AN EXAMINATION OF THE EFFECTS OF PHYSICAL EXERCISE ON
AGGRESSIVE BEHAVIOR IN INDIVIDUALS WITH DEVELOPMENTAL
DISABILITIES

Thesis

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ABSTRACT

Students with significant disabilities frequently engage in challenging behavior, such as shouting out in the classroom, not paying attention, and aggressing towards others. Consequently, they are often put on medication, disciplined, or secluded from their peers taught in general education classrooms without fully examining other options that may help to decrease challenging behaviors. One possible way to decrease challenging behavior among individuals with disabilities is to provide them with access to increased physical activity. This study used a multiple baseline across participants design to investigate the effects of physical exercise on aggressive behavior in individuals with developmental disabilities. Results indicated that providing students with increased physical activity decreased their aggressive behavior. The results generalized to various settings throughout the day. Maintenance data showed a continuance of the intervention data and supported the idea that exercise decreases challenging behaviors. Parents reported that they felt exercise was extremely important and that it would help their child’s behavior. The paper will discuss limitations and directions for future research.
Dedicated to my students. They are the reason I go to work.
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CHAPTER 1

INTRODUCTION

Students diagnosed with significant disabilities frequently engage in challenging behavior (e.g., shouting out in the classroom, not paying attention, aggressing towards others), which may lead to difficulty acquiring and maintaining new skills (Schloss & Smith, 1998). These challenging behaviors may stem from a variety of setting events, including being late from the bus, getting a look from a classmate, having too much or too little energy, or even something that happened last year (e.g., a death in the family; Cooper, Heron, & Heward, 2007). With this challenging behavior comes frustrating situations for the student(s), their teacher, and anyone who comes in contact with the student (Hussey, 2002). Consequently, students with significant disabilities are often put on medication, disciplined, or secluded from their peers taught in general education classrooms without fully examining the cause of their behavior (Horner, Carr, Strain, Todd & Reed, 2002). The antecedents to these challenging behaviors as well as ways to intervene and decrease the behaviors need more examination (Hussey).

Students with significant disabilities engage in challenging behavior (e.g., aggression, self-injury, and property destruction) for a number of reasons (Prupas & Reid 2001). Some possible functions include gaining access to attention or tangible items, escaping from task demands, or (i.e., automatic reinforcement; Cooper et al., 2007). These behaviors help to create a negative opinion about people with significant
disabilities within the community. In addition, the behaviors make it difficult for these individuals to maintain a job, friendships and their own independence (Horner et al.).

In recent years, there have been a number of studies done to examine how to help people with significant disabilities communicate their needs, control their challenging behaviors, and engage in less aggression. These studies have shown a number of methods for targeting challenging behavior. Some methods include reinforcement (social or tangible), contingency contracts, response costs, differential reinforcement, time out, social stories, and punishment (Schloss & Smith, 1998). A method to decrease challenging behavior among individuals with disabilities may be to provide them with access to increased physical activity as an antecedent intervention. Exercise may help to create a common bond between students with multiple disabilities and their non-disabled peers (Weiss, Diamond, Denmark & Lovald, 2003). In addition, if students are given the opportunity to exercise, then students who are more active may settle down while students who are lethargic may become more alert (Azrin, Vinas, & Ehle, 2007).

According to Zygmunt-Fillwalk and Bilello (2005), children perform better academically when they have opportunities for movement in a variety of forms and at various times throughout the school day. Zygmunt-Fillwalk and Bilello researched how recess time or a lack of recess time affects the behaviors and learning of typically developing students. Their study examined why children lack the ability to pay attention in longer stretches of time. Through their after recess and classroom observations of on-task behavior (i.e., following directions, completing assignments, staying in seat, and looking at the speaker) they found more on task behavior when they had recess compared to when they didn’t have recess. Zygmunt-Fillwalk and Bilello suggest that if students are
given access to movement throughout the day, their test scores and overall cognition may improve. Not only do breaks in the regular school day appear to boost children's cognitive and physical development, they strongly support their social development (i.e., friendships, waiting, interaction with peers; Zygmunt-Fillwalk & Bilello).

In addition to the aforementioned study, several studies have focused on changing the antecedents to help modify challenging behavior. Bachman and Fuqua (1983) noted that manipulating antecedent stimuli and/or the setting events are not as often examined as research that examines how behaviors are managed and modified when the consequences for the behavior are changed. They felt that this was a significant problem and lack within the research and suggested that more studies examine the effects of exercise on appropriate and challenging behavior. In addition, studies should focus on the effects of consecutive days exercises has on student behavior.

In their study, Bachman and Fuqua (1983) examined how various antecedent exercises can help to manage challenging behavior specifically they used an alternating treatments design to examine the effects of different intensities of exercise on the participants’ behavior. The study participants included 5 males, ranging in age from 6 to 16, enrolled in a school for individuals with mental retardation. Exercise was introduced and then reintroduced to the participants in five separate phases: (a) two daily alternating sessions of jogging at a moderate pace for a long period of time and short vigorous jogging, (b) two daily alternating sessions of no exercise and jogging at a short vigorous rate, (c) jogging on consecutive days for short vigorous periods, (d) jogging on consecutive days for long periods, and (e) reintroducing Phase B, two daily alternating sessions of no jogging and jogging at a short vigorous rate. After each session, the
researchers collected pulse rates for each participant (to determine the intensity of the workout) and then observed if their inappropriate behavior decreased in the 30 minutes following their exercise. They found that exercise had the most significant effect on behavior when it was done throughout the day, on consecutive days. Also when the participants had higher heart rates for longer periods of time, challenging behaviors decreased. However, the researchers point out that behavior changes could level out once the students’ bodies begin to regulate at the new level of fitness and this should be further examined. Nonetheless, the researchers stressed that manipulation of antecedent and setting events is a practical practice and worthy of further research.

Elliott, Dobbin, Rose, and Soper (1994), compared vigorous aerobic exercise and general exercises to determine which, if either, had an effect on the challenging behaviors across time of six adults with autism and mental retardation. In this study, the 6 adults randomly completed 3 different antecedent sessions: (a) one with no exercise, (b) one with general motor activities, and (c) one with vigorous, aerobic exercises. After the sessions, the participants returned to their regular environment and were observed for 30 min to gather data on the target behaviors (i.e., self-injury, property destruction, stereotypic behavior). The results indicated the largest decrease in challenging behavior when vigorous exercise took place.

Exercise has also been examined in other ways, not just in the as an antecedent. In a study completed by Azrin, Vinas, and Ehle (2007), exercise was used as a reinforcer. They looked at providing physical activity as reinforcement for controlling and maintaining proper classroom behavior of 2 boys with attention deficit and hyper-activity disorder (ADHD). The students were reinforced with 5 min of activity for every 15 min
of classroom attentiveness and calmness, (i.e., participating in the class discussions, completing work and staying in their seats). The students were first taught to engage in the correct classroom behaviors (i.e., sitting in their chair, engaging in the lesson) for 15 minutes. The initial goal was to have the students engage in 1 minute of correct behavior; each minute was then rewarded using a token economy. After earning 15 tokens, the boys received 5 min of physical activity. Eventually the token economy was phased out and the boys just worked for the 5 min of physical activity. The results of this study showed that the boys improved remarkably and were much more engaged in the instruction and not as disruptive when given the opportunity to participate in physical activity every few minutes. The study does caution that the behaviors of the students could have improved because of the token economy system, the physical activity given, or simply because the students were made aware of their behaviors and given a goal to work towards. The token economy made use of the Premack Principle (i.e., rewarding a difficult task with a positive one) and encouraged the students to work towards an activity they would enjoy. The exercises gave the students an opportunity to move and use their energy appropriately. Further research should examine the above variables to determine which behavior has the greatest effect: the exercise, the token economy system, or working toward a goal.

According to Prupas and Reid (2001), much of the research on stereotypic behavior has concluded that this behavior stops or, at the very least, hinders learning and that correct behaviors are much harder to teach while the individual is occupied in stereotypic behaviors. The authors state that students with disabilities engage in stereotypic behaviors to meet some other need that is not being met. Their study
examined the effects of exercise on the stereotypic behavior of four children with developmental disabilities using two different exercise conditions: (a) a 10 min walk/jog session at one specific time during the day, and (b) three different 10 min sessions, completed throughout the day. Each phase lasted 5 days, and the researchers examined which phase produced the greatest decrease in stereotypic behavior. They found that there was a greater decrease in stereotypic behavior during the multiple exercise condition compared to the single session condition. They suggested that future research examine how multiple frequency exercise programs could lower levels of stereotypic behavior in larger groups. They also cite the benefits of using physical fitness as a means to decrease stereotypic behaviors including it being age-appropriate, a social activity, and a positive and pro-active approach that improves overall attitude. They point out that exercise activities are also free, easy to use, and easy to teach.

In another study, Johnson, Van Laarhoven, and Repp (2002) examined four students with moderate to significant mental retardation to determine if additional exercise of any kind decreased stereotypic behaviors. They used an alternating treatments design to determine the effects of two different intensities of movements on challenging behavior during instructional periods. They conducted 15 min sessions to teach new activities with varied levels of gross motor movement. After these teaching sessions, the researchers had sessions where they prompted students to engage in gross-motor activities (i.e., pushing a chair) during more difficult tasks and less physical activities (i.e., walking to a chair and sitting down) during easier tasks. After these contrived sessions, they had sessions where the physical activity level was randomly paired with a task to examine varied task levels with varied exercise levels. The results of this study
indicated that matching higher levels of physical activity with more difficult tasks helped to increase positive behavior as well as decrease stereotypic behavior. Johnson, Van Laarhoven and Repp found that the availability of gross motor activity helped develop overall skills and helped the students to maintain a positive learning environment.

Stueck and Gloeckner (2003) had another take on decreasing the challenging behavior of students with multiple disabilities. Their research included teaching yoga to 110 students between the ages of 11 and 12. Their goal was to teach the students self-management techniques that would decrease stress-levels and increase positive reactions when high demands were being placed or in stressful situations. Their study was based on a program used in Germany that taught yoga exercises to students before, during, and after participation in stressful activities. The idea behind this program was that the relaxation and exercise techniques taught would help students cope with difficult activities and situations. An alternating treatments design was used to determine if aggressive behaviors and negative attitudes decreased with relaxation training. Relaxation, yoga techniques, and a “game stage” where they taught the participants a variety of imagination techniques to use when they were upset. After they taught the skills, they examined the students’ behaviors. They found that students were able to practice the taught skills, and that when the students used the new skills, they had less challenging behavior. Stueck and Gloeckner propose further research should teach students on the autism spectrum ways to manage their stressors.

Teaching students with multiple disabilities to exercise will likely benefit their overall health. Given that students with significant disabilities frequently grow into adults who are obese, exercise seems to be an obvious tool to help in all areas. According to
Lancioni, Gigante, and O’Reilly (2000), people with profound mental retardation and other disabilities are usually inactive and even sedentary. There are many factors that contribute to this sedentary lifestyle, including lower developmental levels, little initiative, and a lack of independence, to name a few. Lancioni, Gigante and O’Reilly believe that obesity is a frequent problem in adults and children with mental retardation that needs to be confronted. Through a multiple-baseline across participants, the trio examined the effects of mild physical exercise paired with technological support (to increase independence during exercise) of two men with significant disabilities to determine if this would help to increase their activity level. They felt that teaching adults to exercise was not enough; it was also necessary to teach them to be independent with that exercise, as their care providers are not always able to ensure proper exercise time. Therefore, this study used a permanent paper trail with footprints to cue the participants to walk. After training sessions, they reinforced the participants for independent completion of the trail; from here the participants were left to be independent. They found that the adults still needed prompting to begin the exercise, but once they had started, they were more likely to finish if they had some independence with the routine.

In another study, Lancioni and his colleagues (2004) looked at the problem that obesity plays in the behavior problems of individuals with significant disabilities. In this study, the researchers examined if the pairing of a favorite stimulus with treadmill use increased the likeness that adults with multiple disabilities would use the treadmill and then if this use of the treadmill would decrease the negative behaviors of the adults. This is because many times people with significant disabilities dislike exercise and do not participate in it; this causes health issues as well as other problems, such as lower social
skills (Lancioni et al.). Lancioni and his colleagues worked with three adults with significant disabilities on participating in treadmill exercises paired with positive stimuli (e.g., music or TV). The goal was to increase the likelihood of the adults participating in the physical activity in order to improve other aspects of their lives. When the treadmill exercise was paired with the positive stimuli, there was a significant increase in the happiness of the participant and the willingness to participate. The authors found that the higher the overall happiness of the participant, the more likely they would be to complete the exercise. In addition, the participants showed a decline in their challenging behavior upon completing the exercises. They suggest that future research should not only examine the generality of the findings, as this study was only completed with three people, but also to examine the number of sessions and the length of exercise sessions that will be the most beneficial in changing behavior and a general attitude towards exercise.

Exercise may help develop self-esteem and self-efficacy in a number of ways, including increasing feelings of self-worth, this is because it is an activity that is good for the body and may ultimately provide benefits to the body (Weiss, Diamond, Denmark & Lovald 2003). In addition, participation in physical activities promotes social acceptance and status (Weiss et al.). Exercise alone has the potential to alter one's body, increase positive self-image, and improve self esteem. Frequent physical activity also promotes on-going physical challenges and goals. When these goals are met, it creates feelings of self-efficacy and helps to teach perseverance.

Weiss et al. (2003) examined how exercise helps to improve the overall sense of self. They looked at 97 participants in Special Olympics and conducted perceived
competence tests and interviews to the participants and their families. They examined five factors: (a) Personal Self-Sufficiency, (b) Community Self-Sufficiency, (c) Personal-Social Responsibility, (d) Social Adjustment, and (e) Personal Adjustment. According to Weiss et al., participants in Special Olympics had a more positive self-concept and were more adept in social situations than those not involved in a sporting program. They suggest that one’s general self-worth is improved through exercise, because exercise increases cognitive competence, physical competence, and social acceptance. These are all improved through the experiences practiced and acquired through daily and long term participation in physical activity, specifically with other people and in competition. This is important to note because individuals who are angry and/or depressed often also have a negative self-concept (Weiss et al.). An increase in self-concept may result in a decrease in challenging behavior, while a decrease in self-concept may result in an increase in challenging behavior. It is also important to note that Weiss et al. stated that the longer and more consecutive the participation was the more positive effect it had on the individuals. Weiss and colleagues suggest that how people perceive their intellectual levels, given their successes or failures in both academics and social situations, paired with stigmas that often accompany developmental disabilities are all risk factors for developing a poor self-efficacy and low self-esteem. They promote that one way to combat those feelings and the challenging behavior that comes as a result is through consistent daily exercise.

In addition to providing students with disabilities an outlet for unused energy, providing time and instruction on physical activity and exercise provides an educational experience that may lead to healthy adults with disabilities. Mann, Zhou, McDermott, and
Poston (2006) examined the effects of attendance in a health promotion program on the behavior of 192 adults with mental retardation. They created a curriculum that focused on exercise, nutritional choices, and reducing stress. The researchers had the participants attend classes on a variety of topics to help them learn to be healthier. In addition, the participants were given the option to exercise daily and develop a dietary plan. The main purpose of this study was to educate the adults so that they would be able to make decisions about their life, thus increasing independence and overall self-esteem as well as changing their lifestyles to be healthier. The most significant finding of this study was not only a reduction in the participants’ body mass index but changes in their overall feelings about themselves. The participants had increased knowledge, a healthier diet and an increase in their physical activity. Although this study did not examine the direct effects the additional exercise and better overall health had on the participants’ behavior, it did refer to the stress level of the participants. The authors advocate that people with disabilities can learn to regulate their needs based on their stress and activity levels. The author’s also state that more research should examine how the effects of a healthy lifestyle affect the behavior of a variety of participants with significant disabilities.

Further studies have focused on using physical activity as a means of aiding in inclusive settings. Lorenzi and Horvat (2000) compared the physical activity and overall physical health of boys with and without mental retardation using the school playground during recess time. They simply spent time observing the interactions and activities of boys on the playground. In addition, they took the heart rates of the participants before and after recess times. Their findings showed that the boys with mental retardation had lower cardiovascular fitness and therefore they met their max heart rates with lower
levels of activity. Additionally their bodies have more fat and less muscle mass than their peers. They assert that there is a connection between activity levels (including free play time) and academic and social achievements and daily competence. Through observation of the recess activities, the researchers found that the lower the skills of the students (i.e., social, academic, and play skills) the lower their activity levels and thus they had less interaction with their peers. They found that using recess as a means to teach exercise skills benefits the students in a variety of ways: physically (healthy weight, good blood pressure, high muscle tone), emotionally (better sense of self), academically (more willing and ready to learn), and socially (making friends on the playground). They concluded that recess, where all students are expected to interact and all students are included together in non-structured play, encourages and facilitates more physical activity for the children with mental retardation. Lorenzi and Horvat suggest that more research needs to be done to examine how children respond to play in all areas of development. Also, research should expand to include an examination into both heart rates and recovery rates of individuals with mental retardation and compare this to their non-disabled peers’ heart rates and recovery rates.

Exercise has been shown to have many benefits in all aspects of life: mentally, emotionally, physiologically, socially, and physically. Huett (2001) points out that exercise is an activity that enhances the person’s overall quality of life. Exercise by itself may improve cognition and foster physiological functioning and behavioral change (Huett). In her article, Huett examines the concept that exercise is an important factor to health on the whole and a necessity to a happy life. Even so, exercise is not utilized by enough people. She states that depressed individuals grade exercise as the most important
feature in their treatment and recovery, yet there is research that indicates that participation in a daily exercise or physical routine is lower among individuals with mental health issues (Burbach, 1997).

Students with significant disabilities frequently do not engage in a regular exercise program (Lancioni, Gigante, & O’Reilly, 2000), even though it has been shown that incorporating regular exercise into a person's day can lead to decreases in challenging behavior. Some studies have found that when people with disabilities are given the opportunity to engage in exercise (i.e., are taught or encouraged to exercise), they show a decrease in challenging behavior (Lancioni et al.). The purpose of this study is to examine the effects of physical exercise on challenging behavior in students with significant disabilities.

More research needs to be done on exercise as an antecedent measure. The questions should center on how much exercise is needed and what type of exercise is the most effective at decreasing challenging behavior and increasing appropriate behavior. In this paper, exercise was examined as a means of decreasing challenging behavior. A variety of cardio exercises were used throughout the day, on consecutive days to determine the effects of those exercises on challenging behavior, mainly aggression. The goal was to examine if engaging in physical activity once per hour would decrease challenging behavior (e.g., aggression towards others, destruction of property, self-injurious behavior, and dropping to the ground) in the classroom. This study examined the effects of physical exercise on aggressive behavior in elementary students with developmental disabilities. Specifically, this study examined the following research
question: What are the effects of aerobic activity on aggressive behavior for elementary students with developmental disabilities?
CHAPTER 2

METHOD

Participants

There were 3 participants, all students between the ages 8 and 11, who had an emotional disturbance and moderate intellectual or developmental disabilities. Inclusionary criteria included participants (a) having an IQ below 70, and (b) engaging in frequent challenging behavior (e.g., threats, physical aggression, property destruction, and/or self-injury). The participants were educated in a classroom for students with multiple disabilities (MD) in a self-contained public school designed for children identified as having an emotional disturbance. All students who attended this school were required to have a behavior intervention plan. This plan was reviewed once a year and was used as an intervention guide for each student’s independent behavioral needs. Assessments were completed with each student in order to obtain current levels of performance and to establish goals for the year. Each student was given the Brigance Inventory of Basic Skills Assessment; this test was done at least twice a year to monitor progress.

William was a 9-year-old male with autism, moderate to severe mental retardation, and an emotional disorder. He functioned at a low kindergarten level (determined through the Brigance Inventory of Basic Skills test) and had an IQ score of 47 (determined through the Stanford-Binet IQ test). Often, when given a difficult task or
during transitions, he became aggressive. His challenging behaviors included cussing, yelling, insulting, hitting, punching, spitting, flopping to the floor and aggression (see Appendix A for behavior details). Previous behavior management techniques that were attempted included providing a sensory activity when William engaged in aggression (e.g., deep pressure, resistance, cocoon sleeve). These methods were effective in calming William down after he engaged in challenging behavior; however they did not prevent the behaviors from occurring.

Reese was an 11-year-old male diagnosed with autism and emotional disorders. He functioned at a low second grade level (determined through the Brigance Inventory of Basic Skills test) and had an IQ score of 57 (determined through the Stanford-Binet IQ test). Reese engaged in vocal (e.g., yelling, swearing) and physical aggression (e.g., hitting, kicking) towards teachers and peers. He also threw his work or ripped it up. In addition to these disruptive behaviors, he also exhibited some behaviors that are detrimental to his health, such as, purposeful incontinence, inappropriate sexual behavior, and fecal smearing. His aggression could become intense and could last for up to 30 to 40 minutes. His episodes occurred as frequently as daily or as infrequently as once a week. Previous behavior management including self-monitoring techniques and deep pressure, these were both effective in his understanding of the behaviors and did help to decrease the total number of challenging behaviors, but did not eliminate them altogether.

Lonny was an 8-year-old boy diagnosed with a hearing disorder, moderate mental retardation, and an emotional disorder. He functioned at a low 2nd grade level (determined through the Brigance Inventory of Basic Skills test) and had an IQ score of 63 (determined through the Stanford-Binet IQ test). Lonny engaged in challenging
behaviors that included hitting, kicking, yelling, spitting, and throwing objects (including his hearing aids). When staff attempted to redirect him, he would either ignore them, or he would sit in a chair and scream. In previous school years; Lonny had engaged in a token economy system where he worked towards a goal. This was effective for him; however his challenging behaviors did not stop altogether.

Materials and Setting

The materials for this study included a table, a chair, exercise equipment (e.g., trampoline, hula hoop, scooters, and jump ropes), timers, and reinforcers that were individualized for each participant.

All sessions took place in a classroom at a specialized K-5 public school for students with emotional disturbances (described above). The intervention took place in the multiple disability room, the gymnasium, the art room, the recreation therapy room, the music room and therapy rooms. Students from 3rd (8 years) to 5th grade (12 years), all with similar disabilities and varied academic levels were served in this classroom. There were seven students served in this room, 5 boys and 2 girls. All of the students participated in the intervention; however, only three students have their data included in this study, this is due to parental request. All baseline and intervention sessions were conducted during instructional and leisure activities across the day.

Target Behaviors

The target behavior for this study was challenging behavior exhibited in the classroom setting. Challenging behavior was defined as: (a) aggression towards others (i.e., hitting, kicking, biting, yelling, spitting, throwing), (b) destruction of property (i.e., tearing, throwing, kicking objects, breaking objects, pushing things over, or shoving
objects and/or furniture), (c) self-injurious behavior (i.e., head banging, hitting, biting, and wetting pants), and (d) dropping to the ground (i.e., dropping to the ground with belly flat against the floor, legs kicking up), (See Appendix C for a complete description).

Independent Variable

The independent variable was the daily exercise program the students completed. The students completed a 20 minute exercise program in the morning and then again after lunch. In between each long exercise program quick exercise breaks were taken every hour that lasted about 1 to 5 minutes. The procedures for these programs are described in detail in the procedures section below.

Data Collection

Baseline and intervention data were collected using a frequency count. The day was divided into one hour intervals, and the frequency of challenging behavior (as specified by the four groups of challenging behavior above) was recorded for each interval and then a total was recorded at the end of the day. In addition, data were collected on whether the students completed the exercise. The students were given a plus for each activity they completed and a minus if they did not complete the exercise. The exercises had to be completed as independently as possible and as accurate as possible in order to earn a plus on their chart.

Interobserver agreement was calculated for each phase of the research using total agreement using the following equation: agreements/ (agreements +disagreements) x 100. Agreement was calculated for 20% of all sessions for all participants and was calculated to be 100% in agreement.
Experimental Design

To show experimental control, a multiple-baseline across participants design was used. Each participant began the program when their baseline data were stable and data showed a decreasing trend. The order for introducing the participants to the program was chosen based on the stability of their baseline data and the intensity of their challenging behavior.

Procedures

Baseline

During baseline, participants engaged in the typical levels of physical activity: gym class, physical therapy, recreation therapy, and recess time. Total physical activity averaged 20 to 40 minutes a day. Typical behavior management techniques (e.g., redirection, behavior charts, personal goals, work breaks, timers and visual schedules, and physical intervention) were continued during baseline sessions. If a participant became a danger to themselves or others, they were physically restrained or escorted into a respite room as described in their individual behavior intervention plans.

Intervention

Once a stable baseline was observed, the intervention phase began. Each student was walked through the exercises and given an example of how to complete the exercises. During the entire intervention prompts on how to do the exercises were given on an as needed basis. The intervention consisted of a 20 min exercise routine in the morning followed by 1-5 min of cardio work every hour until after lunch, when the entire program was repeated. The 20 min exercise routine consisted of: (a) 12 jump in/out of the hula hoops, (b) 20 trampoline jumps, (c) 10 “crunches” with weights, (d) 20 line hops
over a jump rope, (e) 10 wall pushes, (f) leg/arm stretches with bands, (g) 5 minutes on scooter boards, and (h) 5 minutes of slow jogging or fast walking (for more details see Appendix A). Every hour following the 20 min exercise routine, a quick 1 to 5 min exercise break was taken. The exercises were chosen at random (i.e., drawn out of a bin). The brief exercises consisted of jumping in place, running in place, jumping jacks, yoga poses, quick body movements, leg kicks, or scissor jumps (explained in detail in Appendix A). Each student had an exercise chart on which their participation in the daily exercise program was recorded. Praise was delivered and a sticker was placed on the student’s exercise chart for completion of each exercise. Once the exercise chart was filled (this required the student earning 30 stickers), the student was allowed to pick a prize from the prize bag. The teachers in the room continued to reward students for positive behavior and continued to supply consequences and/or redirect challenging behavior as described in baseline. If a student was not able to participate or refused to do exercises for a day or time it was noted on the data.

**Student Choices Phase**

After all three students were participating in the intervention phase they began to express preferences for some of the exercises and began asking to pick their own exercises. At this point, the intervention was changed to allow the students the opportunity to choose their own exercises. The only condition was that once an exercise had been done it could not be repeated that day. This was done to keep student interest in the intervention and to help them personalize the routine. All other aspects were kept the same during this phase.
No Chart Phase

During this phase of the intervention, the students continued to exercise as in the choice phase, however, they were no longer required to complete an exercise chart that they would then use to turn in for a prize. This change was made because the students did not have an interest in the charts and had to be reminded to complete them and to turn them in for their prizes. All other aspects of the intervention remained the same during this phase.

Generalization

Generalization was a part of the intervention the intervention from the very beginning. The exercises were completed in a variety of settings (e.g., art room, gym, library, music room, and therapy rooms) and with a variety of teachers working with the students.

Social Validity

Parents were given a questionnaire to attain their opinions on the behaviors that are desirable to help students learn and to help them function in society. The parents were asked to rate the importance of a variety of behaviors and how they feel exercise influences their child (see Appendix B for details). In addition to the surveys, social validity was determined through the appeal of the exercise program to the students. Each participant was excited to complete the exercises, did so willingly, wanted to do extra exercises, and wanted to show the exercises to other teachers. Their excitement about the intervention shows that it was a socially valid tool.
CHAPTER 3

RESULTS

Intervention

William

Results for William are presented in the top tier of fig. 1.1. During 4 days of baseline, William engaged in an average of 7 challenging behaviors per day, ranging 6-8 challenging behaviors per day. During most of his behaviors, he ended up being escorted or taking himself to the respite room (a padded isolated room). An immediate decrease in challenging behavior was observed when treatment was initiated. On the first day of the intervention, he only engaged in 3 challenging behaviors, all of which occurred in the first hour of the day, prior to completion of the first 20 min exercise session. Following the first day, William had an average of 1.3 challenging behaviors per day. William would mark his exercise chart after each activity and earned the maximum of 8 stickers a day, each day. He needed to be reminded to complete the exercise chart, and was given a prize from the class random prize bag after he completed a chart. After 4 charts were used, a fifth chart was not started, because William had to be reminded to complete the chart each time and when asked if he wanted to continue the chart he say he did not. Once the charts were removed, William continued to show a stable behavior pattern.
Reese

Results for Reese are presented in the second tier of Figure 1.1. During 9 days of baseline, Reese engaged in an average of 9 behaviors a day, ranging from 8-10 challenging behaviors per day. Once intervention was started Reese’s behaviors decreased immediately. During intervention, Reese engaged in an average of 1.8 challenging behaviors per day. As with William, Reese needed to be reminded to mark his exercise chart. However, each day he earned the maximum of 8 stickers. When his exercise chart was full, he was allowed to pick a prize from the class random prize bag. After 3 charts were used, a fourth chart was not started because when Reese asked if he enjoyed the chart, he stated that he was not interested in the exercise chart and was excited to be getting up in the middle of his everyday work. Once the charts were removed, Reese continued to show a stable behavior pattern.

Lonny

Results for Lonny are presented in the bottom tier of Figure 1.1. During 14 days of baseline, Lonny engaged in an average of 5.5 challenging behaviors per day, ranging from 5-7 challenging behaviors per day. Once intervention was started he immediately dropped to one challenging behavior for the entire first week. After that, he dropped to zero behaviors for week 2 of the intervention. He averaged a total of 0.2 challenging behaviors during the entire intervention. Like Reese and William, when asked about the exercise chart, Lonny stated that he was not interested in the additional step of charting his exercises to earn a prize. He was excited to participate in the activities and often requested exercise breaks between the hour time tables. He received two prizes from the class prize bag for completing two charts. After which, the use of the exercise charts was
discontinued and his behaviors stayed stable (Results for Lonny can be seen in the bottom tier of Figure 1.1).

**Generalization**

Generalization was a part of the intervention as the students engaged in the intervention in a variety of settings and with a variety of people. In addition, the data were collected in a variety of settings, throughout the entire day.

**Follow-Up**

*William*

Follow-up was assessed for three weeks. During follow-up, William continued to exhibit lower levels of challenging behavior. In fact on the days that data were collected, he engaged in 0, 0, and 1 challenging behaviors. In addition, William continued to participate in the exercises with no problems and continued to enjoy them.

*Reese*

As with William, follow-up was assessed on Reese for three weeks. Reese also continued to exhibit lower levels of challenging behaviors. His follow-up points consisted of 1, 0, and 1. This shows a steady decline in the behaviors. As with William, Reese continued to enjoy the exercise program and completed the daily exercise program enthusiastically.

*Lonny*

Lonny was also assessed for three weeks to examine the follow-up of the intervention. As with his previous data, Lonny exhibited no challenging behaviors during follow-up. In addition, he completed the exercises appropriately and with no objections.
Social Validity

All three students’ parents were asked to complete the survey on exercise and behavior. Only two parents returned the survey. The surveys had 12 questions; 10 questions where parents were asked to rate the importance of a variety of exercise and behavior questions, from 1 to 5 and 2 additional questions to provide comments. Each parent rated all 10 questions very important, stating that their child’s behavior was important and that their health and exercise was also important. Both of these responded to the surveys in complete agreement with the exercises and the idea that exercise may help diminish challenging behaviors (for more detail on the survey questions, see Appendix B). They both reported that anything that can help their child to prevent outbursts and stay focused was very important. Each parent stated that it was very important for their child to learn a variety of exercises, to exercise daily, and to take exercise breaks throughout the day. In addition, they both reported that it was important for their child to learn to control their bodies and that exercise would help them to do that. One parent wrote that their child was implementing exercises that he said he learned at school on the weekends at home. She stated that exercise is a great for her child’s behavior because of his aggression.
Figure 1 Effects of exercise on challenging behavior.
CHAPTER 4

DISCUSSION

In this study, physical activity was used effectively to decrease challenging behavior in three students with multiple disabilities who received services in a separate facility for individuals with emotional disturbance. During baseline, the students engaged in an average of 7.1 aggressive behaviors daily. During the intervention, the students engaged in an average of 1.1 aggressive behaviors daily. In this study, antecedent exercise had a positive effect on decreasing challenging behavior throughout the school day.

Although the intervention was successful, several changes were implemented that should be considered. The intervention began with the exercises being randomly drawn out of an “exercise bag”—the students would pick an exercise from the bag and complete it. After all three students began the intervention they asked if they could choose which exercises they would do. At this point, the intervention changed and the students were given the opportunity to choose their own exercises, with one rule: they could not choose the same exercise more than once a day. Upon implementing this change in the routine, the students showed no change in challenging behavior from the initial intervention and continued to exhibit low and stable levels of behaviors. Allowing the students to choose their own exercises gave them more control over their routine. Many people with disabilities are not given the opportunity to make choices or to refuse things (Dalrymple,
1993). This is a skill necessary for independence and one that is also necessary to teach (Dalrymple). This also lends itself to future research, looking at whether offering students a choice between exercises verses creating an exercise program for them helps their behaviors and how many choices they should be given. There has been a lot of research done that focuses on the idea that choice creates more independence and enhances quality of life (Dalrymple), this line of inquiring could be incorporated into the exercise research.

Another change that took place during the intervention was the removal of the exercise chart. Each student was asked to complete an exercise chart at the end of each exercise. Once the chart was filled, the students were allowed to choose a prize from a prize bag. However, after completing at least one week of the intervention with each student, it appeared that the exercises were effective alone because they were excited to exercise and requested exercising in between the scheduled times and had to be reminded to complete the chart and to turn it in for a prize. Due to this enthusiasm in the intervention itself, it was determined that the students did not need the charts as an incentive to exercise. In fact, they had to be reminded to mark their charts and when asked if they wanted to continue using them, they all said that they did not care. Upon removal of the exercise chart, challenging behavior remained low and stable, suggesting that the chart did not help the students to complete their exercises or to control their challenging behaviors. Future research should examine if a sticker chart or some type of reinforcement is necessary to encourage students to stay engaged in an exercise program. After a longer period of time, it might be necessary to reward students for continuing to exercise and this should be examined. There has been some research done where people with disabilities attended a health program were rewarded for their participation (Mann,
et al, 2008). This study found that it helped adults with disabilities to stay engaged in the fitness program. Future research could examine the success that this has with younger children, over an extended period of time.

The findings of the current study suggest that teachers may be able to reduce challenging behavior by having students participate in regular exercise activities. Although challenging behavior was not completely eliminated for all students, it did decrease significantly in both frequency and severity, making the behaviors much more manageable. The behaviors that stayed consistent throughout the intervention may have been due to outside stimuli (e.g., the bus ride, home issues, other students), or may have served another function. However, having the lower rates of challenging behavior allows the examination of the function of those behaviors to be more manageable (Cooper et al, 2007).

The students who participated in this study had a significant drop, not only in the frequency of challenging behavior that they engaged in, but also in the severity of those behaviors. One student, Lonny, stopped aggressive behaviors during the intervention and did not engage in them again during the maintenance stage. Another student, William decreased in the number and severity of the behaviors during the intervention. He was able to be redirected verbally rather than with a physical restraint. In addition, the pluration of his behaviors decreased. During the follow-up phase, William did not engage in any challenging behaviors. The last student, Reese engaged in fewer behaviors during both the intervention and the maintenance stage. Like, William, he was usually able to be redirected without being put into a restraint or being escorted to the respite room.
Generalization was a part of the intervention from the beginning, as the students completed the exercises throughout the entire day and in different settings. Once the intervention was implemented, the students completed the exercises in the gymnasium, the art room, the music room, and in their therapy rooms (i.e., occupational, physical, and speech therapy). The students had no trouble completing the exercises in any setting and, in fact, often asked to do or show their exercises their other teachers. Additionally, their behaviors stayed low across all settings, including those outside of their home classroom.

There are several important implications that arise from this study. First, implementing this intervention was very simple. The exercises were easy to teach, as well as easy for the students to learn and practice. The exercises were also enjoyable for the students. It was not something that they found difficult, rather it was something they looked forward to doing and even requested. The exercises were done throughout the day, which may appear to be time consuming; however, since the exercises were completed in between 1 and 5 min, almost no instructional time was lost. It is important to note that since the behaviors decreased with the exercise, there may actually have been more time for instruction (Crollick, et al, 2006). Future researchers should examine this question further.

For the classroom teacher, this study gives an example of exercises that can be easily implemented to help reduce challenging behaviors. If a teacher is looking to help one student manage their challenging behavior or looking for a class management system, this study would show a new way to look at changing behavior through changing the antecedent. This study helps to show a variety of exercises that can be used at quick intervals throughout the day. In addition, it gives teachers a good example and clear data.
on exercise. Often, teachers feel that there is not enough time to implement anything extra in the day. However, this study shows the benefits that exercise can bring and the changes that it can make in student behavior. Teachers may be more apt to implement exercise into their daily routine, knowing that it can be done quickly without additional preparation and will likely decrease challenging behavior and therefore increase student productivity (Crollick, et al 2006).

Another implication would have to do with the fact that many schools have cut out recess and physical activity from the daily routine because of budgeting or time restraints. In addition to the current study that shows a decrease in challenging behavior with an increase in physical activity, there have been numerous studies that show a direct link between physical activity and cognitive functioning (Satcher & Carter, 2004). For example, Satcher and Carter found a correlation between high test scores and physical activity. Upon review of test scores and activity records, it was concluded that the schools that did not have the students participating in physical activity had lower test scores than the schools that had students participating in physical activity. In fact, even in schools where the physical activity time took away from academic time, the test scores rose. Therefore, the current study could be used to help teachers of both students with disabilities and without disabilities to find a way to incorporate exercise into their daily routine, especially considering that only 36 percent of children meet doctors’ recommendations for physical activity (Johnston, 2007). Classroom teachers could encourage their students to stand up and move around during lessons, or even incorporate some of the quick and simple exercises into their lessons.
Limitations

This study had positive results, showing a clear drop in challenging behavior with the use of exercise. However, there were some limitations. First, the number of students (3) who participated in the study was too small to get a clear sampling of how exercise might affect behavior across all students. Future research should include a larger sampling of students to give a better argument that exercise is a good way to decrease challenging behavior. There have been a number of studies that have shown a decrease in challenging behaviors when exercise has been introduced. For example, Prupas and Reid (2002) examined the frequency of exercise on stereotypic behaviors. Their research found a positive change to take place with the more exercise the students completed. However, the research only focused on 4 students, this is also a small sampling. In addition, Bachman and Fuqua completed a study using antecedent exercise to manage inappropriate behaviors. This study also had a positive outcome and showed that exercise does help to decline negative behaviors; however, once again only 4 students were involved in the study. The small sampling of participants in the above mentioned studies supports the idea that a larger sampling is needed to make a general statement.

The sampling number was also a limitation from a social validity stand point, as only 2 of the 3 parents returned their questionnaires. This made it difficult to state what is truly important to parents of students with disabilities and whether or not exercise is something they are willing to try. It may also have been helpful to ask teachers of students with severe disabilities their thoughts on exercise and how exercise and incorporating exercise into the daily routine may affect behavior.
The sampling number also revealed another limitation—all the students in this research enjoyed the exercises and were able to complete them, there were no students who were physically impaired or obese. Therefore, this study did not show how exercise could benefit someone that has extreme difficulties exercising. Future research should look at students with physical disabilities who also engage in challenging behaviors or those who are obese and engage in challenging behaviors. The research could examine how to use exercise with a variety of students and how obese students or students with physical disabilities respond to exercise.

Another limitation was the students included in this study were all in the same disability category: SED and MD. This is a small sampling of the many disabilities. Future research should examine students with attention deficit hyperactivity disorder and no cognitive delays to see how exercise affects their ability to pay attention and complete work.

This study also had some time restraints, after the final participant was added to the intervention; the study was continued for just a few more weeks. It would be beneficial to examine the students for a longer length of time to see how the exercise continues to affect their behaviors. Future research could do a longitudinal study to see how exercise affects behavior over an entire year.

Another limitation was the way that data was collected, a frequency count. For these students, they only engaged in at most 10 challenging behaviors per day so it was not a very significant number. However, when they engaged in the behaviors it was for extended periods of time. If the duration of behaviors would have been recorded it may have shown a clearer picture of the effectiveness of the intervention.
In addition, there was not a treatment integrity recorded for this study. It would have made the data stronger to examine the presentation of the exercises to be sure that each day the students had the same expectations and that each student was given the same length of exercises.

Future research should also look at the amount of exercises done daily. In this study exercise was completed hourly, with two 20 minute exercise routines followed by 1-5 minute exercise intervals. This is a significant amount of time exercising daily. It would be beneficial to examine if the exercise routine alone changed student behavior, or if the hourly breaks alone changed the behavior.

This study effectively changed the behavior of 3 students with severe disabilities and emotional disturbances. When the students began the exercise routine, their challenging behavior quickly decreased and remained low and stable throughout the entire intervention. The exercises and lower rates of behavior generalized to other environments, which was promoted by the fact the students had to complete the exercises in a variety of settings throughout the day. The findings suggest that exercise can reduce the moderately high rates of challenging behavior and do so quickly. In addition, exercise helped to reduce the need for physical controls to be used on the students and allowed them to let their aggressions out in a more positive manner. Using exercise in the classroom on a daily basis will create a more positive learning environment and help to prevent challenging behavior.
LIST OF REFERENCES


APPENDIX A

EXERCISE DETAILS
20 Minute Exercise Routine (completed twice daily)

- 12 Hula Hoop Jumps – 4 hula hoops were put in a straight line, each touching the next one. The students had to jump from one to the next one. They had to go to one side, turn around and come back to the beginning. They completed this three times.
- 20 Trampoline Jumps – A small trampoline was put on the floor, the students had to jump, with their feet coming off the trampoline, completing 20 jumps total.
- 10 “crunches” with weights – The students held a two-pound weight in each hand. They had to start with their hands at their sides bend their arms to touch their shoulders and repeat 10 times.
- 20 line hops over a jump rope – A jump rope was placed flat on the floor, the students had to stand sideways and jump from one side to the other. They completed 20 jumps.
- 10 wall pushes – The students had to find a place on the wall and stand facing the wall, about one foot away from the wall. They then had to place their hands on the wall and complete a push-up. They completed 10 push-ups in a session.
- Leg/arm stretches – The students had to stand straight up then bend down to reach and touch their toes (or as far as they could reach with their knees straight). They held this for 10 seconds. The arm stretch consisted of crossing one arm across their body and pushing on their elbow, counting to 10 and then repeating on the other arm. Finally, they had to reach one arm over their head, bend it behind their hand and press on their elbow for 10 seconds, again repeating on the second arm.
- 5 minutes on scooter boards – The students would walk to the gymnasium, where they would get a small scooter board. They would lie on their stomachs and use their arms to push them from one side of the gym to the other side. They completed anywhere from three to five laps.
- 5 minutes of slow jogging or fast walking – The students then jogged, as long as they were able and then walked in a square around the gymnasium. They did this for about 5 minutes, completing anywhere from 3 to 10 laps.

Random Exercises Picked from the Exercise Tub

- Jumping in place – the students would stand wherever they were and jump in place for up to 1 minute.
- Running in place – The students would stand wherever they were and run in place for 1 minute intervals.
- Jumping jacks – The students would go to a “safe” place, where they had enough room to complete a jumping jack and would do anywhere from 20 at a time or up to 1 full minute.
- Yoga poses – The students would pick a letter of the alphabet and complete the corresponding yoga pose for that letter (i.e. a=alligator, b=butterfly, c=caterpillar). They would usually complete up to 8 poses at a time.
- Trampoline jumps – The students would get out the trampoline and each take 20 jumps, feet leaving the floor of the trampoline.
10 Sit-Ups – The students would lie on their backs and complete a full sit up (bringing their elbows to their knees) with or without assistance. They would complete 10 sit-ups.

Chair Rises – The students would stand like they were going to sit down on the chair, but instead use their arms to support their bodies. They would put their hands on the seat of the chair, keep their feet on the floor and bend their knees until their bottoms were almost touching the floor. They would complete 10 of these at a time.

25 Toe Raises – The students would stand flat footed, and then rise up onto their toes. They would complete this 25 times.

ABC Write – The students would lie and their backs and make the letters of the alphabet with their legs, keeping their writing leg in the air. They would complete a-l with one leg and then switch and complete m-z with the other leg.

Jump-Ups – The students would bend down and touch the ground and then jump as high as they could, reaching their hands up into the air. They would complete between 10 and 20 of these.

Leg Kicks – The students would stand sideways then take one leg and kick it out, trying to get the leg high off the ground. They would complete 5 kicks on each leg.

Crab Walk – The students would get down on the ground and put their arms behind them. From there they would push up, stabilizing on the palms of their hands and their feet. They would then “walk backwards” 20-30 yards.

Lunges – The students would put one leg in front, bend it towards the ground. Then they would stand up and switch legs. They would complete this 10 times on each leg.

Bear Crawl – The students would get down on their hands and feet, with their bodies in a bend. They would then “crawl” 20-30 yards.

Hopping – Using both legs the students would bend at their knees, jump up and move forward 20-30 yards.

Scooters – Students would sit on a square scooter, they would then move forward, using their legs to pull them forward. They would do two laps in the gymnasium.

Tummy Scooters – Students would lie on their stomachs and use their arms to push them from one side of the gym to the other side.

High Knees – Students would bring one leg up to their chest (or so their knee was above their waist), then they would quickly switch legs. They would repeat this motion for 1 minute or for 30 times.

Scissor Jumps – Students would put one leg in front then jump and switch legs. They would complete anywhere from 10 to 20 of these in a set.
APPENDIX B

SOCIAL VALIDITY QUESTIONNAIRE
Parent Survey

Please rate the following statements.

1 = Not at all important
2 = A little important
3 = Somewhat important
4 = Important
5 = Very Important

1. It is important for my child to control his/her own body.
   1   2   3   4   5

2. Exercising will help to keep my child from not hurting others or him/herself.
   1   2   3   4   5

3. It is important for my child to keep his/her hands, feet, arms, legs, and mouth to yourself.
   1   2   3   4   5

4. It is important for my child to feel safe in school.
   1   2   3   4   5

5. I think that exercising can prevent some of my child’s outbursts.
   1   2   3   4   5

6. It is important for my child to have a healthy body.
   1   2   3   4   5

7. It is important for my child to exercise every day.
   1   2   3   4   5

8. It is important for my child to know different ways to exercise.
   1   2   3   4   5

9. It is important for my child to take exercise breaks during the day.
   1   2   3   4   5

10. It is important for my child to stay focused at school.
    1   2   3   4   5

11. Does your child currently exercise at home? (yes / no)
    If so, please list the types of activities your child participates in below.
    ____________________________________________________________
    ____________________________________________________________

12. Please write any comments that you have below:
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
APPENDIX C

TARGET BEHAVIOR DETAILS
A. aggression towards others
   a. hitting (taking hand, opened or closed, and striking another person)
   b. kicking (using foot to strike another person)
   c. biting (opening mouth and closing it onto another person’s body or clothing)
   d. yelling (raising voice above a classroom level while speaking to another person)
   e. spitting (opening mouth and projecting own saliva onto another person)
   f. throwing (taking an object and forcibly flinging it at another person)

B. destruction of property
   a. tearing (ripping up personal property/work of another person)
   b. throwing (taking an object and forcibly flinging it)
   c. kicking objects (using foot to forcibly make contact with an object)
   d. breaking objects (using body to forcibly break an object)
   e. pushing things over (using body to forcibly push over classroom objects)
   f. shoving (using body to heave objects from one spot to another)

C. self-injurious behavior
   a. head banging (forcibly banging head onto the floor, wall, table, chair, or another person)
   b. hitting (using hand to strike own self with force)
   c. biting (opening mouth and closing it onto a body part or clothing)
   d. wetting pants (purposely urinating on self)
   e. inappropriate sexual behavior (touching private parts for lengthy periods of time in front of others)
f. fecal smearing (pulling fecal matter out of pants or buttocks and smashing it)

D. dropping to the ground
   a. dropping to the ground with belly flat against the floor (lying flat on the ground, covering face with hands)
   b. legs kicking up (while lying on the ground, legs are kicking up and out)