

Physical Activity and Its Effect on the Classroom

by

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Abstract

The purpose of this study was to determine if third grade students would achieve higher on math assignments and behave more orderly in the classroom when they receive more physical activity. The measurement tool was direct observations on classroom behavior and the math teacher's grade book. This study was a quasi-experimental design. Ultimately, the amount of physical activity a student received did not impact academic achievement or student behavior. Research in this area should continue as there is minimal information on the correlation between physical activity and academic achievement. Future studies should be done at a longer duration and classroom schedules in regards to lessons and activities should be taken into account.

CHAPTER I

INTRODUCTION

Overview

Many schools in the public school systems across the nation have cut recess and physical education courses. This has been done by administrators and central office officials in the wake of standardized testing and the pressures requiring high academic achievement by all students across the nation. Lost in the shuffle is the focus on the whole child. Schools are meant to not only fulfill students academically but also psychologically, socially and developmentally. With the extreme focus on academics students have increasingly lost touch of collaborative work, team building and physical activity. Unfortunately there are many educators and school staff members that do not believe physical education and play - the foundation of cognitive, social and mental development - are necessary during the school day (Denehy, 2002). This becomes compounded when students are dismissed from school and immediately spend hours at their house in front of a computer or television screen with minimal social interaction. This issue has escalated with the societal demand for current information and knowledge that is accessible at any moment in time. With the rise of technology and immediate desire of humans, the times of taking a long walk, or playing a game of charades or freeze tag have been deemed a low priority.

This issue was sparked by the researcher's current role as a Program Manager for a national non-profit organization called Playworks. Playworks is an organization that focuses on improving the health and well-being of children by increasing opportunities for physical activity and safe, meaningful play. With play, whether it is on the playground or a sports field, friendships are developed, teamwork and collaboration are learned, bodies are satiated with exercise and complex, strategic thinking is taught. The researcher's role in the organization is to

manage a group of Program Coordinators who are each placed at a school in one of the urban school districts in Maryland. Each Program Coordinator has a full-time position of implementing a five component program built around supporting education through play and physical activity. The two components that were monitored for this study were recess and class game time. Both will later be operationally defined for the purpose of this study. Outside research groups have done studies on the Playworks program to determine its effectiveness in regards to student attendance, bullying and attentiveness in the classroom after participation in physical activity. None, however, have attempted to link this program to student achievement.

Statement of Problem

The purpose of this study, therefore, is to determine if there is a correlation between the amount of physical activity a student receives in a given day and their academic achievement. The study will look at the number of minutes of physical activity, play, movement and social time and compare this information with quantitative grades on classroom assignments in the subject of math. Additionally, the study will look at student behavior and how well the children stay on task and follow directions during classroom lessons.

Hypothesis

The null hypothesis for this study is: The number of minutes of physical activity in a given day for elementary school age children does not have a statistically significant impact upon the mathematics achievement, nor does it have a statistically significant impact upon discipline-related incidents in the classroom.

Operational Definitions

In this project physical activity is defined by three different components which are recess, physical education class and class game time. Recess was operationally defined as the number of

minutes students actively participated in an unstructured, but supervised physical activity during a designated part of the school day called “recess”. Physical education was operationally defined as the amount of time students were physically active in a supervised activity by the certified physical education instructor during a designated time each week. Class Game Time was operationally defined as those opportunities before or after lunch when students participate in multiple games set up outdoors, or in the gymnasium when there is inclement weather.

Academic achievement will be defined as quantifiable grades given by classroom teachers. These figures will be obtained from teacher grade books with consent from the school administration and the teacher herself. The grades can range on assignments from participation, class worksheets, assignments, projects, quizzes and tests. Student behavior will be measured with random observations during lessons given by school instructors. During these sessions teachers will not be aware of when the observer is charting a student displaying off-task behavior. The observer will keep a tally of the amount of times the instructor calls on a student to either correct or redirect their behavior. Examples of the kinds of student behaviors that were a focus of this study were following directions, class rules, expectations and procedures. Additionally, it was noted when students displayed off-task behavior such as talking during independent reading, arguing, making comments and complaining to other students.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review seeks to explore the impact of physical activity on academic achievement and student behavior. Section one provides an overview of physical activity, and why it is important to student's positive behavior. Section two explores how the lack of physical activity can lead to negative behavior. Section three explores physical activity tools to implement.

Physical Activity is Important to Students' Positive Behavior:

Physical activity is an essential part in the lives of youth and is especially important to enhance student behavior in the classroom. The advantages of physical activity and exercise are numerous and lead to physical health, mental health and well-being for all. Activities in the natural outdoor environment have been widely effective as opposed to activities in indoor classroom settings (Johnson, 2005). Studies have shown that exercise has direct value as an alternative to medication in treating hyperactive and distracted behaviors in children. When parents or peers join in physical activity with children there is additional uninterrupted interaction found to positively impact activity intensity. Physical activity also provides a base for parents to use encouragement methods when they watch and praise their child (Sandford, Armour & Warmington, 2006). Additionally, transporting their child to and from sporting events such as contests, practices or other competitions, gives parents an appropriate opportunity to discuss life lessons that may have come about from the activity. Physical movement and action also leads to social, affective, emotional and cognitive behaviors (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006). Many sports are team sports where a participant needs to interact with teammates and opponents in order to succeed or even make any sort of progress. Communication

is vital in many contests, and teammates must also interact with others nonverbally to accomplish a mutual goal. Certain skills and technique must also be learned, in most cases taught by another person, or in some cases visually seen or mimicked. Emotional benefits are also absorbed in physical and sporting activity because one will learn how to deal with both achievement and failure on a certain level (Sandford, et al., 2006). This is done in the team setting as well, but in most instances, the individual will learn how to cope with a defeat and must learn to focus on positive aspects and how improvements can be made in future occurrences. This is a life lesson that can be applied to nearly every individual on a regular basis. Cognitive benefits are learned through play and physical activity. As students practice a skill and become more comfortable with an activity, modifications can be made by the instructor to make the activity more complex. This allows for strategic thinking and problem solving (Johnson, 2005). More complex games and sports require an extensive knowledge of rules and policies and it can be quite a challenge to perform physically and also to think in intricate schemes and patterns at the same time. Obviously, there are countless health advantages from physical activity with the increased heart rate and development of muscles, bones, joints and tendons. These benefits are determining factors that the improvement socially, emotionally and cognitively goes well beyond enhancement from laboratory-based exploration (Greer & Gilbert, 2006). The outstanding element of physical activity is that anyone has the immediate capability of partaking in some form of physical activity. This can range from taking a walk to competing in a decathlon. Physical education courses promote an open environment that does not discriminate against children of physical or academic ability. Each child has the potential to become lively and connected. Results also show that, in individual cases, there is an increase in ‘on-task’ behavior after a physical education class, compared to behavior before participation in

the class (Kubesch, Walk, Spitzer, Kammer, Lainburg, Heim, 2009). This indicates that pupils display a significant improvement in task fulfillment and focus after a physical education session. Consequently, off-task behavior diminishes after physical activity takes place and students' psychomotor development is enhanced. Physical education class experiments have also been able to show a reduction in unstable and impulsive behaviors (Medcalf, Marshall & Rhoden, 2006). As a result of the active motion, a learning environment is established that is better suited to the learning needs of those individuals with emotional, behavioral and challenging issues. Furthermore, their classmates are certainly affected in a positive manner with the smaller amount of disruptions.

Lack of Physical Activity on Student Behavior:

Without the presence of physical activity on a regular, constant basis students would become idle and have an unhealthy school day, as well as lifestyle. Youth that lead sedentary routines are more likely to lack physical education and have inconsistent amounts of activity (Seghers, de Martelaer & Cardon, 2009). These habits lead to laziness and trouble with time management skills. The articles stress not only having physical education courses for all students for a given amount of time each week but education should also be geared to teaching children, at a young age, the importance of proper eating habits to maintain a healthy body, but also to develop a routine of exercise, dieting and cooperative activities (Kubesch, et al., 2009). When students do not participate in physical education, sports or other outdoor activities, they lose a chance of interacting with other students, learning ways to deal with faults or failures, and learning ways to communicate and work collaboratively with members of a team. The decrease in physical play, larger portion sizes and the rise of television viewing has led to a negative attitude toward exercise involvement (Greer & Gilbert, 2006). Displaying proactive

healthy behaviors to students at a young age cannot be stressed enough. If youth develop habits of overeating or sitting in front of a monitor for multiple hours each day, they may not be able to break out of that mold and decide to partake in physical activity. The American culture has growing problem of childhood obesity and measures are being taken to fight this battle. The convenience factor has become a troubling one, and society has become lazier over time, which has carried over to our youth. Students who are overweight or obese often experience poor body image and lack of self-esteem (Denehy, 2002). They are more likely to be teased, ridiculed and bullied. When students do not have a structured routine of physical play with others, that can have a direct physical impact on a student. If students are being bullied or bullying others, it can cause major disruptions in class for those involved and also their peers. The likelihood is much greater for those not implementing an active lifestyle.

Physical Activity Tools:

With the implementation of a variety of tools related to physical activity student behavior will drastically improve in a classroom setting allowing learning to be the paramount focus. Not only does implementing physical activity have a positive effect on behavior in the classroom, it also has a tremendous impact in students' social well-being (Beets, et al., 2006). The presence of physical activity combats a wide range of potential problems ranging from violence, depression, delinquent labels, obesity and overall poor health. Physical activity alleviates and minimizes these issues by not only filling time that can be spent in a mischievous manner, but also teaches lessons on how to act properly (Sandford, et al., 2006). In addition, regular participation can reduce obesity, improve fitness levels, and improve self-esteem, concentration, accomplishment, conduct, and attendance (Denehy, 2002). By implementing state standardized

benchmarks for physical activity, it is easier to determine the effects on students' learning and their overall in-class behavior. By integrating more active learning in the school one experiment uses Personal Digital Assistants to track and record students strengths and weaknesses, thus easing the process of performing assessments in the physical education setting (Wegis & van der Mars, 2006). Introducing computerized human agents into students' typical school day promotes an overall increase in the student's health and fitness knowledge as well as exercise value. It was found that students who were able to interact with the computerized human agents had a much higher overall understanding than students who were only exposed to written material (Murray & Tenenbaum, 2010). These results present a clear turnaround compared to figures that display steady decline in the last 25 years in participation in physical activity. Not all behaviors should be replicated, especially those demonstrated by professionals (Johnson, 2005). Fair play should be paramount and winning is not always the focus. Values, respectful sporting behavior and gracious acts should be recognized with physical activity and sports. Many life lessons along with fitness and cardiovascular health can be taught with physical education and sports leagues.

CHAPTER III

METHODS

Design

The purpose of this study was to determine whether the amount of physical activity a student receives has a statistically significant impact on academic achievement and student behavior. This study used a quasi-experimental design which aims to estimate the impact of an intervention on its target population. It is important to note, however, that while this study was designed to determine whether the intervention (i.e. physical activity) had an impact upon student achievement, a cause-effect relationship could not be determined. Unlike more traditional experimental studies in the physical, biological, and medical sciences, the quasi-experimental design of this study did not involve the use of a randomized control trial and random assignment of participants. This study focused on the researcher's observations of two 3rd grade classes over a period of one month. Each of the four weekly classroom observations over the course of the month only lasted 30 minutes, thus giving a small snapshot of the entire school day.

The independent variable in this study was the total number of minutes of physical activity each student received per week - which included time spent at recess, physical education class and Playworks class game time. There were two dependent variables. One was the average grade students received during the week in their mathematics class. Each week students received two or three grades in math which included classroom and homework assignments, homework, tests, quizzes and participation on a variety of third grade level math topics. Each assignment was graded on a scale from 0 to 100 percent. The other dependent variable was off-task student behavior within a 30 minute time frame of an afternoon lesson just before students were

dismissed. This behavior was measured by a discipline tally where the observer noted the amount of times a student was demonstrating off-task behaviors or was redirected or called out by the instructor to get back on task. Examples of these off-task student behaviors included talking to others during designated independent activities; arguing over sharing books; making comments to other students; complaining about an activity; calling out to the teacher out of turn; laying down or fidgeting instead of sitting properly; not following directions and distracting others.

A major constraint of this study was that the researcher could only observe one of the two 3rd grade classes at a time. Classroom observations on student behavior were conducted weekly for the four weeks of the entire study but observations alternated between the two classes. Another large constraint of the project was that the month of observations happened to fall just before and during the weeks that the 3rd graders were taking the Maryland State Assessment (MSA) for both reading and math. Thus, one of the 3rd grade classes received more physical activity time than normal and the other received less than they typically would if not for the weeks of testing. More of these grades included participation and quizzes as opposed to more frequent classroom assignments, which were collected earlier in the school year. Class lessons and activities were adjusted to focus more on potential test questions instead of previously planned lessons. Additionally, there were two weeks where the math teacher only graded two assignments as opposed to three for each of the other weeks during the study. Another constraint was that during the final week of the study one of the 3rd grade teachers was on a field trip so the class she had during the observation time was taught by the other teacher.

The components of the design included being introduced as the observer to each class before behavior and discipline were tracked. The observation tally period happened on

Wednesday afternoons once a week during the same time frame each week for 4 consecutive weeks. During the tally period, which was 30 minutes during each classroom observation, the observer was quiet and not engaging with students or staff members. The observer arrived to the classroom approximately 15 minutes before the observation period to ensure that students had the opportunity to settle down and refocus after a visitor entered the classroom. After the behavior tally period was complete, the observer obtained the math grades from the teachers' books and also compiled the amount of physical activity students had participated in for that week.

Participants

The participants in the study included two 3rd grade classes at a preparatory elementary school located in Baltimore, Maryland. The school was a part of the Baltimore City Public School system. In total, 37 3rd grade students were observed who are between the ages of 8 and 10 years old. The school was relatively diverse in terms of ethnicity and social class in comparison to other Baltimore City Public Schools. There was a mixture of students who identify as Asian, Hispanic, Black and Caucasian. Both classes possessed a fairly equal ratio of males and females and academic grade level. The school also had a mixture of middle and lower social class households as well. There were two 3rd grade teachers. The observer alternated between class A and class B every other week for the four weeks of the study. The math teacher shared the grades in her grade book for the assignment grades used for this project. These two classes were selected because of the rapport between the observer and each of the teachers who were both very cooperative and supportive of the study. The teachers also shared that there were a few students with an Individualized Education Plan (i.e. IEP), in each of the two classes but the exact number was not made explicit.

Instrument

The primary instrument used in the study was direct observation by the observer of one 3rd grade class each week. The observer sat in the back of the classroom silently taking notes and using a chart to tally the number of off-task behaviors each child exhibit during the 30 minute time frame once a week. The observations were all conducted on Wednesday afternoons from 1:50 pm to 2:20 pm. Students had already eaten lunch and had recess before each observation, and the end of the school day dismissal took place at 2:40 pm. The enclosed chart includes the first name of each student; columns for the number of minutes of recess, physical education class, class game time and the total number of physical activity minutes; a weekly average grade in math and the discipline tally column. Before each Wednesday afternoon observation the students were reminded by the teacher that an observer would be coming to visit and sit in the back of the classroom. The students were not told what the observer would be watching or looking for. Other qualitative, descriptive notes were also taken each week explaining the reasons why students were called on by the teacher or redirected. The type of activity or lesson was also written by the observer for each observation period. The physical activity times are broken down into three categories - recess, class game time and physical education class. Recess is a general leisure period where students have the option of choosing from a variety of games including kickball, four-square, basketball, jump ropes, hula hoops, soccer and hop-scotch. Class game time was facilitated by the Playworks program coordinator and involved a variety of icebreaker activities, skills building, cooperative and team building games and activities. The physical education class was led by a certified physical education teacher and included drills and activities on a variety of sports, as well as competitive matches on

the focus unit or lesson. The math grades were collected for the appropriate week and subjects include functions, function tables, long division and MSA preparatory lessons.

Procedure

The data collection procedure that was used in this study was replicated each Wednesday afternoon for the duration of the project. The first date of classroom observations took place on Wednesday, February 27th of 2013. The observer arrived to the school and classroom a few minutes early to set up the chart and observation station in the back of classroom. The chart had the first name of each student in the classroom. The number of physical activity minutes for each child was transmitted to the chart and this is the total for the week of February 25th to March 1st. At exactly 1:50 pm the observer began tallying each incident when a child was off-task or redirected by the teacher. Until 2:20 pm the observer did not engage with any students or adult staff members and charted each discipline incident until the time had elapsed. After 2:20 pm, behavior incidents were no longer included in the study and the observer retrieved the math grades for each student in both of the 3rd grade classes for the previous week. This process was repeated each Wednesday at the same time on March 6th, March 13th and March 20th. The math teacher sent her grades for all students from the final week to the observer via a photo through a cell phone message. The observer also made time to communicate with both teachers through email and phone conversations to discuss scheduling conflicts and other logistical issues that added a constraint to the study.

CHAPTER IV

RESULTS

The purpose of this study was to determine whether the amount of physical activity a student receives on a weekly basis has a statistically significant impact on student behavior and academic achievement. There were three major variables of interest in this study. The first of them (i.e. the independent variable) was the total amount of minutes of physical activity 3rd grade students received over the course of a week. This total included the collective number of minutes from recess, Playworks class game time and physical education class.

In addition to measuring the total amount of time students were engaged in physical activity over a four-week period, there were two dependent variables (i.e. students' physical activity and mathematics achievement) being assessed in the study. Mathematics achievement, which was operationally defined as the average grade in math class a student received in the corresponding week, was assessed using students' grades that were compiled from a combination of classroom and homework assignments, tests, quizzes and participation. Students were graded on either two or three assignments each week. Each assignment was graded on a scale from 0 to 100 percent. The other dependent variable of interest was student behavior. This variable was monitored and observed by the researcher on a once a week basis and involved noting each time a student demonstrated an off-task action and was reprimanded or redirected by the educator. Examples of these off-task student behaviors include talking to others during designated independent activities; arguing over sharing books; making comments to other students; complaining about an activity; calling out to the teacher out of turn; laying down or fidgeting instead of sitting properly; not following directions and distracting others. Thus, the purpose of this quasi-experimental study was to determine the degree of impact students' physical activity had upon their mathematics achievement, and student discipline. An independent group research

design was used to determine whether physical activity had a statistically significant impact upon both student achievement and student discipline in each of two classrooms of students that were used in this study.

Table I reports the total number of minutes of physical activity each classroom of students had each week, their mean performance in mathematics over a four-week period, and the average number of instances in which teachers responded to students regarding some type of disciplinary behavior.

TABLE I

The Total Number of Physical Activity Minutes Used by Each Class, Students' Average Math Grades in Each Class, and the Number of Discipline Incidences for Each of the Four Weeks

CLASSROOM A

Avg. Total Minutes of Physical Activity	Avg. Math Score	Avg. Math Score S.D.	Discipline Count
Week 1			
255	75.9	15.1	21
Week 2			
120	76.9	12.35	n/a
Week 3			
120	93.1	23.24	33
Week 4			
105	81.1	9.66	n/a

CLASSROOM B

Avg. Total Minutes of Physical Activity	Avg. Math Score	Avg. Math Score S.D.	Discipline Count
Week 1			
165	76.6	13.99	n/a
Week 2			
150	82.5	13.27	19
Week 3			
165	88.3	14.89	n/a
Week 4			
105	83.6	11.89	13

The researcher's first observation, based upon the data reported in the above-mentioned summary table is that there are conflicting results between Classroom A and Classroom B with regard to the number of physical activity minutes and academic achievement, quantified by the student's average math grade for week 1. In week 1, students in Classroom A received 90 more minutes of physical activity than Classroom B yet their average math grade was less than one percentage point lower than Classroom B. Conversely, in week 2, Classroom B received 30 more minutes of physical activity than Classroom A and had a higher average math grade by over five percentage points.

It should also be noted that the discipline tally between Classroom A and Classroom B was very similar after weeks 1 and 2, even though Classroom A received 105 more minutes of physical activity in week 1 than class B did in week 2. In week 3, Classroom B received 45 more minutes of physical activity, but had a lower average math score by just under five percentage points. Also in week 3, Classroom A received 135 less hours of physical activity than it received in week 1; however, the discipline tally in week 3 from week 1 for Classroom A increased by 12 incidents. In week 4 both classes received the same amount of physical activity, but Classroom B had a higher math grade average by 2.5 percentage points. This was the third week out of the four that Classroom B had a higher math average than Classroom A. Additionally, Classroom B had more physical activity than Classroom A in two out of the four weeks, with each class having the same amount in the final week of the study. Lastly, in week 4 Classroom B's discipline total declined by 6 incidents from week 2 even though it received 45 minutes less of physical activity than in week 2.

The researcher's initial conclusion was that the results reported in Table I were inconclusive with regard to the null hypothesis. The mean of the math grade is noted on the

following table. Each week is broken down by student, physical activity minutes, math grade average and the discipline tally if the class was observed for the given week. The overall math grade averages are reported in the summary table and are rounded to one tenth of a percent.

The above findings coincide with each of two additional analyses that were conducted. The results are reported in Tables II and III below. In each analysis, a *t* test for independent groups procedure was used to determine whether the difference in number of physical activity minutes students received in Classroom A versus Classroom B for each of the four weeks significantly impacted their mathematics achievement and the number of student discipline incidents.

TABLE II

A Comparison of the Impact of Weekly Differences by Classroom in the Amount of Weekly Physical Activity Students Received and Their Mathematics Grades

	<i>t</i> statistic	Degrees of Freedom	Probability	Level of Significance
Week 1	.144	35	.887	>.05
Week 2	1.310	35	.199	>.05
Week 3	.067	35	.947	>.05
Week 4	.691	35	.494	>.05

TABLE III

A Comparison of the Impact of Weekly Differences by Classroom in the Amount of Weekly Physical Activity Students Received and the Occurrence of Discipline Incidents

	<i>t</i> statistic	Degrees of Freedom	Probability	Level of Significance
Week 1	.334	35	.740	$p > .05$
Week 2	1.548	35	.131	$P > .05$

The findings from the data reported in Table II suggest that the first part of the null hypothesis (i.e. that students' physical activity has no statistically significant impact upon students' and academic achievement) should be retained. Similarly, the results reported in Table III suggest that the second part of this study's null hypothesis (i.e. that students' physical activity has no statistically significant impact upon student also should be retained).

CHAPTER V

DISCUSSION

Conducting the study and analyzing the results that are reported in Tables I through III, the null hypothesis that the number of minutes of physical activity in a given day for elementary school age children, has no statistically significant impact upon students' math grades and student behavior, was retained. However, while the null hypothesis was retained, there were various constraints and obstacles related to potential problems of internal and external validity that need to be addressed.

Implications of the Results

As initially indicated, when students' total physical activity is compared with their grades in mathematics and the number of student discipline incidents reported, the results of the study are contradictory. For example, there were weeks when students received more physical activity time than other weeks, and grades and student behavior would improve. There were also weeks when students received more physical activity time, and academic achievement and student behavior declined.

Potential Problems of Internal Validity

This can be attributed to a number of factors relating to the design of the study. The one that is most apparent is that students' physical activity schedules were not consistent when compared to the rest of the school year. This was due to the Maryland State Assessment (MSA) that were administered in March. For the entire four weeks of the study, students were either preparing for or taking the MSA. This altered both the plans and the methods of instruction used by teachers. Daily schedules were also greatly compromised and it was apparent that students could feel the pressure and intensity from the assessment.

In addition, without a pre-test, it was not possible to compare the results from this study to the results at other schools to determine whether they were similar. Internal validity issues in this study include the difficulty of the varying difficulty of the math assignments from week to week. There may have been easier assignments given by the teacher with the MSA being given during the study. Furthermore, some weeks could have included more participation or quiz grades, which would potentially skew the average for each student and ultimately the entire class. There were a number of other internal threats to validity throughout the process of the study. There certainly can be other explanations for the results of the study which have already been discussed including the ease or difficulty of the given math assignments from week to week. The type of activity students were working on during the observation each week was different and could be the reason for the fluctuation in student behavior figures. The MSA and changes in the regular schedule for all students may have also been the major determinant for conflicting results. Additional factors relating to problems of internal validity relate to the maturation of students over the course of the year and duration of the study. Students get used to their routines and amount of physical activity that if it is greatly altered it can affect their classroom behavior and level of concentration during lessons. Additionally, the two teachers on occasion, were mindful of the study and of being observed. They could have been acting and teaching unnaturally because they unconsciously wanted to inflate the results of the study. This is known as the Hawthorne effect. At the same time, students could have been acting out more or less often than they normally would to receive attention with their knowledge of a visitor sitting in the room.

External Validity Concerns

External validity concerns relate to the degree to which students at this school compare to others in the Baltimore City Public School (BCPS) district. The school used for the study has a much broader spectrum in terms of ethnic diversity when compared to the Baltimore City School system as a whole. Additionally, the school in the study has a much lower percentage of students receiving free and reduced meals (FARMS). Test scores at this school have also historically been significantly higher than other BCPS schools.

Connections to Previous Studies/Existing Literature

The previous studies and existing literature explain the results to a deeper degree, but do not fully support each other due to the inconsistency of the data. The literature suggests that play and physical activity is vital throughout the day, of not only students at school, but humans in general. One source claimed that exercise has a calming effect on student behavior and allows them to focus better in a classroom setting. This is congruent to class A in the study that increased its student discipline tally by 12 from week 1 to week 3 after it received 135 minutes less of physical activity. However, in week 4 of the study, class B had the lowest behavior tally, and could be dubbed the best behaved class, when it received the lowest amount of physical activity for the entire four weeks of the project. Other previous studies show students improve socially, emotionally and cognitively after physical activity and increase on-task behavior after a physical education class. These findings are not exactly supported in the research project because in the short term of four weeks, math grade averages fluctuated with the amount of physical activity and there were two weeks when the class that received more physical activity had a lower class average on the week's assignments. To support this existing literature and the importance of physical activity and education class, the week where the most behavior problems

occurred was when class A did not receive any physical education class and only one Playworks class game time, resulting in the second lowest total of minutes for the week in the entire study.

Implications for Future Research

There are many strategies and techniques future researchers can use to more effectively collect data and test the hypothesis of the correlation between physical activity, academic achievement and student behavior. Future researchers should use a longer period of time to collect data than just 4 weeks. With the structure and set-up for this project, each class was only observed twice, which did not allow for a large sample size of scores and averages. Additionally, the time of year should be kept in mind and the study should take place either well before or after MSA testing. This is due to the preparations of each teacher trying to cram information into the minds of the students and schedules are also more conventional. Another thing to keep in mind is the type of lesson or activity that is being observed. In order to obtain more reliable data the researcher should ensure that all activities observed are similar and observations should be done over a longer period of time than just 30 minutes. A full day would give more comprehensive results than just an afternoon snapshot when most students are typically more off-task than they are in the mornings. A year-long study that could be manipulated by the researcher may allow for clearer results. If two classes could be used in the study, both receiving the same lessons each day but having completely different physical activity schedules, where one class has zero minutes a day, may lead to stronger results. Of course, this would not be feasible due to moral and legal stipulations.

Conclusions/Summary

Although the findings of the study suggested that the null hypothesis should be retained, there were several valuable lessons learned and it was intriguing to compare the numbers from

the study. There were results that supported the null hypothesis and others that rejected the null hypothesis. Additionally, there were extenuating circumstances that threatened the external validity of the project and internal threats that could have skewed the data as well. The project could be more successful and conclusive for future researchers if a longer period of time is used and the instruments are more streamlined and consistent. Overall, a school environment is ever changing and rarely a clean cut, perfect environment, so there will regularly be uncontrollable factors affecting the data.

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