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**THE EFFECTS OF MOVEMENT BREAKS IN THE CLASSROOM ON
READING COMPREHENSION AND ON-TASK BEHAVIOR**

by

Kelly A. Simon

A Thesis

Submitted to the
Department of Interdisciplinary and Inclusive Education
College of Education
In partial fulfillment of the requirement
For the degree of
Master of Arts in Special Education
at
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May 1, 2019

Thesis Advisor: Amy Accardo, Ed.D.

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Dedication

I would like to dedicate this thesis to my parents, Michael and Gail Simon.

Acknowledgements

I would like to thank Professor Accardo for her guidance, encouragement, assistance throughout the thesis process. I feel prepared and inspired to accept new challenges in my career as an educator.

I would like to thank my fiancé for his support, patience, and encouragement throughout this process.

Abstract

Kelly A. Simon

THE EFFECTS OF MOVEMENT BREAKS IN THE CLASSROOM ON READING
COMPREHENSION AND ON-TASK BEHAVIOR

2018-2019

Amy Accardo, Ed.D.

Master of Arts in Special Education

The purpose of this study is to investigate the effect of an increase in physical activity in the classroom on (a) the on-task behavior of special education students and (b) the reading comprehension scores in a READ 180 classroom. The aim of this study is to identify teaching strategies that impact the behavior and academic success of students with special needs. Five sixth graders, three males and two females, with learning disabilities participated in the study. A single-subject ABAB design was used. During the baseline phases, students did independent reading and a reading comprehension assignment without movements immediately beforehand. During the intervention, students participated in a two-to-three minute movement break that incorporated spelling, vocabulary, or grammar review. Words read per minute and percentage correct on the five question comprehension assignment were recorded throughout all phases. Results indicate that students did not increase their on-task behavior or reading comprehension scores after participating in movement breaks. The student satisfaction survey suggests that students enjoyed participating in movement breaks. Further research is suggested to investigate the effects of movement-based lesson activities on the on-task behavior and reading comprehension scores of those with learning disabilities.

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Chapter 1

Introduction

Children spend about half of their waking hours in school (Ridgers, Stratton, Fairclough, & Twisk, 2007). Despite that, there has been a significant decrease in physical activity during recess in recent years and an increase in sedentary time. Few states require the implementation of daily recess (Ridgers et al., 2007). Many schools are decreasing the amount of recess in order to fit in more time for academic lessons (Henley, McBride, Milligan, & Nichols, 2007). In addition, the older the children get, the less recess time they receive (Ramstetter, Murray, & Gardner, 2010). Ninety-two percent of schools in Oregon do not meet their weekly recommended hours in physical education (Bobe, Perera, Frei, & Frei, 2015). Students with special needs get very little physical activity time during the school day (Sit, Mcmanus, Mckenzie, & Lian, 2007).

Physical activity can have a positive impact on academic performance. In addition, students are more on-task after engaging in physical exercise (Luke, Vail, & Ayres, 2014) One way to increase the amount of physical activity that students receive during the school day and, therefore, potentially see an increase in on-task behavior is through in-class movement breaks (Mahar et al., 2006). Not only may these breaks improve physical activity and reduce off-task behavior, but they have also been linked to improved reading scores (Kibbe et al., 2011).

Statement of the Problem

Physical activity in the classroom is a simple, yet effective way to improve aspects of children's mental functioning (Davis et al., 2011); however, many schools are

not meeting recommended physical education hours each week (Bobe et al., 2014). This is unfortunate since physical activity shows either a positive change or no harmful effects on academic performance (Sallis et al., 1999; Rasberry et al., 2011)

Executive function skills support reading comprehension (Sesma, Mahone, Levine, Eason, & Cutting, 2009). Executive functioning and brain activation improvement has been linked to exercise (Davis et al., 2011). Similarly, numerous studies suggest that physical activity aids cognitive functioning (e.g., Donnelly & Lambourne, 2011; Silby & Etnier, 2003). Specifically, elementary and middle school students benefit most from physical activity in school in regard to cognitive improvement (Silby & Etnier, 2003). The more children move, the more active their brains will become, as movement develops both the physical and mental components of a child (Stevens-Smith, 2016).

Increased movement at school has been found to lead students to be more on-task (Kibbe, 2011; Luke et al., 2014; Carlson et al., 2015). Students have been observed and self-assessed as being less tired and being able to sustain attention for longer periods of time after a movement break (Lotta, 2015). Also, teachers reported an improvement in concentration in their students (Bobe et al., 2015). In addition, students may show more effort in their work and/or become more motivated after a physical activity break (Carlson et al., 2015)

Research studies have found that physical activity has an effect on academic achievement (Kibbe et al., 2011; Luke et al., 2014). Mullender-Wijsma et al. (2016) found that students obtained better reading scores after engaging in reading lessons that include physical activity. Similarly, reading test scores improved after including physical

activity breaks in the middle of class instruction (Kibbe et al., 2011). Chomitz et al. (2008) also found that increased fitness leads to improved English test scores.

Even though physical activity has been found to increase academic achievement (Lambourne, 2006), students with disabilities are less active during the school day than their peers (Sit et al., 2007). In addition, Lambourne (2006) suggests that exercise has been shown to increase working memory and working memory training has been shown to be beneficial for reading comprehension development in children with special needs (Dahlin, 2010). Exercise at home has been found to increase phonological skill, naming fluency, and semantic fluency for those with dyslexia (Reynolds, Nicolson, & Hambly, 2003). Similarly, it has been shown that adhering to a physical fitness program improves behavior and information processing in students with ADHD (Verrt, Guay, Berthiaume, Gardiner, & Beliveau, 2010).

Significance of the Study

Physical activity has decreased over the years and students with special needs are less active during the school day than their peers (Sit et al., 2007). However, more and more research is suggesting that physical activity has a positive impact on academic achievement, including reading (e.g., Kibbe et al., 2011; Mullender et al., 2016; Reynolds et al., 2003). Little research has been done on the impact of physical activity in school on the reading scores and on-task behavior of students in special education, in particular. The present study will build upon the research of Kibbe et al. (2011) to investigate the effect of increased physical activity in the classroom and the effect of physical activity on the on-task behavior and reading comprehension of students with special needs.

Purpose of the Study

The purpose of this study is to investigate the effect of an increase in physical activity in the classroom on (a) the on-task behavior of special education students and (b) the reading comprehension scores in a READ 180 classroom. The aim of this study is to identify teaching strategies that impact the behavior and academic success of students with special needs.

Research Questions

The research questions in this study are:

1. Will the implementation of physical activity breaks increase the on-task behavior of special education students in a READ 180 classroom?
2. Will the implementation of physical activity breaks increase the reading comprehension scores of special education students in a READ 180 classroom?
3. Will students in a READ 180 classroom be satisfied with the increase in physical activity breaks in the classroom?

Hypothesis

I hypothesize that the increase in physical activity in the classroom will increase on-task behavior in the READ 180 setting.

I hypothesize that the increase in physical activity breaks in the classroom will increase the reading comprehension scores of special education students in the READ 180 setting.

Chapter 2

Review of the Literature

Rasberry et al. (2011) examined several studies investigating the association between physical activity and academic achievement. Out of 251 studies, 50.5% of all associations were positive and 49% of associations were not significant. Only 1.5% of associations were negative. Despite the lack of negative association and several studies suggesting a positive association between physical activity and academic achievement, many children are not getting adequate daily physical activity (Troiano et al., 2006). Only 42% of children ages six-to-eleven and 8% of adolescents ages 12-19 met the recommended 60-minutes of physical activity per day (Troiano et al., 2008). Sedentary behavior has been linked to poorer academic achievement (Tremblay et al., 2011), yet children become more sedentary when they enter elementary school (Jauregui et al., 2010).

Executive Functioning and Reading Comprehension

Focusing on improving working memory may improve reading comprehension skills in children with problems in attention and reading comprehension (Dahlin, 2010). Sesma, Mahone, Levine, Eason, and Cutting (2009) examined the contribution of executive functioning, which includes working memory and planning, to reading comprehension with a sample size of 60 children ages nine through fifteen. Out of the 60 children, 16 had deficits in word reading accuracy and 10 had deficits in reading comprehension. In this study, the children were given multiple tests to determine abilities in attention, decoding, fluency, vocabulary, working memory, and planning (Sesma et al., 2009). They were also given an assessment on reading comprehension. From these assessments, Sesma et al. (2009) determined that working memory and

planning accounted for 63% variance in reading comprehension. Working memory and planning skills contributed to the prediction of reading comprehension skills. Sesma et al. (2009) suggest that those who struggle with reading comprehension should focus on developing executive functioning skills.

Dahlin (2010) had a similar purpose for her study on working memory, but the sample size included only students with special needs. Out of the 57 children with special needs in her sample size, 11 were girls and 46 were boys in the third through fifth grade. Forty-two were in the treatment group and 15 were in the control group. Those in the treatment group were trained in working memory by using a program called RoboMemo for 30-40 minutes per day for five weeks. Testing on verbal working memory, non-verbal reasoning, visual-spatial working memory, and response inhibition were done pre-intervention, post-intervention, five-to-six weeks post-intervention, and six-to-seven months post-intervention. Results showed a correlation between working memory capacity and reading comprehension. In particular, working memory training improved the ability to store verbal information (Dahlin, 2010).

Movement and Brain Activation

Sesma et al. (2009) suggested that developing executive functioning skills could help children who struggle with reading comprehension and executive functioning has been shown to increase after participating in physical activity (Davis et al., 2011). Specifically, children with attention-deficit/hyperactivity disorder (AD/HD) have shown an increase in executive functioning after participating in physical activity (Gapin & Etnier, 2010). Davis et al. (2011) hypothesized that exercise would improve executive functioning. They selected sedentary, overweight seven-to-eleven-year olds and

randomly assigned them to one of three exercise conditions: low-dose (20 minutes), high-dose (40 minutes), or no exercise. All exercise conditions were done at the same intensity, which was an average heart rate of 150 bpm. Afterward, blinded, standardized psychological evaluations were conducted using the Cognitive Assessment System and Woodcock-Johnson Tests of Achievement III, which assessed cognition and academic achievement. In addition, a fMRI was given to assess brain activity during executive function tasks. Results showed that aerobic exercise improved cognitive performance, specifically executive function improved. A difference in results based on exercise dose was not observed (Davis et al., 2011).

Instead of examining different doses of exercise on executive functioning, Pesce, Crova, Cereatti, Casella, and Bellucci (2008) investigated different types of physical activity on the specific area of memory. Fifty-two students between the ages of 11 and 12 engaged in three testing sessions in which they had to free-recall items from a 20-item word list. In one session, students participated in one hour of individual circuit training and in another session they participated in one hour of group aerobic training. In a third session, participants did not engage in any physical activity. After engaging in the activity, the children's immediate and delayed word recall were tested. Only acute bouts of group aerobic games enhanced immediate word recall relative to baseline performance. Delayed free recall was better after any physical activity as compared to no activity. Pesce et al. (2008) suggests that acute but submaximal exercise may improve memory storage.

Similar to Pesce et al. (2008), Budde et al. (2008) examined the type of exercise and its effect on executive function. Budde et al. (2008) tested their hypothesis that

bilateral coordinative exercise might influence cognitive performance. One-hundred-fifteen students were assigned to either the bilateral coordinative exercise (CE) experimental group or normal sport exercise (NS) control group. Bilateral exercises included alternating bouncing a basketball from your left to right hand. A test to determine attention and concentration called the d-2 test was given to each group before and after the 10-minute exercise. D-2 test scores were higher post-exercise when compared to pre-exercise, regardless of the type of exercise. However, the CE group had a higher improvement than the NS group. Budde et al. (2008) suggested that the higher improvement in the CE group is because those exercises pre-activate parts of the brain connected to attention. Best (2010) suggested in his literature review that cognitively engaging exercise, such as team games, have a stronger effect on executive functioning in children than non-engaging exercise, which supports the results of the studies done by Pense et al. (2008) and Budde et al. (2008).

Biederman et al. (2004) concluded that significantly more youth with AD/HD had deficits in executive functioning compared to control participants. Therefore, they are at more risk for decrease in academic achievement. Physical activity might assist in improving the executive functioning skills of those with AD/HD (Gapin & Etnier, 2010). Gapin and Etnier (2010) recruited 20 children with AD/HD to investigate the extent to which physical activity is connected with executive functioning (EF). Participants were guided through four executive function tasks assessing planning, inhibition, working memory, and processing. Then, they were given an accelerometer to measure their moderate-to-vigorous physical activity for the next seven days. Gapin and Etnier (2010) also had participants log their physical activity. The study suggests that higher physical

activity leads to higher executive functioning in children with AD/HD, especially in the EF task of planning.

Physical Movement and Academic Achievement

Chomitz et al. (2008) conducted a cross sectional study to examine if there is a relationship between physical fitness and academic achievement. A passing score on the Massachusetts state test, the MCAS, was used to measure academic achievement. Fitness achievement was measured by the number of passed fitness tests during physical education. Chomitz et al. (2008) concluded that the odds of passing the MCAS increased as the number of passed physical activity tests increased.

Coe et al. (2005) also focused on physical education classes and used standardized tests as one of the measures to assess academic achievement, but his results were different than Chomitz et al. (2008). Coe et al. (2005) assessed the effect of moderate-vigorous physical activity on the academic achievement of middle schoolers. Sixth-graders were assigned to having physical education either first or second semester. The students took an alternative exploratory class, such as computers or art, during the semester in which they were not enrolled in physical education. Students also self-reported the amount of physical activity they did in the previous three consecutive days. To measure academic achievement, Coe et al. (2005) observed marking period grades and standardized test scores from the Terra Nova test. The results showed no significant relationship between academic achievement and physical education enrollment. However, higher grades were associated with self-reports of vigorous physical activity outside of school.

Castelli, Hillman, Buck, and Erwin (2007) also used state standardized tests to determine if physical fitness was positively related to academic achievement. Students in the third through fifth grade were guided through five components of the FitnessGram program which identified muscle fitness, aerobic capacity, and body composition (Castelli et al., 2007). The students also took two components of the ISAT, which is the Illinois standardized state test (Castelli et al., 2007). The results indicated that aerobic capacity is positively related to academic achievement; however, muscle and flexibility were not related to academic achievement. More specifically, there was an association between physical fitness and reading achievement. (Castelli et al., 2007)

Hillman et al. (2009) focused solely on aerobic exercise in the form of walking and found a similar outcome to Castelli et al. (2007). Hillman et al. (2009) orchestrated a within-studies design with 20 sixth-graders. Students were assigned to one day of a resting session and one day of an aerobic exercise session. Depending on the session, participants were assigned to 20 minutes of complete rest or walking at 60% of their maximum heart rate. After the period of rest, participants were put through tests to determine inhibitory control, academic achievement, EEG testing, and cardiorespiratory fitness. After 20 minutes of walking, participants were put through the same tests but waited until their heart rate went down to their resting heart rate. The results indicated increased response accuracy and better performance on academic achievement tests after aerobic exercise relative to resting (Hillman et al., 2009).

Movement Breaks in the Classroom and On-Task Behavior

Standing desks are one way to have children expend energy at a low level (Dornhecker, Blake, Benden, Zhoa, & Wende, 2015). Dornhecker et al. (2015) studied

the effects of using standing desks in second, third, and fourth grade classrooms compared to traditional desks. Time-sampling was used to record the frequency of behaviors every 15 seconds. Students with standing desks did not decrease their engagement in the classroom when compared the the students who were in seated desks. They observed a general increase in academic engagement overtime in both groups (Dornhecker et al., 2015). Dornhecker et al. (2015) concluded that stand-based desks in classrooms allowed students to expend energy without negatively affecting their performance in class.

Bobe, Perera, Frei, and Frei (2014) conducted a study in which they gave teachers a DVD of several Brain Break activities to show segments from at least once per week. The Brain Breaks were five-to-seven minutes in length and included a warm up, core exercise, and cool down that could be done standing in place. The teacher determined how many segments were going to be shown and how often they were shown during the week. There were a variety of types of physical activity to choose from including stretching/relaxation, aerobic activity, and strength. After four weeks, teachers filled out a two-page survey that asked questions about perceived benefits, perceived barriers, perceived students' responses, multi-sensory engagement, and preferences. The results indicated that the stretching/relaxation segments were played most often and had the highest approval rating amongst the teachers (Bobe et al., 2014). Ninety-one percent of the teachers reported an improvement in focus and concentration after the Brain Breaks and the same percentage of teachers intended to continue using the program (Bobe et al., 2014). Bobe et al. (2014) identified one of the perceived barriers to implementing physical activity in school was a lack of time.

Janssen et al. (2014) conducted a study with 123 ten and eleven-year-old children in Amsterdam. The students participated in one hour of regular school followed by no break, a passive break, moderate exercise, or vigorous exercise (Janssen et al., 2014). Before and after the break, students' selective attention was tested. Findings revealed that students' attention was best after moderate activity breaks, but passive and vigorous breaks were effective, too (Janssen et al., 2014).

Similarly, Donnelly, and Lambourne (2011) also found moderate-intensity physical activity to be beneficial in the classroom. In their large-scale, longitudinal, cluster-randomized trial over 3 years, changes in fitness and fatness were compared with changes in academic achievement (Donnelly & Lambourne, 2011). Data supported the connection between physical activity, cognitive function, and academic achievements. Moderate-intensity, physically active lessons improved academic achievement by 6% compared to a decrease of 1% for the controls.

Mahar et al. (2006) observed the use of energizers and their effect on on-task behavior. Energizers are 10-minute long, learning-integrated physical activities. A multiple base across classrooms design was used to conduct the study with 243 kindergarten-through-fourth graders (Mahar et al., 2006). In addition, observations were done 30 minutes before and after the energizer. Observers observed six students per 30-minute period, spending five minutes per child. The on-task behavior of all of the students in the intervention group increased 8%. Limitations in this study include observers knowing whether or not students did energizers.

Carlson et al. (2015) investigated in relationship between classroom-based activity breaks and classroom behavior with 10-minute physical activity breaks, similar to

Mahar et al. (2006). Twenty-four schools from six districts in California participated. At least one 10-minute physical activity break was implemented in the classrooms each day. Teacher-reports were used to assess students' classroom behavior and implementation of the physical activity breaks. Teachers reported fewer students who lacked effort or motivation after a physical activity break. In addition, physical activity was negatively associated with off-task and inattentive classroom behavior.

Luke, Vail, and Ayres (2014) studied the effects of physical activity on on-task behavior, but the participants were unique in that they were preschoolers with developmental delays. An A-B-A-B format was used in which the children would either participate in 20 minutes of physical activity or seated activities for 20 minutes prior to a 15-minute teacher-directed group activity. During the activity, students' on-task behavior was assessed every 15-seconds with the use of momentary time sampling. Luke et al. (2014) concluded that physical activity immediately before a teacher-led activity led to more on-task behavior for every student. Limitations for this study include the intensity of the physical activity not being monitored (Luke et al., 2014). Instead, teachers and paraprofessionals were only guiding students to continuously engage in their physical activity of choice for the entire duration of the 20 minutes. In addition, the dependent variable was hard to quantify and there was easy susceptibility to observer drift and bias. Observers were aware of both the students and the purpose of the study which could have led to bias (Luke et al., 2014).

Movement and Reading

Haapala et al. (2014) examined the associations of cardiovascular exercise and motor performance in first grade with the academic performance in grades one through

three. Students' cardio performance was assessed by observing the maximal workload during an exercise test. Motor skills were assessed by participation in a shuttle run to measure agility, a balance test, and a box in block test to measure dexterity. Poorer motor skills were associated with poorer academic scores, especially for boys. Specifically, poorer balance was associated with poorer reading comprehension scores. This supports the observations that stretching and relaxation brain breaks had a positive impact on on-task behavior in Bobe et al. (2014). Haapala et al. (2014) suggested that identifying poor motor skills and working on improving them early may help students in the academic setting.

Kirk, Vizcarra, Looney, and Kirk (2013) examined the effects of integrating reading lessons involving physical activity on overall physical activity levels and early literacy development in preschoolers. This study was done at two urban Head Start programs, one being the control site and the other being the experimental site. For the intervention group, two 15-minute literacy lessons involving physical activity were implemented in the classroom on a single day while the control group's 15-minute lessons did not involve physical activity. Lessons included topics like picture naming, rhyming, and alliteration. The study revealed that the skills alliteration and picture naming were significantly improved in the intervention group. These two activities are associated with greater early literacy skills and phonological awareness. Kirk et al. (2013) suggested that physical activity may help young children who are struggling with early literacy skills.

Similarly, Mullender-Wijnsma et al. (2015) investigated the effect of physically active academic lessons on the reading and math scores; however, they were working

with a population of second and third graders from six different elementary schools. Like the study by Kirk et al. (2013), the intervention group participated in academic lessons that involved physical activity (Mullender-Wijnsma et al., 2015). This included doing specific exercises when questions were answered, such as jumping for every letter stated when spelling a word. Other activities included working with an interactive whiteboard and marching in place. The results included higher reading scores for the intervention group compared to the control group (Mullen-Wijnsma et al., 2015).

Movement and Special Education

Everhart, Dimon, Stone, Desmond, and Casile (2012) conducted a study with seven primary grade students and six intermediate elementary students with intellectual disabilities. Each day, the students participated in a physical activity lesson in their Life Skills class prior to academic work. They would participate in an aerobic exercise DVD for their physical activity. Intermediate elementary students showed consistent improved seat work after the physical activity lesson. In addition, students were observed as being more focused (Everhart et al., 2012).

Pontifex et al. (2012) focused on their study on children with AD/HD. Pontifex et al. (2012) examined the effect of moderate intensity aerobic exercise on the attention, brain neurophysiology, and academic performance of children with AD/HD. Children performed an attention control task followed by 20 minutes of exercise of seated reading. After exercise, both students with AD/HD and those without AD/HD showed greater response accuracy. Stimulus-related processing, regulatory processing, and reading performance all improved after a single bout of moderate-intensity exercise.

Summary

Children become more sedentary upon enrolling in school, but more and more studies are suggesting that physical activity is associated with better executive functioning (Sesma et al, 2009; Dahlin, 2010), academic achievement (Chomitz et al., 2008; Castelli et al., 2007; Hillman et al., 2009), and on-task behavior (Mahar et al., 2006; Carlson et al., 2015; Luke et al., 2014). Multiple studies suggest that improving students' executive functioning may improve reading skills (Sesma et al, 2009; Dahlin, 2010) and studies have been done that show an association between physical activity and improved executive functioning skills (Davis et al., 2011; Budde et al., 2008; Gapin & Etnier, 2010). However, few studies have been done on the effects of physical activity on reading, specifically reading comprehension. More specifically, minimal studies have been completed on physical activity's impact on the reading comprehension and on-task behavior of students with special needs. It is difficult to find information on the effect of physical activity on students with learning disabilities, but studies on AD/HD are more common (Ponifex et al., 2012; Gapin & Etnier, 2010).

The present research will evaluate the effectiveness of physical activity/movement breaks on on-task behavior and reading comprehension scores of students with special needs in a READ 180 classroom. The effectiveness will be assessed based on the number of words read per minute and accuracy in reading comprehension questions.

Chapter 3

Methodology

Setting

School. The study was conducted in an upper elementary school (fourth through sixth grade) in suburban New Jersey. The district has four lower elementary schools (kindergarten through third grade), two upper elementary schools, one middle school (seventh and eighth grade), and one high school. According to New Jersey School Performance Report, there 503 students enrolled in the school during the 2016-2017 school year (New Jersey Department of Education, 2017). Out of the 503 students, 61.6% of the students are black, 17.9% white, 11.9% are Hispanic, 4.6% are two or more races, 3.2% are Asian, and 0.8% are Pacific Islander. During the 2016-2017 school year, 22% of the students were identified as having disabilities, 51% were considered economically disadvantaged, and 1% were English Language Learner. During that year the Partnership for Assessment of Readiness for College and Careers (PARCC) assessment was administered, and 40.8% of students taking the test met or exceeded expectations on the English Language Arts/Literacy portion. On the math portion, 36.8% of students met or exceeded expectations.

Classroom. This study was designed for a classroom set up for small group instruction. On a typical day in the READ 180 classroom, students rotate through three stations: small group instruction, software instruction, and independent reading. Small group instruction occurs at a kidney-shaped table, software instruction occurs at one of the five desktop computers in the classroom, and independent reading occurs in the library section of the classroom which has four rocking lounge chairs. The study took place in the students' READ 180 class during first period, which is from 8:50am to

10:05am each day. This class is a special education class and all students have been classified as having a disability. All of the students were in the sixth grade at the time of the study.

Participants

Table 1 presents the basic information of the participants.

Table 1

General Information of Participants

Student	Age	Grade	Classification
A	11	6	CI
B	11	6	OHI
C	11	6	CI
D	11	6	SLD
E	12	6	CI

Student A. Student A is an 11-year-old sixth grade African American male who is classified with communication impairment. In November 2018, Student A was given the Houghton Mifflin Harcourt Reading Inventory and received a Lexile score of 730. This equates to a fourth grade proficient reading level. He is easily distracted in class and has difficulty sitting still. He sometimes will shut down in class. This is his first year in READ 180. Last year, he was in System 44. He received an A- in the first marking period.

Student B. Student B is an 11-year-old sixth grade African American female with a diagnosis of other health impaired. She has a brain disorder. In November 2018, she scored a 702 Lexile on the Reading Inventory Test. This was a jump of about 200 points from when she was tested in September 2018. Student B was in System 44 for fourth and fifth grade. She has need in the areas of spelling and sentence structure. Student B is talkative and is inconsistent with her homework completion.

Student C. Student C is an 11-year-old sixth grade African American male who has a classification of communication impaired. In November 2018, his Lexile score was 651, determined by the Reading Inventory. This is the student's third year in READ 180. Student C is a very quiet student who usually will not speak voluntarily in class. He typically will not ask for help. He benefits from refocusing as he has a tendency to zone out when working independently. His mother said he is self-conscious of his speech. Student C continues to work on the vocalic /r/, pronouncing it with accuracy only 2%. Despite his struggles with speech, he is a good speller. Student C benefits from directions broken down and seeing a model/example. He earned a B for the first marking period.

Student D. Student D is a 11-year-old Caucasian female who has a classification of specific learning disability. This is her first year in READ 180. Her Lexile score in November 2018 was a 368. She has not been diagnosed with dyslexia, but she displays many of the signs. These signs include reversing the letters *b* and *d*, inconsistent fluency, skipping small words when reading aloud, and switching letters in words when writing. However, she is a hardworking student who has a lot of family support. Student D enjoys participating in class, stays on-task, and consistently completes her homework.

Student E. Student E is a 12-year-old African American male who has a classification of communication impairment. This is his second year in READ 180 and he has a Lexile score of 437. Student E has great fluency when reading, but struggles with many areas of comprehension. When left alone to do independent work, he will often daydream or start chatting with a neighbor. It takes a while for Student E to get settled and started on work as he tries to avoid it. Student E earned a B in the first marking period.

Materials

Readinga-z assessment passages. Readinga-z.com's benchmark passages and corresponding comprehension questions were printed out and given to students during small group instruction. The passages chosen were based on the reading level of the students determined by their current Lexile level. The passages were in the range of 100 points below and 50 points above their most recent Lexile score. Half of the passages were non-fiction and the other half will be fiction passages.

Average words read per minute chart. The READ 180 software indicates the number of words in each of the READ 180 books. The number of words were divided by the number of pages in the book to determine the average number of words on each page. When the students came to the independent reading stations, they reported the page number they were starting on to the classroom aide. The classroom aide wrote down the page number and a timer was set for 10 minutes. After 10 minutes, the students showed the aide where they stopped and that number was recorded. The average number of words per page was multiplied by the number of pages read to determine the estimated words read per minute. Figure 1 shows the chart used to organize the data.

Book Read & Number of Words	Page Start	Page End	Average Words Per Minute

Figure 1. Average words per minute recording sheet.

Likert Scale Survey. At the end of the study, the students took a survey using the Likert scale of 1 (strongly disagree) to 4 (strongly agree). Students placed an X in the column for the number that best represented their feelings. Enjoyment, usefulness, and ease of the movement breaks were rated in the survey. Figure 2 displays the survey that students filled out.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Statement	1	2	3	4	5
1. I found the movement break activities easy to follow.					
2. I enjoyed the movement breaks.					
3. I would prefer to move to my next station without a movement break.					
4. I would prefer a seated break between stations.					
5. After a movement break, I felt that I was able to focus better on my reading assignment.					
6. I felt that the movements were too difficult.					
7. I enjoyed being able to move in between stations.					
8. I felt that the movements were boring.					
9. I would like to continue participating in movement breaks in the future.					
10. In the future, I think about would be able to do a better job understanding what I have read after a movement break.					

Figure 2. Likert Scale

Research Design

The research utilized a single-subject ABAB design. During Phase A, baseline data was collected from the use of data from the Reading A-Z comprehension question answers and students' pages read logs. As baseline on-task behavior data, information was collected on the average number of words read per minute in a 10-minute period over the course of two weeks. This occurred at the independent reading station in the READ 180 rotation. As baseline data for reading comprehension scores, students read a passage on their Lexile level and answered five comprehension questions obtained from Readinga-z.com three times per week. Phase A was two weeks long. During Phase B, three movement breaks were implemented. Movement breaks occurred before each of the three READ 180 stations, or every 15-20 minutes. Prior to the start of the study, different movement breaks were introduced to the students to discover which ones in which the students were most likely to participate. The movement breaks that were engaging for the students included teacher-led light to moderate physical activity, such as walking around the room, throwing a light ball, stretching, jumping jacks, and marching in place. A spelling, grammar, or vocabulary review was often incorporated in the breaks. Students participated in the intervention for two weeks and progress was collected throughout the period. During the second Phase A, the movement breaks were removed and students returned to baseline conditions for two weeks. During the second Phase B, the movement breaks intervention were reintroduced for two weeks. Data was collected for each phase. Results were interpreted by reviewing the average number of words read per minute in a 10-minute period and the average reading comprehension score on the

Readinga-z.com quizzes. At the end of the second Phase B, students were asked to fill out a Likert scale about their satisfaction with implementation of physical activity breaks.

Procedures

This study was conducted from January 2019 to March 2019. Students reported their start and end pages during independent reading since the beginning of the school year, so the students were used to the procedure for gathering on-task behavior data. Students had not used Readinga-z.com passages, but they were used to a similar format. Students were given the passage or story 100 points below to 50 points above their most recent Lexile score. Students were instructed to read the passage and answer the five comprehension questions. Students were given 10 minutes to complete the activity.

During the first intervention phase, students participated in a two-to-three-minute physical activity break before going to their first station: small group, independent reading, or software. Immediately upon arriving at small group, the students completed their Readinga-z.com passage. Upon arriving at independent reading, the students reported their current page number to the classroom aide and begin reading for 10 minutes. The students then immediately worked with software at their station. After 15-20 minutes, the students did another two-to-three-minute movement and moved to their next station where they immediately completed the assigned task for that station. This was repeated for a third time so that each student went to each of the three stations.

In the second baseline phase, the movement breaks were removed but students continued to complete the assigned task immediately upon arriving at the station. In the last phase, the movement breaks were added back in.

Measurement Procedures

Readinga-z.com assessment passages. Assessment passages were one-page stories with five comprehension assessment questions on the back. These assessments were used to determine the impact of movement on reading comprehension. The passage given was determined by the student's most current Lexile score. Out of all of the passages given, half were non-fiction and half were fiction. The assessments were scored out of five points. Results were recorded in a table.

Average words per minute chart. Students reported their beginning page number and after 10 minutes of reading, reported their ending page. An average words per minute was determined by dividing the number of words in the book by the number of pages. The number of pages read was multiplied by the average number of words per page. This determined the mean words per ten minutes. That number was divided by 10 to result in the mean words per minute. This number was recorded in a table. The number of pages read determined the student's on-task behavior. Higher numbers of pages read suggested increased on-task behavior.

Likert scale survey. At the conclusion of the study, the students completed a survey to determine their feelings of enjoyment, usefulness, and ease of the movement breaks. A higher score was associated with greater satisfaction.

Data Analysis

Scores from the comprehension quizzes and number of pages read were recorded on a table. The number of pages read was converted to estimated words per minute. Data were recorded in a spreadsheet. Each student's data was graphed and patterns were analyzed visually by comparing student intervention and baseline data.

Chapter 4

Results

The single-subject design study used ABAB phases to examine the effect of movement breaks on reading comprehension and on-task behavior of students with special needs. Five sixth graders in a READ 180 classroom participated in this study. The research questions investigated were:

1. Will the implementation of movement breaks increase the reading comprehension scores of special education students in a READ 180 classroom?
2. Will the implementation of movement breaks increase the on-task behavior of special education students in a READ 180 classroom?
3. Will students in a READ 180 classroom be satisfied with the increase in movement breaks in the classroom?

Data was collected throughout all phases. The number of pages read during independent reading, which was later converted to an average words read per minute, was recorded five times in each phase. In addition, students read a short passage and answered five comprehension questions five times during each phase. At the end of the study, students completed a Likert scale survey regarding their satisfaction with the implementation of movement breaks in the classroom.

Reading Comprehension

Students read a passage on their Lexile range and answered five comprehension questions based on the passage. The mean and standard deviations of the data are presented on Table 2.

Table 2

Student Reading Comprehension

Student	Baseline 1		Intervention 1		Baseline 2		Intervention 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
A	64	26.5	68	34.9	72	20.4	76	23.3
B	88	16.0	64	15.0	72	20.4	84	15.0
C	80	25.3	68	9.8	48	1.27	56	19.6
D	88	9.8	84	0	80	7	92	9.8
E	64	15.0	40	21.9	56	15.0	56	8.0

Student A is an 11-year-old African American male who is eligible for special education services under the classification of CI. During the first baseline phase, Student A's mean score on his reading comprehension score was 64%. During the first intervention phase, the mean score increased to 68%. When the intervention was removed for the second baseline intervention, the mean score increased again to 72%. The mean score increased slightly to 76% in the last intervention phase. As seen in the figure, Student A's scores increased slightly from each baseline and intervention phases.

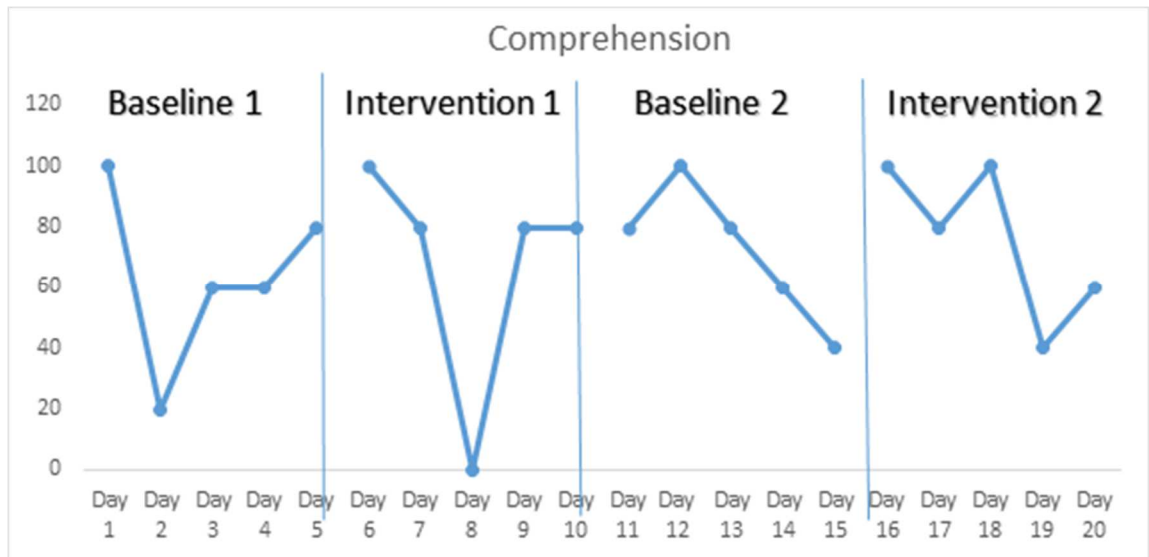


Figure 3. Student A comprehension scores.

Student B is an 11-year old African American female who is eligible for special education services under other health impaired. During the first baseline phase, Student B’s mean reading comprehension score was 88%. In the intervention phase, the mean score decreased to 64%. In the second baseline phase, the mean score was 72%. The mean score increased to 84% in the last intervention phase. As shown in the figure, Student B’s score when down in the first intervention phase, but increased in the second intervention.

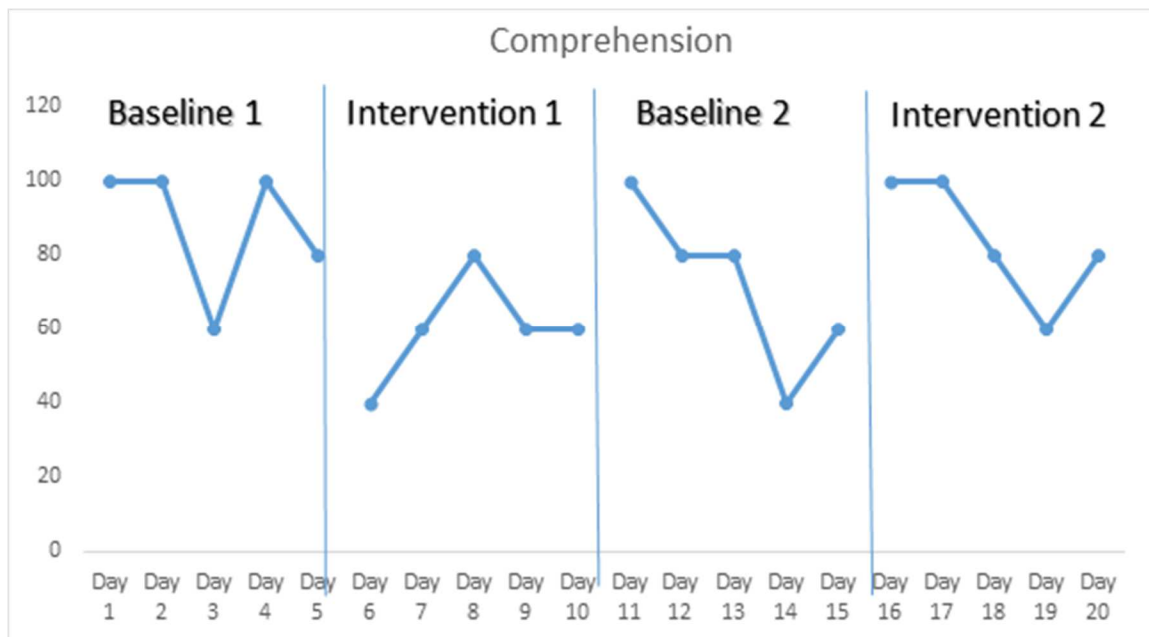


Figure 4. Student B comprehension scores.

Student C is an 11-year-old African American male who receives special education services because of the classification of CI. Student C had a mean score on his reading comprehension of 80%. His mean score decreased to 74% in the first intervention phase. In the second baseline phase, his reading comprehension score was 48%. His mean score in the last intervention phase increased from the second baseline phase to 56%. As shown in figure 5, Student C's scores were higher in the first baseline and intervention phases, but there was an increase from the phase B baseline phase and the phase C intervention phase.

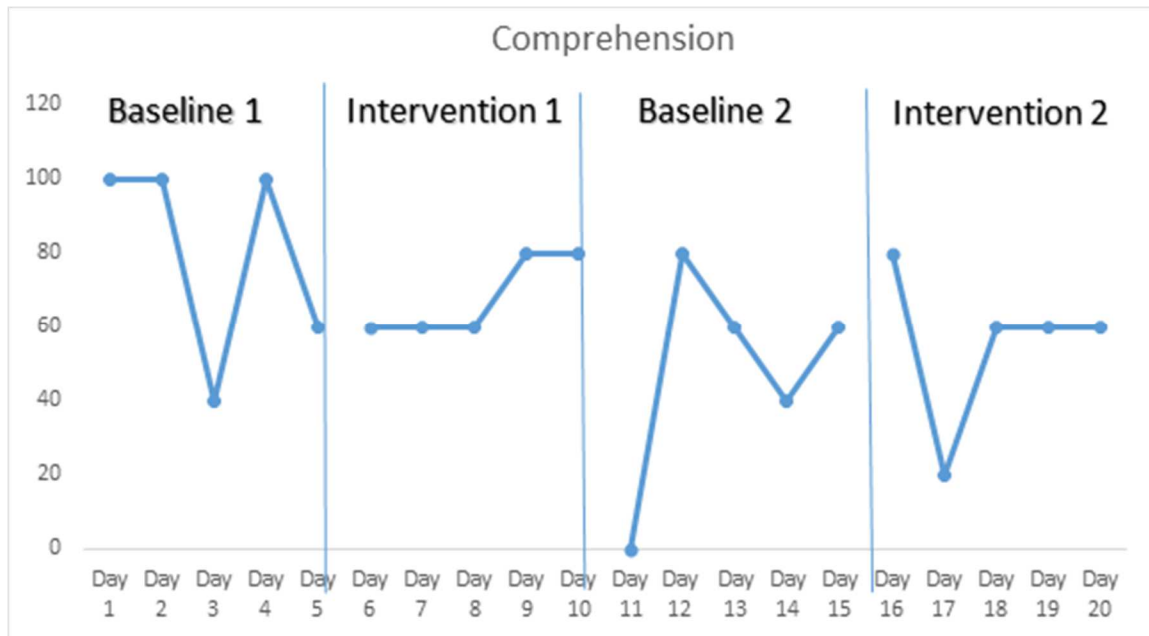


Figure 5. Student C comprehension scores.

Student D is an 11-year-old Caucasian female who is eligible for special education services under the classification of specific learning disability. In the first baseline phase, Student D's mean reading comprehension score was 88%. In the first intervention phase, her mean score decreased to 84%. In the second baseline phase, her mean score was 80% and it increased to 94% in the second intervention phase. Student D's score decreased in the first intervention phase but increased in the second intervention phase.

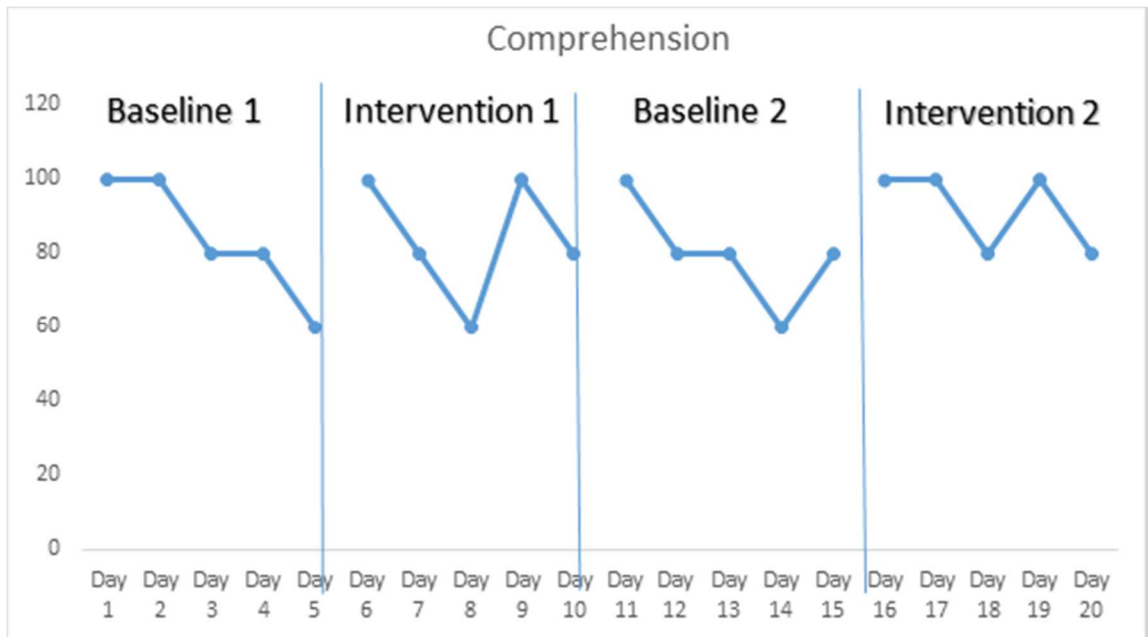


Figure 6. Student D comprehension scores.

Student E is a 12-year-old African American male who is identified as being communication impaired. During the first baseline phase, Student E’s mean score was 64%. His mean score decreased to 40% in the first intervention phase. In the second baseline phase, Student E’s score was 56%. In the second intervention phase, his mean score remained 56%. As displayed in the figure, the score decreased from the first baseline phase to the first intervention phase, but the scores stayed the same from the second baseline to the second intervention.

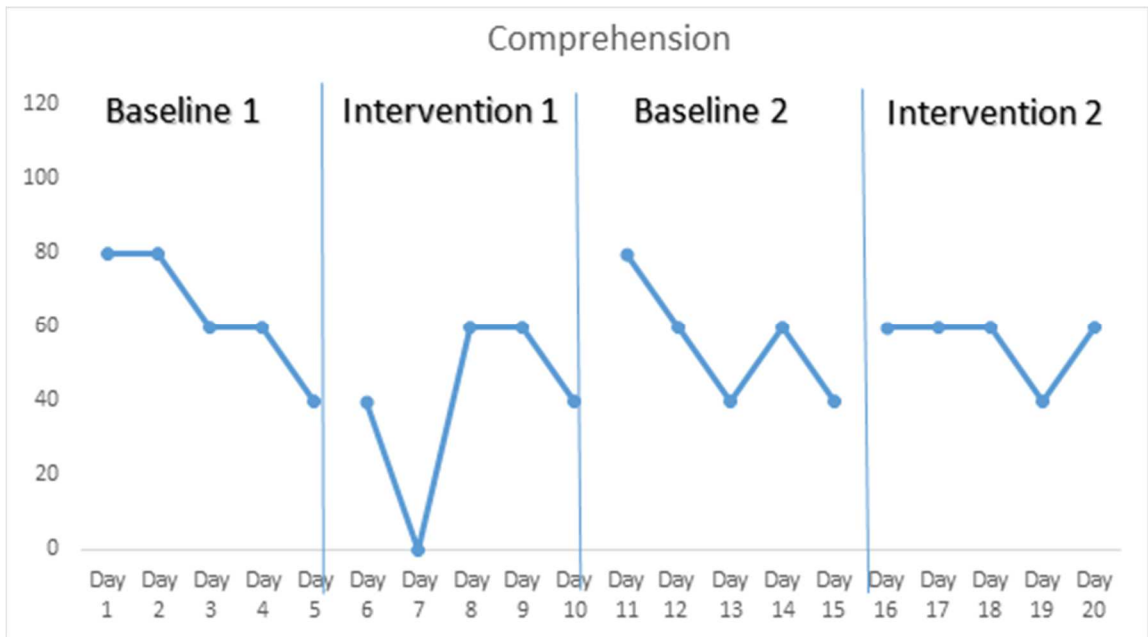


Figure 7. Student E comprehension scores.

On-Task Behavior

On-task scores were obtained by obtaining a mean number of words read per minute based on ten minutes of independent reading. The total number of words in the book was divided by the number of pages in the book to calculate an estimated number of words per page. The number of words read in the set time period was multiplied by the estimated number of words per page to calculate an estimated number of words read per minute. Means and standard deviations of students' words read per minute are shown in table 3.

Table 3

Student On-Task Behavior

Student	Baseline 1		Intervention 1		Baseline 2		Intervention 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
A	20.8	12.1	16.5	4.3	13.4	6.1	10.5	4.6
B	68.8	19.3	44.0	8.8	39.2	4.4	29.3	10.3
C	38.4	10.0	24.2	2.2	21.7	9.9	16.2	5.7
D	80.6	14.2	47.4	2.3	43.9	3.2	32.6	12.3
E	52.8	15.6	34.2	18.6	30.3	14.8	22.7	8.0

During the first baseline phase, Student A's mean words read per minute was 20.8. This increased to 30.8 in the first intervention phase. During the second baseline phase, Student A's mean words per minute increased to 35.2. This increased again to 44 words per minute in the last intervention phase. Student A's daily data is shown in Figure 8. As shown in the figure, the student's mean words read per minute increased in each phase.

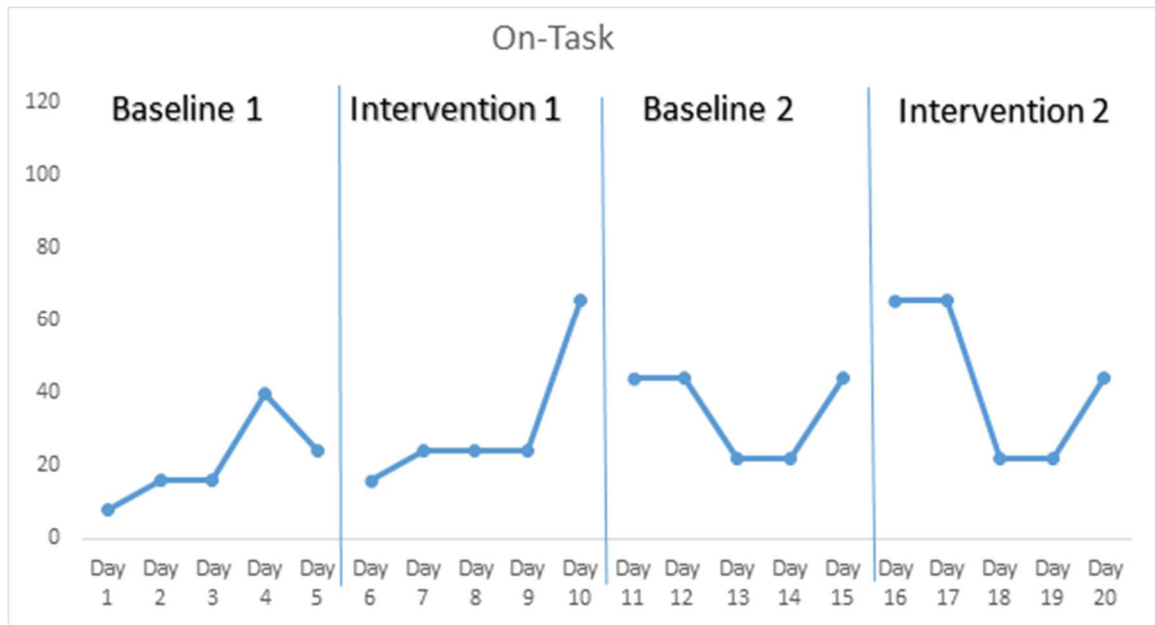


Figure 8. Student A on-task scores.

During the first baseline phase, Student B's mean words read per minute was 68.8. This decreased in the intervention phase to 56 words per minute. In the second baseline phase, the average words per minute increased slightly to 57 words per minute. The mean increased to 64.6 in the second intervention phase. As seen in Figure 9, Student B's mean words read per minute decreased from the first baseline phase to the first intervention phase, but increased from the second baseline phase to the second intervention phase.

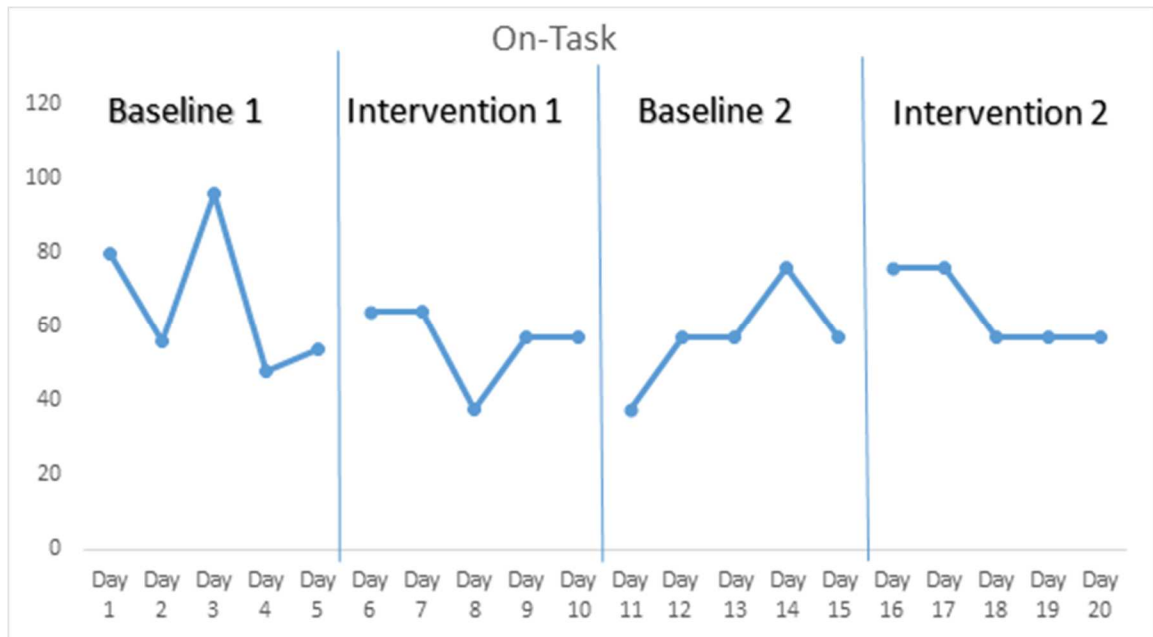


Figure 9. Student B on-task scores.

During the first baseline phase, Student C's mean words per minute was 38.4. This decreased slightly in the first intervention phase to 36 words per minute. In the second baseline phase, Student C's mean words per minute increased to 40 words per minute. The mean decreased to 24 words per minute in the second intervention phase. As shown in Figure 10, the mean number of words read per minute decreased from the baseline to the intervention phases in phase one and phase two.

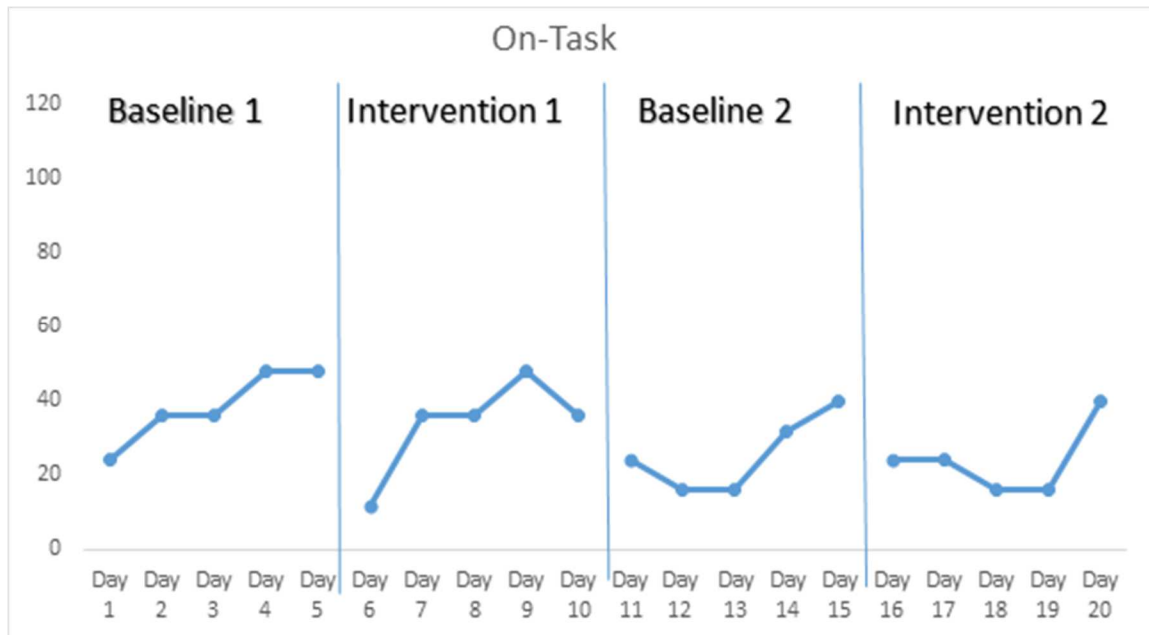


Figure 10. Student C on-task scores.

During the first baseline phase, Student D's mean words per minute was 80.6. This decreased slightly in the first intervention phase to 75.6 words per minute. In the second baseline phase, Student C's mean words per minute decreased again to 72 words per minute. The mean increased to 81 words per minute in the second intervention phase. As shown in Figure 11, the average number of words read per minute decreased from the baseline to the intervention phases in phase one, but the mean increased from the baseline to the intervention in phase two.

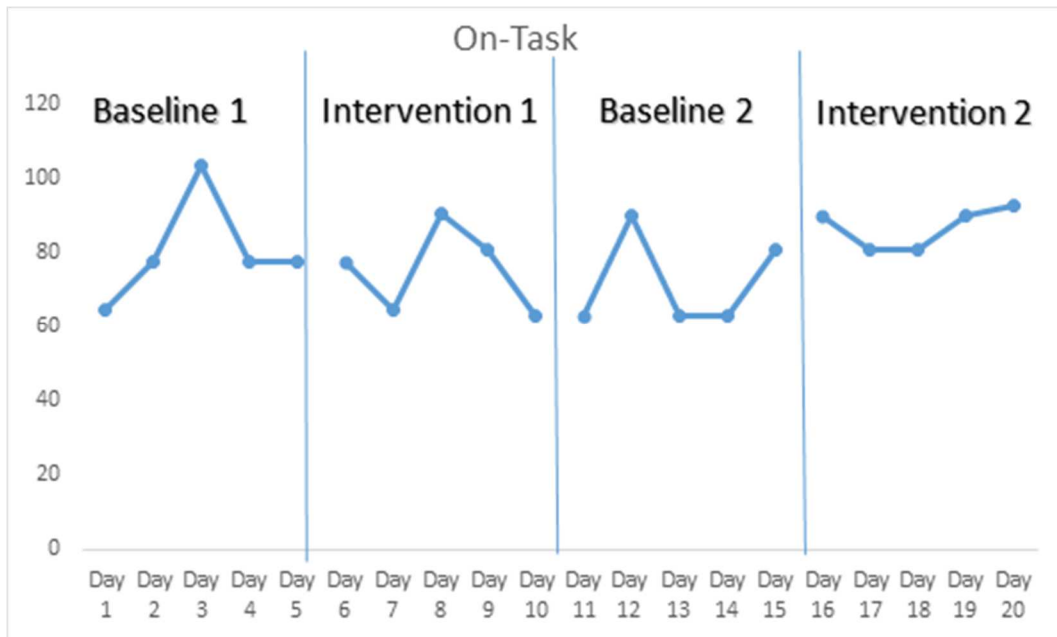


Figure 11. Student D on-task scores.

During the first baseline phase, Student E's mean words per minute was 52.8. This decreased slightly in the first intervention phase to 51.2 words per minute. In the second baseline phase, Student C's mean words per minute decreased again to 37.8 words per minute. The mean increased to 45 words per minute in the second intervention phase. As shown in Figure 12, the mean number of words read per minute decreased from the baseline to the intervention phases in phase one, but the mean increased from the baseline to the intervention in phase two.

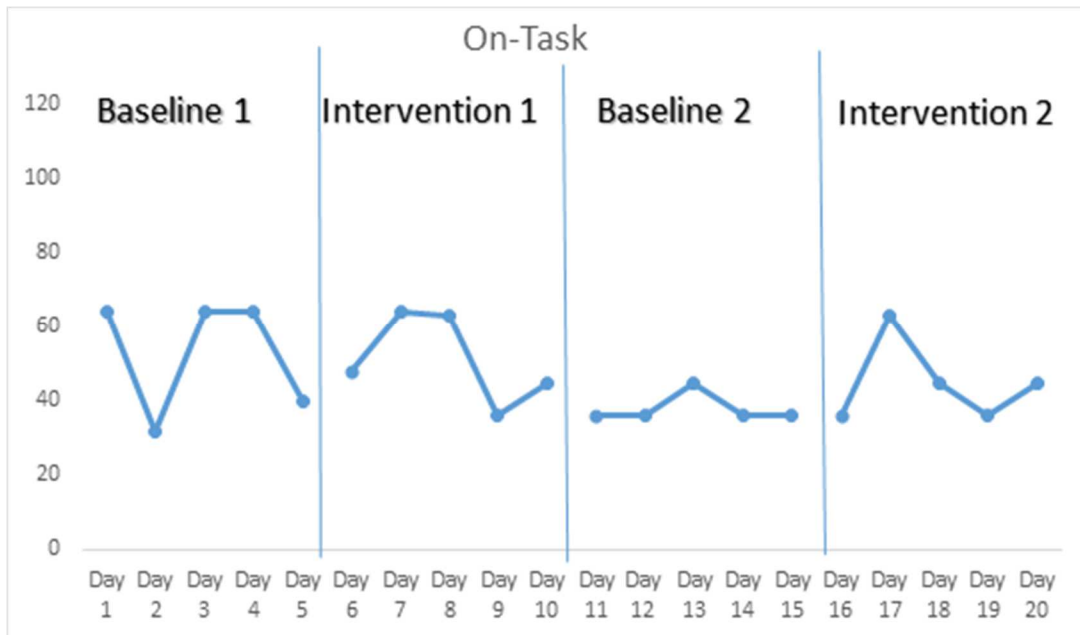


Figure 12. Student D on-task scores.

Student Survey

All students voluntarily completed a Likert scale satisfaction survey after completing of the second intervention phase. Results were converted to percentages after being tallied. The student response percentages for each statement in the ten-item survey are presented in Table 4.

Table 4

Student Satisfaction Survey Percentage Results

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Statement	1	2	3	4	5
I found the movement break activities easy to follow.	0	0	0	20	80
I enjoyed the movement breaks.	0	0	20	0	80
I would prefer to move to my next station without a movement break.	20	0	40	0	40
I would prefer a seated break between stations.	40	0	0	20	40
After a movement break, I felt that I was able to focus better on my reading assignment.	40	0	0	20	40
I felt that the movements were too difficult.	60	40	0	0	0
I enjoyed being able to move in between stations.	0	0	20	0	80
I felt that the movements were boring.	80	20	0	0	0
I would like to continue participating in movement breaks in the future.	0	0	0	0	100
In the future, I think about would be able to do a better job understanding what I have read after a movement break.	20	0	0	20	60

As seen in Table 4, a score of 4 or 5 indicates that the students agreed or strongly agreed with the statement. If a score of 3 was marked, it means that they were undecided on the statement. If the students disagreed with the statement, 1 or 2 were marked. Table 4 indicates that all of the students would like to continue participating in movement breaks in the future. All of the students either agreed or strongly agreed that the movements were easy to follow. In addition, all of the students either disagreed or strongly disagreed that the movements were boring. Overall, Table 4 shows that students enjoyed the movement breaks in between stations.

Chapter 5

Discussion

The purpose of this study was to determine the effectiveness of movement breaks to improve the reading comprehension scores and on-task behavior of students with learning disabilities in a READ 180 classroom. At the end of the study, students' feelings towards the movement breaks were assessed through a voluntary satisfaction survey.

Findings

Research has suggested that physical activity breaks during class have a positive impact on reading scores (Kibbe et al., 2011). In addition, studies have shown that students are more focused and on-task after engaging in physical movement (Luke et al., 2014; Bobe et al., 2014; Mahar et al., 2006). However, the present study did not confirm that movement breaks improve reading scores and on-task behavior.

The results from the present study do not confirm the findings of Kibbe et al. (2011) since the results were inconsistent. With the exception of Student A, all of the participants' mean reading comprehension scores decreased from the first baseline to the first intervention. From the second baseline to the second intervention phase, the students' scores went up slightly or stayed the same. Only two out of the five students increased their mean reading comprehension scores from the first baseline to the last intervention phase.

The present study also did not reinforce the research of Luke et al. (2014) who concluded that every participant's on-task behavior increased after a physical activity break. Student A is the only student whose number of words per minute increased from the first baseline to the first intervention. Similar to the results for reading

comprehension, more students' words per minute increased from after the intervention was reintroduced after the second baseline; only Student C's mean words per minute decreased. Moreover, only Student A's mean words per minute increased from the first baseline to the last intervention.

Limitations

The present study had multiple limitations. First, there were several limitations with the on-task component of the student. Every student finished a book and started a new book during the study. Because of this, the difficulty and interest in the book may have changed and influenced the results. For example, a participant may have started the study with a book that they were engaged in, but may have taken awhile to get interested in a new book. This may have slowed the pace of the reading.

Additionally, the number of words read was only an estimate, not an exact number. Several of the books read had pictures that took up the majority of a page; however, picture pages counted as the same number of words read as a page without a picture in the calculation used for this study.

During the study, there were several abbreviated days because of inclement weather and conferences. On those days, the students were in the room for a shorter amount of time. On most days, an average number of words read was calculated based on ten minutes of reading. However, on some days, such as abbreviated school days, the students read for a shorter amount of time. This may have altered the average number of words read per minute.

Students were given a one-page passage and five comprehension questions to answer based on the passage to assess the reading comprehension of each participant. I

observed that the students were taking their time completing these assignments during the first week, but began to complete them quicker in the following weeks. The students seemed to lose interest and motivation to try their best on the assignments. This may have been due to the frequency that the passages were given to the students.

Implications and Recommendations

This study builds upon the research investigating the use of physical activity breaks on on-task behavior and reading achievement. This study used shorter movement breaks than previous studies. In addition, many studies used observation to assess the effectiveness of physical activity breaks instead of assessments and words read per minute (Bobe et al., 2014; Mahar et al., 2006; Luke et al., 2014). The data collected in this study did not reveal that movement breaks had an effect on reading comprehension and/or on-task behavior.

One of the movement breaks that was implemented was walking worksheets. Students had a clipboard and completed task cards around the room that were connected to spelling, vocabulary, or the grammar topic of the week. Through observation, students were more on-task when completing the assignment using the walking worksheet approach versus completing the worksheet at their desks. They were able to complete the assignment in a shorter amount of time than if they were to complete them at their desks. Based on the observations from the present study, it would be beneficial to examine the effectiveness of movement-based reading lessons on the on-task behavior and achievement of students. It could also be broadened to other areas of language arts such as spelling and vocabulary.

According to the Likert scale data, the students enjoyed participating in the movement activities. The results the studies done by Kirk et al. (2013) and Mullender-Wijnsma et al. (2015), in which movement-based reading lessons were implemented in the classroom, support the observations made in the present study. It is hypothesized that participants will be more on-task and achieve better grades when participating in movement-based lesson activities versus stationary lesson activities.

Conclusions

Overall, it appears that movement breaks did not help increase student's reading comprehension scores or on-task behavior in the ways they were measured in the present study. Through observations in the present study, students were more on-task and accurate on their answers when they were participating in movement-based lesson activities compared to doing the activities while stationary at their desks. Further research is needed to determine if movement-based lesson activities increase on-task behavior and reading comprehension.

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