

THE BENEFITS OF PHYSICAL EDUCATION PROGRAMS FOR STUDENTS IN
SPECIAL EDUCATION PROGRAMS WITH
ATTENTION DEFICIT HYPERACTIVITY DISORDER

By

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Abstract

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Researchers have reported that exercise has had positive results on decreasing many behaviors for children with ADHD. The purpose of this study is to examine the impact of a structured physical education program for students in grades K-4 with attention deficit hyperactivity disorder (ADHD) on academic performance. This study utilized a single subject withdrawal design. Four participants attending a special day class in grades K-4 in Northern California participated in this study. Results of this study demonstrated that 30 minutes of structured physical activity had a positive impact on decreasing the number of off-task behaviors for all four of the participants. Future teachers and researchers working with students with ADHD should consider incorporating structured and consistent physical activity into their student's daily routines.

Keywords: Physical activity, attention deficit hyperactivity disorder, off-task behaviors, physical education

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Table of Contents

Abstract	ii
Acknowledgements.....	iii
List of Tables	viii
List of Figures	ix
Introduction.....	1
Attention Deficit Hyperactivity Disorder	1
<i>EMERGING SUPPORT FOR A ROLE OF EXERCISE IN ADHD INTERVENTION</i>	
<i>PLANNING</i>	2
Behavior	2
Benefits of exercise.....	3
Early Intervention	4
Physical Activity.....	5
Attention deficit hyperactivity disorder	5
Off- task behaviors.....	5
Physical Education.....	6
Limitations.	6
Delimitations.....	7
Methods.....	8
<i>Participant Demographics and Setting</i>	8

<i>Setting</i>	8
<i>Instrumentation</i>	9
<i>Experimental Design</i>	9
Baseline Phase 1	9
Baseline Phase 2	10
Intervention Phase 2.....	10
<i>Intervention</i>	11
<i>Dependent Variable and Data collection</i>	12
On task behavior	12
Off task behavior.....	12
<i>Procedures</i>	13
<i>Data Analysis</i>	13
Results.....	15
<i>Participant 1</i>	15
Baseline Phase 1	15
Intervention Phase 1.....	16
Baseline Phase 2	16
Intervention Phase 2.....	16
<i>Participant 2</i>	17
Baseline Phase 1	18

Intervention Phase 1	18
Baseline Phase 2	19
Intervention Phase 2.....	19
<i>Participant 3</i>	20
Baseline Phase 1	21
Intervention Phase 1.....	21
Baseline Phase 2	21
Intervention Phase 2.....	22
<i>Participant 4</i>	23
Baseline Phase 1	24
Intervention Phase 1.....	24
Baseline Phase 2	24
Intervention Phase 2.....	25
Discussion.....	26
<i>Outcomes</i>	26
References.....	29
Appendix.....	39
<i>Tables and figures</i>	39
<i>Baseline Phase 1 (A)</i>	40
<i>Intervention Phase 1 (B)</i>	41

Intervention Phase 2 (B)..... 43

List of Tables

Table 1	39
Table 2	40
Table 3	41
Table 4	42
Table 5	43

List of Figures

Figure 1	17
Figure 2	20
Figure 3	23
Figure 4	25

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a common *neurodevelopmental* disorder that is diagnosed in childhood (Chang, 2010). ADHD can be diagnosed as either inattentive or hyperactive and is usually first diagnosed in childhood and in most cases can last into adulthood (American Psychological Association, 2000). Children with ADHD may have trouble paying attention in school, controlling impulsive behaviors, appear to be overly active, and have difficulties focusing and behaving at one time or another (Wang, 2021). Researchers have also reported that many times these same difficulties in paying attention and or completing task are observed in the home environment as well, resulting in negative outcomes in relationships with peers (National Institute of Mental Health, 2021). Additionally, the National Institute of Mental Health has reported children with ADHD may get lost in their own thoughts, move often when seated, impulsively shout out, distract peers, and become physically aggressive when over stimulated or frustrated (NIMH 2021). Conversely, researchers have reported that exercise has had positive results on decreasing many of the above behaviors for children with ADHD (Chan et al., 2021). Exercise is defined as any activity that requires physical effort and movement of the body (World Health Organization,2023). For teachers at the k-12 grade levels many times exercise opportunities are limited to physical education (PE) (Wiium, 2021). Physical education is defined as education through the physical (Wiium, 2021). Consistent with United Nations Educational, Scientific, and Cultural Organization, PE embraces terms, such as

“physical culture”, “movement”, “human motricity”, and “school sport”, and refers to a structured period of directed physical activity in school contexts (Hardman et al., 2014, Pg.6). Physical activity is any movement that causes an individual to expend energy using their skeletal muscles (World Health Organization, 2020). Researchers have demonstrated that children with ADHD are able to remain on task in the classroom after participating in a physical activity (Teasley, 2008).

EMERGING SUPPORT FOR A ROLE OF EXERCISE IN ADHD

INTERVENTION PLANNING

Evidence based treatment for ADHD fall into two categories, pharmacological and psychosocial. (Berwid et al., 2012). It has been reported that physical exercise has powerful effects on brain function and structure and can affect cognitive and developmental function. (Berwid et al., 2012). In some instances, studies have shown that children’s ability to stay on tasks improves following 30 minutes of moderate aerobic activity.

Behavior

Early intervention is very important for children who have been diagnosed with ADHD (Chen et al., 2014). Children with ADHD tend to show difficulty with behavior in school and can often cause disturbances during class due to their need to move or be vocal (Conrad et al., 2000). Impulsive behaviors can be lessened with the use of pharmacological intervention, but not all children take ADHD medications due to various

reasons. (Verrett, 2012). There are also students with ADHD who are not impulsive and do not exhibit the need to move often, but are inattentive and also benefit from movement breaks throughout their day (Mulrine et.al., 2008). Physical exercise has recently been proposed as an alternative or additional treatment for ADHD, (Gapin, 2011). Exercise does not have the ability to replace medications, but is definitely a useful resource to help students manage their impulsive need to move (Miller, 2016).

Researchers have reported a limited number of studies on best-practices to improve performances in the physical education setting for children with attention deficit hyperactivity disorder (Verret, 2010). Taylor (2019) demonstrated that students with ADHD do exhibit improvements with on task behaviors after participating in physical activity.

Benefits of exercise

While in school, students with ADHD may exhibit more impulsive behaviors or act out due to their inability to attend to the challenging work that is presented to them (Verheul, 2015). Evidence indicates that exercise might benefit those with ADHD more than those with few or no symptoms of ADHD (Verheul, 2015). In addition, no studies reported adverse effects of exercise (Halperin, 2012). Therefore, it appears that PE lessons for the whole class could be especially beneficial for children with ADHD. However, the standard PE lessons in school can be challenging for children with ADHD due to long periods of the same activity, or periods of inactivity in team sports (Halperin, 2012).

Early Intervention

The influence of early physical activity study emphasized the importance of early intervention for young children diagnosed with ADHD (Harvey, 1997). Acute exercise is thought to enhance cognitive functioning by immediate neurochemical responses (Barkley, 2006). Parents are the first source of physical activity for their children and if they are able to provide outlets in the home setting, they may have less frequency of behaviors associated with ADHD (Gapin, 2014). Parents often report that children with ADHD who engage in regular physical activity experience positive behavioral changes (Gapin, 2014).

Purpose Statement. The purpose of this study is to determine if structured physical education can positively impact the number of off-task behaviors in the classroom for students with ADHD. The researchers believe that the physical education class will have a positive impact on the students with ADHD.

Research Questions

1. Will structured physical activity benefit students with ADHD?
2. Will structured physical education lessen the number of off-task behaviors during independent Math and English language arts sessions?

Definition of Terms. The following terms are important in understanding the presented study. Physical activity, attention deficit hyperactivity disorder, off-task behaviors, physical education

Physical Activity

Any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health (World Health organization, 2020).

Attention deficit hyperactivity disorder

A common *neurodevelopmental* disorder that is diagnosed in childhood (Chang, 2010). ADHD can be diagnosed as either inattentive or hyperactive and is usually first diagnosed in childhood and in most cases can last into adulthood (American Psychological Association, 2000).

Off- task behaviors

Off task behaviors are defined as engagement in any tasks other than the assigned task or ongoing activity (e.g., looking around the room, playing with items, talking, head on the desk) for more than x seconds. (Indicate time.) (Operational Definitions of Commonly Occurring Behaviors, 2023).

Physical Education

The foundation of a Comprehensive School Physical Activity Program. It is an academic subject characterized by a planned, sequential K–12 curriculum (course of study) that is based on the national standards for physical education. Physical education provides cognitive content and instruction designed to develop motor skills, knowledge, and behaviors for physical activity and physical fitness. Supporting schools to establish physical education daily can provide students with the ability and confidence to be physically active for lifetime (Centers for Disease Control and Prevention, 2019).

Limitations. Teaching students with disabilities has its own challenges, in general, so there are several limitations that can take place over the period of 4 weeks. The biggest limitation for some students may be implementing the change in their daily schedule. Students with ADHD rely on a concrete schedule and adding the morning physical activity may be challenging initially. Another limitation is absences of students, if some students have repeat absences during the four-week trial it may be difficult to collect adequate data. If students decide to drop out of the study, or refuse to complete the four weeks of participation, or if the teacher is unable to collect data due to outside stimulus with other classmates. These limitations may affect the outcome of the study. One more challenge with this study is that the level or degree of ADHD differs from child to child and what works for one student may not be as beneficial for the other. It is difficult to pick a group to study that have similar needs and are in the same type school setting.

Delimitations. The following delimitations are noted as they may affect the outcome of this study. Only students with a diagnosis of ADHD will qualify to participate in the study. Students in controlled Special Day class settings will be included in the study. Students must be in the age range of 6-9 to be included in the study. It is important that these delimitations are in place because the study is focusing on students who have a diagnosis of ADHD and are currently placed in a Special Education Program.

Methods

Participant Demographics and Setting

All four participants are in the same Special Education Classroom in Northern California. The age range for the participants is between 6 and 9 years. All participants are enrolled in a Social Emotional Learning environment and are either at grade level or close to grade level. Each participant has been unsuccessful in the established academic goals in the general education classroom and require additional support to access curriculum. The classroom includes a total of 7 students, one teacher and three support staff in the class at all times. Additionally, the school counselor is present 3 days a week and all other support services (i.e., speech occupational therapy, and adapted physical educator) are present in the class twice a week.

Setting

The study will take place in the gymnasium on the Elementary school where all participants attend. When the gym is not available due to assemblies or other school wide events, all participants will participate inside of their homeroom classroom. On warm days students will be taken outside to utilize the field and track areas.

Instrumentation

All off-task behaviors will be recorded using a teacher developed recording sheet. All Support staff will use the same recording sheet for each student. Staff will tally and add up the total number of off task behaviors during the 15-minute work sessions for each phase of the ABAB study.

Experimental Design

This study will follow a single subject ABAB design. An ABAB research design, also called a withdrawal or reversal design, will be used to determine if the intervention (i.e., exercise) has a functional relationship with the target behavior (i.e., time-on-task) for each participant. The design has four phases denoted by A1, B1, A2, and B2. In each phase, repeated measurements of the participants behavior are obtained. Below is a summary of the procedures that will be followed in each of the phases within the study.

Baseline Phase 1

Within baseline phase 1 all participants will attend the ELA and Math independent work class period during the same time. Support staff will record the occurrence of off-task behaviors within the 15-minute class session using tally marks to record each off-task behavior.

Intervention Phase 1

Prior to attending the ELA and Math independent class each participant will be placed in an exercise-based intervention class developed by the primary researcher. Post exercise intervention the primary researcher will take all participants into ELA and Math independent classroom to begin recording total number of off-task behaviors. During the class time non-continuous interval recording set 15 minutes will be used to determine the occurrence of off-task behaviors each participant demonstrates within the ELA and Math independent work class post exercise. Support staff will record the total number of off-task behaviors using the teacher developed recording sheet.

Baseline Phase 2

Within baseline phase 2 all participants will attend the ELA and Math independent work class period during the same time. Support staff will record the total number of off-task behaviors that occur within the 15-minute class period using non-continuous partial interval recording.

Intervention Phase 2

Prior to attending the ELA and Math independent class each participant will be placed in an exercise-based intervention class developed by the primary researcher. Post exercise intervention the primary researcher will take all participants into ELA and Math independent classroom to begin recording total number of off-task behaviors. During the class time non-continuous interval recording set 15 minutes will be used to determine the

occurrence of off-task behaviors each participant demonstrates within the ELA and Math independent work class post exercise. Support staff will record the total number of off-task behaviors using the teacher developed recording sheet.

Intervention

Each participant will participate in a 30-minute exercise program in the school gym. Prior to beginning the exercise intervention, the primary researcher will demonstrate the required exercises and answer any questions. A total of three stations with participants rotating through at the end of each 2-minute block will be followed by a 1-minute recovery. Specific exercises will follow a high-intensity interval training pattern where participants engage in developmentally and age-appropriate explosive movements, such as lifting, pushing, pulling and throwing weighted objects. Participants will also be placed in agility activities that include running and obstacle courses. Participants will rotate for the duration of the session and will repeat activities. Each session will end with a cool-down stretching that will include yoga and other static stretches. Participants will be allowed to extend their break time if needed but will be encouraged to rejoin or continue working at the prescribed levels.

Dependent Variable and Data collection***On task behavior***

On-task behavior includes verbal or motor behavior that follows the class rules and is appropriate to the learning situation. As such, on-task behavior is context specific, defined with reference to both the rules of the classroom and the teacher designated academic activity.

Off task behavior

“Off-task” refers to engaging in activities or conversations that are not part of the teacher-assigned instructional activity. Examples: Talking to others and not listening to or following directions from the teacher or staff. Doodling or drawing on paper or desk during direct instruction, shouting out or yelling profanities during instruction, striking peers or staff, throwing furniture or breaking classroom materials, walking out of class and slamming the door, walking around the classroom with the goal of interfering with other students work.

Procedures

Each day the primary researcher will greet the students and complete the morning routine prior to beginning the physical education session. All visual schedules will be updated to show the physical activity icon for the activity of the day. Prior to any physical activity the primary researcher will reiterate the behavioral expectations for all participants.

Data Analysis

The determination of the impact of the intervention (exercise) on the total number of off-task behaviors demonstrated by each participant will be completed using visual analysis and descriptive statistics. Specifically, the researcher will determine the level of change in data from the baseline phase to the intervention phase.

Prior to beginning the program, teachers will be recording data during individual work time in the form of number of off task behaviors during 15-minute sessions of Math and English language arts activities. The data will be collected over a 4- week period and recorded.

After completing the physical activities, students will return to their special education class during independent work time where they will be given Math and English language arts activities that are goal orientated. Independent work time lasts for 15 minutes. While completing work, data will be recorded by paraprofessionals teacher or adapted physical education specialist for the number of off- task behaviors after

completing the physical activity. The tracking form that will be used is the same sheet that the pre-exercise program data was taken on.

Results

Participant 1

Participant 1, is a 7-year-old male who has a dual diagnosis of autism spectrum disorder and ADHD. Participant 1 is performing at his current academic grade level, but has difficulty with completing activities and is easily distracted. Specifically, Participant 1 demonstrates difficulty within his general areas when students make too much noise or are off task, causing him to stop doing his work, shouting out, or getting up to move around the room. Participant 1 enjoys being physically active and often requests a physical activity for a brain break and is performing at his age level in gross motor abilities based on the Test of Gross motor skills-2.

Baseline Phase 1

Within Baseline Phase 1 (5 days) participant 1 demonstrated 5 off task behaviors on day 1. This was followed by 8 off task behaviors on day 2, 6 on day 3, 8 on day 4, and 11 on day 5. The most common type of off task behavior demonstrated by Participant 1 was shouting out the fewest type of off task behavior demonstrated by Participant 1 was classroom destruction.

Intervention Phase 1

During Intervention Phase 1 (5 days), Participant 1 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 2 off task behaviors. This was followed by 3 off task behaviors on day 2, 2 on day 3, 3 on day 4, and 4 on day 5. The most common type of off task behavior demonstrated by Participant 1 was shouting out. The fewest type of off task behavior demonstrated by Participant 1 was classroom destruction. The number of off task behaviors decreased during the intervention phase 1.

Baseline Phase 2

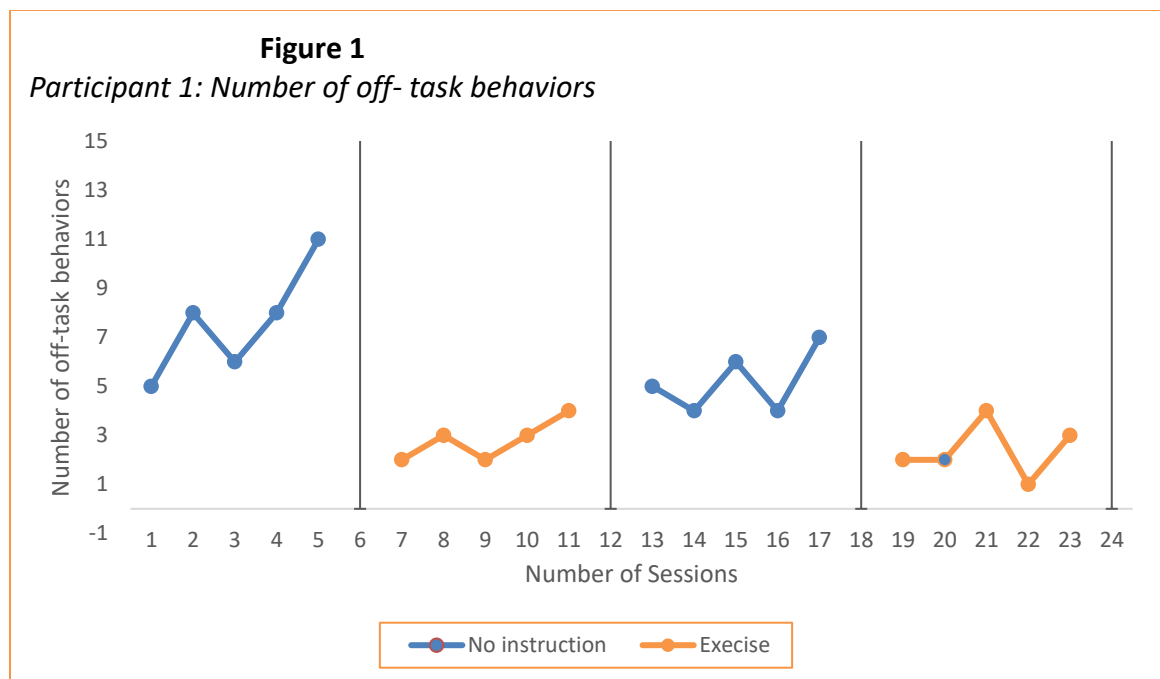
Within Baseline Phase 2 (5 days) participant 1 demonstrated 5 off task behaviors on day 1. This was followed by 4 off task behaviors on day 2, 6 on day 3, 4 on day 4, and 7 on day 5. The most common type of off task behavior demonstrated by Participant 1 was shouting out. The fewest type of off task behavior demonstrated by Participant 1 was classroom destruction.

Intervention Phase 2

During Intervention Phase 2 (5 days), Participant 1 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 2 off task behaviors. This was followed by 2 off task behaviors on day 2, 4 on day 3, 1 on day 4, and 3 on day 5. The most common type of off task behavior

demonstrated by Participant 1 was shouting out. The fewest type of off task behavior demonstrated by Participant 1 was classroom destruction. The number of off task behaviors decreased during the intervention phase 2.

Figure 1



Participant 2

Participant 2 is a 9-year-old male with a dual diagnosis of emotionally disturbed (ED) and ADHD. Participant 2 is performing just below grade level at this time and has been struggling to complete academic work due to constant outbursts, leaving the classroom and aggression towards staff or peers. A new behavior plan has just been implemented in hopes to lessen the current behaviors. Participant 2 enjoys being

physically active and physical education is a preferred activity for him. Participant 2 demonstrates confidence when performing gross motor skills (e.g., balls skills, running, motor planning and strength activities).

Baseline Phase 1

Within Baseline Phase 1 (5 days) participant 2 demonstrated 4 off task behaviors on day 1. This was followed by 4 off task behaviors on day 2, 5 on day 3, 7 on day 4, and 8 on day 5. The most common types of off task behavior demonstrated by Participant 2 was shouting out, talking to peers and leaving the room, the fewest type of off task behavior demonstrated by Participant 2 was classroom destruction.

Intervention Phase 1

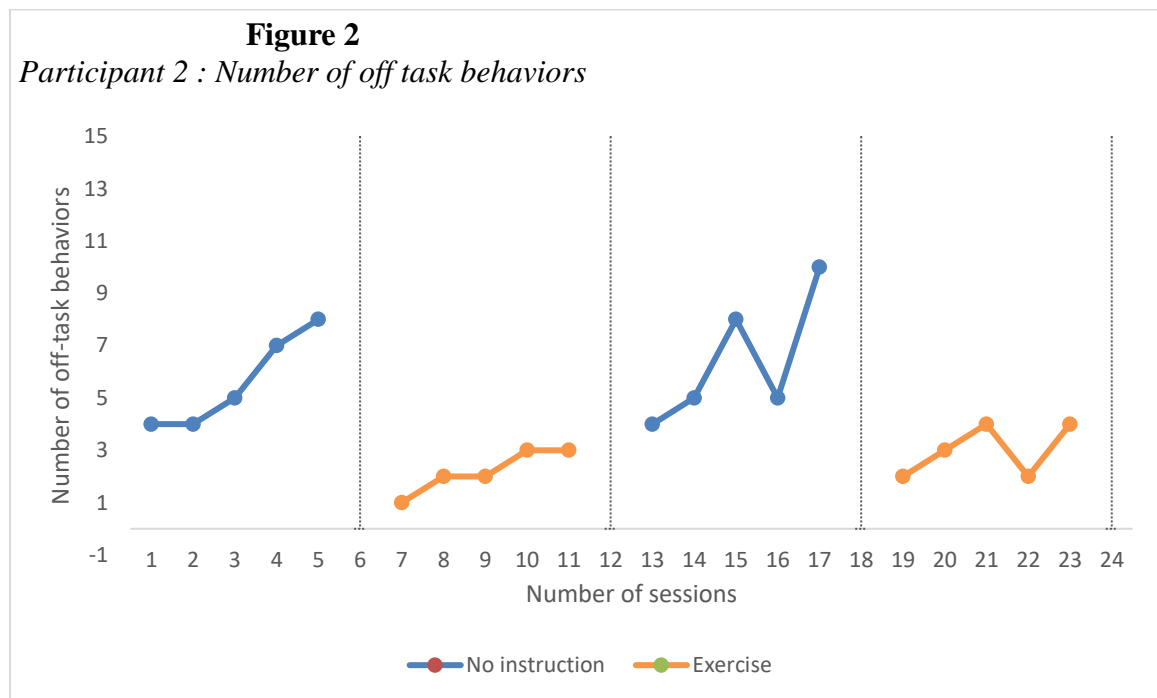
During Intervention Phase 1 (5 days), Participant 2 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 1 off task behavior. This was followed by 2 off task behaviors on day 2, 2 on day 3, 3 on day 4, and 3 on day 5. The most common type of off task behavior demonstrated by Participant 2 was talking to peers. The fewest type of off task behavior demonstrated by Participant 2 was leaving the room. The number of off task behaviors decreased during the intervention phase 1.

Baseline Phase 2

Within Baseline Phase 2 (5 days) participant 2 demonstrated 4 off task behaviors on day 1. This was followed by 5 off task behaviors on day 2, 8 on day 3, 5 on day 4, and 10 on day 5. The most common type of off task behaviors demonstrated by Participant 2 were shouting out and striking others. The fewest type of off task behavior demonstrated by Participant 2 was talking to peers.

Intervention Phase 2

During Intervention Phase 2 (5 days), Participant 2 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 2 off task behaviors. This was followed by 3 off task behaviors on day 2, 4 on day 3, 2 on day 4, and 4 on day 5. The most common type of off task behavior demonstrated by Participant 2 was shouting out. The fewest type of off task behavior demonstrated by Participant 2 was classroom destruction. The number of off task behaviors decreased during the intervention phase 2.

Figure 2**Participant 3**

Participant 3 is an 8-year-old female with a diagnosis of speech and language impairment, autism spectrum disorder and ADHD. Participant 3 is generally calm when sitting at her desk, but demonstrates characteristics associated with ADHD (i.e., inattentiveness). Participant 3 is unable to attend to school work for more than a few minutes at a time and tends to sit quietly at her desk. Participant 3 has mild delays with her overall gross motor development, but much of her delays are due to her lack of exposure and, she has demonstrated progress this school year. Finally, Participant 3 enjoys attending and participating in APE.

Baseline Phase 1

Within Baseline Phase 1 (5 days) participant 3 demonstrated 9 off task behaviors on day 1. This was followed by 6 off task behaviors on day 2, 4 on day 3, 4 on day 4, and 6 on day 5. The most common types of off task behaviors demonstrated by Participant 3 were shouting out, and leaving the room, the fewest type of off task behavior demonstrated by Participant 3 was classroom destruction.

Intervention Phase 1

During Intervention Phase 1 (5 days), Participant 3 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 4 off task behavior. This was followed by 2 off task behaviors on day 2, 3 on day 3, 1 on day 4, and 2 on day 5. The most common type of off task behavior demonstrated by Participant 3 was shouting out. The fewest type of off task behavior demonstrated by Participant 3 was striking others. The number of off task behaviors decreased during the intervention phase 1.

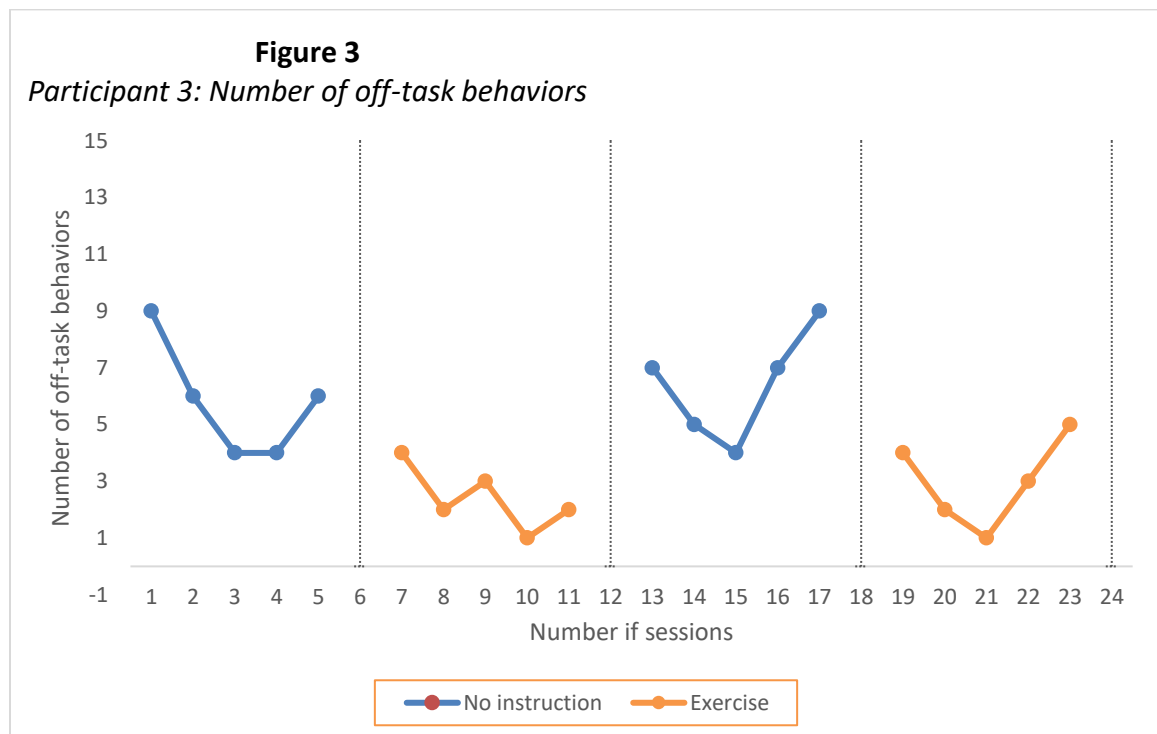
Baseline Phase 2

Within Baseline Phase 2 (5 days) participant 3 demonstrated 7 off task behaviors on day 1. This was followed by 5 off task behaviors on day 2, 4 on day 3, 7 on day 4, and 9 on day 5. The most common type of off task behaviors demonstrated by Participant 3

were shouting out, leaving and talking to peers. The fewest type of off task behavior demonstrated by Participant 3 was striking others.

Intervention Phase 2

During Intervention Phase 2 (5 days), Participant 3 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 4 off task behaviors. This was followed by 2 off task behaviors on day 2, 1 on day 3, 3 on day 4, and 5 on day 5. The most common type of off task behavior demonstrated by Participant 3 was shouting out. The fewest type of off task behavior demonstrated by Participant 3 was classroom destruction. The number of off task behaviors decreased during the intervention phase 2.

Figure 3**Participant 4**

Participant 4 is a 9-year-old male with a dual diagnosis of Autism and ADHD. Participant 4 is academically at grade level at this time and is able to demonstrate academics for ten-minute increments. Participant 4 is very easily overstimulated and distracted by outside stimuli and needs a lot of staff support to remain on task. Participant 4 generally does not enjoy being physically active and is over weight for his age. Participant 4 needs a lot of motivation during APE, but has made some good progress during this school year. For brain breaks he typically will choose laying in a bean bag chair, going in a dark tent or simply laying on the floor. Even with being inactive and

overweight, Participant 4 is at age level with his current gross motor abilities based on the Test of gross motor development-2.

Baseline Phase 1

Within Baseline Phase 1 (5 days) participant 4 demonstrated 7 off task behaviors on day 1. This was followed by 6 off task behaviors on day 2, 6 on day 3, 8 on day 4, and 9 on day 5. The most common types of off task behaviors demonstrated by Participant 4 were shouting out, and leaving the room, the fewest type of off task behavior demonstrated by Participant 4 was classroom destruction.

Intervention Phase 1

During Intervention Phase 1 (5 days), Participant 4 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 3 off task behavior. This was followed by 2 off task behaviors on day 2, 3 on day 3, 4 on day 4, and 5 on day 5. The most common types of off task behaviors demonstrated by Participant 4 were shouting out. The fewest type of off task behavior demonstrated by Participant 4 was classroom destruction. The number of off task behaviors decreased during the intervention phase 1.

Baseline Phase 2

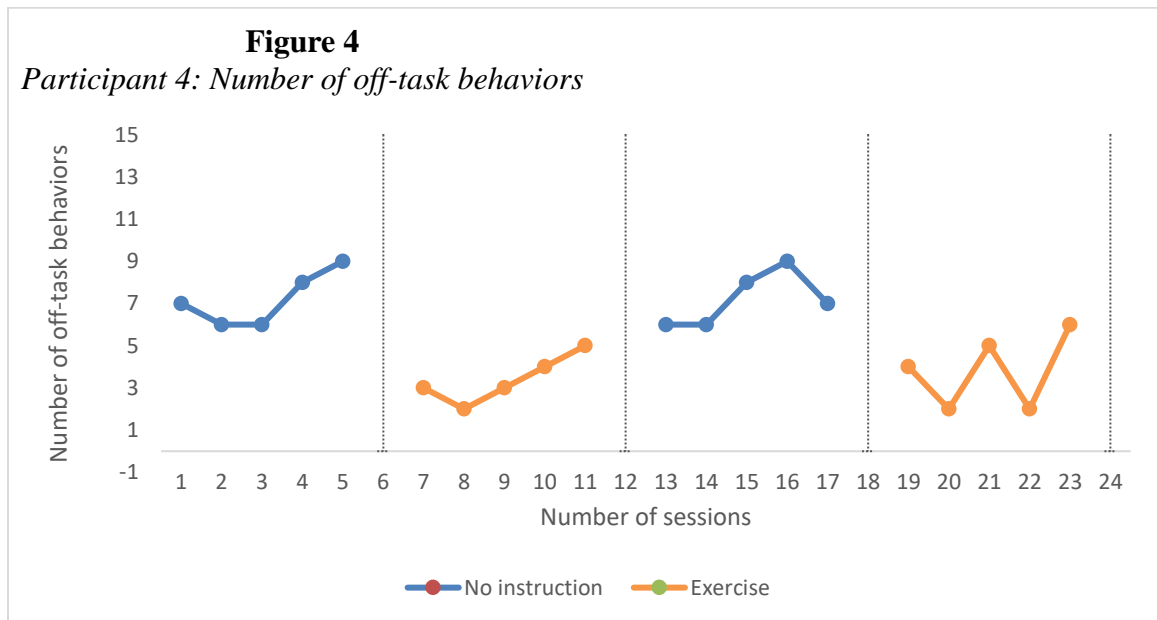
Within Baseline Phase 2 (5 days) participant 3 demonstrated 6 off task behaviors on day 1. This was followed by 6 off task behaviors on day 2, 8 on day 3, 9 on day 4, and

7 on day 5. The most common type of off task behaviors demonstrated by Participant 4 were shouting out and talking to peers. The fewest type of off task behavior demonstrated by Participant 4 was striking others and classroom destruction.

Intervention Phase 2

During Intervention Phase 2 (5 days), Participant 4 participated in a structured exercise program prior to beginning their academic time. On day 1 the participant demonstrated 4 off task behaviors. This was followed by 2 off task behaviors on day 2, 5 on day 3, 4 on day 4, and 6 on day 5. The most common type of off task behavior demonstrated by Participant 4 was shouting out. The fewest type of off task behavior demonstrated by Participant 4 was leaving and striking others. The number of off task behaviors decreased during the intervention phase 2.

Figure 4



Discussion

This study examined the benefits of physical education programs for students in grades K-4 with attention deficit hyperactivity disorder. For this study, 4 students from Special Day class settings in grades K-4 were observed post Adapted Physical Education sessions during academic work times. Academic work times consisted of Math and English Language arts activities that were goal orientated. The purpose of the study was to see if students had more success with staying on task after receiving Adapted Physical Education consisting of strength and cardiovascular exercises.

Outcomes

The data from the study showed that the 30 minutes of structured physical activity had a positive effect on all 4 of the participants. Off- task behaviors decreased during both the Intervention phase 1 and Intervention phase 2. One classroom teacher and 3 paraeducators aided in taking data during both the baseline and intervention phases. Each staff member was assigned 1 participant to focus on for all data recording. Staff used a tally mark to keep track of the number of off-task behaviors and then used the table to specify the type of behavior. Tally marks were added up at the end of each session. A general pattern that occurred for all students was that during both nonintervention and intervention phases students generally had more off task behaviors on Mondays and Fridays. The increase in off task behaviors stems from outside stimuli such as unstable

living conditions and lack of routine and structure on non-school days. Students often have high anxiety on Fridays leading into the weekend.

The most recent studies that have been done to determine if exercise is beneficial for students with ADHD have shown that students with ADHD do show improvements staying on task after participating in physical movement. A Meta analysis done in 2018 by Giesige showed that physical activity interventions did show a decrease in impulsive behaviors for students with ADHD. The Meta analysis looked at 11 studies that were done to analyze how physical activity affected students with a variety of needs including anxiety, ADHD and depression. In many cases it was proven that physical activity was a beneficial tool for students with ADHD.

An explorative study that was done in 2012 by Verret used a similar age group as this study and was done over a span of 10 weeks. The objective was to see if moderate- to high intensity physical activity had a positive effect on students with ADHD for behavior and cognition. Similar to this study, the students showed positive improvements with behaviors reported by both parents and teachers after 30 minutes of physical activity. Dissimilar to this study, Verret used standardized physical education assessment before and after intervention to monitor improvement with gross motor skills. With this study, data of off task behaviors was used to determine if physical activity had a positive impact.

A Limitation of this study is the fact that the group of students was small and only consisted of 4 students. There are many outside stimuli when working with a group of students in a social emotional classroom setting, so each day can look very different as

far as behavior and outcomes for each student. This study was only done over a span of 4 weeks, so data is limited. The group of students had great attendance over the 4 weeks, which could have potentially been a limitation if students were consistently absent. It may be beneficial for future researchers to expand this study over the span of a school year. It would be helpful to see if there are any specific times in the school year that off task behaviors increase or decrease. For example, off task behaviors may increase around the holidays due to overall excitement or anxiety of long spans of time at home. The next step that I would take with this study would be to gradually increase the time of the study to compare data in order to see if there are consistencies and inconsistencies.

After each intervention phase it was clear that physical activity aided in decreasing off task behaviors in all 4 students. All of these students have a diagnosis of ADHD, so it proved the hypothesis that 30 minutes of physical activity would have a positive effect on students with ADHD. All children with ADHD vary, so it cannot be stated that this intervention would work for all students with ADHD, but with further research we can get a bigger picture.

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Appendix

Tables and figures

Shouting out: S

Leaving work area/room: L

Striking others: SO

Classroom destruction: CD

Talking to peers: T

Table 1

Participant	Monday	Tuesday	Wednesday	Thursday	Friday
Participant 1					
Participant 2					
Participant 3					
Participant 4					

Off-task behavior tracking form

Baseline Phase 1 (A)**Table 2**

Participant	Monday	Tuesday	Wednesday	Thursday	Friday
Participant 1	5 S, T, L	8 S, T, L	6 S, T, L	8 S, T, L	11 CD, S, T, L
Participant 2	4 T, L, S	4 T, L, S	5 CD, T, L	7 T, S, L	8 T, S, L, SO
Participant 3	9 S, L, T, CD	6 SO, S, L, T	4 S, L, T, SO	4 S, L, T	6 S, L, T
Participant 4	7 S, T, CD, SO	6 S, L, T	6 S, L, T, CD	8 S, SO, L, T	9 S, CD, SO, T

Baseline Phase 1 number of off-task behaviors

Intervention Phase 1 (B)**Table 3**

Participant	Monday	Tuesday	Wednesday	Thursday	Friday
Participant 1	2 S	3 S, T	2 T, L	3 S, T	4 SO, S
Participant 2	1 T	2 S, T	2 S, T	3 T	3 T, S, L
Participant 3	4 S, L, T	2 SO, S	3 S, L, T	1 L	2 S, T
Participant 4	3 S, T, SO	2 S	3 S, L, T	4 S, L, T	5 S, CD, SO

Intervention phase 1 number of off-task behaviors

Baseline Phase 2 (A)**Table 4**

Participant	Monday	Tuesday	Wednesday	Thursday	Friday
Participant 1	5 S, T, L	4 S, T, SO	6 T, L, S	4 S, T, CD	7 SO, S, T, L
Participant 2	4 T, S, L	5 S, T, SO	8 S, T, CD, SO	5 T, S, L	10 T, S, L, CD, SO
Participant 3	7 S, L, T	5 S, SO, T	4 S, L, T	7 T, S, L	9 S, T, L, SO
Participant 4	6 S, T, L	6 S, T, L	8 S, L, T, SO	9 S, L, T, CD	7 S, T

Baseline phase 2 number of off-task behaviors

Intervention Phase 2 (B)**Table 5**

Participant	Monday	Tuesday	Wednesday	Thursday	Friday
Participant 1	2 S, L	2 S, T	4 T, L, S	1 S,	3 S, T, L
Participant 2	2 S	3 S, T, CD	4 S, T, L	2 S, SO	4 S, T, L
Participant 3	4 S, L, T, SO	2 S, SO	1 S	3 T, S	5 S, T, L, CD
Participant 4	4 S, T, L	2 S, T	5 S, L, SO	2 S, L	6 S, T, CD, SO

Intervention phase 2 number of off-task behaviors