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The Impact of Physical Activity Breaks in the Classroom

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The Impact of Physical Activity Breaks in the Classroom

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Northwestern College

An Action Research Project Presented
in Partial Fulfillment of the Requirements
For the Degree of Master of Education

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Abstract

The purpose of this action research study was to determine the relationship between physical activity breaks and their impact on student achievement and behavior. The participants included 30, eleven and twelve-year-old students, who attended a public school in the north suburbs of MN. Students participated in 5-10-minute physical active breaks in health class during a 6-week trial period. Data was collected through the use of summative assessments, student surveys, and an observational behavior chart. The study found that implementing physical activity breaks in the classroom can have a positive impact on students' academic achievement and behavior. The researcher recommends further studies be conducted with regards to varying ages, gender, content area, and economic status, to further validate the results.

Physical Activity Breaks in the Classroom

Middle School is a time when children are transitioning from childhood to adulthood. During this period of growth, students are changing physically, socially, mentally, and emotionally (Blakemore, 2019). The use of an exploratory curriculum has been implemented in many states over the years. This form of curriculum has allowed students to take elective classes of their choosing in tandem with core classes (Ladd, 2017). The curriculum design gives children an opportunity to make choices, develop curiosity, find interests, build strengths, as well as provide opportunities to create relationships with peer (Ladd, 2017). When the No Child Left Behind Act passed legislation in 2001, many schools had to make curriculum and funding changes to allow more instructional time in preparation for standardized testing (Ladd, 2017). Over the last decade there has been a decrease in requirements for allied classes at the middle and high school level. The general population of students have started to miss out on these electives to make way for more instructional time, interventions, and remediations as educators began teaching to the test (Coburn, Hill, & Spillane, 2016). Although the benefits of regular physical activity are known, recent epidemiological findings provide evidence that an increasing number of adolescents are not as active as they should be (Ma, Le Mare, & Gurd, 2014). The impact of a sedentary lifestyle during adolescence on lifelong brain health has created a need for immediate action to manage, if not prevent, unhealthy behaviors during this time of development (Faigenbaum & Myer, 2012).

Physical education in particular, has had decreasing requirements over the last decade which has reduced students' ability to be physically active during the school day (Ladd, 2017). The School Health Policies and Practices Study determined that less than 5% of elementary, middle, and high schools require daily physical education or its equivalent for the entire school

year (American Heart Association, 2015). As more time has been dedicated to instructional time and assessments, students' opportunities to be physical active during the school day have declined (Ladd, 2017). In schools, time allocated to physical activity is decreasing despite considerable evidence that regular participation in physical activity is beneficial for both health and fitness (Ma, Le Mare, & Gurd, 2014). Physical diseases are not the only serious threats to the health and well-being of children. Obesity has been connected to brain deficits that start during childhood and continue throughout adulthood (Snelling, Belson, Watts, George, Van Dyke, Malloy, & Kalicki, 2015). With the reduction in physical activity during the school day, there is a concern that students may not be as engaged in the classroom during the day, which may in turn impact their overall achievement. There is a need to find new instructional strategies that can help students stay engaged in the classroom (Ma, Le Mare, & Gurd, 2014).

The purpose of this action research study is to find a correlation between physical activity breaks in the classroom and its impact on student achievement and student behavior. As physical education requirements are lowering and students are not provided as much time for physical activity, there needs to be a new avenue which once again provides the opportunities.

Review of the Literature

There is great importance to continue to pursue research so that all students are proficient. Implementing physical activity breaks during class time can be an essential way to help keep students focused during the school day (Howie, Beets, & Pate, 2014). Students may be missing out on the many benefits that physical activity has to offer as physical education classes and recess time have been reduced. These benefits not only aid in a student's physical health, but also their social and mental well-being (Howie, Beets, & Pate, 2014).

When the No Child Left Behind Act (NCLB) was passed in 2001, there began a shift in educational reform. Standardized testing and high stakes exams put pressure on school districts to ensure students were performing at a high level (Coburn, Hill, & Spillane, 2016). In order to improve student test scores, school districts increased instructional time (Coburn, Hill, & Spillane, 2016). Research on NCLB, as well as state accountability programs created in its wake, have shown that school curriculums across the nation shifted instructional time towards the tested subjects of reading and math (Coburn, Hill, & Spillane, 2016). A nationally represented survey that included multiple school districts was conducted between the years 2001 and 2007. The study provided information about how schools raised instructional time in English and math significantly, while reducing time in physical education and recess (Ladd, 2017). This had a significant impact on students' opportunities to be physically active during the school day. The NCLB Act also impacted States because it changed the way in which they reported testing results. Adequate Yearly Reports were published in an attempt to help create public pressure to increase accountability for closing the achievement gap (Ladd, 2017). Policy makers started implementing high sanctions which pressured schools to focus on high test scores since their funding was dependent upon it. In some cases, low performing schools were shut down and

reopened with new staff in an attempt to increase performance (Coburn, Hill, & Spillane, 2016). As more accountability research was conducted during the years following the NCLB Act, there was no compelling evidence that linked high stakes testing to closing the achievement gap. However, what was found was that low-stakes subjects were marginalized as the majority of funds and time were spent teaching to the high-stakes tests (Coburn, Hill, & Spillane, 2016). Howie and Pate (2012) conducted a cross sectional analysis of over 50 articles and concluded that there is a positive association with physical activity and academic achievement. Even with the common understanding of these benefits, The Center for Education Policy found that almost 70 percent of schools reported funding decreases to staff in non-core academic areas which included physical education (Howie & Pate, 2012). The reason for the decrease was to provide more instructional time in tested subjects.

The researcher has chosen to focus on childhood and adolescence research in regard to physical activity breaks in the classroom and their impact on student achievement and behavior. With the reduction in physical education requirements over the last decade, children and adolescents are missing out on opportunities to be physically active which may be impacting not only their health but also their academic achievements and behaviors.

Physical Activity Reduction

Physical education is a class in which requirements have been lowered nationwide to allow for more instructional time in core classes including math, science, English, and social studies (Ladd, 2017). According to the School Health Policies and Practice study, less than 15% of elementary, middle, and high schools require physical education at least three days per week for the entire school year (American Heart Association, 2015). In addition to enhancing cardiorespiratory and musculoskeletal fitness, regular physical activity has the potential to

enhance a child's emotional, social, and cognitive well-being (Faigenbaum & Myer, 2012). With the reduction in physical activity opportunities afforded to students in recent years, researchers have attempted to link the impacts on childhood obesity. Snelling et al. (2015) found that childhood obesity is likely to double over the next two decades. More children are showing signs of chronic conditions such as Type II diabetes, hypertension, and bone and joint problems, that were once mainly seen in adults. These diseases are not the only serious threats to the health of our children in society; obesity also plays a role in cognitive deficits which may start during childhood and continue into adulthood (Snelling et al., 2015). Many of these children live a sedentary life and do not meet the physical activity requirements that are recommended for a healthy lifestyle. This may be due to the fact that these students are not offered sufficient physical education. Physical activity could provide a more powerful impact than school districts may realize. The NCLB Act caused many changes in school legislation over the last decade, much of which has had an unprecedented impact on physical education and the activity of students (Ladd, 2017).

National physical activity guidelines suggest that at least 60 minutes of moderate to vigorous physical activity can help prevent or treat various diseases (Castelli et al., 2014). Healthier students are able to attend school on a more regular basis which helps facilitate academic success. Children who engage in daily physical activity breaks which requires energy expenditure beyond rest, reap multiple health benefits (Castelli et al., 2014). These researchers came to this conclusion through the use of an afterschool program that provided over 70 minutes of moderate to vigorous physical activity. This exceeded the daily recommendations for children's physical activity and provided evidence that aerobic fitness can improve significantly

with daily implementation. Aerobic fitness and centralized adiposity were related to aspects of cognitive control which was compared to students who were not active (Castelli et al., 2014).

With regard to the reduction in the number of students enrolled in physical education due to legislation changes, there is still great importance for students to take part in physical activity at some point during the school day. Physical activity breaks are a cost-effective intervention that classroom teachers can use during the day to promote fitness (Erin, Beighle, Morgan, & Noland, 2011). Physical activity is an important part of a student's education. Students are able to develop social skills, increase self-esteem, improve physical health, as well as stay more engaged during the school day (Faigenbaum & Myer, 2012). There is a plethora of research that backs up the importance of physical education classes for children, but when that is not an option, teachers should strive to incorporate physical activity breaks into the classroom as there are many positive impacts.

Physical Activity Breaks Impacts on the Brain

Physical activity breaks are an opportunity for students to be physically active during the school day. Research shows that students who are allowed at least one physical activity break during the school day have benefited greatly (Erin et al., 2011). These breaks between instructional time allow for the students to increase their heart rate in an interactive way. In order to find out how physical activity impacts the body; researchers have continued to perform action research studies. Davis et al. (2011) used functional magnetic resonance imaging (fMRI) to analyze how blood flow in the brain of children was impacted by physical activity. fMRI is a noninvasive test that uses magnetic fields and radio waves to create detailed images of the body. Sedentary, overweight children were observed to see how physical activity would impact their brain. Through the use of aerobic games including tag, jump rope, basketball, and soccer,

students were able to increase their physical activity up to 40 minutes per day. David et al. (2011) found that there was a link between the physical activity and its impact on cognitive control and mathematics achievement. The physical exertion helped increase prefrontal cortex fMRI activity. This increase in prefrontal activity can help improve reasoning, impulse control, and problem solving (David et al., 2011). Ultimately, a stronger brain helps foster better academic performance.

Similar to David et al. (2011), Thomas, Dennis, Bandettini, and Johnsen-Berg (2012) found that physically active and cardiovascular fit children and adolescence consistently outperform their peers who are less fit, in regard to academics. The researchers were able to identify that physical activity enriched cognitive development and lifelong brain health. The increases in aerobic fitness and physical activity were directly linked to the integrity of the brain and its structure (Thomas et al., 2012). Aerobic activity particularly helps cognitive skills such as memory and problem solving which has aided student performance in math, reading, and English. Experts believe that teacher-based classroom physical activity interventions such as these, can have a positive impact on all students (Erwin et al., 2011). Different activities produce various types of changes in the brain including size, density, neuron activity, and blood flow (Thomas et al., 2012). Researchers have been able to make these claims based on evidence collected with the use of authentic correlational studies, experimental randomized controlled trials, as well as non-invasive brain imaging (Thomas et al., 2012). With the impact that physical exertion has on brain structure, it has been identified that children who are more active also demonstrate higher scholastic achievement, better classroom behavior, greater ability to focus, and less absenteeism compared to their unfit peers due to increased brain health (Faigenbaum & Myer, 2012). The more active body has been linked to a healthier mind.

Taking a closer look at executive functions and brain health, Chaddock-Heyman, Hillman, Cohen, and Kramer (2014) found evidence comparable to Thomas et al. (2012) in relation to physical activity impacts. Their analysis explained that fit children have larger brain volumes in the basal ganglia and hippocampus compared to less fit children (Chaddock-Heyman et al., 2014). These parts of the brain relate to the peak performance of cognitive control and memory. Cognitive control refers to processes associated with thought, action, decision making, and the ability to guide behavior toward specific goals. This cognitive control, also referred to as selective attention, is relevant for filtering distracting information, acquiring appropriate response tendencies, switching from one task to the next, restructuring knowledge, and the ability to manage information (Chaddock-Heyman et al., 2014). The executive functioning skills are strengthened through play, which allows students to develop comprehension, stay organized, as well as manage their time and attention (Thomas et al., 2012). These researchers have identified a strong correlation between physical activity and how it impacts student decision making, which in turn aids academic performance. The development of these skills in childhood and adolescence allows students to work through cognitive challenges as well as grasp concepts of relevant thoughts and actions (Chaddock-Heyman et al., 2014). With the implementation of physical activity breaks into the classroom, students are able to build these skills at a young age which helps shape their future learning and success in adulthood (Thomas et al., 2012).

Continuing with the linked theme of physical activity and brain growth, Holt, Smedegaard, Pawlowski, Skovgaard, and Christiansen (2019) studied physical activity and its impact on student autonomy. This student autonomy was linked to a feeling of ownership and responsibility. The basis of their research was to focus in on the “Self-Determination Theory” which is grounded in motivation. Three basic human needs that underlie psychological growth

and well-being include autonomy, competence, and relatedness. Holt et al. (2019) argued that fulfilling these conditions increases the motivation for a given activity. School based physical activity intervention impacted students' sense of autonomy, competence, and relatedness as well as affected their psychosocial well-being. For children, this plays a vital role in their educational experience (Holt et al., 2019). Through the use of physical activity breaks, the researchers were able to identify a relation to student autonomy and competence. When students are able to make choices and take ownership over their actions, they begin to find relevance in the material.

Affording students these opportunities allows them to strengthen autonomy through the use of physical activity breaks (Chaddock-Heyman et al., 2014). Holt et al. (2019) believed that once these traits of autonomy and competence are developed, students carry them over to the formal classroom setting. Besides the importance of cognitive development in children, physical activity may also prove as an important way to strengthen cardiovascular fitness, maintain weight, and reduce health risks that are linked to childhood obesity (Davis et al., 2011).

Physical Activity Impacts on the Body

There is a great deal of research that explains the importance of physical activity due to its impact on brain growth. Physical activity breaks are also a great opportunity to help students improve cardiovascular fitness and lower their Body Mass Index. Bershwinger and Brusseau (2013) completed a pilot study which included children from a rural area in Western New York. The purpose of the physical activity breaks was to increase students' fitness levels. After having students perform activities such as jumping jacks, walking breaks, and outdoor games, researchers noticed that there was a large increase in physical activity time, when compared to baseline data (Bershwinger & Brusseau, 2013). Implementing a school based physical activity program helped increase student physical activity during the school day by a high percentage

(Berswhinger & Brusseau, 2013). Classroom teachers can have a big impact on increasing child activity time (Erwin et al., 2011). By participating in physical activity, students are able to increase the number of steps that they are taking during the school day. Increasing physical exertion is a step in the right direction when trying to overcome obesity and other health related issues (Snelling et al., 2015).

Physical Activity Break's Impact on Academic Performance

Physical activity breaks help improve student brain health, promote the acquisition of traits such as competence and autonomy, as well as improve students' physical health (Erwin et al., 2011) With regard to these points, it is also important to find out how this translates to academic performance. Research has consistently addressed the idea that physical activity intervention is beneficial to children's health, but various academic pressures have started to limit students' abilities to take part in these activities (Erwin, Fedewa, & Ahn, 2017). Students who have participated in daily physical activity breaks have shown academic improvements. Data collected on reading and math fluency, physical activity, grades, and standardized tests has provided evidence of the achievement impacts of activity breaks (Erwin et al., 2017). The researchers concluded that even short physical activity exercises can be especially important for improving math and reading fluency. The time students spent being physically active, outweighs the loss of academic time as students' performance increased (Erwin et al., 2017). Teachers who find time to take a break during class instruction and provide activity time, have a direct impact on helping students achieve academic excellence.

With math being one of the standardized test subjects, many teachers and researchers have searched for ways to improve student performance. Hraste, DeGiorgio, Padulo, and Granic (2018) analyzed the use of physical activity to aid the learning of mathematics. By using an

integrated curriculum that emphasized activity breaks and geometry, these researchers found that middle school students were able to retain more information and increase proficiency. Physical activity was paired with tasks that required cognitive functions, similar to how Schmidt et al. (2016) organized their study. Students were asked to move around the room in the direction of shapes as well as create angles with their arms. The researchers realized that incorporating physical activity with high level thinking promoted greater academic results when compared to simple aerobic activity without high level cognitive demands. An integrated approach to teaching mathematics and geometry that is supplemented with physical activity breaks, is more effective than the traditional methods prevalent in 21st century schools (Hraste et al., 2018). Shifting from testing-centered teaching to child-centered teaching should be a main focus for teachers as it has the students' best interest at heart. This is important because pairing kinesthetic movements with course content is a quality instructional strategy to help increase learning and promote fitness (Camahalan & Ipock, 2015).

Physical Activity Break's Impact on Student Behavior

Creating a classroom environment that encourages students to stay engaged and on task is crucial in helping students' academic achievement. As teachers search for strategies to reduce off-task behaviors, physical activity breaks should be at the top of the list. Watson, Timperio, Brown, Best, and Hesketh (2017) conducted a systematic search of electronic databases. Almost 40 of the articles included data on physical activity impacts on students. The study investigated a range of academic related outcomes including classroom behavior. Twelve studies that included physical activity breaks were investigated, 10 of which showed that classroom-based physical activity had a positive effect on improving on task behaviors which led to academic improvements. Howie, Beets, and Pate, (2014) spent time working with 4th and 5th grade

students on a daily basis to analyze classroom behaviors. Student behaviors were monitored during sedentary instructional time and then again after participating in physical activity bursts. The off-task behaviors were significantly decreased after participating in physical activity breaks (Howie et al., 2014). Schmidt, Benzing, and Kramer (2016) came to the conclusion that as students become more engaged during instructional time, off task behaviors minimize and achievement often improves. The researchers used trial groups that included physical activity with high cognitive demands, sedentary with high cognitive demands, physical activity with low cognitive demands, and a control group that was sedentary with low cognitive demands. Observation of the groups provided evidence that off-task behaviors were reduced after physical activity. This led to more engagement during instruction.

Intensity Impacts Benefits

When comparing no activity breaks to high intensity physical activity breaks, researchers have found a direct link in both student achievement and behaviors. Ma, Le Mare, and Gurd (2014) discovered that there was a direct correlation between the intensity of physical activity and on-task behaviors. Through the use of high-intensity circuit training as well as physical movements such as squats, jumping jacks, and scissor kicks, students were able to burn off energy and stay more engaged during instruction (Ma et al., 2014). The researchers noted that intense physical activity had the greatest impact on students who typically demonstrated the highest rates of off-task behavior on no-activity days (Ma et al., 2014). Schmidt et al. (2016) took this one step further with the assertion that students who participated in vigorous activities that required more cognitive engagement, demonstrated even better engagement when compared to mild aerobic activities.

Further research on the concept of intense physical activity breaks was conducted in 2018. Egger, Conzelmann, and Schmidt (2018) found that as the difficulty of the form of exercise increased, so did the level of performance in regard to complex thinking and on-task behavior. Understanding the value in being physically active, these researchers identified how different levels of intensity impacted the students. Elementary students were placed in different groups including an aerobic group which consisted of more strenuous physical activity, a cognitive group which included moderate physical activity paired with executive commands, and a combination group that included strenuous activity and executive commands. The best results were obtained by the group that experienced more strenuous physical activity paired with high cognition activities (Egger et al., 2018). Along with the behavior benefits associated from vigorous physical activity, Donnelly, Lambourne, and Kate (2011) observed that vigorously intense activity helped improve students' overall performance on standardized tests and academic achievement compared to students who were not active.

As school districts look to improve students' standardized test scores, increasing more intense physical activity opportunities is a good place to start. There is a constant need to find ways to better engage students in their learning. Physical activity breaks could be a great way to help increase student proficiency as well as reduce negative classroom behaviors. There has been a multitude of research done in regard to physical education and its benefits. This being said, many students are missing out on these experiences because they are placed in core content classes for more instructional time to prepare students for high stakes exams. These core classes include English, math, science, and social studies. The reduction in physical education requirements due to legislative changes have led to fewer opportunities for students to be physically active during the school day. More research should be done to help validate the need

for implementing physical activity breaks across all content areas so students can reap the benefits and achieve academic excellence.

Methods

To determine the relationship between physical activity and its impacts on student achievement and behavior, there were two guiding questions that focused the research. Do physical activity breaks improve student achievement? Do physical activity breaks improve student behavior? In recent years, students have lost opportunities to be physically active during the school day to allot more time to prepare for standardized tests. Understanding the documented research in regard to physical activity and its benefits, the researcher wanted to go one step further and see how physical activity breaks during class time would impact students. The independent variable of the research study consisted of the various physical activity breaks that the students performed each day. The dependent variables included the students' achievement and behavior. Student achievement was recorded with the use of test scores during the trial period which consisted of multiple summative assessments. Student behavior was recorded through the use of a tally chart that was used to identify off-task behaviors. Lastly, the researcher created a student survey to help develop an understanding of the student's perspective of the use of physical activity breaks and whether or not they felt it impacted their achievement and behavior.

Participants

The participants in the study were enrolled in a school district located 25 miles north of St. Paul, Minnesota. The school district is one of the largest in the state that serves multiple suburban cities with a total population of over two-hundred-thousand people. There are twenty-four elementary schools, six middle schools, and five traditional high schools. Currently there are 30,000 k-12 students enrolled in the district.

The building that the action research took place in had 1,000, 11-14-year-old students enrolled during the time of the study. The demographics of the building were 76% white, 8% Black, 7% Asian, 4% Hispanic or Latino, and 4% two or more races. At the time of the study, 24% of the student population was receiving free reduced lunch and 11.7% of the students were receiving special education services (Minnesota Report Card, 2018). The typical school schedule was from 8:25-3:05, and the students attended seven classes each of which lasted 46 minutes.

Two health classes were chosen to take part in the research. Each class had 30, 6th grade students, who were randomly selected to take part in the study. The gender of the students in the control group consisted of 15 males and 15 females and the intervention group had 16 males and 14 females. All of the students involved in the study were between the ages of 11 and 12. The class breakdown of both trial groups was very similar. The ethnicity was 70% white, 3% Hispanic/Latino, 3% American Indian/Alaska Native, 10% Asian, 10% African American, 3% two or more races. All of the students in both classes received instruction in English and there were no English language learners in the trial. One student from the intervention group was on an Individualized Education Program and received speech therapy.

Measures

During this research study, various measurement instruments and tools were used to gather quantitative data in order to answer the question of whether physical activity breaks improve students' academic performance and behaviors. The data was collected over a six-week trial period, two weeks of which were used to compile baseline data and four weeks of physical activity implementation.

Quantitative data was collected through the use of common summative assessments, frequency charts of behavior, and student surveys. The common summative assessment tests

were created by health department leaders of each building during professional development. Each assessment was specifically linked to national standards. These standards included material that the students needed to know and be able to do at a proficient level. The scores of these summative assessments were recorded in a mastery manager program to allow the researcher the opportunity to come back and analyze the data. These common summative assessment tests were created to help gather evidence on the dependent variable relating to student achievement.

A frequency chart created by the researcher was used to collect data on student behavior. Each time a student had an off-task behavior or required redirection; the researcher recorded the data on the chart. The frequency chart was used to further collect quantitative data in regard to the impact physical activity had on the dependent variable of student behavior.

The researcher also created a four-question student survey that was based on students' opinions about the physical activity breaks. These surveys were used on the last day of physical activity implementation to help gather more quantitative data in relation to the impact physical activity had on the variables of achievement and behavior. These were designed to better understand the students' perspective about physical activity breaks. The participants were asked questions about their experience with physical activity breaks during class instruction. The questions were in relation to how they felt physical activity impacted their achievement, engagement, and behavior.

Procedures

The purpose of the action research study was to find a correlation between physical activity and its impact on student achievement and behaviors. The researcher used two different health classes to conduct the research. One class was a control group that did not participate in physical activity breaks, and the other class, taught by the researcher, incorporated the breaks.

These two classes were chosen by the researcher because of their similarities in demographics and both classes were taught 1st hour on alternating days. To gather baseline data, the students attending both health classes were observed without the implementation of any physical activity breaks starting on September 3rd and concluding on September 13th. Student behavior was documented in regard to off task behaviors and redirections needed each day. All data was recorded and documented on an excel spreadsheet.

September 16th marked the first day of physical activity integration into the classroom. Each day, the intervention group participated in 5-10 minutes of physical activity including jumping jacks, sprints, lunge jumps, agility drills, and other moderate to vigorous activities. The 45-minute class period was broken down allowing for 20 minutes of instructional time followed by 5-10 minutes of physical activity. Shorter activities were typically more vigorous to get the students heart rate up. The last 10-15 minutes were dedicated to more instruction class time and group work. Behavior was monitored and data was tracked for six weeks to see how the physical activity breaks impacted student behavior. The researcher continued to document student behavior to make a note of any changes since the implementation of physical activity breaks.

To gather evidence in relation to student achievement, both the control and intervention trial groups took a series of common summative assessment tests throughout the study. One assessment was given each week in relation to new content that was being studied. Students answered multiple choice, true false, and short answer questions at the end of each week to demonstrate their knowledge of material related to the National Health standards. These tests included the Health Triangle assessment given on September 20th, Goal Setting assessment given on September 27th, and the Communication assessment given on October 4th. On October 6th, the researcher had the intervention group take a survey to grasp a better understanding of

how the physical activity breaks impacted the students. A computer cart was checked out and the students completed the survey which was created through google forms software.

Results

In order to determine the impact physical activity had on student behavior and achievement, data was tracked and recorded during the course of the study. In regard to student behavior, the researcher used a tally chart to document the frequency of off-task behaviors during health class. Values of off-task behaviors were obtained by averaging the daily data that was recorded during and after the implementation of physical activity breaks. Baseline data was gathered for two weeks and intervention data was collected for 4 weeks.

The baseline data for the daily average of off-task behaviors before physical activity breaks were implemented was 32. Once the students started participating in the activity breaks, the frequency of off-task behaviors was reduced. At the end of the six weeks, the average daily total of off-task behaviors was 14. During the intervention period, a number of the students were able to reduce their off-task behaviors by fifty-percent. Multiple students reduced their frequency of off-task behaviors by 3 incidents or more during the course of the study. This being said, a handful of the students did not exhibit any off-task behaviors before or during physical activity implementation.

A dependent group *t* test revealed that there was a slightly statistically significant difference in off-task behaviors before physical activity breaks ($M = 32.00, SD = 1.06, n = 30.00$), as compared to off-task behaviors ($M = 14.00, SD = .46, n = 30.00$) with a small effect size, $t(29) = 2.07, p < .05, p = .047, d = .22$, following a physical activity break intervention. The physical activity breaks helped reduce the average number of daily off-task behaviors

In an attempt to answer the research question of how physical activity breaks impact academic achievement, multiple assessments were used during the course of the study. Both the control group and intervention group took the same assessment each week. The graph below

shows the class averages on each assessment and compares the performance of the two trial groups to one another.

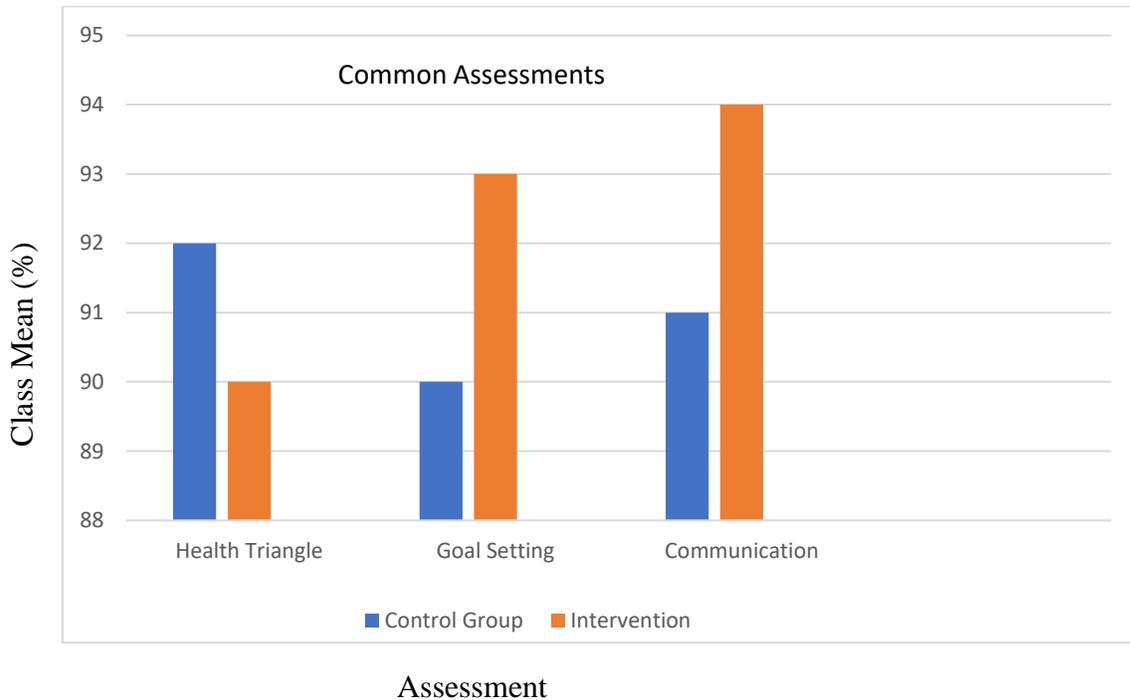


Figure 1. Mean common assessments.

Figure 1 shows that the control group had a class average of 92-percent on the Health Triangle Assessment while the physical activity intervention group averaged 90-percent. This was the first assessment of the school year for both trial groups. The second assessment was on goal setting. The control group averaged 90-percent compared to 93-percent for the physical activity group. The third assessment took place after multiple weeks of physical activity intervention. On this assessment, the control group averaged 91-percent and the physical activity group averaged 94-percent.

An independent group *t* test revealed that there was a statistical significance in students test scores for the control group ($M = 3.25$, $SD = .486$, $n = 30$), as compared to the intervention

group which participated in physical activity breaks, ($M = 3.48$, $SD = .091$, $n = 30$), with a small effect size, $t(58) = 2.58$, $p < .05$, $p = .01$, $d = .32$.

Below you will find a series of survey questions that the students answered in regard to physical activity breaks in the classroom.

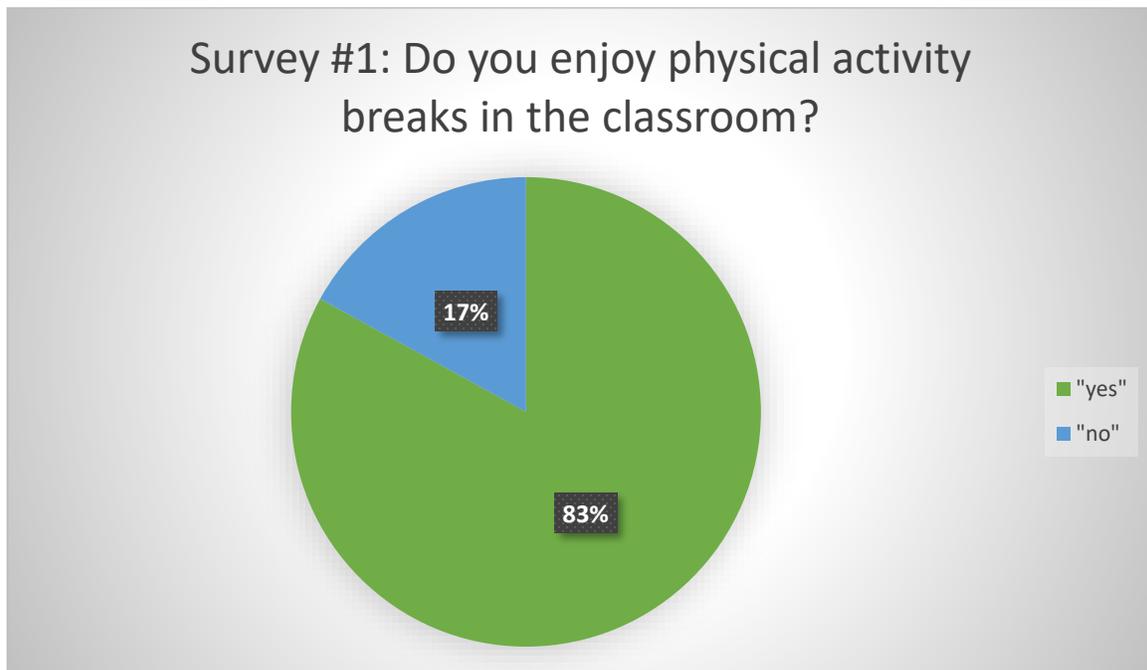


Figure 2. Percentage of students who enjoyed physical activity breaks.

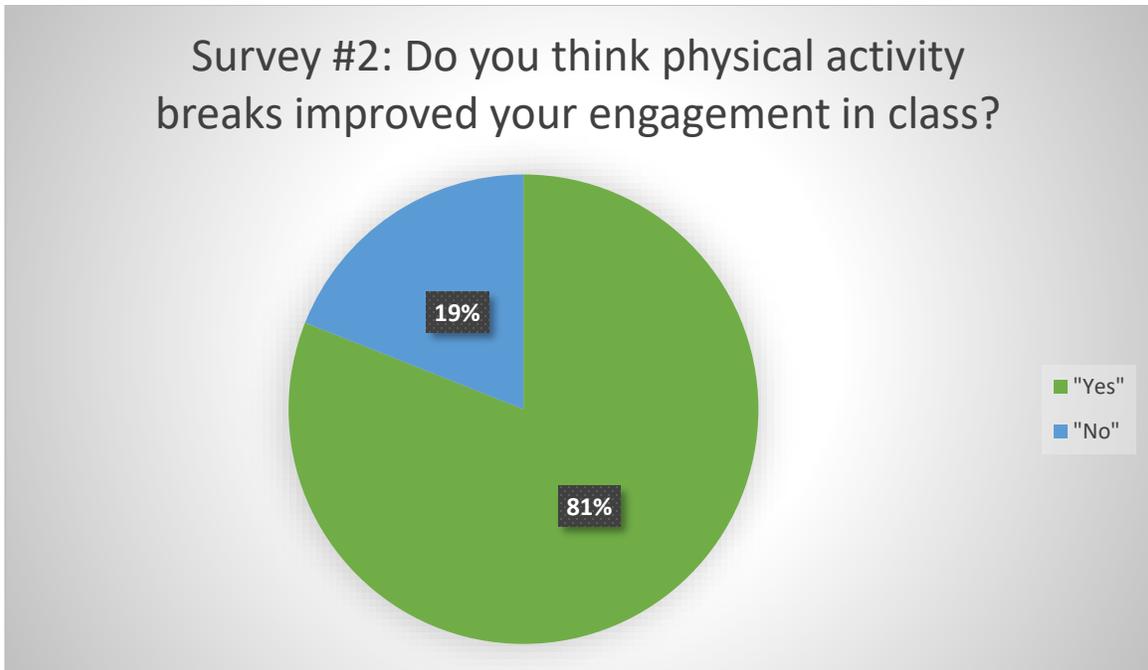


Figure 3. Percentage of student who felt more engagement during physical activity breaks.

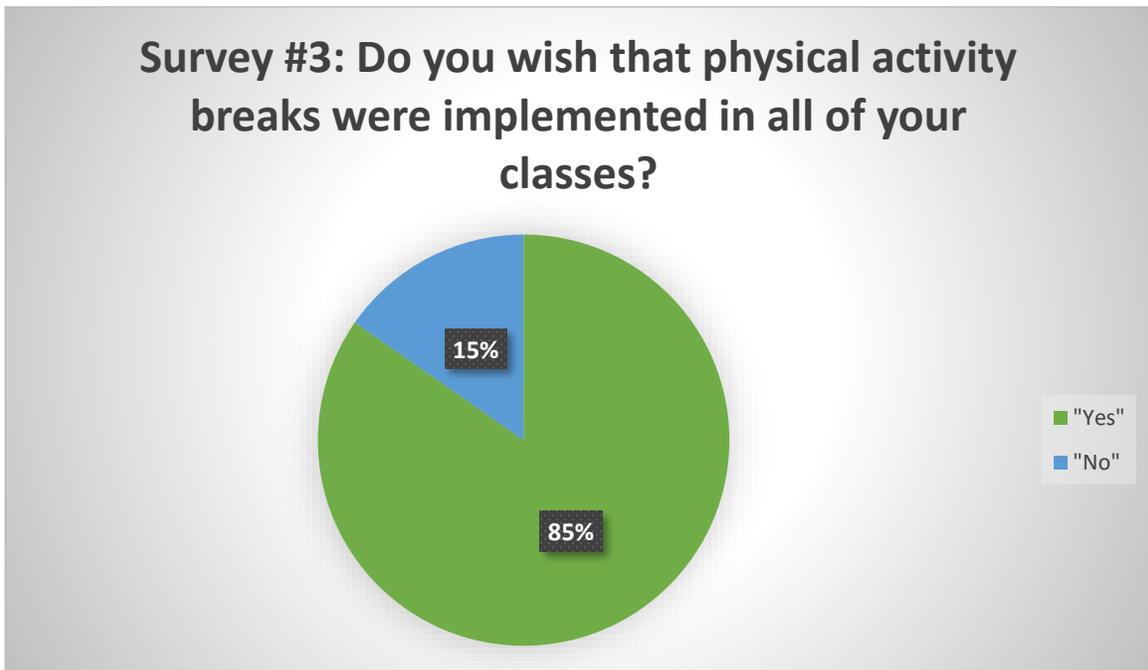


Figure 4. Percentage of students who would like physical activity breaks in other classes.

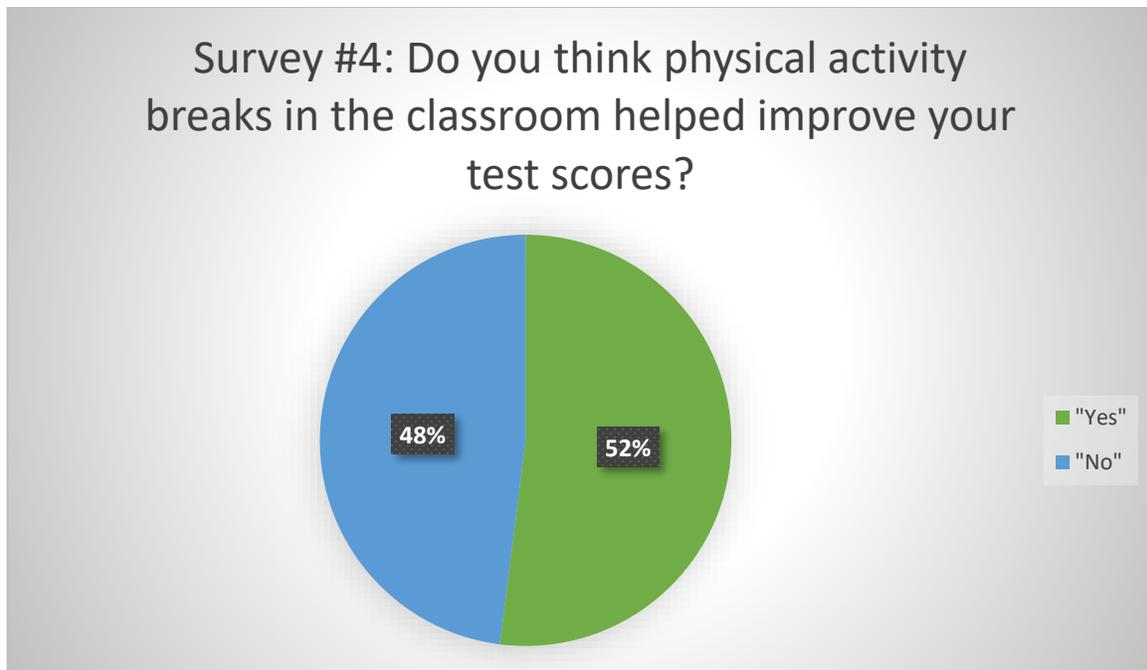


Figure 5. Percentage of students who feel physical activity breaks help achievement.

The data from the surveys provides evidence that students appreciated the physical activity breaks. Figures 2, 3, 4, show that over 80-percent of the students enjoyed physical activity breaks, felt that they helped their engagement, and would like to have the breaks in other classes. When asked about whether or not the breaks impacted test performance, 52-percent said yes.

Discussion

Summary of Major Findings

The results of the study indicate that physical activity breaks helped reduce off-task behaviors in the classroom. As noted in figure 1, baseline data was collected over the course of two weeks and the average daily off-task behaviors was 32. The students were spending the whole hour immersed in instruction and group work. There were no opportunities for breaks during this time. As the results show, multiple students were averaging more than six negative behaviors during a class period but there were also many students who were consistently on task. During the four weeks of physical activity implementation, the average number of off-task classroom behaviors each day was lowered to 14. Students who were struggling with negative behaviors were able to stay more engaged during the lessons once physical activity breaks were implemented. Many students showed no change in behavior during the course of the trial. These students were able to stay engaged before and during physical activity break interventions. One student showed a negative response to the physical activity breaks as their average daily off task behaviors went from two to four times per class period. Overall, the researcher felt that the data gathered helped develop a better understanding of how physical activity breaks can have a positive impact on student behavior by creating a more engaging classroom. The implementation of physical activity breaks in the health class promoted a more engaged classroom with a reduced frequency of off-task behaviors.

The data that was collected from the common summative assessments in order to answer the question of how physical activity impacts student academic achievement was not quite as obvious. During the six weeks of physical activity intervention the students took a series of assessments. Figure 2 illustrates how the intervention group scores compared to the control

group. The data shows that students in the intervention group had a lower-class average on the health triangle assessment but started to perform better the following weeks. The intervention group had a higher-class average on both the goal setting and communication assessments. The researcher notes that students were beginning to develop more of a routine with physical activity breaks during the course of the six-week trial, which could possibly be linked to improvement that occurred later in the trimester.

More qualitative data was collected through the use of a class survey. This survey was used to determine how the physical break intervention impacted the dependent variables of student achievement and student behavior. Over 80-percent of the students said that they felt the activity breaks increased their engagement by reducing off-task behaviors. Just over 50-percent of the students believed the breaks impacted their test scores and improved their achievement. Overall, the students had a positive experience during the implementation of physical activity breaks in the classroom, and a high percentage of them would like to have similar breaks in other classes.

Limitations of the Study

During the implementation of the study, there were a few different limitations that became evident. One limitation included the consistency of the class. The school the study took place in was on a two-day digital calendar which meant that students attended health class every other day. Having this type of schedule reduced the number of contact days and made it harder to create fluidity. Also, during the first two weeks of implementation, students missed class due to a field trip one day and a fundraiser the next. Students did not attend health class at all for one week which may have impacted the results. Along with the inconsistency of schedule early on,

the research was limited to only two classes from the same school. This small sample size was limited and further research among other schools in different parts of the state is encouraged.

Another limitation in the study was proper footwear of the students. Multiple students did not have tennis shoes some of the days during the course of the physical activity implementation. This limited the participation of the students, as they had to sit out during the breaks which included moderate to vigorous physical activities. These same students also had a harder time staying engaged with the lessons and demonstrating proper behavior in class.

Limitations to demographics may have also played a role in this study. Seeing as the majority of the students were Caucasian, this leaves the question of how physical activity breaks may impact students of other ethnicities. Also, all of the students were between the ages of eleven and twelve, which limited the understanding of how physical activity may impact students at different maturity levels.

Lastly, the measurement instruments and tools used to gather the data do not have published research to back up their validity or reliability. Even though multiple schools in the same district are using the assessments, one might question the accuracy on how well they help determine the proficiency of student achievement.

Further Study

In the future, the researcher hopes to expand on the study and further research in a few different ways. Utilizing different grade levels and content areas will help increase the scope of the study which will allow for more data to be collected. Students who are in various grade levels may be impacted by physical activity in different ways than previous observation. Also, the specific subject areas and content learned may play a role in the results of future studies. Getting other teachers on board to conduct a similar study in their classes would be ideal for furthering

the research. The researcher also suggests that a similar study be conducted at a different middle school in the district that has a wide range of demographics. Ethnicity and socioeconomic status are two variables that could impact the study results. Conducting further research may help gather more important data that can shed light on how physical activity breaks impact student achievement and behavior.

Conclusion

The findings of this study suggest that physical activity may have a positive impact on both student achievement and behavior. Analysis of the individual class results indicate that allowing between five and ten minutes of moderate to vigorous physical activity during class time can help improve student scores on assessments as well as reduce the number of off-task behaviors during instruction. Through the use of a variety of activities including jogging, jumping jacks, squat jumps, tag, etc., the researcher was able to increase the students' heart rate and promote physical fitness. The physical activity breaks that were implemented in the classroom helped create a more engaging environment which improved student achievement, behavior, and well-being. Inferential data determined that the results of the study were statistically significant, and the researcher encourages others to continue to further investigate the relationship physical activity breaks have on student achievement and behaviors.

With the reduction in physical education requirements due to the No Child Left Behind legislation, it is important to note the benefits physical activity has on students. Students are missing out on opportunities to be physically active which can have an impact on brain function, achievement, and behavior. As teachers are researching for new instructional strategies, they should look towards implementing physical activity breaks in the classroom. The research suggests that the benefits of the physical activity may outweigh the loss of instructional time during the breaks. The findings of this study should be used as a springboard for further research. Expanding on the sample size, demographics, content areas, length of study, and collaboration amongst educators, would help increase the validity of the study.

References

- Bershawinger, T., & Brusseau, T. (2013). The Impact of Classroom Activity Breaks on the School-Day Physical Activity of Rural Children. *International Journal of Exercise Science*, 6(2), 134-143. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4882465/>
- Blakemore, S. (2019) Adolescence and mental health. *The Lancet*, 393(10185), 2030-2031
10.1016/S0140-6736(19)31013-X.
- Camahalan, F. M. G., & Ipock, A. R. (2015). Physical activity breaks and student learning: a teacher-research project. *Education*, 135(3), 291-298. Retrieved from: <https://eis.hu.edu.jo/deanshipfiles/pub110165721.pdf#page=27>
- Castelli, D., Centeio, E., Hwang, J., Barcelona, J., Glowacki, E., Calvert, H., & Nicksic, H. (2014) The History of Physical Activity and Academic Performance Research: Informing the Future. *Monographs of the Society for Research in Child Development*, 79(4)119-148.
doi.org/10.1111/mono.12133
- Chaddock-Heyman, L., Hillman, C., Cohen, N., & Kramer, A. (2014). The Importance of Physical Activity and Aerobic Fitness for Cognitive Control and Memory in Children. *The Society for Research in Child Development*, 79(4), 25-50.
doi.org/10.1111/mono.12129
- Coburn, C., Hill, H., & Spillane, J. (2016). Alignment and Accountability in Policy Design and Implementation: The Common Core State Standards and Implementation Research. *Educational Researcher*, 45(4), 243–251. doi.org/10.3102/0013189X16651080
- Davis, C., Tomporowski, P., McDowell, J., Austin, B., Miller, P., Yanasak, N., ... Naglieri, J. (2011). Exercise Improves Executive Function and Achievement and Alters

- Brain Activation in Overweight Children: A Randomized Controlled Trial. *Health Psychol*, 30(1), 91–98. doi.org/10.1037/a0021766
- Donnelly, J., & Lambourne, Kate. (2011) Classroom-based physical activity, cognition, and academic achievement. *Preventive Medicine*, 52(1) s36-s42. doi.org/10.1016/j.ypmed.2011.01.021https://
- Egger F., Conzelmann, A., & Schmidt, M. (2018). Boost your brain, while you're having a break! University of Bern. Retrieved from https://boris.unibe.ch/129494/1/__avdfilesvr.campus.unibe.ch_ub_users_fhofer_Windows_DesktopCitrix_Poster_Egger_asp_2018_neu.pdf
- Erwin, H., Beighle, A., Morgan, C., & Noland, M. (2011). Effect of a Low-Cost, Teacher-Directed Classroom Intervention on Elementary Students' Physical Activity. *Journal of School Health*, 81(8), 455-46. doi.org/10.1111/j.1746-1561.2011.00614.x
- Erwin, H., Fedewa, A., & Ahn, S. (2017). Student academic performance outcomes of a classroom physical activity intervention: A pilot study. *International Electronic Journal of Elementary Education*, 9(3), 473-487. Retrieved from <https://www.iejee.com/index.php/IEJEE/article/view/191>
- Faigenbaum, A., & Myer, G. (2012). Exercise Deficit Disorder in Youth: Play Now or Pay Later. *Current Sports Medicine Reports*, 11(4), 196-200 doi: 10.1249/JSR.0b013e31825da961
- Holt, A., Smedegaard, S., Pawlowski, C. S., Skovgaard, T., & Christiansen, L. B. (2019). Pupils' experiences of autonomy, competence and relatedness in 'Move for Well-being in Schools': A physical activity intervention. *European Physical Education Review*, 25(3), 640–658. doi.org/10.1177/1356336X18758353

- Howie, E., & Pate, R. (2012) Physical activity and academic achievement in children: A historical perspective. *Journal of Sport and Health Science*, 1(3), 160-169.
doi.org/10.1016/j.jshs.2012.09.003
- Howie, K., Beets, M., & Pate, R. (2014). Acute classroom exercise breaks improve on-task behavior in 4th and 5th grade students: A dose-response. *Mental Health and Physical Activity*, 7(2), 65-71. doi.org/10.1016/j.mhpa.2014.05.002
- Hraste, M., De Giorgio, A., Jelaska, P.M., Padulo, J., & Granić, I. (2018) When mathematics meets physical activity in the school-aged child: The effect of an integrated motor and cognitive approach to learning geometry. *PLoS ONE*, 13(8), 1-14.
doi.org/10.1371/journal.pone.0196024
- Ladd, H. (2017). No Child Left Behind: A Deeply Flawed Federal Policy. *Journal of Policy Analysis and Management*, 36(2), 461-469. doi.org/10.1002/pam.21978
- Ma, J., Le Mare, L., & Gurd, B. (2014). Classroom-based high-intensity interval activity improves off-task behavior in primary school students. *Applied Physiology, Nutrition, and Metabolism*, (39), 1332-1337. doi.org/10.1139/apnm-2014-0125
- Minnesota Department of Education. (2018). Minnesota Report Card. Retrieved from https://rc.education.state.mn.us/#demographics/orgId--10011195000__p--5
- Schmidt, M., Benzing, V., & Kamer, M. (2016). Classroom-Based Physical Activity Breaks and Children's Attention: Cognitive Engagement Works! *Frontiers in Psychology*, 7(1474).
doi.org/10.3389/fpsyg.2016.01474
- Snelling, A. M., Belson, S. I., Watts, E., George, S., Van Dyke, H., Malloy, E., & Kalicki, M. (2015). Translating school health research to policy. School outcomes related to the health environment and changes in mathematics achievement. *Appetite*, 93, 91-95.
doi.org/10.1016/j.appet.2015.06.001

Thomas, A.G., Dennis, A., Bandettini, P.A., & Johansen-Berg, H. (2012). The effects of aerobic activity on brain structure. *Frontiers in psychology*, 3(86), 1-9.

doi:10.3389/fpsyg.2012.00086

Watson, A., Timperio, A., Brown, H., Keren, & Hesketh, K. D. (2017, August 25). Effect of classroom-based physical activity interventions on academic and physical activity outcomes: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 114. doi.org/10.1186/s12966-017-0569-9