a school in North Carolina. “Energizers are short classroom-based physical activities” (Mahar et al., 2006, p. 2087) that are designed for use with little equipment or space. The students also wore pedometers as a measure of activity. After teachers were trained, classes were divided up and baseline observations and pedometer data were recorded. Following the baseline observations some of the classes implemented the energizers right away and were used as the intervention group, other classes implemented the energizers on a staggered schedule and were used as the control group. Activity levels and observations were taken regarding on-task and off-task behavior of all groups. At the end of the study the researchers had found that students in the intervention group were averaging approximately 782 more
daily in-school steps than the control group. They also found that off-task behavior with the energizers was reduced in all students; more so the longer they participated in the energizer group (8% decrease on average). However, in students who were identified as being “least on-task” they found a 20% decrease in off-task behavior (Mahar et al., 2006).

Another study by Tompkins and associates (2012) took body measurements and used questionnaires to gather information about a before school physical activity program. Tompkins and associates (2012) invited children in grades 3-5 to participate in a before school program that focused on being physically active. They took skin measurements, blood pressure, weight, academic measurements and surveyed participants to determine baseline and follow-up measures. The program lasted 12 weeks. Following their study Tompkins and associates (2012, p. 1) authors stated that schools are “contributing to the culture of physical inactivity.” Tompkins and colleagues (2012) explain that their findings show a positive association between physical activity and academic performance and behavior. Tompkins and her associates (2012) support the current guidelines of 60 minutes of moderate to vigorous physical activity each day and the need for “free-play” where children were found to spend more time in the moderate to vigorous intensity of physical activity.

Similarly, Trost (2009) found that physically active children tend to perform better in the classroom. Trost (2009) also found that nearly ⅓ of children and teens in the United States are classified as overweight or obese. Trost (2009) suggests that schools not only serve to educate students on math, science and
reading, but also teaching the importance of regular physical activity and health. Schools should help students build skills that support healthy and active lifestyles (Trost, 2009). The review also cites a study done in Texas involving 2.4 million students grades 3-12. This study analyzed the FITNESSGRAM pacer test results and compared them to state standardized tests. Trost (2009) found that students who did better on the FITNESSGRAM test also had higher scores on state standardized tests, better school attendance, and fewer disciplinary incidents.

The CDC (2011) released a statement that connects the increase in childhood obesity and the need for increased physical education / physical activity in schools. They have created a “Toolkit” for educating and encouraging physical activity among youth, their families, and their communities. This toolkit includes their recommendations for an hour or more of physical activity at least 3 days a week (CDC, 2011).

Summary

When reviewing the literature there are some very common recommendations and findings. It has been shown that children and youth are less active than past generations (Mahar, 2011). This lack of activity has a negative effect on classroom behavior (Barros et al., 2009; Mahar et al., 2006). It is recommended by all the major professional organizations involved in school health policy and physical education recommendations such as the AHA, American Academy of Pediatrics, CDC, and SHAPE America that children and youth should participate in a minimum of 60 minutes of moderate to vigorous
physical activity on three or more days in a week (Barros et al., 2009; CDC, 2014; Pate et al., 2006; SHAPE America, 2013). Schools should take an active role in increasing student activity by implementing daily physical activity for grades k-12 and ensuring that elementary students have the opportunity to be physically active at minimum every two hours (CDC, 2011; SHAPE America, 2013).
Chapter Three: Methodology

Introduction

This study examined the amount of time elementary students participate in physical activity and how that may affect classroom behavior. In this chapter the methodology used to gather data about student activity and classroom behaviors are identified. This study is to find answers to the following research question:

1. What is the relationship between negative classroom behavior and the amount of time spent in daily physical activity?

Research Design

This study used archival data. Information was acquired from the (electronic) Positive Behavior Intervention Strategies (PBIS) system for students in grades kindergarten thru second grade (see Appendix A). Prior to data collection for this research, permission was obtained from the following:

1. Pine Island Public Schools (Superintendent Tammy Berg-Beniak) where data was collected (see Appendix B).

2. Minnesota State University, Mankato Institutional Review Board (see Appendix C).

The Data Set

The archival data used in this study was based on the physical activity and PBIS data recorded for students in grades kindergarten to second grade at Pine Island Public Schools during the 2013-2014 and 2014-2015 school years. The data set was selected based on convenience and familiarity of the researcher.
with the PBIS system. Students in Pine Island Schools have access to recess, physical education class and Stimulating Maturity through Accelerated Readiness Training – SMART Gym, is a program that incorporates brain based movements into physical activity. All of these were included in the total recorded physical activity minutes.

**Instrumentation: PBIS System Data**

I will use archival data that was collected during the 2013-2014 and 2014-2015 school years through the PBIS system. This system (Appendix A) tracks the number of behavior issues, where they occur, when they occur, and the severity of the behavior. The behaviors are broken down into “Red Tickets” and “Stop and Thinks” which categorize the level of the behavior infraction.

Stop and Thinks consist of: disruption/ distracting others, disrespect to other students, gossip or rumors, personal space, disrespect to adults, talking back or poor attitude, property misuse, recurring off task behavior, physical contact, running in building, unexcused tardy, or other behavior as assigned by the teacher.

Red Ticket offenses include: inappropriate language, fighting, physical aggression, defiance/disrespect/disruption, harassment/bullying, stealing, property damage, lying/cheating, 3 stop and think/minors, dress code violation, skipping, cell phone infraction, bus infraction, or other behavior as assigned by the teacher.

These actions/offenses by students are reported by the school staff via electronic form. The data is then stored by the school and accessed by the Dean
of Students for student consultation if needed. For this study I will be focusing on the more severe behaviors called Red Tickets.

**Data Entry**

Archival data was retrieved from the school’s Positive Behavior Intervention Strategies (PBIS) system, was coded by the dean of students and was given to the researcher (Appendix D). The data showed the number of students in each grade level, the quarter in which behavior infractions occurred, the number of behavior infractions in each category for each grade level, and the number of minutes of recess, SMART gym, and physical education each grade level receives each week. Data collection started in February, 2015.

**Table 1**

<table>
<thead>
<tr>
<th>Research Question (RQ)</th>
<th>Survey items or methods used to assess RQ’S</th>
<th>Level of Data (Nominal, Ordinal, Interval/Ratio)</th>
<th>Analysis needed to assess RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the correlation (positive or negative) between classroom behavior and the amount of time spent in daily physical activity?</td>
<td>I will be gathering data in the following categories: Number of students in the grade level Number of Males and Females in the grade level. Number of Majors and Minor behavior infractions recorded in each grade level. Calendar month infractions occur. Number of Minutes in Recess, SMART gym, and Physical Education students spend in a year.</td>
<td>Interval/Ratio</td>
<td>Aggregate Data Analysis</td>
</tr>
</tbody>
</table>

* Indicates level of data for survey items or methods, not RQ’s

Aggregate data analysis was used to interpret data. “Aggregate data are quantified attributes of collectives that either related to the body of interest as a
whole or have been aggregated on the basis of the properties of individual members of the collective" (Sebastian, 2015, p. 1). Aggregate data is predominately secondary data and refers to quantities on a higher macro level (Sebastian, 2015, p. 1). Aggregated data is used by social researchers to test and develop hypothesis from models and theory (Sebastian, 2015, p. 3).

**Data Analysis**

Data was grouped into aggregate form in order to consider an entire grade level at a time versus singling out individual students. Aggregate Data Analysis was chosen for three main reasons:

1. I was working with historical/archival data.
2. The use of individual data would be problematic in terms of size.
3. I was not given permission by the school to access individual students’ information.

Due to the 6 day schedule for the first grade (2014-2015) the amount of time in physical education, SMART gym, and recess had to be pro-rated to a 5 day schedule like grades kindergarten and second. Data was graphed, plotted, and charted so that the researcher could make observations on the data.

**Summary**

The purpose of this study is to identify influences of student classroom behavior. One of these influences is daily physical activity. Understanding the effects of physical activity on student classroom behavior can help school teachers and administrators in their creation of school scheduling and policy. A sample of students from grades kindergarten through second grade was used
from Pine Island Public Schools. The data was graphed, plotted and charted so the researcher could make observations on the data.
Chapter Four: Results and Discussion

Introduction

Archival data was retrieved from the school’s Positive Behavior Intervention Strategies (PBIS) system, was coded by the dean of students and was given to the researcher. The data was collected for the school years 2013-2014 and 2014-2015 for grades kindergarten thru second grade. Data showed the number of students in each grade level, the quarter in which behavior infractions occurred, the number of behavior infractions in each category for each grade level, and the number of minutes of recess, SMART gym, and physical education each grade level receives each week.

The data was graphed, plotted and charted so the researcher could make observations on the data. Four tables and four graphs were created and used to report and analyze the data.

Participants


Result

The research question was being considered with this data collection and analysis is: What is the relationship between negative classroom behavior and the amount of time spent in daily physical activity?

The data gathered (figure 1) plots the relationships between opportunity for physical activity and negative behavior issues based on the grade level.
When comparing classes that did not change the number of minutes of physical activity each week (kindergarten and second) I found that there are fewer behavior issues in 2014-2015 school year than there were in 2013-2014 school year. In the first grade class behavior issues almost doubled in number (10.9 in 2013-2014, to 20.3 in 2014-2015) and physical activity time was cut from 330 min. a week in 2013-2014 to 275 min. a week in 2014-2015 school year.

Figure 1: All data points (Average behavior issues per/student)

**Summary**

The results of the study for kindergarten and second grade levels were not similar to findings in previous studies as discussed above in Chapter Two and (Appendix E). In both cases the number of physical activity minutes stayed the same but the number of behavior issues decreased from 27.2 in second grade and 26.3 in kindergarten in school year 2013-2014 to 14.1 in second grade and
20.5 in kindergarten in school year 2014-2015. There could be a few reasons for this:

1. The number of students in the 2013-2014 kindergarten class was higher than the number of students in the 2014-2015 kindergarten class.

2. The teachers and students in the 2013-2014 second grade class had two years of PBIS training and the 2014-2015 second grade class has had three years of PBIS training.

3. You’re also dealing with a different group of students, each group of students have their own maturity level. All kindergarten classes are not the same, and this is true through all grade levels.

The results of the study for the first grade level were similar to the findings in research done by Barros and associates (2009), Mahar (2011) and Mahar and colleagues (2006) that found by observation or teacher interview, students are more on-task and have fewer behavior issues when they have more physical activity in their day.
Chapter Five: Conclusion and Recommendations

Introduction

There is no shortage of scientific evidence that shows regular physical activity reduces the levels of obesity, and helps decrease likelihood of developing heart disease, type II diabetes, depression, anxiety, and some forms of cancer (Hillman et al., 2008). Researchers report that children are growing increasingly sedentary resulting in the likelihood that for the first time in United States history children will live less healthy lives than their parents (Hillman et al., 2008).

To help counter the sedentary lifestyle of students and recognizing that physical activity is essential for student health the Society of Health and Physical Education (SHAPE America) (2014, para. 1) revised the national standards and made the following recommendation: “SHAPE America recommends that schools provide 150 minutes of instructional physical education for elementary school children, and 225 minutes for middle and high school students per week for the entire school year.” Since children spend most of their day in school where equipment is more readily available and there are available staff who are trained in implementing physical education curriculum; schools provide an excellent opportunity for children to be physically active for most of those recommended minutes (Mahar, 2011). Research published by Strong and associates (2005, p. 735) states that there is data that suggests that increased time in physical activity suggests a “relative increase in academic performance per unit of time.” Research done by Mahar et al. (2006) found that off-task
behavior with physical activity was reduced in all students; more so the longer they participated (8% decrease on average). However, in students who were identified as being “least on-task” they found a 20% decrease in off-task behavior.

The purpose of this study is to determine the relationship between physical activity and student classroom behavior. The research reviewed focused on student on-task and off-task behaviors in relationship to the amount of time spent in physical education each day.

Conclusion

The research question was being considered with this data collection and analysis is: What is the relationship (positive or negative) between negative classroom behavior and the amount of time spent in daily physical activity?

The data gathered plots relationship between physical activity and number of negative behavior issues (figure 1) based on the grade level. When comparing classes that did not change the number of minutes of physical activity each week (kindergarten and second) I found that there are fewer behavior issues in 2014-2015 school year than there were in 2013-2014 school year. This could be because teachers have more experience with the PBIS system, class sizes in the kindergarten grade were reduced from 2013-2014 to 2014-2015 and students in the second grade during the 2014-2015 school year have had three years of PBIS training. In the first grade class behavior issues almost doubled in number (10.9 in 2013-2014, to 20.3 in 2014-2015) and physical activity time was cut from 330 min. a week in 2013-2014 to 275 min. a week in 2014-2015 school
year. This increase could be due to the larger class size or the shorter amount of time in physical activity each week or a combination of both factors. These findings are supported by research done by Barros and associates (2009), Mahar (2011), and Mahar and colleagues (2006) that found by observation or teacher interview, students are more on-task and have fewer behavior issues when they have more physical activity in their day.

**Recommendation for Schools and Health Educators**

Children are becoming increasingly sedentary (Hillman et al., 2008), from a health educator point of view this is very troublesome. The purpose of Education is to provide students with the tools necessary to live long, productive, healthy lives. Part of this education needs to be the emphasis on lifelong physical activity to build healthy bones, hearts, muscles and brains. In a study done by the United States Department of Health and Human services, Healthy people 2020, states that over 80% of adolescents don’t get enough aerobic physical activity (Healthy People 2020, 2014). We need to promote and reserve space in students’ schedules for physical activity during the day with emphasis on structured physical education classes taught by trained, licensed physical education staff. We as educators and school policy makers need to be aware of the impact lack of physical activity has on our students’ bodies and brains, and take heed the recommendations made by professional organizations like SHAPE America, The AHA, and the CDC. Students should be participating in a minimum of 60 minutes of moderate to vigorous physical activity on at least three days a week. (Couturier et al., 2013). Since students spend most of their time in school
they should be participating in a minimum of 30 min. of moderate to vigorous physical activity every day in school. NASPE recommends that students spend no more than two hours in stationary positions or at desks without a break that incorporates at least ten minutes of physical activity (Barros and colleagues 2009). The AHA recommends that students in elementary school receive 150 minutes of physical education each week and students in middle / junior and senior high receive 225 minutes of physical education each week (Pate et al., 2006).

These organizations have done in-depth research and have developed these guidelines based on scientific evidence. We as schools should be implementing these recommendations into our school schedules for the health of our students.

**Recommendation for Future Research**

If I were to continue this research further I would expand the primary research done on the effects of physical activity on classroom behavior and the effects of physical activity on the brain. The benefits of knowing how physical activity affects classroom behavior could have a major impact on classroom management strategies, and school schedules. Student classroom behavior affects how the teacher teaches as well as how other students in the classroom learn. Are they being distracted by another student? Are they getting less time because the teacher is spending more time working with a student who has behavior needs? Are they themselves in need of physical activity to burn off some energy? There is no shortage of research done on how physical activity
affects the body in regards to weight and effects on the body systems. The number of studies done on physical activity and concentration, focus and academics is far fewer and in much greater need (Mahar et al., 2006).
References


Pine Island P.B.I.S. Reporting K-4

If you wish to make a referral for students in grades 5-12, please use the following link:
https://docs.google.com/forms/d/1KKU54S7x8wLOWQ0xq35BQ3Ow_Tod2ICO2L0JAUDNCtE/viewform?usp=send_form

If you wish to make an official bullying report for K-4 students, please use the following link:
https://docs.google.com/forms/d/1GOmh1ld0zcec7oWH5gKzU47EM14NnTcCPkDWkqOAKRI/viewform?usp=send_form

* Required

**Your Name** *

**Student Name** *

**Student Grade**

**Positive Behavior Report**

**Time of Incident**
Location

- Classroom
- Playground
- Hallway
- Cafeteria
- Restroom
- Specialist
- Arrival/Dismissal
- Other:

Stop And Think

Teacher/ Para Directed Consequence For Stop And Think

- Loss of Privilege
- Conference with Student
- Other:

Red Ticket

Possible Motivation

- Obtain Peer Attention
- Obtain Adult Attention
- Obtain items/Activities
- Avoid Peer(s)
- Avoid Adult(s)
◦ Avoid Task/Activity
◦ Don't Know
◦ Other: _______________________

*Any Additional Information (info sent to guardian of student)

Any Additional Information (info only visible to the principal)
Appendix B

Pine Island Public Schools Permission Letter

Pine Island Public Schools
223 1st Ave SE, PO Box 398, Pine Island MN 55963
Tammy Berg-Beniak, Superintendent    Kevin Cardille, 5-12 Principal    Cindy Hansen, PreK-4 Principal

January 15, 2015

To Whom It May Concern:

The Pine Island School gives permission to Kortney Aeikens to use the school’s student data from the PBIS system without any personal information.

She may use the:
- number of students in a grade level
- number of minutes of Physical Education/Smart/recess each week
- Number of Majors
- Number of Minors
- Time of year they occur

Sincerely,

Tammy Berg-Beniak
Superintendent
Pine Island Public Schools
Appendix C

IRB Approval Letter

Resent-From: <kortney.aeikens@mnsu.edu>
From: Mary Hadley <no-reply@irbnet.org>
Date: February 18, 2015 at 7:08:12 AM CST
To: Kortney Aeikens <kortney.aeikens@mnsu.edu>, Marge Murray-Davis <mmd@mnsu.edu>
Subject: IRBNet Board Document Published
Reply-To: Mary Hadley <irb@mnsu.edu>

Please note that Minnesota State University, Mankato IRB has published the following Board Document on IRBNet:

Project Title: [716554-2] The Relationship between Physical Activity and Classroom Behavior
Principal Investigator: Dr. Marge Murray - Davis

Submission Type: Amendment/Modification
Date Submitted: February 16, 2015

Document Type: Approval Letter
Document Description: Approval Letter
Publish Date: February 18, 2015

Should you have any questions you may contact Mary Hadley at irb@mnsu.edu.

Thank you,
The IRBNet Support Team

www.irbnet.org
### Appendix D

Data Gathering Sheets

#### Table D1

*Data Gathering Sheet 2013-2014*

<table>
<thead>
<tr>
<th>Class of 2024 (2)</th>
<th>Number of Students</th>
<th>Majors Quarter 1</th>
<th>Majors Quarter 2</th>
<th>Minors Quarter 1</th>
<th>Minors Quarter 2</th>
<th>Number of Majors</th>
<th>Number of Minors</th>
<th>Number of Min. of Recess in a Week</th>
<th>Number of min of SMART in a Week</th>
<th>Number of Min. of PE in a Week</th>
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<td>92</td>
<td>10</td>
<td>15</td>
<td>54</td>
<td>29</td>
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<td>83</td>
<td>150 min/week</td>
<td>30 min/week</td>
<td>120 min/week</td>
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<td>Class of 2025 (1)</td>
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<td></td>
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<td></td>
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<td>30 min + 5 days</td>
<td>30 min*2 days</td>
<td>30 min*3 days</td>
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<td></td>
<td>92</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>18</td>
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<td>Class of 2026 (K)</td>
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<td>16</td>
<td>15</td>
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<td>9</td>
<td>31</td>
<td>26</td>
<td>30 min + 5 days</td>
<td>30 min*2 days</td>
<td>30 min*3 days</td>
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#### Table D2

*Data Gathering Sheet 2014-2015*

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<th>Majors Quarter 2</th>
<th>Minors Quarter 1</th>
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<th>Number of Majors</th>
<th>Number of Minors</th>
<th>Number of Min. of Recess in a Week</th>
<th>Number of min of SMART in a Week</th>
<th>Number of Min. of PE in a Week</th>
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<td>6</td>
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<td>48</td>
<td>150 min/week</td>
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<td>90 min/week</td>
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<td></td>
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<td>180 min every 6 days</td>
<td>60 min every 6 days</td>
<td>90 min every 6 days</td>
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<td>118</td>
<td>13</td>
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<td>21</td>
<td>27</td>
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<tr>
<td>Class of 2027 (K)</td>
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<td>7</td>
<td>10</td>
<td>12</td>
<td>17</td>
<td>17</td>
<td>29</td>
<td>30 min + 5 days</td>
<td>30 min*2 days</td>
<td>30 min*3 days</td>
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Table D3
*Physical Activity Calculations 2013-2014*

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<th>2013-14 School Year</th>
<th>Number of Min. of Recess in a Week</th>
<th>Number of min of SMART in a Week</th>
<th>Number of Min. of PE in a Week</th>
<th>Total Physical Activity Minutes Per Cycle</th>
<th>Days per Cycle</th>
<th>Average Physical Activity per school day (Total Min PA / Days per cycle)</th>
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<td>150</td>
<td>30</td>
<td>120</td>
<td>300</td>
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<td>60</td>
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<td>Class of 2025 (1)</td>
<td>180</td>
<td>60</td>
<td>90</td>
<td>330</td>
<td>5</td>
<td>66</td>
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<tr>
<td>Class of 2026 (K)</td>
<td>210</td>
<td>60</td>
<td>90</td>
<td>360</td>
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Table D4
*Physical Activity Calculations 2014-2015*

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<th>2014-15 School Year</th>
<th>Number of Min. of Recess in a Week</th>
<th>Number of min of SMART in a Week</th>
<th>Number of Min. of PE in a Week</th>
<th>Total Physical Activity Minutes Per Cycle</th>
<th>Days per Cycle</th>
<th>Average Physical Activity per school day (Total Min PA / Days per cycle)</th>
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<tbody>
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<td>Class of 2025 (2)</td>
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<td>60</td>
<td>90</td>
<td>300</td>
<td>5</td>
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<td>180</td>
<td>60</td>
<td>90</td>
<td>330</td>
<td>6</td>
<td>55</td>
</tr>
<tr>
<td>Class of 2027 (K)</td>
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<td>90</td>
<td>360</td>
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<td>72</td>
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Table D5
*Mathematical Calculations:*

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<th>School Year</th>
<th>Student Grade Level</th>
<th>Number of Students in Grade</th>
<th>Number of Behaviors in Grade</th>
<th>Average Number of Behaviors / Student</th>
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<td>26.3</td>
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<td>1</td>
<td>92</td>
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<td>10.9</td>
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<td>2</td>
<td>92</td>
<td>25</td>
<td>27.2</td>
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<tr>
<td>2014 - 2015</td>
<td>K</td>
<td>83</td>
<td>17</td>
<td>20.5</td>
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<tr>
<td></td>
<td>1</td>
<td>118</td>
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<td>92</td>
<td>13</td>
<td>14.1</td>
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## Appendix E

### Literature Review Matrix

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<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| Journal | Effects of a Classroom-Based Program on Physical Activity and On-Task Behavior | Matthew T. Mahar, Sheila K. Murphy, David A. Rowe, Jeannie Golden, A. Tamlyn Shields and Thomas D. Raedeke | 2006       | On-task Classroom behavior before and after energizer activities | Systematic Observations | • Increasing / Implementing structured physical activity breaks (10 min.) daily increased on-task behavior >8%  
• Increased in students that were “least on-task” increased by 20%  
• Aren’t many studies on how physical activity impacts concentration and mental cognition  
• Definition of On-task behavior  
• Exercise is a habit developed when young  
• Physical activity among children and adolescents has declined. |
Table E1  
*Literature Review Matrix*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| Journal         | Journal             | American Academy of Pediatrics. PEDIATRICS Vol. 123 No. 2 February 1, 2009 pp. 431 - 436 | Romina M. Barros, MD, Ellen J. Silver, PhD, Ruth E.K. Stein, MD | 2009 | Compare Classroom Behavior of Students with daily Recess & those without daily Recess | Survey | • Students are more attentive (on-task) and less fidgety in the classroom after recess  
• 40% of schools have eliminated or are planning to eliminate at least 1 recess period from the school day  
• No Child Left Behind Act 2001 focus on reading and math caused more cuts in recess, arts and PE.  
• Since 1970 children have lost 12 hrs/week play time in schools and obesity and more than tripled students age 6-11.  
• NASPE recommendations |
<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| American Heart Association Journals,        | Journal             | Volume 114, Pages 1214-1224 Circulation       | Russell R. Pate, PhD, Michael G. Davis, PED, Thomas N. Robinson, MD, MPH, FAHA, Elaine J. Stone PhD, Thomas L. McKenzie, PhD, Judith C. Young, PhD | 2006           | Recommending Physical Activity in Schools and programs for student physical activity | Various    | • Between 1991 and 2003 enrollment in HS PE decreased 13.2%  
  • Professional organizations recommendation >60 min of physical activity daily for children and youth.  
  • 2000 SHPPS found only 6.4% of middle schools provided daily PE for the entire school year.  
    o 15.5% offered daily PE (or its equivalent) for ½ the year.  
    o 34.4% offered PE 3 days per week for ½ the school year.  
  • “The average maximum ratio was 28:1 for elementary schools, 31:1 for middle /junior high schools, and 33:1 for senior high schools. Large class sizes, common in many PE programs, are associated with reduced levels of student physical activity.” |
<table>
<thead>
<tr>
<th>Source</th>
<th>Literature Review Matrix</th>
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</thead>
<tbody>
<tr>
<td>Type of Information</td>
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<tr>
<td>Book, Guide, or Journal</td>
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<tr>
<td>Title &amp; Article</td>
<td>Be smart, exercise your heart: exercise effects on brain and cognition</td>
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<tr>
<td>Title</td>
<td>Nature Reviews. Neuroscience</td>
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<td>Author(s)</td>
<td>Charles H. Hillman, Kirk I. Erickson and Arthur F. Kramer</td>
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<td>This article examines the positive effects of aerobic physical activity on cognition and brain function, at the molecular, cellular, systems and behavioural levels.</td>
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<td>Study Tool</td>
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<td>Conclusion / Notes</td>
<td>Participation in physical activity has been associated with the reduction of a number of physical and mental disorders (p.58)</td>
</tr>
<tr>
<td></td>
<td>- In 2000, estimated $76 billion in medical costs with the reduction of a number of physical and mental disorders (p.58)</td>
</tr>
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</table>

http://search.proquest.com.ezproxy.mnsu.edu/medline/docview/224998033/fulltextPDF/E5CB07C58AB249D4PQ/1?accountid=12259
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<tr>
<th>Source</th>
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<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| Journal | The effect of an unstructured, moderate to vigorous, before-school physical activity program in elementary school children on academics, behavior, and health. | Connie L Tompkins1 *, Jacob Hopkins2, Lauren Goddard3 and David W Brock1 | 2012 | Provide insight to the relationship between physical activity and academic performance as well as assist in the design of future physical activity interventions. | Body measurements and questionnaires. | • Current guidelines for physical activity recommend children partake in regular, moderate to vigorous physical activity for 60 minutes or more each day.  
• Schools are contributing to the culture of physical inactivity  
• “In recent years, many school systems removed recess and /or physical education due to growing pressure to increase academic scores.” (p.1)  
• There appears to be a positive association between physical activity and academic performance and behavior.  
• When allowed to engage in unstructured “free-play” children were significantly more likely to achieve physical activity levels considered to be of moderate to vigorous intensity. |
<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| Journal      |                     | The Journal of Pediatrics, Volume 146, Issue 6, Pages 732–737, June 2005, EVIDENCE BASED PHYSICAL ACTIVITY FOR SCHOOL-AGE YOUTH | WILLIAM B. STRONG, MD,* ROBERT M. MALINA, PHD,* CAMERON J. R. BLIMKIE, PHD, STEPHEN R. DANIELS, MD, PHD, RODNEY K. DISHMAN, PHD, BERNARD GUTIN, PHD, ALBERT C. HERGENROEDER, MD, AVIVA MUST, PHD, PATRICIA A. NIXON, PHD, JAMES M. PIVARNIK, PHD, THOMAS ROWLAND, MD, STEWART TROST, PHD, AND FRANCOIS TRUDEAU, PHD | 2005          | To review the effects of physical activity on health and behavior outcomes and develop evidence-based recommendations for physical activity in youth | Archival Data | • “The addition of physical education to the curriculum results in small positive gains in academic performance. The quasi-experimental data also suggest that allocating more curricular time to programs of physical activity does not negatively affect academic achievement, even when time allocated to other subjects is reduced. Some results also suggest a relative increase in academic performance per unit of time.” (p.735)  
• “School-age youth should participate every day in 60 minutes or more of moderate to vigorous physical activity that is enjoyable and developmentally appropriate.” (p.736)  
• “The Centers for Disease Control recommends daily quality physical education from kindergarten through grade 12. Both physical education and recess afford opportunities to achieve the daily physical activity goal without any evidence of compromising academic performance.” (p.737)  
• School age youth should participate in at least 60 min. or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities. (p.732) |
<table>
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<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
<th>Year Published</th>
<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
</tr>
</thead>
</table>
| Preventive Medicine, © 2011 Published by Elsevier Inc | Preventive Medicine, © 2011 Published by Elsevier Inc | Preventive Medicine, © 2011 Published by Elsevier Inc | Matthew T. Mahar | Available online 31 January 2011 | To observe and measure on-task behavior in students who experience different levels of physical activity throughout their day. | Observation | • Reasons children are less active:  
  - Shortage of play space, unsafe neighborhoods, increased screen time, and increased demands of schooling.  
  - Decreased opportunities during school due to increased pressure on administrators and teachers to spend more time in the classroom to improve standardized test scores.  
  - Cuts in recess and physical education classes  
• Because children spend most of their day in school and equipment is more readily available and staff who are trained in leading physical activity are in place; schools provide an excellent opportunity for children to be physically active.  
• It is estimated that only 57% of school districts in the US require daily elementary school recess.  
• It is estimated that only 4% of elementary schools, 8% of middle schools, and 2% of high schools in the US provide daily physical education class.  
• Physical activity during the school day has been shown to increase on-task behavior and can motivate teachers to continue physical activity. |
## Table E1
*Literature Review Matrix*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
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<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
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</thead>
</table>
| Preventive Medicine Journal | Volume 52, Supplement, 1 | June 2011, Pages S36–S42 | Joseph E. Donnelly, Kate Lambourne | 2011           | Classroom-based physical activity, cognition, and academic achievement | ActiGraph measured Physical Activity and Wechsler Individual Achievement Test 2nd Ed measured Academic Achievement. | Physical activity in public schools has steadily declined since the 1970s. During this time, the percentage of children who are overweight has more than doubled, and the rates among adolescents have more than tripled (p.36).
- In parallel fashion, co-morbidities formerly only seen in adults have emerged in children including type 2 diabetes, elevated blood pressure, triglycerides, and low HDL cholesterol. Metabolic syndrome has been estimated to be at 5% in elementary school children and this percentage increases to 12% and 20% in minority and overweight children, respectively (p. 36).
- Children are accessible in this setting because the majority of children in the United States spend most of their day at school. However it should be noted that schools promote a sedentary lifestyle. Children spend between 6 and 8 h in academic instruction per day. Paradoxically, physical education classes may detract from physical activity, as children spend less than half of this time engaged in moderate to vigorous physical activity (p.36).
- Children who are fit perform better on attentional tasks that require greater amounts of cognitive control. This includes a subset of goal directed, self-regulatory processes that include planning, organization, abstract problem-solving, working memory, motor control, and inhibitory control. (p.37)
- There was a positive association between CV fitness and total achievement score (r=0.48), math score (r=0.49) and reading score (r=0.45). Similarly, significant associations between fitness scores and state-wide academic achievement tests in Texas were recently reported by Welk (2010). (p.37)
- Significant improvements in academic achievement from baseline to 3 years were shown in the PAAC compared to the control schools for the composite, reading, math, and spelling scores.
Table E1

<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Information</th>
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<td>Journal</td>
<td>Preventive Medicine</td>
<td>Volume 52, Supplement 1</td>
<td>June 2011, Pages S10–S20 doi:10.1016/j.ypmed.2011.01.027</td>
<td>The association between school-based physical activity, including physical education, and academic performance: A systematic review of the literature</td>
<td>Catherine N. Rasberry, Sarah M. Leet, Leah Robint, B.A. Larist, Lisa A. Russells, Karin K. Coylet, Allison J. Nihisers</td>
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<td>Systematic Review of the Literature</td>
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<tr>
<td>Table E1</td>
<td>Book</td>
<td>Handbook of Physical Education</td>
<td>GREGORY J. WELK &amp; JOEY C. EISENMANN &amp; JAMES DOLLMAN</td>
<td>2006</td>
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**Title**: Chapter 37: Health-Related Physical Activity in Children and Adolescents: A Bio-Behavioral Perspective

**Purpose**: Explore the impact of physical activity on health for youth and document the effectiveness of school-based programming to promote physical activity in youth.

- Declines in physical education and/or lack of physical activity in the school day have not been specifically implicated as contributing causes of the increased prevalence of obesity in youth but these school-based programs are clearly viewed as part of the solution - [Intro]
- Schools provide opportunities for children to be active during the day and training on the physical, cognitive and behavioral skills needed to be active later in life. Our primary suggestion is that the role of physical education specialists should be extended beyond the current paradigm of fixed curricular responsibilities, to include physical activity promotion in the broader school context. A broader role for teachers in the school setting would enable the development of a more integrated physical activity program in the school and better outreach into the community.
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<th>Source</th>
<th>Type of Information</th>
<th>Book, Guide, or Journal Title &amp; Article Title</th>
<th>Author(s)</th>
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<th>Purpose</th>
<th>Study Tool</th>
<th>Conclusion / Notes</th>
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</table>
| Standards book | Book | National Standards & Grade Level Outcomes for K-12 Physical Education | Principal Writers: Lynn Couturier, Stevie Chepko, and Shirley Holt/Hale | 2014 | Provide standards and benchmarks for teaching Physical Education in schools. Provide research based recommendations to schools about student activity levels. | Standards and Developmentally Appropriate Benchmarks | • Recommends children and adolescents participate in at least 60 min. of physical activity daily. Most of the time should be spent in moderate to vigorous physical activity. (p. 8)  
• Because students spend most of their day in school it’s recommended that at least half of the 60 min. be provided by schools. (p.8)  
• New standards focus on lifetime skills more than traditional competitive team games. (p.10) |
### Table E1

**Literature Review Matrix**

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<tr>
<th>Source</th>
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</table>
| http://www.eatsmartmovemorenc.com/MoveMoreSchoolStds/Texts/MMPAStandards.pdf | Book | MOVE MORE: NORTH CAROLINA’S Recommended Standards For Physical Activity In School | Ballard, K., Caldwell D., Dunn C., Hardison A., Newkirk, J., Sanderson, M., Thaxton., Vodicka, S., & Thomas, C. | 2005 | North Carolina State Standards | - It is recommended that children and adolescents participate in at least 60 minutes and up to several hours of age-appropriate physical activity per day  
- Definition of Physical Activity: Physical activity provides health benefits to people who are active at an intensity that increases heart rate and requires heavier than normal breathing. |
Table E1

*Literature Review Matrix*

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| http://www.cdc.gov/physicalactivity/everyone/guidelines/children.html | Guidelines | CDC: How much physical activity do children need? | CDC | November 9, 2011 | To establish guidelines to help increase the general health and wellbeing of children, youth, and adults. | Guidelines | • Aerobic activity should make up most of children’s 60 min. of physical activity each day.  
• Muscle Strengthening (gymnastics, push-ups) should be included at least 3 times per week.  
• Bone strengthening activities (running, jumping rope) should be part of your child’s 60 min. at least 3 times per week.  
• Traits of moderate physical activity: increased heart rate, breathe harder than normal  
• Traits of vigorous physical activity: heart beat much faster than normal and breathing will be much harder than normal.  
• “Age-Appropriate” – physical activity better – suited for children’s age category |
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| CDC: Youth Physical Activity Guidelines Toolkit | Guidelines | CDC: Youth Physical Activity Guidelines Toolkit | Page last updated: March 5, 2014 | To establish guidelines to help increase the general health and well-being of children, youth, and adults. | Guidelines | - Children and adolescents should have 60 min. or more of physical activity daily.  
- Aerobic: Most of the 60+ minutes should be aerobic of moderate to vigorous intensity at least 3 days per week  
- Muscle – Strengthening: at least 3 times per week  
- Bone – Strengthening: at least 3 times per week  
- Activities need to be age appropriate, enjoyable and varied.
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| Institute of Youth Sport, The impact of physical education and sport on education outcomes: a review of literature | Literature Review | Richard Stead, Dr. Mary Nevill | 2010 | | Examine the impact of physical education and sport on academic achievement and on those wider social outcomes which might impact on academic achievement and other aspects of school performance. | Review of the literature | • Sites several studies done regarding the correlation between physical activity and classroom behavior  
  • All studies cited show positive behavior changes when physical activity is increased.  
  • Mahar (2006) Increase in on-task behavior of 8% for regular ed and 20% for most disruptive students  
  • Fourestier et al (1996), Dwyer et al (1983), and Shepard & Lavalee (1994) showed when the amount of time dedicated to physical activity was increased, teachers reported better behavior and higher motivation in pupils towards academic work.  
  • Qualifications and Curriculum Authority Survey (2001) Physical Education and school sport had made successful contributions to behavioural improvements and that negative behaviour and exclusions were on the decline. |
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| Literature Review | Active Education: Physical Education, Physical Activity and Academic Performance | Active Education: Physical Education, Physical Activity and Academic Performance | Stewart Trost PhD | 2009 | This research shows that children who are physically active and fit tend to perform better in the classroom and that daily physical education does not hurt academic performance. | Literature Review | • Schools across the US have reduced or eliminated physical education and recess in response to budget and pressures to improve academic test scores.  
• Evidence shows that daily physical education does not adversely affect academic performance.  
• Nearly 1/3 of children and teens are overweight or obese – physical inactivity is a leading contributor to the epidemic.  
• Surgeon General recommends children should engage in 60 minutes of moderate activity most days of the week.  
• Studies show only 3.8% of elementary schools provide daily physical education class.  
• Schools serve as a venue to provide students opportunity for daily physical activity, teaching the importance of regular physical activity for health, build skills that support active lifestyles.  
• Regular exercise may improve students’ concentration and cognitive functioning.  
• Study in 2004 found girls who participated in PE 70+ minutes of PE/week had significantly higher achievement scores in mathematics and reading than girls who participated in 35 or fewer minutes of PE/week.  
• Study in 2006 found students who enrolled in PE had similar standardized test scores as those who did not despite 55 min. fewer daily classroom instruction  
• Researchers in Texas analyzed FITNESSGRAM test results from more than 2.4 million students in grades 3-12 during the 2007-2008 school year. Found a significant correlation between physical fitness achievement and state standardized tests, better school attendance, fewer disciplinary incidents and fewer instances with drugs, alcohol, violence and truancy. |
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| CDC    | Literature Review   | The Association Between School – Based Physical Activity, Including Physical Education, and Academic Performance | CDC      | July 2010     | The results of this review support several strategies that schools can use to help students meet national physical activity recommendations without detracting from academic performance. | Literature Review | - The articles in this review suggest that physical activity can have an impact on cognitive skills and attitudes and academic behavior, all of which are important components of improved academic performance. These include enhanced concentration and attention as well as improved classroom behavior.  
- Research on brain development indicates that cognitive development occurs in tandem with motor ability.  
- Schools should continue to offer or increase opportunities for physical activity. There is evidence that physical activity may help improve academic performance (including grades and standardized test scores) in some situations. Increasing or maintaining time dedicated to physical education does not adversely impact academic performance.  
- The studies in this review also suggest that physical activity can impact cognitive skills and attitudes, important components of improved academic performance. This includes enhanced concentration and attention as well as improved classroom behavior. |

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| http://www.shapeamerica.org | Website | Society of health and Physical Education | SHAPE America | 2014 | This is a resource for those who are promoting physical activity amongst our youth. | Website | - Revised the national standards 2013 – Book listed above  
- “SHAPE America recommends that schools provide 150 minutes of instructional physical education for elementary school children, and 225 minutes for middle and high school students per week for the entire school year.” |
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| http://www.sparkpe.org/blog/how-physical-activity-affects-academic-performance/ | Blog                | The Official SPARK Blog: How Does Physical Activity Affect Academic Performance? | None Given          | None Given      | Discuss benefits of physical activity and academic performance         | CDC and Columbia University Study | • “CDC states... physical activity can have an impact on cognitive skills and attitudes and academic behavior, all of which are important components of improved academic performance. These include enhanced concentration and attention as well as improved classroom behavior.”  
|                                            |                     |                                               |                     |                |                                                                        |            | • “Exercise directly impacts the behavior and development of the brain” – Charles Basch of Columbia University  
|                                            |                     |                                               |                     |                |                                                                        |            |   o Increased oxygen flow to the brain  
|                                            |                     |                                               |                     |                |                                                                        |            |   o Increased brain neurotransmitters  
|                                            |                     |                                               |                     |                |                                                                        |            |   o Increased brain-derived neurotrophins that support neuronal differentiation and survival in the developing brain.” Neurotrophins assure the survival of neurons in areas responsible for learning, memory, and higher thinking.  
|                                            |                     |                                               |                     |                |                                                                        |            | • “Growing body of evidence shows that increased time for physical education and other school-based physical activity programs is associated with either a neutral or positive impact on academic outcomes.” – Columbia University  
<p>|                                            |                     |                                               |                     |                |                                                                        |            | • NASPE recommends 60 min./day for children and adolescents. Schools should provide 150 min./week of physical education for elementary, 225 min./week for middle and high school throughout the year. |</p>
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| http://www.scholastic.com/teachers/article/recess-makes-kids-smarter?eml=ANL%20Polar/ | Magazine Article | Recess Makes Kids Smarter | Caralee Adams | None Given | Present benefits to students related to physical activity in PE and recess. | Interviews | - The scaling back of PE and recess can be traced back to the late 80’s and NCLB when districts were required to show academic progress on standardized tests.  
- Other schools eliminated recess due to concerns about safety, lack of supervision and subpar playground equipment.  
- School’s decision on if / when / how long to have recess  
- Nationwide principals report 89% of discipline-related problems occur at recess or lunch.  
- Benefits from recess  
  o Less fidgety and more on-task  
  o Improved memory and more focused attention  
  o Develop more brain connections  
  o Learn negotiation skills  
  o Exercise leadership, teach games, take turns, and learn to resolve conflicts  
  o Are more physically active before and after school |
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• Study shows that students’ math and reading scores raise if they go for a walk beforehand. |