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Brain Breaks Improve Student Behavior and Focus

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Abstract

The purpose of this action research project was to determine the impact of brain breaks, or physical activity breaks, when implemented as a transition to learning centers in the preschool classroom. Learning centers consist of small group time, one-on-one time with the teacher, and whole group time where important preschool state standards are taught. The study was conducted over five weeks in two preschool classrooms. One classroom was designated as the control group, and the other classroom as the treatment group. Data was collected to determine if brain breaks had an impact on student focus and behavior. After five weeks of intervention, students in the treatment group displayed a decrease in instances of off-task behavior. It was concluded that brain breaks do improve student focus and behavior. The study found that as the research went on and brain breaks became a normal part of the routine for the students in the treatment group, they engaged in more on-task behaviors and less off-task behaviors.

Do Brain Breaks Improve Student Behavior and Focus?

"Preschool-aged children spend significant portions of their day engaged in sedentary behaviours" (Hinkley et al., 2010, p. 66). Sedentary behaviors like watching TV, reading, using computers, sitting at a table or desk, and instruction in school are behaviors with little movement that often require a great deal of focus. Physical breaks, or "brain breaks," that take a few moments away from instruction can potentially allow students to get their wiggles out and focus more on learning centers where focus and behavior are important. While more research needs to be done to specifically focus on the influences of sedentary and active behaviors, current research shows that movement is beneficial to improved cognition and focus, relaying that short activity breaks help improve student behavior and ability to stay on task and focused (Howie et al., 2014).

The idea of brain breaks has been around for years, but now teachers are starting to see benefits of incorporating brain breaks for long-term classroom use. These brain breaks provide schools with another opportunity to increase physical activity without extending the school day and help enhance cognitive outcomes (Eggers et al., 2019). The goal of a brain break is to help students transition from one learning activity or lesson to another. While some teachers love them, there are others who say they can have a longer refocus time and may not be desirable to use (Weslake et al., 2015). Until more studies show the wide-range of benefits of incorporating brain breaks into academics, there may still be skeptics.

This action research project will explore the effects brain breaks have on student behavior and focus. One class of students in this study was used as a control group, while the other class, the treatment group, was given an intervention of brain breaks during the transition from "carpet time”--the time where students are expected to sit still while receiving direct instruction and discussion with little-to-no movement to learning centers. The brain breaks used were physical activities that took 10-15 minutes, from sitting still to moving around. Both groups of students were observed, and instances of on and off-task behaviors were recorded for a period of five weeks. Data was analyzed to answer the research question: Do brain breaks improve student behavior and focus?

Literature Review

Brain breaks are brief 10-to-15-minute physical activity breaks that take place during the school day. These brain breaks can be integrated into lessons using movement or be completely separate from anything academic. They can take place in any amount of space, indoor or outdoor. Benefits of brain breaks include, but are not limited to, increase of productivity, increased attention, the ability to learn new social skills, and boosted brain function when academically integrated (Terada, 2018).

Importance of Brain Breaks

Children spend a substantial amount of time in school each day, most of it in sedentary behavior, sitting or staying still listening to instruction. There are limited opportunities for physical activity within the classroom, apart from a physical education course that is its own specific class within the school day. It is crucial that physical activity be incorporated into more of the school day, as it refocuses students (Bedard et al., 2019). In 2012, Mary Helen Immordino-Yang and her colleagues at USC and MIT completed a study that would play a key role in the implementation of brain breaks. Using an MRI scanner, they studied the brain's neural activity at rest in "'default mode'—a state of rest that's usually associated with taking a break or letting the mind wander" (Immordino-Yang et al., 2012). The brain remains active when the body is at rest, but there are different parts of the brain that light up with activity when the person is at rest:

> Recent research shows that brains aren't idle when breaks are taken—they're hard at work processing memories and making sense of experiences. When people wakefully rest in the functional MRI scanner, their minds wander, and they engage a so-called default mode (DM) of neural processing that is relatively suppressed when attention is focused

> on the outside world. Accruing evidence suggests that DM brain systems activated during rest are also important for active, internally focused psychosocial mental processing, for example, when recalling personal memories, imagining the future, and feeling social emotions with moral connotations. Rest is indeed not idleness, nor is it a wasted opportunity for productivity (Immordino-Yang et al., 2012, p.352).

The brain is not resting while at rest, the brain is working hard to create the memories and information needed to recall information just learned.

Movement and On-Task Behavior

A quick break involving physical activity provides immediate benefits that can improve academics and decrease instances of off-task behaviors (Mahar et al., 2006). In a study conducted by Howie et al., (2014) 96 4th and 5th grade students in 5 classroom groups participated in each of four conditions: 10 minutes of sedentary classroom activity and 5, 10, and 20 minutes of physical brain breaks. Looking at the connections between the brain and movement, on-task behavior was observed from videotapes before and after each condition. The post-test time-on-task scores were compared between the treatment and control group. Research found the treatment group participants' time-on-task was significantly higher after 10 minutes of classroom exercise breaks at 87.6%, compared to a sedentary attention control at 77.1%. The 5-, 10-, and 20-minute groups improved on-task behavior following the exercise breaks. There was improvement in the 20 minute groups, although not significantly higher, there was still a positive impact on on-task behaviors and a decrease of off-task behaviors. The 5-minute groups did not make a significant improvement in on-task behavior, but on-task behaviors still increased slightly.

Implementing physical activity breaks in the classroom can improve student behavior and improve time on-task (Carlson et al., 2015; Mahar et al,, 2006; Orlowski et al., 2013). In a 2013-2014 research study in California, six different elementary school districts implemented brain breaks that comprised physical activity separated from academics (Carlson et al., 2015). They researched, by accelerometer measurement, 1322 students' moderate-to-vigorous physical activity (MVPA) during school. They collected 397 teachers' reports, from 24 schools, detailing implementation of brain breaks and student behavior in the classroom. Research showed a positive correlation in the number of minutes dedicated to brain breaks with students' MVPA. Research showed that students in classrooms with implemented brain breaks "were more likely to obtain 30 minutes per day of MVPA during school" (Carlson et al., 2015 p. 69). Implementation had a negative association with lack of effort and being off-task in the classroom.

Elementary school children sit for prolonged periods of academic instruction on a daily basis. These children often become more fidgety or restless, which can create more distracting behavior and can increase instances of off-task behavior (Goh et al., 2016). During a 2016 study conducted by Goh et al. (2016), researchers collected baseline data on on-task behavior for four weeks prior to the intervention. The next eight-week period was used to implement the Take10! classroom-based physical curriculum to determine the effects on student physical activity. All students in the study received the same interventions. Four teachers implemented this program into math lessons, four teachers implemented this program into their language arts lessons, and one teacher implemented Take10! into her social studies lessons. Each teacher integrated 1 Take10! activity per day. Results showed that there was a significant increase in on-task behavior from pre-intervention to post-intervention with Take10!, with a level of significance at $p < .001$. The increase of on-task behavior increased approximately 6% from pre-intervention to post-intervention. “Practically, within a 30-minute lesson, students’ on-task behavior decreased by approximately 2 minutes (4 minutes/hour) during baseline, whereas their on-task behavior increased by approximately 2 minutes (4 minutes/hour) during intervention” (Goh et al., 2016 p. 715). This study showed that Take10! would be an effective possible incorporation into classrooms as an intervention to increase on-task behavior with a physical break (Goh et al., 2016). While there are other factors such as behavioral issues and environmental issues specific to certain classrooms that may alter future studies, Take10! may be an asset in the classroom to get students physically active and staying on task.

In a 2015 research study, three types of brain breaks were implemented in a third-grade classroom to study student enjoyment and response time (Weslake, 2015). The response time refers to the time needed for refocusing on academics after the brain breaks. Refocus time for Mathematics was measured by actual time with a timer. Relaxation and breathing brain breaks were implemented to calm students down. Physical brain breaks were implemented to study the refocus time after being highly physical. The third type of brain break intervention was mathematics-related; it was used as an integration with the lesson, not a break entirely removed from academics. The brain breaks went from low, to moderate, to high in activity level. Refocus time was as little as 30 seconds in one brain break activity, the moderate activity level. It took as long as 3 minutes after the high activity brain break for students to refocus. The researcher found that content-related brain breaks with a moderate activity level proved to be the best type of brain break implemented. Student engagement and time taken to refocus the class were determined to be at their best after these specific brain breaks were utilized. The researcher concluded that even though this study does not represent all third graders, just a small group, the brain breaks had a positive use in the classroom. The study also concluded that the type of brain break should be considered to maximize students' full potential. The use of brain breaks with moderate activity proved to be the best option for student engagement in class. The type of brain break should also be considered for refocus time for academic activities and lessons (Weslake, 2015).

Movement and Academic Achievement

Current studies are beginning to prove that movement matters. What has been studied for years is now validated, revealing that there is an impact on education, which creates a connection between academics and movement (Furmanek, 2014). The 2019 National Youth Risk Behavior Survey showed that students who are higher academic achievers are more likely to be engaged in physical activity (Centers for Disease Control, 2019). Those same students are less likely to engage in sedentary behaviors than students who are lower achieving academically. One issue with this survey was that it did not take into account other factors that could affect academic achievement. Sedentary behavior is not proven to cause lower grades, however, the relationship between sedentary behavior and lower grades does exist.

The evidence that physical activity impacts cognitive performance was revealed in a 2019 meta-analysis conducted by Bedard et al. This research examined 25 studies that analyzed the cognitive functions in children when physical activity was implemented during lessons, where restrictions of physical activity existed during the regular school day. Findings suggest "cute aerobic exercise can induce generalized cognitive improvements through increased blood flow and neurochemical responses leading to upregulation of neurotrophins." (Bedard et al., 2019 p.

2) The implementation of physical activity showed that the students' brain centers changed while being associated with academics. Physical activity in association with academics may lead to enhanced brain function in the academic activities or lessons immediately following the physical activity. This study also suggests that with continuous integration of physical activity, the brain can keep increasing in cognitive function, potentially leading to higher test scores. Bedard et al. (2019) concluded that physical activity integrated into classrooms may slightly improve academic achievement in classrooms where students are used to sedentary behaviors and little physical movement. More research is needed on how to effectively integrate physical activity into academics, and the physical activities should be appropriate for the age range being taught (Bedard et al., 2019).

"Movement is a natural tendency in young children, and when movement is linked to teaching practices, a mind and body connection happens that enhances children's learning" (Furmanek, 2014 p. 80). As younger students need to move to learn and discover, teachers can use movement to teach academic concepts by integrating them into the classroom environment through brain breaks (Gehris et al., 2014). Teachers must create a classroom environment conducive to learning, but also incorporating activity. They must have an active classroom environment and plan to integrate opportunities for physical activity (Furmanek, 2014; Goh, 2018; Orlowski et al., 2013).

In 2016, a study was conducted with 165 pre-adolescent children from 9 different classes throughout 6 weeks to investigate whether movement, or gross motor skills, would improve students' math performance if it were integrated into math lessons (Beck et al., 2016). A cluster intervention study was completed and control and treatment groups received 1) conventional math 2) conventional math with fine motor skills incorporated, and 3) conventional math with fine and gross motor skills incorporated. Groups 2 and 3 had an improvement in math performance, with a significantly higher improvement in students who were integrating fine and gross motor skills into their mathematics. Performance on math tests improved in all children in first grade, with an increase of over 75% at completing tasks in the normal performers group and the lower performer group. The mean math score of all groups improved at the end of the study. Gross motor skill performance improvement accounted for approximately 25% of the effects of the intervention implemented on these groups. The major findings of this study demonstrate how physically enriched lessons incorporated into academics can improve mathematical performance (Beck et al., 2016).

The relationship between exercise and cognitive ability is not restricted to children. In 2010, 19 young, pre-screened (for health restrictions) adults were given a series of tasks to determine whether they would perform better cognitively after completing an exercise. Six test blocks were created to assess the immediate effects of exercise on cognitive function. These six blocks were comprised of 40-minute exercise phases followed by a 30-minute recovery period. The two-way ANOVA assessed the immediate effects and revealed a significant relationship between exercise and executive function. The 19 participants had a positive correlation between exercise and cognitive ability (Lambourne et al., 2010).

"Acute bouts of moderate-intensity exercise influenced the performance of a sensory dependent cognitive task. This effect increased throughout the exercise period but disappeared rapidly once exercise was terminated" (Lambourne et al., 2010 p.1401). This study explained that "exercise-induced arousal" will affect the control process in the brain that controls the stimuli. This means that cognition and cognitive processes improve after exercise. More research will need to be completed to study the working memory and its changes after short bouts of physical activity (Lambourne et al., 2010).

Methods and Timing

Incorporating brain breaks does not require specific timing, as brain breaks can take place during transitions, during learning centers, prior to sedentary movement, or after sedentary activities. Routines and activities can be established through movement within a lesson as well as separate from all academic activity. If movement during brain breaks is incorporated into the lesson, the students become familiar with the movement and focus on the content that is being taught (Orlowski, et al., 2013).

After direct observation, children become less attentive as they sit confined to their classrooms (Pellegrini & Davis, 1993; Pellegrini et al., 1995). Most children are in school approximately 8.5 hours per day. Children are more active physically and socially during recess after long periods of confinement as opposed to shorter periods of confinement. This increases with age and gender, as boys have been found to be more physically active both in and out of the classroom at school. Attention and focus have been consistently higher, and students have been more focused and less off-task, after having recess as compared to prior to any physical activity. Replacing classroom sedentary behavior with more movement and recess is crucial to the physical health of students (Pellegrini & Davis, 1993; Pellegrini et al., 1995).

Jarret et al. (1998) conducted research in a southern, urban school district with a strict, no recess policy. Children in the district were allowed no physical breaks from school during the school day. (This district allowed the researchers to implement recess in 2 classes, A and B. Both classes implemented a 15-20 minute recess period for comparison between recess and non-recess days, and both classes saw significant improvements in student outcomes on recess days. Children worked more and were less fidgety on days where recess was implemented. “Without recess, the students were on task 85% of the time and fidgety 16% of the time. With recess, they were on task 90% of the time and fidgety 7% of the time. They did not differ on listless behavior.” (Jarret et al., 1998, p. 124)

In 1995, a study was conducted to examine student attention and focus on classroom tasks before and after recess (Pellegrini et al., 1995). In a series of experiments, either recess timing during the school day was manipulated, or students completed sedentary work prior to recess. The results concluded that in every series of the experiment, children were more attentive after recess than before. Students were also less attentive in the longer time periods before recess than on the days with shorter time periods before recess (Pellegrini et al., 1995).In the series of experiments, experiment 3 took a different approach to manipulating recess by holding it indoors (Pellegrini et al., 1995). The researchers were curious as to the effects of recess on attention if the venue changed and recess were held inside. Researchers stated that the results were replicated from the outdoor recess experiment. Just as in the series of experiments where recess was manipulated but still held, students were more attentive after returning from recess. Every experiment strongly supported the idea that recess increases attention spans. and the break from academics, whether indoor or outdoor, proved to be beneficial in students’ attention spans after returning from recess (Pellegrini et al., 1995).

Movement can be incorporated throughout the day whether or not there is a specific time frame that allows for it, such as a physical education class. Introducing movement into the curriculum regularly helps students develop motor skills and learn body boundaries and their own levels of comfort with physical movement (Furmanek, 2014). Integrating movement through lessons is supported by curriculum and Early Learning and Development Standards, and can be incorporated throughout the day in smaller time frames, or integrated within lessons to learn to problem solve and refocus (Furmanek, 2014).

It has not yet been determined that the methods and timing of implementing brain breaks play a bigger role in whether or not they are effective. While there is not enough research to make an exact statement, the research that is available shows that timing of physical activity brain breaks is beneficial if implemented prior to academic activities (Pellegrini & Davis, 1993; Pellegrini et al., 1995; Orlowski, et al., 2013). Timing, implementation, and integration methods may in fact play an important role after all. Until further studies have concluded specific findings, it can only be stated that timing and methods may affect the increases in behavior and focus in academic activities.

Methods

Participants

This action research project was completed in two classrooms with fifteen preschool students total. All students observed in this research project were three and four years old. Eight students were male, and seven students were female. The students spent their days in the preschool classroom with the teacher, a teacher aide, and an intervention specialist who worked with several students. The time frame in which this research took place was roughly 45 minutes per day, every school day. Gender, race, and income played no known role in this study. One group of seven students was the control group, the other group of eight students was the treatment group. The class chosen for the treatment group had more students with a tendency to disrupt the class or get distracted easily and would benefit from a small, active change in their routine.

Description

The research question that prompted this action research project was as follows: Will brain breaks before transitions to learning centers improve focus and behavior in preschoolers? Using a mixed-methods study, data was collected on student focus and behavior. The qualitative data included anecdotal notes explaining behavior in both treatment and control groups. Behavior included, but was not limited to: talking to other students, sitting still, following directions, distracted, and keeping hands and feet to self. Descriptions of behavior throughout the weeks were recorded in notes immediately after, if not during, the learning centers. The quantitative data was taken daily as well, in real time during the learning centers. Tallies were given for incidents of on-task behavior and off-task behavior as observed by the teacher. Those tallies were added together per student, weekly, to show the total number of on and off-task behaviors.

Procedures

Students in the control group participated in their normal school days with no changes, and had their on and off-task behaviors recorded during their learning centers. Learning centers are whole-group or small-group activities that focus on fine motor skills and other important skills that need to be mastered according to state standards for preschool students. Students in the treatment group were given brain breaks that involved active movement as a transition to learning centers. Brain breaks were implemented to track the outcome of instances of on and off-task behaviors in students. They were implemented at 10:15 am every school day for the treatment group; this was the 15 minute time frame in which students transitioned to learning centers. Instances were recorded in both control and treatment groups, to see if there was a difference in behavior in students who participated in the brain breaks versus the students who did not.

The independent variable in this research project was the intervention of a brain break. This brain break was the physical, active break, in which the students in the treatment group participated. Brain breaks were all focused on improving gross motor skills and included but were not limited to: Simon Says, dancing, active stretching, animal imitations, and obstacle courses. The dependent variable in this study was the students' behaviors. Behaviors included on-task behavior such as: following directions and completing work/activities. Off-task behavior included not keeping hands and feet to self, talking over the teacher, not following directions, not participating in class activities or lessons, and actively moving/not sitting still.

Data Collection

The plan for collecting data involved actively taking observation notes and recording tallies of occurrences of on-task behavior and off-task behavior. Charts were created for each student on each day of the research project. Charts reflected instances of on and off-task behaviors and an additional column for notes regarding instances of behavior that needed to be explained further. Student behavior charts were organized by day, date, week, and included details of behavior when necessary. Tallies were added to consistently keep track of the results. Each student had a daily tally count that was totaled weekly. At the end of the five weeks, the tallies and additional comments written to reflect behavior changes were evaluated.

Reliability is consistent throughout the research project. The same behaviors were evaluated every day within each group regardless whether students were assigned to the treatment or control group. Consistency allowed for true validity of notes, tallies, and results throughout this research. Student behaviors were recorded, and anything of concern or comment was recorded in the additional column provided. Charts were completed during or immediately following learning centers each day. Notes were physically collected and scanned for backup onto the researcher's computer. Physical data was organized and online data was collected to show the comparisons between and among the control and treatment groups.

Quantitative data: The statistical analysis techniques used to understand quantitative data in this study were the cross-tabulation method, the counting method, and a four-way factorial design. The cross-tabulation method was represented in the data tables by looking at both the treatment and control groups in their own tables, and comparing them to the other group to see potential relationships in the instances in on and off-task behavior. The counting technique was used for counting total individual student tallies to be added up at the end of every week, as well as at the end of the five-week study. Counting allowed the researcher to see how students' on-task and off-task behavior changed throughout the study. Counting also allowed for a comparison between the control and treatment groups, showing the differences in on and off-task behaviors at the end of the five-week study.

The factorial design allowed the researcher to study the independent and dependent variables simultaneously. The design utilized an independent samples t-test to compare the baseline of the control group with the baseline of the treatment group to determine whether the groups had significantly different instances of on and off- task behaviors prior to research. A dependent samples t-test analyzed the control groups' baseline on- and off-task behaviors with their on- and off—task behaviors after research concluded. A second dependent samples t-test analyzed the treatment groups' on- and off-task behaviors prior to research and after research concluded, following the intervention of the brain breaks. A final independent samples t-test was utilized to analyze the incidences of on- and off-task behavior following the intervention between the control and treatment groups to determine whether the groups demonstrated different behavior following the intervention period.

Qualitative Data: Anecdotal notes served as concrete records that explained in detail the on and off-task behavior; they provided knowledge surrounding students' behaviors. They tracked progress and the notes were taken in real time regarding students' behaviors. They were used to review progress throughout the 5 weeks of research.

Data Analysis

The data collected was represented in the form of tallies. The researcher marked with tallies any instances of on- and off-task behaviors during learning centers each day. Behavior included, but was not limited to: talking to other students, talking over the teacher, sitting still, following directions, distracted, and keeping hands and feet to themselves. Behaviors were totaled at the end of each week. Weekly comparisons were made within the treatment and control groups and individually, as well as between the treatment and control groups.

The number of on-task behaviors observed in the control group during week 1 of the data collection period was M = 25, and the number of off-task behaviors was M = 21 (see Table 1). At the conclusion of the data collection period in week 5, the number of on-task behaviors observed in the control group was M = 24, and the number of off-task behaviors was M = 10. The number of on-task behaviors observed in the treatment group for week 1 was M = 23, and the number of off-task behaviors was M = 15 (see Table 2). At the conclusion of the intervention and data collection period in week 5, the number of on-task behaviors observed in the treatment group was M = 23, and the number of off-task behaviors was M = 10.

Table 1

Control Group

Week	Total Instances of On-Task Behavior	Total Instances of Off-Task Behavior
1	25	21
2	21	15
3	21	13
4	22	11
5	24	10
Combined Total	113	70

Table 2

Treatment Group

Week	Total Instances of On-Task Behavior	Total Instances of Off-Task Behavior
1	23	15
2	23	11
3	19	11
4	21	12
5	23	10
Combined Total	109	59

A four-way factorial design was employed to determine whether a significant difference existed between the on- and off-task behavior of the treatment and control group following the intervention of brain breaks. A level of significance of .05 was used, as is common in social science research.

Analysis of On-Task Behavior

To determine whether the treatment and control group exhibited a different frequency of on-task behavior at the beginning of the research, an independent samples t-test was conducted. The 7 students in the control group did not exhibit significantly different on-task behavior, (M = 3.14, SD = .69) than the 8 students in the treatment group (M = 3.13, SD = 1.81), t(13) = .728, p = .9808.

A dependent samples t-test was conducted to determine whether there was a change to the number of on-task behaviors exhibited by the 7 students in the control group from the beginning of data collection (M = 3.14, SD = .69) to the control group's on-task behavior (M = 2.71, SD = .49) at the conclusion of the research. There was no significant increase in on-task behavior at conclusion of the research compared to their on-task behavior prior to research, $t(12) = .319$, $p = .2046$.

A dependent samples t-test was conducted to determine whether there was a change to the number of on-task behaviors exhibited by the 8 students in the treatment group (M = 3.13, SD = 1.81) at the beginning of research compared to the treatment group's on-task behavior (M = 3.38, SD = 1.19) at the conclusion of research following the intervention of brain breaks. There was no significant increase in on-task behavior observed in the treatment group following the intervention, $t(14)= .765$, $p= .7486$.

To determine whether the intervention of brain breaks resulted in a different frequency of on-task behavior between the treatment and control group, an independent samples t-test was conducted. The on-task behavior of the 7 students in the control group (M = 2.71, SD = .49) was not significantly different than the on-task behavior of the 8 students who received the intervention of brain breaks in the treatment groups (M = 3.38, SD = 1.19), $t(13)= .483$, $p = .1942$.

Analysis of Off-Task Behavior

To determine whether the treatment and control group exhibited a different frequency of off-task behavior at the beginning of the research, an independent samples t-test was conducted. The 7 students in the control groups did not exhibit significantly different off-task behavior (M = 2.14, SD = 1.46) compared to the 8 students in the treatment group (M = 2.63, SD = 1.19), $t(13) = .684$, $p = .4936$.

A dependent samples t-test was conducted to determine whether there was a change to the number of off-task behaviors exhibited by the 7 students in the control group from the beginning of data collection (M = 2.14, SD = 1.46) to the control group's off-task behavior at the conclusion of the research (M = 1.86, SD = .38). There was no significant difference in off-task behavior at conclusion of research compared to their off-task behavior prior to research, t(12) = .571 , p = .6261.

A dependent samples t-test was conducted to determine whether there was a change to the number of off-task behaviors exhibited by the 8 students in the treatment group (M= 2.63, SD= 1.19) at the beginning of research compared to the treatment group's off-task behavior (M = 1.25, SD = 1.04) at the conclusion of research following the intervention of brain breaks. There was a statistically significant difference in off-task behavior between week 1 and week 5 of the study, t(14)= .557 , p= .0271. Following the intervention of brain breaks, off-task behaviors decreased in the treatment group.

To determine whether the intervention of brain breaks resulted in a different frequency of off-task behavior between the treatment and control group, an independent samples t-test was conducted. The off-task behavior of the 7 students in the control group (M = 1.86, SD = .38) was not significantly different than the off-task behavior of the 8 students who received the intervention of brain breaks in the treatment group (M= 1.25, SD= 1.04), t(13) = .415, p = .1672.

Discussion

Summary of Major Findings

Students may be better focused on their learning centers after transitioning with a brain break. The data collected showed a significant difference in the frequency of off-task behaviors from week 1 to week 5 with the treatment group following the implementation of brain breaks. This result is similar to the results of the studies reviewing students' time on- and off-task after implementing brain breaks (Carlson et al., 2015; Mahar et al., 2006; Orlowski et al., 2013; Howie et al., 2014), suggesting that brain breaks contribute to the decrease in frequency of off-task behaviors. However, the off-task behaviors were not significantly different in comparison with the control group prior to research or at the conclusion of research, resembling results of the 20-minute groups in the studies of Howie et al., (2014). Brain breaks may decrease off-task behavior, but because the findings did not suggest the treatment groups' off-task behaviors were different than the control groups' off-task behaviors, it cannot be said that there was a significant impact on behavior and focus in this study.

Limitations of the Study

There were several limitations of this study that may alter the research and outcomes in future studies. One limitation was the class schedule. These classes were part of a 2 day per week program, where the students in each group were only at school for 2 days each week. While the researcher was able to make observations, a longer data collection period may have allowed for more accurate results. One larger and important limitation was class size. It would be beneficial to see the studies with a class size of more than 8 students.

Further Study

There are many areas of future research recommended in relation to brain breaks. This study focused on the impact of brain breaks on focus and behavior. Further research could explore how brain breaks impact students academically as well. Over an extended period of time, evaluations and grades could be monitored to determine whether the impact of brain breaks was positive or had no influence on academics. Studies conducted with upper elementary students and middle school students may result in more conclusive results on changes to academic achievement due to the higher frequency of graded assignments and school-related responsibilities. One more important factor to consider when implementing future studies on break breaks is that not every brain break is the same. Students need to have brain breaks that are maximized to their full potential, meaning not every brain break will have the same outcome. If the students in a class benefit from a moderate activity level type of brain break, and it will help them improve focus and have higher instances of on-task behavior, no other brain breaks should be considered.

This research study was limited by its daily schedule. In future research, it is recommended that the research be conducted in a classroom that meets each weekday. The outcomes may also vary based on class size and teacher-to-student ratio.

One last but very important recommendation for future research should include the variable of developmental and learning disabilities, and the way that students with those disabilities respond to brain breaks. More research should be conducted to examine any adverse effects brain breaks might create in that subgroup as a result of a change in daily routine, or sensory issues with loud music or too much movement.

Conclusion

The purpose of this research study was to determine if brain breaks improve student behavior and focus. In conclusion, brain breaks might be a solution to the problem of getting students to improve their behavior and focus during learning centers. This study revealed that there was an improvement in behavior and focus with the implementation of brain breaks; students who received the intervention decreased their off-task behavior from the beginning to the end of the study in a manner that was statistically significant. Since the treatment group did not have significantly different off-task behavior than the control group, the findings are inconclusive and more research should be conducted.

This study informs future teaching and future research by expanding from the limitations of this specific study, implementing longer time frames for research and using control and treatment groups that are part of a daily program. The final outcomes, although statistically insignificant, show that there is a benefit to utilizing brain breaks as a transition to academic activities. While the impact of brain breaks has not been conclusively studied, time and future studies will tell if there is a significance in behavior and focus after students have taken a quick physical break between academic activities.

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