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Incorporating Physical Activity Breaks Before Math Improves Students Overall On-Task Behavior

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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 will focus on incorporating physical activity before math into a Kindergarten classroom, to help improve on-task behavior. The study was conducted over a four-week period in one Kindergarten classroom. Data was collected to determine if physical activity or brain breaks help improve students' on-task behavior during the math mini-lesson. Two weeks consisted of the students not receiving the brain break/physical activity intervention and the next two weeks consisted of implementing the brain break/physical activity intervention. After the four-week trial, students showed increased on-task behavior after completing the brain break/physical activity. The conclusion stated that when the intervention was completed before the math mini-lesson, the students were able to demonstrate more on-task behaviors and less off-task behaviors.

Keywords: physical activity, brain breaks, obesity, early childhood, movement

Does the Incorporation of Physical Activity Improve On-Task Behavior?

Physical activity is one of the biggest things that children need to let off steam and to stay focused in their learning (Kriska et al., 2020). Physical activity is important to all individuals, especially students. By participating in physical activity, children can improve their cardio, they are able to help improve muscle strength, maintain a healthy weight, provide for reduced anxiety and depression, and help with different health conditions (Kriska et al., 2020).

Physical activity is needed each and every day in young children's lives. Since children spend the majority of their day at school, the school environment is an appropriate setting in which to incorporate brain breaks, short physical activity breaks from the classroom curriculum, and provides a good setting for children to be physically active (Mahar et al., 2006). By implementing physical activity into every aspect of learning, the students can stay focused and on task. Without an outlet to release energy and re-charge for the next lesson, students are having a difficult time focusing in the classroom (Jarrett et al., 1998). By allowing for students to have built in movement breaks, the students will increase their likelihood to have appropriate on-task behavior (Wong et al., 2014). Wong also states how important it is to continue to provide those movement breaks throughout the day to help promote these appropriate on-task behaviors (2014).

Physical activity breaks have been used in classrooms for many years, but they are normally done during random times. By focusing on when to place the physical activity breaks, will allow for students to stay on task for longer periods of time. By doing this, their academic performances may improve and also their ability to stay focused on the lesson the teacher is teaching (Mullender-Wijnsma et al., 2015).

Because of these statistics, it is prevalent that we look to track the impacts of physical activity on the ability for students to stay on task. Physical activity is a key factor in assisting obesity rates, academic achievements, and overall fitness. Therefore, the study will focus on one main question:

Does the incorporation of physical activity before math improve students on task behavior?

By exploring this question, the Kindergarten team will be able to determine the importance of providing opportunities for physical activity in the classroom each and every day. The Kindergarten team will analyze the data, and consider implementing physical activity breaks before each of their mini-lessons. The research cannot be generalized for all Kindergarten students, but the baseline analysis.

Literature Review

Obesity is one of the leading health issues facing this world (World Health Organization [WHO], 2014). Schools have been identified as a place that staff members, teachers, and classmates can help promote healthy eating habits, physical activity, and overall health (Benes et al., 2016). Students are not meeting the 60/min of exercise a day requirement and that is where schools can play a role (Gallè et al., 2020). This literature review examines why exercise and movement is important in young children. By recognizing this, teachers are also tested to see how they can help incorporate exercise/activity breaks more into their everyday instruction. Additionally, it illustrates how movement can be incorporated into the classroom to help promote learning.

The Development and Importance of Physical Activity

A major reason behind the child obesity rates is the lack of physical activity and movement in young children's lives (Kriska et al., 2020). Schools have been noted as a prime place to help combat this problem and to help promote physical activity. Teachers are also huge stakeholders in helping provide ample opportunities for students to have an increase in physical activity (Benes et al., 2016).

Through ample amount of research, the development and importance of physical activity has been studied. By looking into these studies, research has found that providing physical activity in the classroom will help promote students' positive perceptions of completing physical activities. This has been shown in the classroom through various ways. Popeska et al. (2018), explored the effects of Brain Break activities on the interest and motivation for physical activity amongst school-aged-children. This study showed that with the incorporation of physical activity breaks, students were able to have a better outlook on completing physical activities. This will

allow students to truly understand how important physical activity can be. They did this study through the online tool of GoNoodle. Like Popeska et al. (2018), Galle et al. (2020), also completed a study that focused on GoNoodle activity breaks. This study showed how important it is to get students involved in their own learning, and participate in these fun and engaging GoNoodle activities. By allowing these students to introduce GoNoodle, the students are able to carry this tool with them at home.

Along with Popeska et al. (2018) and Galle et al. (2020), Drummy et al., (2016), completed research that touched on the effects of a classroom activity break on physical activity levels and adiposity in primary school children. As shown through the other two studies, Drummy et al. (2020), showed that through physical activity breaks, students were more likely to be engaged and ready to learn after their movement exercises. This was implemented in the classroom and showed how students were eager and ready to learn after these activity breaks.

Lastly, Goh et al. (2014) conducted a research study that focused on a set intervention program. The students were able to participate in this study to get information on how much physical activity they complete throughout the entire day. The teachers were able to promote physical activity and gather data on how much each student completed. Like the other studies, they were focused on getting students moving and active through breaks.

These studies focused on how classroom activity breaks can be incorporated into the classroom. They all were able to conclude that with the right motivation and technology tools, the classroom teachers were able to incorporate physical activity into the classroom which allowed the individuals to become more physically active throughout the school day.

Physical Activity Breaks Influence on Obesity

Physical activity breaks are a key point in allowing students to stay active throughout the school days (Benes et al., 2016). By allowing students to stay active, the obesity rates may see a decrease if all individual classrooms allow for physical activity breaks. The reasoning behind these studies is supported by the child obesity rates because there is a lack of physical activity and movement in young children's lives (CDC, 2012).

Physical activity and obesity can have a big impact on our youth. Hood et al., (2014) conducted research that focused on physical activity breaks and how facilities help decrease the overall obesity rate in the United States. The study was able to show how with the help and assistance of administration and teachers, students were able to get exercise throughout the school day. The reasoning behind this study is supported by the child obesity rates is the lack of physical activity and movement in young children's lives (CDC, 2012). With the physical activity breaks, it is shown that this has helped students' ability to stay active even throughout the school days (Benes et al., 2016).

Improving Academic Performance by Physical Activity

Mullender-Wijnsma et al., (2015), were also able to conduct a 1-year study in Northern Netherlands. The study focused on improving academic performance of school-age children by physical activity in the classroom. The intervention group completed a physical active academic lesson and the control group had a normal lesson. The students were pretested and post-tested in both math and reading. The findings were shown that the physical active lessons helped contribute to the success of the students' academic performances in the experimental group. The researcher stated that more research should be done on a broader range of subjects.

Brain Breaks with Diabetic Individuals

Brain breaks can have an influential part in keeping individuals with diabetes physically active. Hidrus et al. (2020), conducted a study that involved diabetic individuals in Malasia. Over the course of four months, the participants in the experimental group participated in daily physical activity brain breaks for 10 minutes. Every participant completed a questionnaire that asked questions regarding their awareness and abilities to complete physical activity.

Through this research, Hidrus et al. (2020), demonstrates that Brain Break Videos can be an effective intervention to help motivate type 2 diabetic individuals. The researcher stated that the involvement of more hospitals and more individuals would be beneficial to help with the sampling and overall conclusion of the study (Hirdus et al., 2020).

Effects on Attitudes Towards Physical Activity

By looking at the individual's attitudes towards physical activity, researchers are able to get a grasp on what physical activities individuals would like to complete (Zhou et al., 2021). By seeing and researching their attitudes, researchers can understand how the youth's attitudes reflect on the amount of physical activity they do.

Many different studies were able to be completed to understand how the effects on attitudes towards physical activity played a role in how much a child could be physically active. Zhou et al. (2021) implemented Brain Breaks in the classroom to understand its effects on attitudes towards physical activity in a Chinese school setting. The research showed that incorporating physical activity into everyday instruction allowed them to have a better understanding of how to be physically active.

Zhou et al. (2021), and Hajar et al. (2019), research linked together because they both focused on the attitudes towards physical activity. Hajar et al. (2019), conducted research on the effects of brain breaks on school children in Malaysia. Like Zhou et al. (2021), the conclusion of the study was that the brain breaks helped influence these participants' perceptions and motives of physical activity. These studies showed how important it is to keep students active and do it in a fun and meaningful way.

Along with the other research, Bonnema et al. (2020) conducted a research that also focused on implementing a physical activity program. The researchers were looking to see the changes of students' attitudes towards physical activities and fitness. The research concluded that students' awareness and attitudes towards physical activity changed as they were introduced and completed more physical activities.

By looking at the individual's attitudes towards physical activity, researchers were able to get a grasp on how individuals like completing physical activities (Zhou et al., 2021). According to Zhou et al. (2021) and Hajar et al. (2019), the researchers were able to conclude that the individuals will participate in high amounts if they have a positive attitude towards physical activity and low physical activity if they have negative attitudes towards physical activity.

Teachers Implementation of Classroom Activity Breaks

Teachers are able to influence the lives of many children each and every day (Delk et al., 2014). Through multiple studies, teachers are able to show and demonstrate how important physical activity is to children (Abi et al., 2019). By understanding that physical activity plays a huge role in students lives, teachers can understand how important it is to implement this into their daily routines.

McMullen et al. (2014) conducted a study that focused on the teachers' perceptions of using activity breaks in the classroom. The findings stated that there are distinct characteristics on which activity breaks teachers like to complete based on content, classroom management, and enjoyment. This shows that teachers are less likely to complete activity breaks that provide chaos, aren't connected to content, and that don't fit in their classroom management style.

Like McMullen et al. (2014) and Benes et al. (2016), conducted a story on teachers' perceptions of using movement in the classroom. The conclusion of the research is that there is a lack of using movement in the classroom even though the desire is there. This was also shown through McMullen et al.'s research. By having convenient ways for teachers to incorporate physical activity is key in allowing them to be successful.

By allowing teachers to understand how to incorporate physical activity and different ways for them to implement it will truly help them apply their knowledge each and every day. Abi et al. (2019) completed a research study that focused on Teacher-Level Factors with implementation of classroom-based physical activity breaks. The findings of the study stated that classroom based physical activity tools supported by training helped benefit the teachers' understanding and increased the chances of them implementing them into their everyday classroom. This toolkit would allow all teachers in McMullen et al. (2014), and Benes et al. (2016), to be able to get a better understanding of different ways to incorporate physical activity in the classroom.

Lastly, Delk et al. (2014) completed a study that focused on if the increase of physical activity breaks in the classroom helps overall academic success. The teachers were able to implement a program with assistance into their classrooms. There were three levels of training

that the schools were able to do: basic (normal training), basic plus (monthly visits from facilitator), and Basic Plus SM (monthly visits from facilitator and social marketing that promoted physical activity and water consumption).The findings were that over half of the teachers at the middle schools implemented the CATCH program because of how convenient and easy it was to use like the toolkit in Abi et al.'s study.

Teachers are able to influence the lives of many children each and every day (Delk et al., 2014). By allowing the teachers to incorporate physical activity into the classroom, they are allowing each and every student a chance to live a healthier life (Abi et al., 2019).

Students Response to Activity Breaks

Students' responses to activity breaks are the foundation of figuring out how to help promote physical activity in the classrooms (Erwin et al., 2021). According to research, students that participate in activity breaks are more likely to be happier and more active participants in the classroom (Erwin et al., 2021).

Erwin et al. (2021) completed research that touched on student responses to the walking classroom education program. Through this study, the researcher was able to identify that allowing students to have activity breaks, will in return allow students to be happier, healthier, and smarter. Overall, students should have activity breaks in the classroom and continue to live active lives (Erwin et al., 2021).

Activity Breaks in Early Childhood Settings

Early Childhood settings are a great resource to help build the foundation for a child's education. This is also a platform that can allow for individuals to start promoting physical education. Early Childhood activity breaks allow for individuals to get socialization skills and coordination skills (Omidire et al., 2018).

Omidire et al. (2018), conducted a study that involved using movement activities to help promote mathematics and language to preschoolers. The results of the research showed that when movement activities occurred, the preschool students were able to contribute positively to the math and language concepts. This provided a positive experience for physical activity breaks. They also helped the preschoolers build social and cognitive development. The research also found that when the preschoolers were participating in the movement activities, they were able to listen, see, and do mathematical and reading concepts. The data also showed that after the movement activities, the students all achieved and completed the worksheets. Some of the students completed the worksheets with difficulty, but they were only pertaining to handwriting and letter formation. This shows how the movement activity allowed the brain to get active and have the students prepare for doing their best on the worksheet that was assigned.

When considering the research behind movement in the classroom, all of the research has shown improvement, that childhood obesity is a major problem, and increased negative behavior has been linked to it (Potera, 2017). By helping students get active and stay away from those sedentary activities such as sitting, and lying down, schools can help promote physical activity. Alhassan et al. (2016) conducted research that focused their study on the effects of short activity breaks to help increase preschool-aged children's physical activity levels. The findings of the study stated that short Activity Breaks and physical activity can be implemented in the preschool classroom setting, but more research is needed to be done on preschoolers and the effects of physical activity.

Research has now shown how preschoolers are impacted by physical activity breaks. Like Potera (2017) and Alhassan et al. (2016), Wadsworth et al. (2012) conducted study on preschool students that allowed for planned physical activity breaks throughout the school

day.The findings of the study showed that the planned physical activity breaks helped students engage more in movement exercises and helped get their bodies moving more. The researcher stated that this was a very small number of preschoolers and would need to be tested on many more childcare centers to get better findings.

Segura-Martinez et al. (2020) and Arnaiz et al. (2017) conducted students that implemented programs that implemented physical activity in the early childhood setting. They were eager to get this study completed because they knew how important it was to promote physical activity in our youth. Overall, they both found out that ECE classrooms should increase the amount of physical activity each day. The researchers identified that other ECE classrooms should be monitored and have them modify their environments and to get more data.

Through research, it can be concluded that with physical activity comes benefits. The students are able to benefit from physical activity in the classroom to help promote a positive outlook on physical activity. By allowing and promoting teachers to implement physical activity in the classroom, individuals are helping build healthier and more active students Abi et al. (2019).

Methods

Participants

This action research study was completed in one Kindergarten classroom. All students observed in this research project were 5 and 6 years old. Nine students were male and six students were female. All students were caucasian. Four students received free and reduced lunches. The students spent their time in the classroom with the teacher (full time) and a paraprofessional (3 hours a day). The time frame in which this research took place was about a half an hour each school day.

Data Collection

The researcher focused their research on a quantitative method approach to their data collection. Because this action research study can have impacts on the future Kindergarten curriculum, a robust amount of information will need to be collected.

The “On Task Observation Chart” was measured for quantitative data collection on the dependent variable of students on task behavior. This will be addressing the research question: “Does incorporation of physical activity before math improve students on task behavior?” The “On Task Observation Chart” was created by the researcher, so there is no data on if it is reliable or valid. The “On Task Observation Chart” (see appendix a) consists of all of the researchers' students labeled as student 1, student 2, ect. The chart also allows for the paraprofessional to tally how many times the individual student was off task or doing that specific off-task behavior. For example, student 6 had his eyes off of the teacher, the paraprofessional would put one tally in that box to state they were off-task. The data collection process will take place for two weeks (pre-assessment) that will have no intervention implemented and then for two weeks with the interventional (physical activity) implemented.

To protect anonymity of the participants, all data that will be collected will be stored in a secure place and remain confidential.

Description

The research question that this project was focused around was: Does the incorporation of physical activity before math improve students on task behavior? All participants were involved in the same research design with no control group. This allowed the research to be a one-group pretest-posttest design. The independent variable in this research project is the movement activity that was incorporated before each math lesson for 2 weeks. No data collection was needed for the independent variable. The dependent variable for the research question was a student's ability to stay on task. The qualitative data that was collected is the observations that are completed by the researcher and the paraprofessional. The quantitative data that was collected is the on task (see appendix a) observation chart. The students were observed throughout the mini-lesson

Discussion

This action research study had human participants participating, but no interviews or confidential information will be shared. Because of this, the IRB approved this action research project. The study posed a limited risk to all participants, the research was conducted within a public school, and did not involve data from secondary sources. The National Research Act of 1974 was equipped to protect the privacy of students' records (Mills, 2018).

Because the researcher completed this study in their own classroom, a potential bias did occur. One potential bias will be sampling bias. Since this study was completed on fourteen Kindergarten students, it was not based on all Kindergarten students. When completing research, small studies based on their findings don't accurately describe a larger population (Kiger, 2020).

Another potential limitation that was looked at was that the paraprofessional was able to complete the on task behavior observations. This allowed the research to focus on teaching the mini lesson to their students and allowing an outside individual to come in and observe the students on-task behavior

Findings

Data Analysis

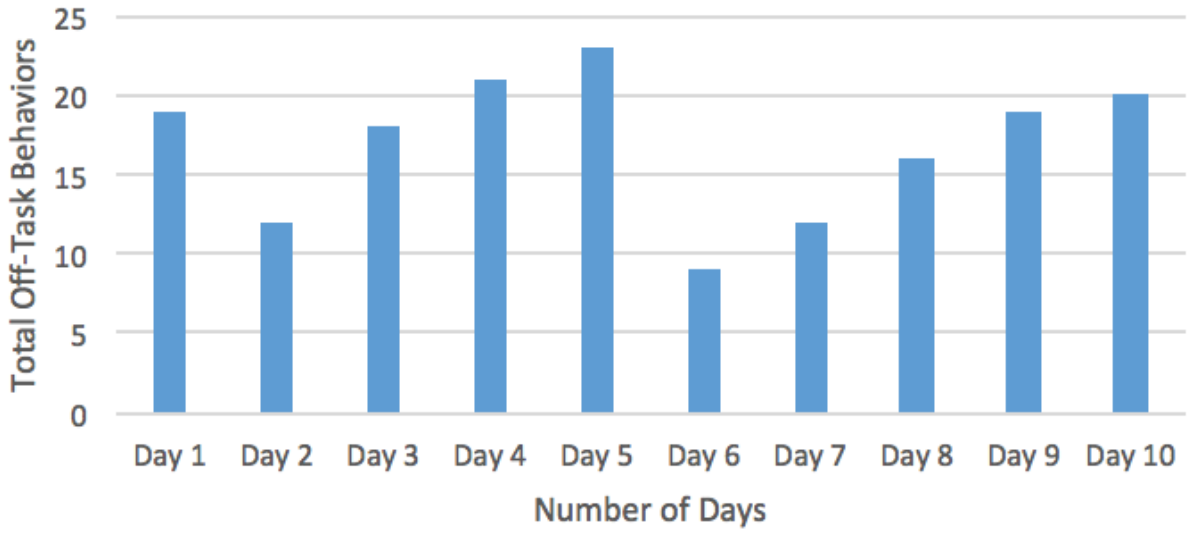
The data collected was represented in the form of tallies. The researcher marked with tallies any occurrences of off-task behavior during the math mini-lesson each day for four weeks. The first two weeks were considered the control/baseline weeks. The third and fourth weeks were considered the intervention weeks. Behaviors that are indicators for off-task behaviors include: not sitting crisscross applesauce, eyes are not on the teachers, and hands are not in the lap. Behaviors were totaled at the end of each week. Values of off-task behaviors were completed by averaging the daily off-task behaviors that was recorded during and after the implementation of physical activity breaks. The baseline data was gathered for two weeks and intervention data was collected for 4 weeks.

Analysis of Baseline Data

The baseline data for the daily average of off-task behaviors before implementing physical activity breaks was 16.9. The data that was collected was based on the mean of off-task behavior each day (see table 3). The averages ranged from 23 to 9. Each day, the data was collected, reviewed, and analyzed. By providing this baseline data, the researcher was able to look at this data and compare it to the intervention data that was collected.

Figure 1

Total Off Task Behaviors

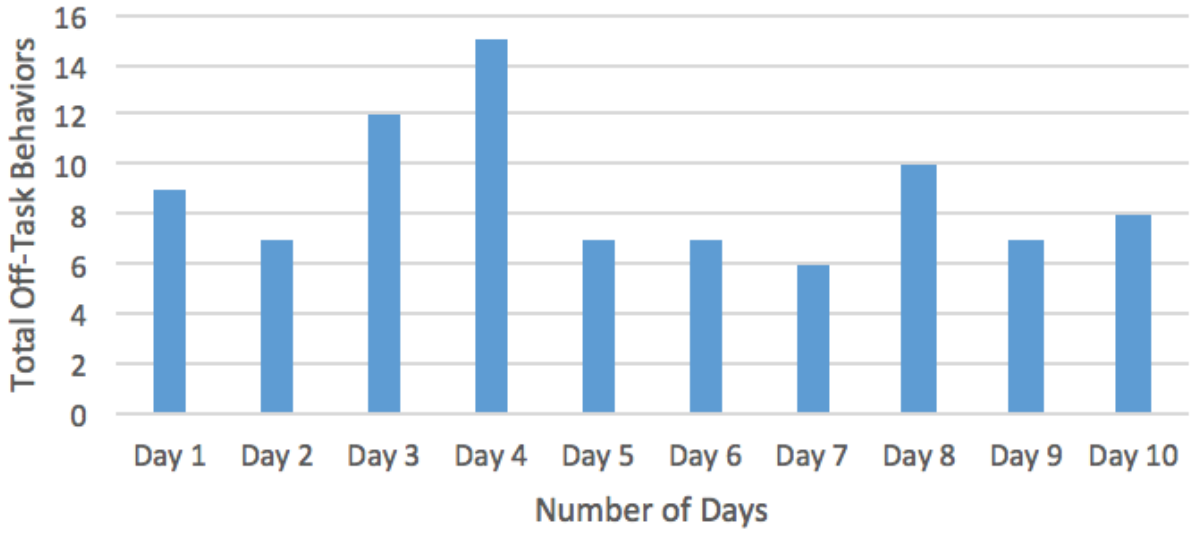


Analysis of Intervention Data

The baseline data for the daily average of off-task behaviors before implementing physical activity breaks was 8.8. The data that was collected was based on the mean of off-task behavior each day. The averages ranged from 6 to 15. Each day, the data was collected, reviewed, and analyzed. By providing this intervention data, the researcher was able to look at this data and compare it to the baseline data that was collected.

Figure 2

Intervention Means by Days



A dependent sample *t*-test was conducted to determine whether there was a significant change in students' on-task abilities following the intervention of implementing brain breaks before the students' math mini-lesson. A baseline observation for two weeks was conducted and showed that students' off-task behaviors ranged from 23 times in one class period to 9 (M = 16.90 SD = 4.53). Students then participated in a two-week intervention where they engaged in a five-minute brain break activity before their math mini-lesson. It was then shown that their average daily off-task behaviors went down (M = 8.80, SD = 2.82) Results of the dependent samples two-tailed t-test reveal a significant difference between the baseline and final assessment, $t(9) = 6.05$, $p < .001$. The intervention of implementing brain breaks allowed for the students to decrease their off-task behaviors.

This data supported the hypothesis of the study that physical activity would improve on task behaviors.

Discussion

Summary of Major Findings

The results of the study indicate that physical activity breaks help reduce students off-task behaviors in the classroom. As shown in table 1, baseline data was collected for two weeks and the average daily off-task behavior showed a significant amount of off-task behaviors.. The students were not allowed any breaks during the 15-minute math mini-lesson. As the results show, on average, students were showing a greater amount of off-task behaviors during this baseline data collection period. During the 2-weeks that the intervention was implemented, the average off-task behaviors were reduced. Students who had been dealing with off-task behaviors during the baseline data weeks, were shown to have significantly reduced their off-task behaviors because of implementation of the physical activity break.

Overall, the researcher found that the data that was collected helped develop a better understanding of how physical activity breaks can positively impact students' behaviors. The researcher found that this provided a more engaging time for all students and helped promote student excitement and engagement throughout their lessons.

Potential Limitations

Because all participants will be Kindergarten students, the findings could be altered, because of their attention spans (Pellissier, 2016). Because of this limitation, participants could naturally lose focus on the task at hand or during the interview process. To reduce the limitations posed by the Kindergarteners attention spans, further studies would need to be conducted. These studies could be with different age groups, or by completing the research with multiple groups of Kindergarten students to get a baseline of knowledge.

Because all participants are white and live in a rural community, findings could be altered because of the lack of diversity within the group. To reduce the limitations posed by the lack of the diverse participants, further studies would need to be conducted in order to get a more diverse group of participants to see all ranges/backgrounds and how they react to the action research project.

Because all participants are humans, they are flawed by their emotions, presence, and physical ability. This limitation could not be altered and would happen if the study were to be completed again. All human emotions are subject to change and on the day of the research/interviews the students could have been feeling a certain way that altered their responses. All the participants can not predict their ability to be in person or from a distance. This limitation can not be changed due to COVID-19 and also sicknesses. Lastly, all participants have a different range of physical ability. This may alter how they feel about physical activity.

The number of participants will be a threat to both internal and external validity. Because the group of participants is not a sample of a larger group, findings could be generalized and not a representation of all Kindergarten students. A study that was based on all Kindergarten students in the state of Minnesota would provide for external validity.

Because the study will only take place for one portion of the semester, the results are confined to that time frame. For future studies, the time frame could be adjusted to a year long study. This would allow for the researcher to complete different interviews/ observations to allow for more information to be conducted.

Further Study

There are many areas of future research recommended in relation to physical activity breaks in the classroom. This study focused on the impact of physical activity breaks before the students' math mini lesson and how it corresponds with students abilities to stay on task. Further research could explore how physical activity breaks impact students' academics. The study could focus on the students' test scores after a physical activity break or how they perform on common formative assessments. By doing this, the study should be conducted with upper elementary students. By doing this, their achievements could be monitored more closely as they have a better range of abilities and precise grading opportunities.

One more important factor to consider when implementing future studies on physical activity breaks is that the physical activity breaks aren't the exact same for each break. By looking at this factor, some physical activity breaks may have been better suited for the students than a different type of physical activity breaks.

This research study was limited by its daily schedule. In future research, it is recommended that the research be conducted after each mini lesson. This could allow for a more concise overall compilation of information between different times of the day and different learning opportunities.

Lastly, for future research on different learning disabilities, physical movement abilities and how students react to different physical activity breaks More research should be conducted to examine diversity within the classroom.

Conclusion

Without an outlet to release energy and re-charge for the next lesson, students are having a difficult time focusing in the classroom (Jarrett et al., 1998). The importance of students' on-task behavior is prevalent in allowing them to achieve and learn new things. Through movement breaks, students can get their bodies moving and then settling down to learn something new. Studies have consistently demonstrated that physical activity is associated with improved cognitive skills, academic achievement and academic behavior (GoNoodle, 2012; Hollar et al., 2010). By implementing physical activity into every aspect of learning, the students can stay focused and on task.

Through this research, the researcher was able to determine that implementing physical activity breaks before the math mini-lesson allowed for students to demonstrate positive on-task behaviors. Overall, the researcher believes to get more accurate and conclusive data, the study would need to be completed on a wider range of individuals.

This study informs future teaching and future research by expanding the study for a longer period of time, recognizing the limitations, looking into the academic benefits of physical activity breaks, and recognizing the different forms of diversity that could play a role. With time and the ability for future studies, research will be able to tell if there is a significant difference in the way students react or stay on task based on the type of physical activity that was completed.

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APPENDIX A

Date_____

Day of the Week_____ Para Completing Observation_____

(Data will be collected within the math mini-lesson; approximately 10 minutes)

The Paraprofessional will tally if the students are off task and not doing the following expectations.

Students	"Eyes on Me"	Criss-Cross Applesauce	Hands in Lap	Bodies Facing Teacher	Observation/ Notes
Student 1					
Student 2					
Student 3					
Student 4					
Student 5					
Student 6					
Student 7					
Student 8					
Student 9					
Student 10					
Student 11					
Student 12					
Student 13					
Student 14					

Comments: