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The Effects of Therapy Balls on In-Seat and On-Task Behavior in Young Children

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THE EFFECTS OF THERAPY BALLS ON IN-SEAT AND ON-TASK BEHAVIOR IN YOUNG CHILDREN

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by

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ABSTRACT

THE EFFECTS OF THERAPY BALLS ON IN-SEAT AND ON-TASK BEHAVIOR IN YOUNG CHILDREN

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This study utilized an alternating treatment design to study the effects of therapy balls, chairs, and the element of choice on the in-seat and on-task behaviors of three, preschool-aged children. Participants were between 4 and 5 years old, typically developing, and were selected based on their ability to make a choice between two different stimuli. This study was conducted at a table, with the participant engaging in a fine-motor activity that they had shown preference to, based on a paired-stimulus preference assessment (Play-Doh, coloring, magnetic blocks, etc.). It was hypothesized that the participants would show higher rates of in-seat and on-task behavior when seated on the therapy ball, and when given the choice, would select the seating arrangement that produced the highest rates of in-seat and on-task behavior. Data were collected for twenty consecutive weekdays (after baseline) and the results indicated that in-seat and on-task behavior increased slightly for the therapy ball condition compared to the chair condition. Additionally, for the choice conditions, each participant chose the therapy ball and further analysis indicated little difference between assigned therapy ball conditions and choice therapy ball conditions. Further research is needed in order to conclude whether or not therapy balls are more or less advantageous in a preschool classroom, as opposed to the typical chair, as well as to evaluate the effects that choice has on a child's ability to stay in-seat and on-task.

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CHAPTER I

INTRODUCTION

In 1999, Spalding, Santopietro, and Posner-Mayer researched the effects of therapy balls on typically-developing, young children and found several advantages: increase in fine motor control, improvement of enunciation due to activated postural muscles, improvement in reaction times with regard to balancing by way of vestibular stimulation, enhanced ability to visually scan and focus, and improvement in muscle control through constant stabilization. Each of these improvements may greatly affect how a child will behave in their classroom, as well as the ability to process and retain information in order to be academically successful. Although this data was conducted with typically developing children, the issue of sitting for extended periods affects people of varying ages, abilities, and diagnoses (Burgoyne and Ketcham, 2015).

The human brain is constantly receiving large amounts of sensory information from its surroundings, to which it must then appropriately process this information and subsequently relay this to the rest of the body, telling it what muscles need to move (Burgoyne and Ketcham, 2015). Although typically developing individuals engage in this process constantly and with ease, the same may not be true for people with sensory-processing disorders. In fact, research shows that children with sensory-processing disorders have a harder time "suppressing repeated or irrelevant sensory information than their typically developing peers" (Pfeiffer, Henry, Miller, & Witherell, 2008, p.275). Research supports that therapy balls are not only advantageous for individuals with a neuro-atypical diagnosis, but rather for all individuals. For instance, when the brain is receiving higher levels of sensory information (i.e. from the therapy balls), it can better the entire educational experience for students (Burgoyne and Ketcham, 2015).

The Centers for Disease Control (CDC) defines Autism Spectrum Disorder (ASD) as "a group of developmental disabilities that can cause significant social, communication, and behavioral challenges" (Centers for Disease Control and Prevention (CDC, 2016). Symptoms of ASD may include decreased eye contact, self-stimulatory behaviors (e.g., hand flapping, hand biting, and jumping), delayed language, disinterest in activities, lack of emotion, and sensory issues. The prevalence of ASD has reached 1 in 68 children (CDC, 2016); however, ASD is not diagnosed equally among the genders (Baio, 2014). ASD diagnosis in males is 1 in 42, whereas in females it is 1 in 189. (CDC, 2010). Children with ASD often show symptoms of Sensory Processing Disorder (SPD), which may increase the amount of hands-on support needed for their success in a classroom setting (Schilling & Schwartz, 2004). SPD inhibits parts of the brain from receiving the information that is needed to appropriately comprehend and react to sensory stimulation (Sensory Processing Disorder Foundation, 2015). The difficulties that often coincide with a diagnosis of SPD are sensitivity to sounds, movements, lights, and physical contact with other people or materials. The noise of other children, bright lights, gym time, singing songs, and other common classroom routines can negatively affect the daily lives of these individuals (SPD, 2015).

Early intervention based on behavioral principles has been shown to be the most effective treatment at helping individuals with ASD increase communication, physical awareness (e.g., balance, coordination, and strength), social skills, and adaptive skills (e.g., potty training and brushing teeth, Reichow & Wolery, 2008). Early intervention targets a child's specific deficits and uses a low teacher-to-student ratio. It is typically provided for a minimum of 20-25 hours per week and includes continuous data collection on performance on the child's specific intervention objectives (Reichow & Wolery, 2008). Early intervention can also include parent and family

training and support components. Treatment goals are generally aimed at increasing behavioral deficits of ASD such as enhancing language, social skills, and behavioral functioning. Specific intervention goals with this population may focus on improving eye contact, initiating social embrace and touch, and talking about appropriate conversation topics (Matson, Matson, & Rivet, 2007). Acquiring these skills is crucial for the wellbeing of the child so he or she is able to communicate his or her interests, what he or she desires, and other basic needs (McConachie & Robinson, 2006).

Discrete Trial Training (DTT) is an instructional method often used during early intervention therapy. DTT utilizes a short period for implementing several work trials. A single trial usually lasts 10-45 s and are separated by the delivery of reinforcers (Smith, 2001). To implement a discrete trial, a behavior therapist (BT) gives a verbal instruction to the child. This instruction serves as a discriminative stimulus that will occasion the desired response. Next, a prompt is delivered following the verbal instruction that is designed to assist the child engage in the appropriate response during instruction. Following the prompt, the child should engage in the desired response, and the BT will deliver a positive reinforcer. These trials are delivered in rapid succession, and any errors emitted are immediately corrected by the BT (Smith, 2001). For example, when teaching a child to complete a fill-in-the-blank phrase, the teacher would present the verbal instruction, “A dog says_____." If the correct response was not immediately produced, the BT would provide an echoic prompt by saying, “A dog says woof,” and then the child would be prompted, “woof.” If the child responded correctly, then the response would be reinforced. If the child said nothing or said an incorrect answer, the BT would provide an error correction by delivering the verbal instruction again with the correct response filled in until the child repeats the correct answer independently (Smith, 2001).

Another teaching tool used in Applied Behavior Analysis (ABA) is Natural Environment Training (NET). Unlike DTT, NET uses an unstructured intervention format in order to complete work trials in an environment that the child is currently showing interest (Cooper, Heron, & Heward, 2007). Prompting and reinforcement are still used in this teaching method; however, the reinforcers used are better suited because they are closely related to the activity that the child is engaged in. The BT uses objects in the environment that the child is currently playing with in order to motivate him or her to take part in the instruction. For example, if a child is playing with a marble track and the BT is working on teaching requests, the BT can hide the marble from the child and prompt the child to say, "marble please" (Cooper et al., 2007). Although DTT and NET have been shown to be effective interventions, there are many difficulties that arise when working with children with ASD in a classroom setting (Schilling & Schwartz, 2004). For instance, these children often need extensive support to sit, focus on work, and use their individualized communication systems. Aggressive, stereotyped, and sensory seeking behavior is often emitted by this population and can increase the amount of staff necessary to run a classroom (Schilling & Schwartz, 2004). A major problem for the population of young children with ASD is that they lack the appropriate support to succeed in school environments (Carr et al., 2008, Jang et al., 2011, Machalicek et al., 2007, 2008). The general purpose of this study is to evaluate the possible effects of alternative seating on in-seat and on-task behavior when working with neuro-typical and neuro-atypical developing children between the ages of two and six.

CHAPTER II

LITERATURE REVIEW

Therapy Balls

Therapy balls have been shown to bring children with and without disabilities to an optimal state of arousal that allows them to remain seated and on-task at a workstation (Schilling, Washington, Billingsley, & Deitz, 2003). Therapy balls have been shown to be effective tools for improving levels of concentration, handwriting neatness, understanding of academic material, and becoming more organized (Al-Eisa, El Buragadda, & Rao Melam, 2013). The movement that individuals receive while seated on the balls provides the sensory input that is necessary to better focus on the work at hand. Studies conducted to examine the effects of sitting in chairs on children's bodies show that chairs are unhealthy for their backs and posture (Illi, 1994, Lear & Pomeroy, 1994, Witt & Talbot, 1998). When children are required to sit in inflexible furniture, they often resort to extreme postures in order to become comfortable. Therapy balls offer the opportunity to move around freely while remaining seated and working at a table (Schilling & Schwartz, 2004). It has been suggested that the greatest gain that come with switching chairs for therapy balls is not in the improvement of posture and overall health, but actually the amount of time that children can remain seated and perform well at academic tasks (Schilling et al., 2004).

Previous Research Using Therapy Balls

Schilling et al. (2003) assessed the efficacy of therapy balls when working with children with Attention Deficit Hyperactivity Disorder (ADHD). The authors used an ABAB design for three students with ADHD in a fourth grade classroom during language arts. The researchers evaluated the effects of therapy balls on in-seat behavior and the legibility of the children's handwriting. Each of the baseline and intervention phases was three weeks long. The therapy

balls were used as seats each day during each of the intervention phases and chairs were used during baseline. The researchers allowed the students 30 minutes in order to move as they pleased while first seated on the therapy balls. The teacher was advised to not give any feedback (positive or negative) to the students with regard to how they were sitting unless their actions put themselves or another individual in danger. The data showed that sitting behavior for all three participants improved. In addition, the participants became more productive, had more legible handwriting, and preferred the balls to the chairs when surveyed post-intervention. The researchers also provided therapy balls for the typically developing peers and found that 17 of 21 students preferred this alternative seating to chairs.

Schilling and Schwartz (2004) conducted another study with young children with ASD to assess the efficacy of an intervention using therapy balls on in-seat behavior and engagement. The intervention was conducted in an integrated preschool classroom for one participant and an extended day program for children with ASD for the other participants. Data were collected during art activities, play activities, table time, or at circle time. The baseline condition included regular chairs for the participants and therapy balls were used during the intervention phase. As soon as the participant's baseline data had become stable, the intervention began. Each of the intervention phases lasted for at least two school weeks. The teachers were advised to only instruct the child to sit down if the behavior was dangerous to themselves or to the children. No changes were made to the classroom routine or activities during any of the phases besides using the therapy balls as seating instead of chairs. The authors observed an increase in in-seat behavior and engagement for all four children when seated on the therapy balls.

To evaluate the efficacy of using the therapy balls with young children, researchers conducted a study with six boys with ASD that attended a large public school district ranging

between kindergarten and first grade (Bagatell, Mingliani, Patterson, Reyes, & Test, 2010). Each of the children was in a program that addressed their sensory, language, behavioral, and social deficits. The researchers used an ABC design, which included baseline, intervention, and choice phases. During the choice phase, the participants were allowed to sample the therapy balls and the chairs before each trial. Each day the participants were asked to choose between the therapy balls and chairs using their individualized system of communication (verbal speech or pictures). Using video recording devices, the children were monitored every day during circle time for sixteen minutes each session to measure the children's in-seat and on-task behavior. The researchers received mixed results between the participants, possibly due to the different sensory processing issues. For instance, this study showed that therapy balls might be more beneficial for participants who tend to seek out vestibular-proprioceptive input instead of the children with different sensory disorders. This study demonstrates that further research must be conducted in order to evaluate who is an appropriate candidate for therapy ball seating and who is not (Bagatell et al., 2010).

Burgoyne and Ketcham (2015) conducted research with nineteen, typically developing second grade participants for an observational study, in order to evaluate the effects of therapy balls on the student's ability to focus and perform academically. Researchers evaluated the students based on whether or not they were on task, level of effort they were eliciting, their attitude, social interactions, participation, and if they were seated or not. Results indicated significant improvements in each of the participants' ability to stay on task, as well as "provided extra proprioceptive and vestibular information" (pp. 47). Overall, this data supports the body of research surrounding the use of therapy balls concerning improving children's ability to stay on task, seated, and appropriately engaged.

Haan (2015) conducted a study on the use of therapy balls as a means to improve handwriting in kindergarten children. Handwriting samples from children in two separate groups (19 in the stability ball group, 19 in the chair group) were evaluated using the "Handwriting Without Tears Screener of Handwriting" instrument before and after the introduction of the stability balls. Participants were evaluated on the following: the ability to recall and write letters and numbers (memory), write letters and numbers in the appropriate direction (orientation), and the capability to write the numbers and letters in the appropriate spot on the line (placement). Twelve weeks of data collection demonstrated by the scoring system from the pre-and post-test, showed that the scores of the therapy ball group were almost twice as high as the chair group post-intervention. Additionally, the participants in the stability ball group showed 5% higher improvements in the measurement of memory than their chair group counterparts.

Choice Behavior

Choice behavior occurs when participants are provided the opportunity to select between activities, academic materials, or environmental options. Opportunities to engage in choice behavior may result in a reduction in problem behavior that is maintained by the possibility of escaping a demand (Rispoli et al., 2012). By giving the child a choice between different reinforcers, ways to complete their work, or even between different seating arrangements (therapy ball or chair), and the individual may be less likely to demonstrate undesirable behavior (Rispoli et al., 2012). In order to evaluate choice behavior, Rispoli et al. (2012) conducted a study with four children with ASD between the ages of 5 and 11 years who all had been reported by their teachers and parents to emit problem behaviors during work instruction. A Questions About Behavioral Function (QABF) assessment was conducted for each of the students to determine the function of their challenging behavior. After the QABF, each of the children took

part in a multiple stimulus without replacement (MSWO) assessment in order to determine which academic activities were preferred. An MSWO assessment is useful in order to determine a hierarchy of reinforcers since the instructor delivering the assessment does not replace the reinforcers once they have been chosen (Cooper et al., 2007). During the choice conditions, each day was randomly chosen for each of the participants as either within-activity or across-activity choice. During the within-activity choice condition, the researchers chose the activity to be completed by the student; however, the student was allowed to choose how the activity was completed. For example, the student would need to complete a writing/coloring task and was allowed to choose between crayons or scented colored pencils. During the across-activity choice condition, the students were given a choice between two to four different activities by being presented with the materials in front of them on the table. The interventionist would repeat the verbal instruction to choose one as many times as necessary until the student made a selection. The results showed lower levels of problem behavior for each of the four students. The across-activity choice condition demonstrated the lowest rates of problem behavior for three of the four participants.

Lough, Rice and Lough (2012) conducted a study with 26 male and female students that ranged from 8 to 15 years old to examine the effects of giving children with ASD a choice in efforts to increase engagement. The children were seen in individual sessions and sat at a table with an assortment of large markers placed directly in front of them. The participant was then given the choice of three different pieces of paper, each with a different picture on it. Once the child had chosen, that particular picture was placed on the table in front of them. The researcher then gave them a verbal prompt to color for as long as they wanted with the markers. A picture of a red and green light was used for the participants to be able to tell the researcher that they

wanted to either continue coloring or be finished. Verbal prompts were given to the children to get up from the table when they were done with their activity. A stopwatch was used to track how much time the child spent coloring. The time began as soon as their marker hit the paper and would stop if the child indicated with the picture of the red light that they were done. Each time the child lifted the marker up from the paper, the researcher asked if they were done and then the child used the pictures to indicate if yes they were done or if they wanted to continue. The results showed that when the participants were given a choice, they colored for a longer amount of time and used a wider array of markers while coloring.

Ulke-Kurkcuoglu and Kircaali-Iftar (2010) compared the effects of activity and material choices on task engagement for four boys ranging from 5 to 8 years old. First, highly preferred food items for each participant were identified through a pre-assessment evaluation. Then, the investigators used these top three food items as reinforcers for this study. During the activity choice phase, the teacher had the student choose between two clear boxes full of materials that were related to the activity at hand. For instance, one of the boxes had objects for matching colors and the other box was used for matching shapes. After the child had selected one of the two boxes, the teacher would then remove two sets of objects from it. During the material choice phase, the teacher would choose the activity and allow the child to choose between two different materials that were related to the activity the teacher selected. For example, if the activity assigned were coloring, the teacher would prompt the student to choose between crayons or colored pencils. Researchers found that for three of the four boys, higher levels of on-task behaviors were emitted during the choice condition in comparison to baseline conditions (Ulke-Kurkcuoglu & Kircaali-Iftar, 2010).

Current Study

The lead researcher was interested in studying the effects of providing a choice of seating arrangement and how it would effect in-seat and on-task behavior. The research questions evaluated in this study were:

- What are the differential effects of chair vs therapy ball on on-task and in-seat behaviors?
- What are the differential effects of general choice seat vs general assigned seat?

It was hypothesized that the therapy balls would result in improved in-seat behavior and on-task engagement when compared to sitting on a chair. Additionally, it was hypothesized that having the opportunity to choose the seating arrangement (general choice condition) would result in the highest rates of on-task engagement and in-seat behavior when compared to the chair and therapy ball phases of this study (general assigned condition).

CHAPTER III

METHOD

Participants and Setting

Three children were recruited to be participants for this research study through the preschool classroom located at Bright Horizons Preschool in Redmond, WA. Participants were between 4 and 5 years old, and were identified by the lead researcher as having trouble with staying in their seats and/or remaining on-task. Before participant recruitment, proper Human Subjects Clearance was received from Central Washington University before conducting a study with the desired population.

Bright Horizons is an all-inclusive preschool, therefore children attending this classroom are not required to have a formal diagnosis of any kind nor be typically developing. At the time of data collection, and in the classroom where this research was conducted, 17-20 children were enrolled (depending on the time of year due to transitions), and only one child had a formal diagnosis of ASD. Several children in the classroom had behavioral issues that affected their ability to remain seated for longer periods, attend to the teacher, and follow simple classroom rules. The classroom had a very large area for different academic centers that the children participated in each day. Each table seated 3-4 children and had a specific focus such as math, science, language, or sensory. At approximately 10:15 each day, the children all used a choice board that had the number of seats available at each center. The children were required to manage their own time during this "center time" and were encouraged to visit every center. The children were required to sit for the entire time (45-60 minutes) except when transitioning between centers. The centers typically had an activity with a clear beginning and end. For example, an outlined art project, writing the letter of the week a certain number of times, or

making a pattern with blocks that match a visual provided. The children all sat in identical wooden chairs at each of the tables. A carpeted area located in the back of the classroom was used for circle times, where the class would sit and sing songs, listen to books, and discuss the day's schedule, convening several times per day. They consistently sat for two, thirty-minute circle times and often more due to varying curriculum needs. The far wall was lined with cubbies for the children to hang their belongings. The children remained in this classroom for the entire day, excluding two, thirty-minute outdoor periods, and weekly extra-curricular activity sessions that ranged from 20-45 minutes. The school day duration ranged for each child since pick-up and drop-off times varied, however, the majority of the children arrived by 9:30 AM and departed by 5:30 PM.

Materials

Materials included therapy balls and chairs for each participant. Typical child-sized chairs were used. The chairs measured 11.5 inches deep, 13.5 inches wide and 14.5 inches high. Therapy balls were made of elastic materials filled with air to provide a sturdy seat. These balls were specifically sized for the children that participated in this study.

Dependent Measure

The dependent variables for this study were engagement and in-seat behavior during table time. In-seat behavior was defined as the child being seated with at least one foot on the floor and his or her bottom resting on the base of the chair/surface of the ball. Engagement was defined as following the directions of the Lead Researcher (e.g., playing with a toy/activity or following appropriate academic directives). Engagement and in-seat behavior were measured using 10 s intervals for a total of 10 min per session (one session per participant per day) using whole interval recording. Occurrence of the behavior was recorded if the child was engaged for

the entire duration of the 10 s interval. If the behavior did not occur at all or only occurred for a portion of the interval, it was recorded as non-occurrence since whole interval recording was used. An interval recording data sheet was used (see Appendix C). This data was saved under pseudonyms in a locked box or brief case, with the code only known by the lead researcher.

Inter-observer Agreement

The lead researcher filmed one session, once a week and sent it to the second observer (faculty sponsor, M. Radeke), in order to account for a secondary observer. Both parties were thoroughly trained on the observational definitions, and the lead researcher had a copy in the classroom in order to refresh whenever necessary. The Treatment Integrity Checklist (Appendix A) was utilized in order to ensure that the lead researcher had conducted each of the different phases accurately. Reliability of 80% between the lead researcher and second observer needed to be reached across at least two sessions before data collection could occur, as well as throughout the data collection process. Inter-observer agreement (IOA) was calculated using interval-by-interval IOA. The number of agreements between observers was divided by the total number of agreements plus disagreements, and then multiplied by 100. IOA was collected once a week for one of the participants and then reviewed by the second observer.

Experimental Design

This study used an alternating treatments design (ATD in order to test the effectiveness of three separate experimental conditions: chair, therapy ball, and choice. An alternating treatment design is an experimental design that contains two or more conditions that are presented in rapidly alternating sequence (Cooper et al., 2007). A functional relationship is shown in an alternating treatments design when data paths for the various conditions diverge. Therefore, an increase in engagement and in-seat behavior while the independent variable (seating device) is

being manipulated will be evident if a functional relationship does exist. If there is not a functional relationship between the seating device and levels of in-seat behavior and engagement, then the graph will show steady data points that remain unaltered by the independent variable. Refer to Figure 1 below for a depiction of an ATD graph.

This research design controls for threats to internal validity because of the alternating phases. If there were extraneous variables, then they should have equally effected each of the conditions (Cooper et al., 2007). For example, if a participant showed increasingly higher levels of in-seat and on-task behavior consistently on the therapy ball condition days, then the lead researcher can summate that the therapy ball condition is responsible for the participants change in behavior. If the participant has inconsistent results across the different conditions, then no functional relationship can be inferred (Cooper et al., 2007). Baer, Wolf, and Risley (1968) stated, "analysis of behavior requires a believable demonstration of the events that can be responsible for the occurrence or nonoccurrence of that behavior. An experimenter has achieved an analysis of a behavior when he can exercise control over it" (pp.93-94). The prediction was that engagement will be higher for the therapy ball condition, and that the children will select the seating option that resulted in their own levels of higher engagement. This hypothesis was demonstrated on Figure 1.

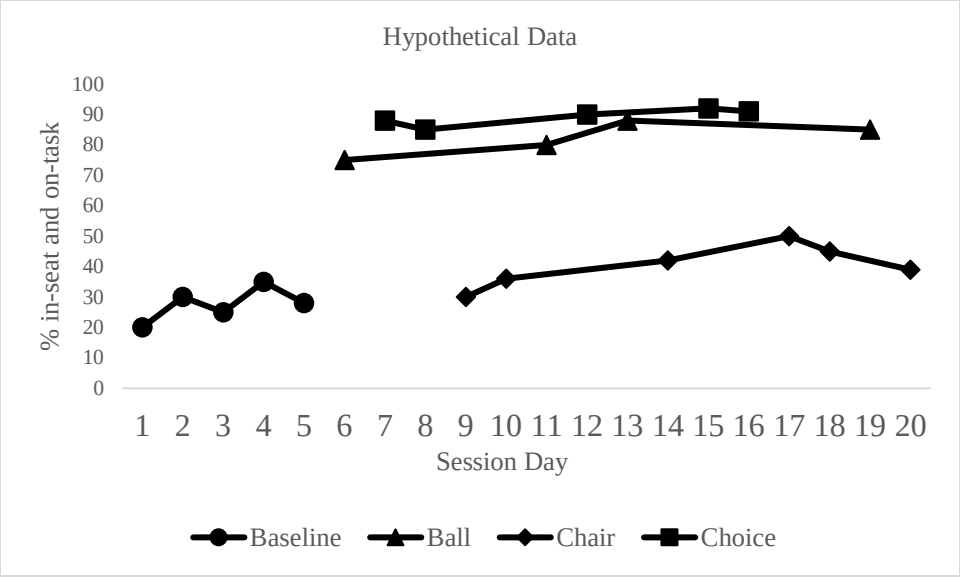

Figure. 1. This line graph is demonstrating a hypothetical relationship between seating arrangement and in-seat and on-task behavior.

For this study, baseline (i.e., the chair condition) was conducted for four sessions for each participant before beginning the alternation of the intervention phases in order to provide a standard of comparison. Once the alternation phase began, the chair, therapy ball, and choice conditions were randomly alternated. If via random selection the last three conditions selected were choice, the lead researcher would conduct a return to chair to show comparison.

The three conditions: chair, therapy ball, and choice, were assigned numbers 1, 2, and 3. Each of these numbers were placed into a cup that was then blindly selected for that participant for that day. A rule was implemented that if a condition were randomly chosen three times in a row, the lead researcher would only choose between the other two conditions as to not ruin the research design. Since each condition would be chosen at random, there was not a predetermined amount of sessions for each, however, it was predicted that each would be chosen at least once per week for the 5 weeks of data collection.

The lead researcher pulled each participant aside for a 10-minute period each day during his or her structured center time to have the child complete an activity pre-determined by the

classroom teacher. This ensured that the participants engaged in the same activity as the other children in the same classroom, in order to minimize distractions for the participant and the other children. The lead researcher sat with the participant during this time at a separate table within the same classroom. Since the class was adjusted to this schedule and the amount of noise at this time due to children talking and transitioning between tables, it was expected that this would be much less distracting than conducting the data in a separate room.

Pre-Experimental Procedures

Before starting the data collection process, the lead researcher discussed the study in detail with the parents and/or guardians of the participants and invited them to sign an informed consent. After obtaining consent, the height of the participants was measured in order to ensure that the correctly sized therapy balls were purchased.

Paired-Stimulus Preference Assessment

After gaining parental consent, the lead researcher conducted a paired-stimulus preference assessment to obtain a list of toys or objects that the child found reinforcing (See Appendix B). Possible reinforcers were presented to the child two at a time, several times, in a predetermined random order. Two items were placed in front of the child, and he or she was told to “pick one”. Items selected most frequently by each child were recorded. The arrangement of this preference assessment allowed the lead researcher to determine if the child could make a choice between two items. If a child was unable to select between two items, he or she would not have been able to participate in the choice condition that required a selection between the therapy ball and chair, therefore, inability to complete this preference assessment would have excluded a child from participation. The lead researcher conducted this preference assessment only once in

order to make the decision of which children were and were not appropriate for this particular study.

Chair Condition

Each session in the chair condition began when the child transitioned to the table. During the chair condition, the chair was the only seating option available. The lead researcher selected the activity that each of the participants participated in during this individual activity time based on the participants paired-stimulus preference assessment and/or whatever toy or activity they were playing with when the lead researcher asked them to come with them. This typically involved a fine motor activity such as Play-Doh, coloring, painting, etc. If the student tried to get out of their chair, the lead researcher verbally prompted them to sit and blocked them from leaving the workstation. There were not any instances during the study in which the lead researcher had to block a participant from getting up. Using the interval recording data sheet (See Appendix C), the lead researcher record instances or non-instances of in-seat and engagement behavior during one-minute intervals, for 10 minutes.

Therapy Ball Condition

During the therapy ball condition, the therapy ball was placed at the table in place of the chair. The classroom schedule proceeded as it did during the chair condition. The only difference was the seating arrangement. If the child attempted to stand up or leave the table, the lead researcher verbally prompted them and physically blocked the child from leaving. As stated previously, there were not any instances of the lead researcher having to block a participant from getting up.

Choice Condition

During the choice condition, the participant selected between the chair and therapy ball. At the start of data collection session, the lead researcher allowed the child to sample sitting on both the chair and the therapy ball. This included sitting on each of the seating devices for five seconds. If the child did not immediately sit down, the lead researcher prompted the child to sit on the specific seating device. Following exposure to both seating options, the lead researcher presented both the chair and therapy ball to the child and provide the instruction "Pick one". If the chair was selected, the child used that seating option for that particular table time. If the therapy ball was selected, the child used that seating option for the remainder of the table time. Requests from participants to change seating during the work period after the choice had been made did not produce the seating change. The lead researcher would continue to encourage the child to participate in the designated activity. If the student tried to get out of their chair, the lead researcher would verbally prompt them to sit and block them from leaving the workstation.

Phase 1: Baseline. Throughout the baseline phase of this research, the only difference that the participants experienced was being asked to move to a different table where there were not any other children present in order to reduce the distractions and influence of the other children. The participants were still sitting on the same chair, playing with the same table activity that was offered to them that day. The lead researcher sat near the participant but did not engage unless the child was to try to leave the table, in which case the lead researcher would verbally prompt them to remain at the table with that activity. This phase lasted for five consecutive days for each of the three participants.

Phase 2: Intervention. The intervention phase lasted for twenty days (4 weeks from Monday through Friday) for each of the children. During this phase, each of the participants had

perfect attendance. During intervention, if the chair condition was randomly selected, the participants experienced the same environment as the baseline phase, except if either they were to disengage in or both the in-seat and on-task behavior, the lead researcher would verbally prompt them to sit down and continue with the activity. If the therapy ball condition was selected, the only difference was that the participant had to sit on the ball instead of the chair. During both the chair and therapy ball conditions, the participant was instructed to have their feet on the ground and their bottom on the seat (of the chair or the ball). While seated on the therapy ball, the child was allowed to engage in a moderate amount of wiggling that was only prompted to stop if the child was ceasing contact with their bottom and the seat of the ball, or moving enough to lose their ability to have their feet planted on the floor.

Phase 3: Choice. When the choice condition was randomly selected, the participant experienced the exact same environment as the intervention phase except that immediately before the trial, the child was allowed to sample sitting on both the chair and the ball for five seconds before being told to "pick one." For each of the three participants, there was never an instance of the child taking longer than the five seconds to choose. In addition, each time the choice condition was selected, each of the participants selected the ball.

Treatment Integrity

The lead researcher and faculty sponsor were both well versed in the operational definitions, variables, and conditions before research began. Treatment integrity was upheld with the Inter-Observer Agreement process and the faculty sponsor addressed all concerns she had. The Inter-Observer Agreement data was taken to ensure that the results regarding the dependent variable, (in-seat and on-task behavior) was indeed reliable. In order to ensure that the intervention measures were conducted as described, treatment adherence was performed through

intermittent, video observation by the faculty sponsor once a week for each week that data was collected.

CHAPTER VI

RESULTS

The research investigated two questions: 1) What would the differential effects be between the chair and the therapy ball on in-seat and on-task behavior, and 2) what would the differential effects be of general choice seating vs general assigned seating? It was hypothesized that each of the participants would have higher rates of in-seat and on-task behavior while seated on the therapy ball, and that while in the choice condition, the participants would select the seating arrangement that resulted in the highest rates of in-seat and on-task behavior for themselves.

As can be seen in Table 1, the results depict the mean intervals spent in-seat and on-task as well as the standard deviations for each of the three participants during the chair, assigned ball, and choice ball conditions. Inter-observer agreement results and the effects of the therapy ball, chair, and choice conditions (mean intervals and range) are presented in the following sections.

Table 1.

Comparison of the Mean Percentage (M) and Standard Deviations (SD) of the Chair, Ball, and Choice Conditions.

Participant	Chair	Assigned Ball	Choice Ball
1	M: 83.44	M: 89.85	M: 95
	SD: 6.85	SD: 6.84	SD: 2.94
2	M: 85.5	M: 90.42	M: 95.8
	SD: 3.42	SD: 10.59	SD: 1.09

3	M: 84.22 SD: 2.90	M: 94.14 SD: 2.91	M: 94.75 SD: 2.06

Inter-Observer Agreement

The lead researcher ensured Inter-Observer Agreement (IOA) by randomly selecting one of the participants and recording one session per week with one of the children and sending it to the second observer. Random selection was ensured by assigning a number 1, 2, and 3 to each of the participants, and drawing one from a hat each week. Both the lead researcher and the second observer used the same whole-interval recording data sheet to confirm if at least 80% IOA was achieved. For each of the five IOA checks during the intervention phase (and two conducted during baseline), this threshold was met. During the 5 weeks of data collection, IOA ranged from 81.67% and 98.33% agreement between the lead researcher and the faculty sponsor.

Therapy Ball vs. Chair

Figures 2, 3, and 4 present a visual analysis of the differences between the therapy ball and chair conditions, across each of the participants. The mean and range percentages given represent the percentage of intervals in which the participant was both in-seat and on-task. As seen in Figure 2, Participant 1 had a mean of 83.44% of in-seat and on-task behavior during the chair condition, ranging from 77%-97%. While seated on the ball, Participant 1 had a mean of 89.85% of in-seat and on-task behavior, ranging from 80%-98%.

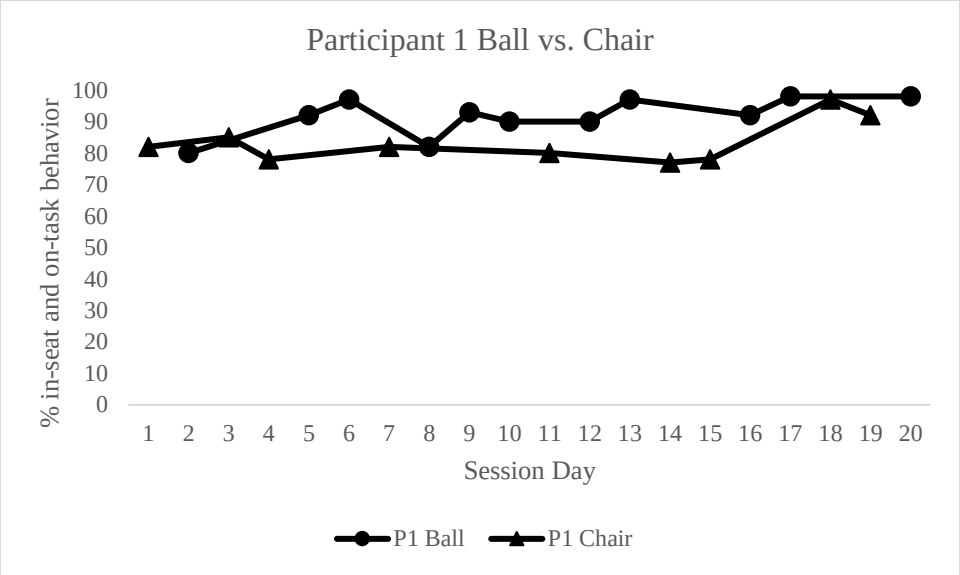

Figure 2. Line graph demonstrates the differences between the chair and therapy ball conditions for Participant 1.

As can be seen in Figure 3, Participant 2 had a mean of 85.5% of in-seat and on-task behavior during the chair condition, ranging from 80%-90%. During the therapy ball condition, the same participant had a mean of 90.42% of in-seat and on-task behavior with a range from 68%-100%.

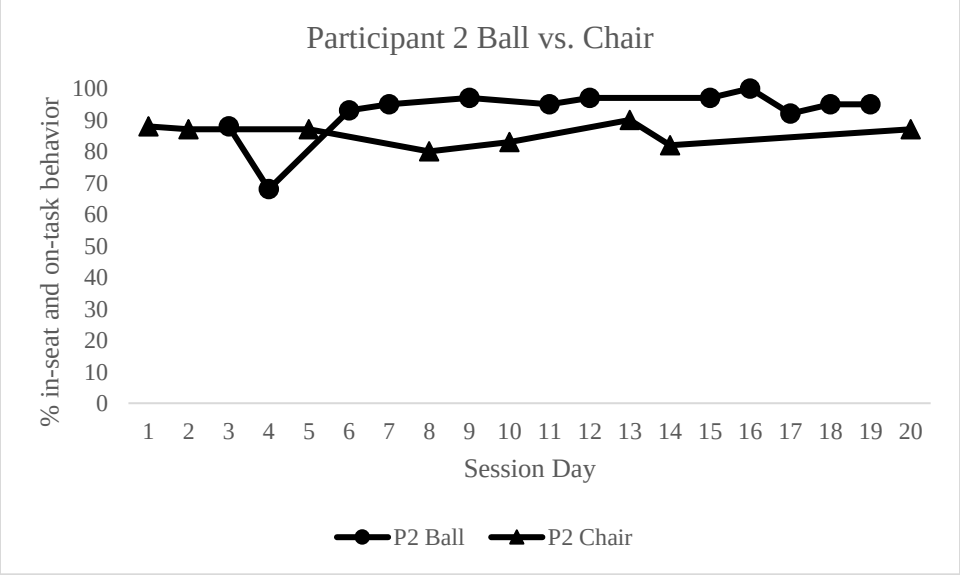

Figure 3. Line graph demonstrates the differences between the chair and therapy ball conditions for Participant 2.

Figure 4 shows that Participant 3 had a mean of 84.22% of in-seat and on-task behavior during the chair condition, ranging from 80%-88%. During the therapy ball condition, Participant 3 reached a mean of 94.14% of in-seat and on-task behavior ranging from 90%-98%.

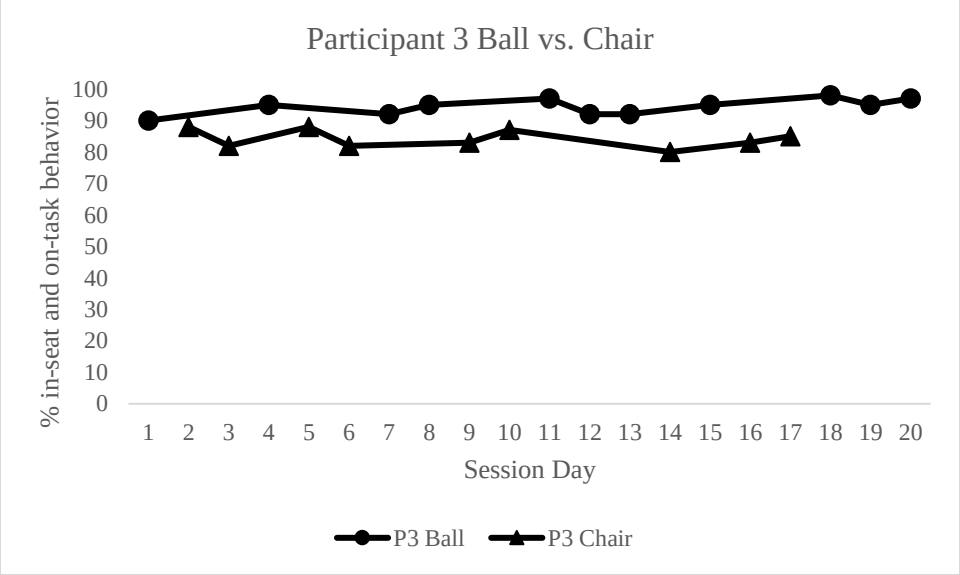

Figure 4. Line graph demonstrates the differences between the chair and therapy ball conditions for Participant 3.

General Choice vs. General Assigned

Figures 5, 6, and 7 present a visual analysis of the differences between the general assigned and general choice conditions, across each of the participants. The mean and range percentages given represent the percentage of intervals in which the participant was both in-seat and on-task. As seen in Figure 5, Participant 1 had a mean of 95.66% of in-seat and on-task behavior, ranging from 92%-98% during the general choice condition. When Participant 1 was assigned to a condition, Participant 1 had a mean of 86.25% of in-seat and on-task behavior, ranging from 77%-98%.

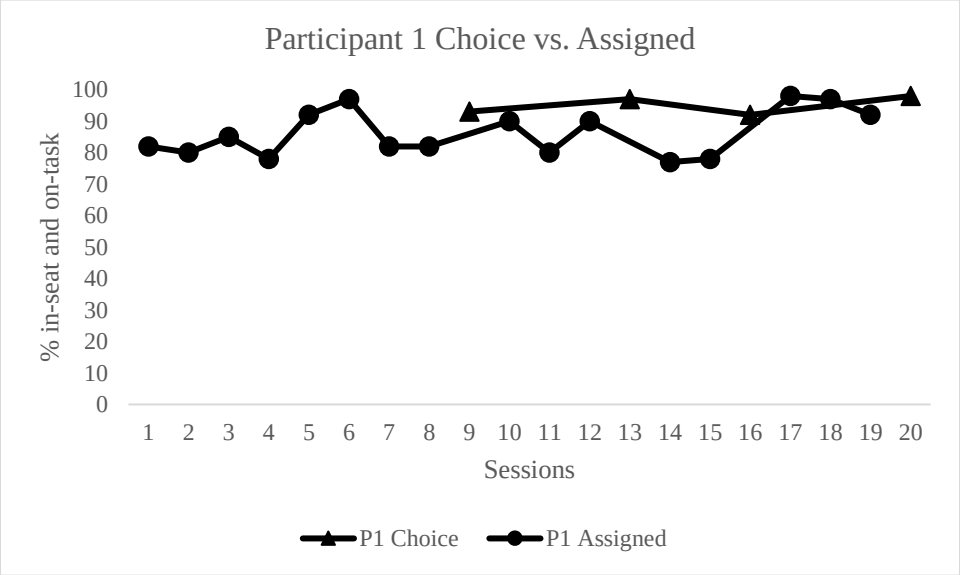

Figure 5. Line graph demonstrates the difference between the choice and assigned conditions for Participant 1.

As seen in Figure 6, Participant 2 had a mean of 95.5% of in-seat and on-task behavior, ranging from 95%-97% during the choice condition. When assigned a condition, Participant 2 had a mean of 87.8% of in-seat and on-task behavior, ranging from 68%-100%.

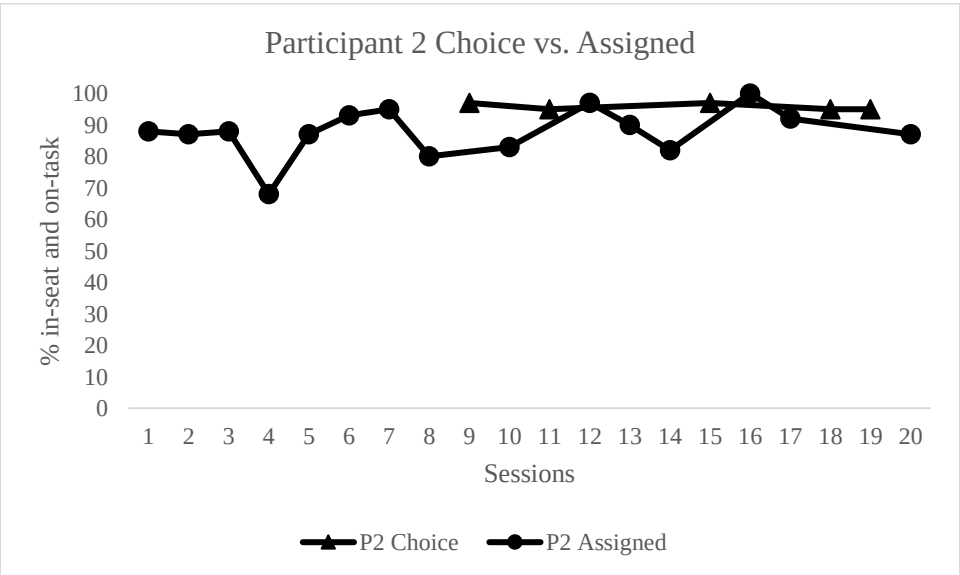

Figure 6. Line graph demonstrates the difference between the choice and assigned conditions for Participant 2.

As seen in Figure 7, during the choice condition, Participant 3 had a mean of 94.75% of in-seat and on-task behavior, ranging from 92%-97%. When assigned to a condition, Participant 3 had a mean of 94.14% of in-seat and on-task behavior, ranging from 90%-98%.

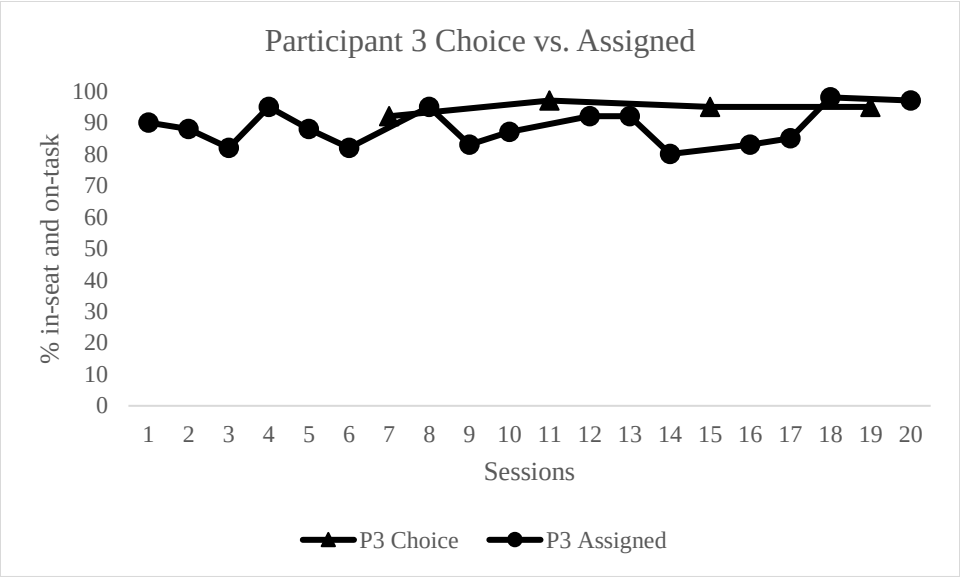

Figure 7. L Line graph demonstrates the difference between the choice and assigned conditions for Participant 3.

After concluding the study, the researcher found that when each of the participants were presented with a choice between the two seating arrangements, they always selected the therapy ball. Due to this unforeseen result, an ad hoc analysis was added to the research questions: What are the differential effects of assigned therapy ball vs. choice therapy ball? The results of this analysis are presented in the following section.

Assigned Therapy Ball vs. Choice Therapy Ball

Figures 8, 9 and 10 provide a visual analysis of the differences between the assigned therapy ball and the choice therapy ball conditions, across each of the participants. The mean and

range percentages given represent the percentage of intervals in which the participant was both in-seat and on-task.

As seen in Figure 8, in the assigned therapy ball condition, Participant 1 had a mean of 89.85% of in-seat and on-task behavior, ranging from 80%-98%. However, when choosing to use the therapy ball, Participant 1 had a mean of 95% of in-seat and on-task behavior, ranging from 92%-98%.

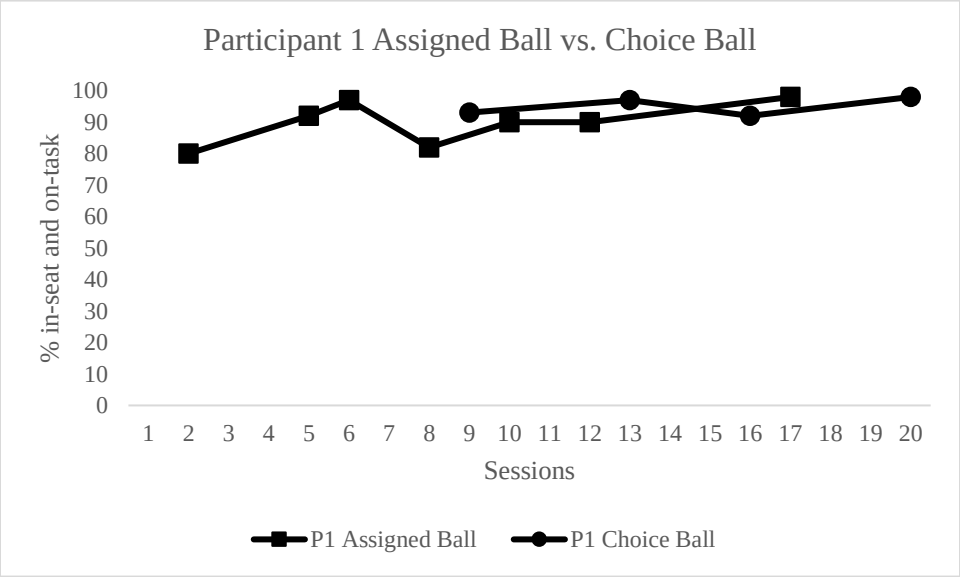

Figure 8. Line graph demonstrates the differences between the assigned therapy ball and choice therapy ball conditions for Participant 1.

As seen in Figure 9, in the assigned therapy ball condition, Participant 2 had a mean of 90.42% of in-seat and on-task behavior, ranging from 68%-100%. When choosing the therapy ball, Participant 2 showed a mean of 95.8% of in-seat and on-task behavior, ranging from 95%-97%.

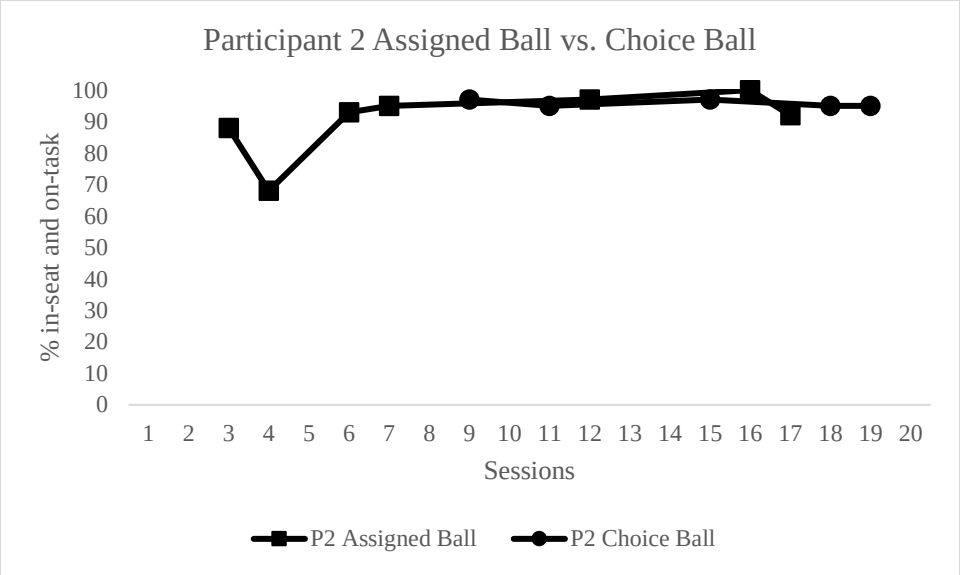

Figure 9. Line graph demonstrates the differences between the assigned therapy ball and choice therapy ball conditions for Participant 2.

As seen in Figure 10, in the assigned therapy ball condition, Participant 3 had a mean of 94.14% of in-seat and on-task behavior, ranging from 90%-98%. When choosing the therapy ball Participant 3 had a mean of 94.75% of in-seat and on-task behavior, ranging from 92%-97%.

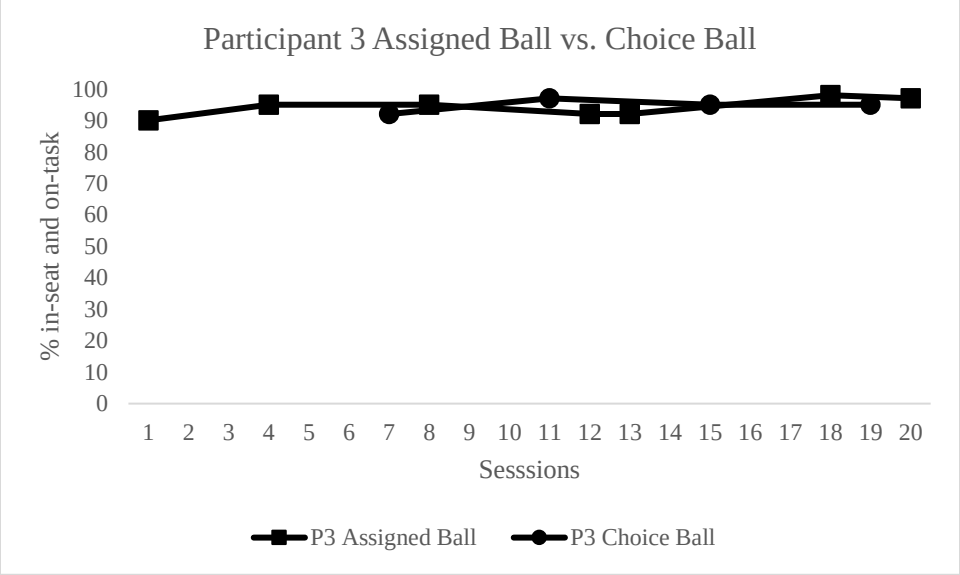

Figure 10. Line graph demonstrates the differences between the assigned therapy ball and choice therapy ball conditions for Participant 3.

Discussion

The primary purpose of this research was to explore the possible effects of using a chair and a therapy ball, between general choice seating and general assigned seating, and finally after data collection indicated that therapy ball was always selected in the choice condition, between assigned therapy ball and choice therapy ball. Each of these analyses were about the rates of in-seat and on-task behavior on three, typically developing, preschool-aged children.

This study used an alternating treatment design in order to measure the rates of occurrences and non-occurrences of the target behaviors: in-seat and on-task behavior. This design was selected so that in case any extraneous variables were presented, they should affect each of the conditions equally, therefore making it possible to draw conclusions from the data.

Even though the current study did demonstrate higher rates of the dependent variables during the therapy ball condition, future research should be pursued in order to conclude that there is a superior seating arrangement when it comes to the effects on a child's in-seat and on-task behavior in a classroom.

Limitations. One difficulty that arose during data collection was that the other children in the classroom were, at times, distracting to the participants. For example, even though the participant was always at a separate table that did not include any of their peers, the other children would often try to engage with either the lead researcher and/or the participant. This was demonstrated in ways such as 1) saying the participants' name in trying to get their attention, 2) walking over to the table, asking the participant to come play with them, or 3) walk in front of the camera while the lead researcher was trying to record for IOA purposes. This was not a substantial problem, as the lead researcher was easily able to redirect the other children to leave the participant alone for the rest of the trial, although could be improved for future research.

The classroom that the data was conducted in did not include children with verifiable neuro-atypical diagnoses; therefore, this population limitation could not have been changed under these circumstances. The inclusion of participants with ASD could have added to the body of knowledge regarding different ways educational professionals can help children with disabilities adjust to mainstream education. The low number of participants can also be a limitation because it does not give the lead researcher a wide enough spectrum of students in order to make any generalizations regarding the results.

An additional limitation concerns the timing and length of the trials. At the time of each trial, it was not known which activity each child had participated in previously. For example, the students could have just sat down for activity time or just come from a different activity in which they were already expected to sit for thirty minutes, most likely making it much more difficult for the child to sit for another ten-minute interval (the trial) without standing. Considering that the children in this classroom are expected to sit for 30 minutes at a time, several times per day, it would have been advantageous to conduct more sessions, for a longer amount of time (more than 10 minutes) to evaluate if the results would have varied. Another limitation of the trial was not controlling if the child has recently eaten, had physical exercise, or been engaged in another activity.

Social validity. Social validity is always an important factor in research because it determines whether it will be accepted and/or utilized by the populations that it could affect (Luiselli & Reed, 2011). After concluding this study, the lead researcher discussed it with the lead teacher with regard to perceived effectiveness as well as possible future use. The teacher responded, “The balls seemed to keep the kids sitting down longer, which would make it easier for me when trying to get them to do daily activities at the table. But I would not be able to use

these in my class considering that the school would not pay for them, and parents would most likely not come to an agreement about if they wanted their children to sit on them or not. It's a great thing that I wish I could use with all of my students, but sadly isn't practical to do" (Parna, 2018). The lead researcher determined that although the therapy balls may be effective tools that could help children be more comfortable, help the teachers when working with students getting out of their seats and not focusing on the task, it is likely going to be difficult to achieve at a larger scale. For instance, a few obstacles include insufficient funding, needing to reach a parent consensus on using balls or chairs, not having enough storage space for the balls, as well as a place to store them that the children will not be able to easily access and/or be distracted by.

Future research. Researchers in the future should focus on conducting data on children with varying disabilities, of varying interval lengths, of varying ages, at varying times per day. It is quite possible that children with Attention Deficit Disorder, Autism Spectrum Disorder, Sensory Processing Disorder, and/or any other learning/developmental disorders would produce entirely different data than the data presented in this study. Upcoming research should also evaluate the possible effects of time of day, time since last meal, and class size on a child's ability to stay seated and on-task while at school.

Conclusion

This study demonstrated that rates of in-seat and on-task behavior *may* increase when using therapy balls as seating devices with typically developing preschool-aged children. This research further implies that children of the same age, living in very similar environments, may benefit from and be affected by different variables. This demonstrates that educational systems and their professionals must adapt to a way of teaching that customizes learning to the individual

child and not the reverse. Finally, research must be continued until a superior seating arrangement is determined for young children in a classroom setting.

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APPENDIX A

TREATMENT INTEGRITY CHECKLIST

Baseline Phase	Name of Lead Researcher: Did they complete this step to the specified criteria?
The Lead Researcher approaches the table with the student.	
Lead Researcher prompts student to sit down on the chair unless child sits without needing prompting.	
Lead Researcher continues with the individual activity selected while prompting the child to sit every time the child tries to get up.	
Choice Phase	
Lead Researcher approaches the table with the student.	
Lead Researcher prompts child to sit on the chair for five seconds and then assists the child as needed to stand up (starting with verbal prompting, partial physical, and then full physical).	
Lead Researcher prompts child to sit on the therapy ball for five seconds and then assists the child as needed to stand up (starting with verbal prompting, partial physical, and then full physical).	
Lead Researcher asks child, "Which one would you like to sit on?"	
If child responds appropriately, the Lead Researcher prompts the child to sit on that seating device.	

If child does not respond or does not respond appropriately, the Lead Researcher prompts child to sit on that seating device.	
If child does not respond appropriately, the Lead Researcher asks the child again, “Which one would you like to sit on?” If the child still cannot make a choice, the Lead Researcher will have the child sit on the chair and make a note that the child was not able to make a decision that day.	
The Lead Researcher continues with the individual activity while prompting the child to sit every time the child tries to get up.	
Therapy Ball Phase	
The Lead Researcher approaches the table with the student.	
The Lead Researcher prompts child to sit down on the therapy ball unless child sits without needing prompting.	
The Lead Researcher continues with individual activity while prompting the child to sit every time the child tries to get up.	

APPENDIX B

PAIRED STIMULUS PREFERENCE ASSESSMENT DATA SHEET

Student: Assessed by: Date: Time:

Stimulus Items:	Overall rank:

Record Item with corresponding item number: Circle item selected:

1.	2.	1 2 3 4 5 N
5.	4.	1 2 3 4 5 N
3.	1.	1 2 3 4 5 N
2.	4.	1 2 3 4 5 N
4.	5.	1 2 3 4 5 N
3.	2.	1 2 3 4 5 N
1.	5.	1 2 3 4 5 N
3.	4.	1 2 3 4 5 N
5.	1.	1 2 3 4 5 N
1.	4.	1 2 3 4 5 N

1. _____ + _____ x100 = _____%
2. _____ + _____ x100 = _____%
3. _____ + _____ x100 = _____%
4. _____ + _____ x100 = _____%
5. _____ + _____ x100 = _____%

APPENDIX C

WHOLE INTERVAL RECORDING SHEET

1. Circle one of the two options:
    - Y = yes, the behavior occurred for the entire duration of the interval
    - N = no, the behavior did not occur for the entire duration of the interval
2. Occurance = In-seat behavior is defined as the child being seated with at least one foot on the floor and his or her bottom resting on the base of the chair. Engagement is defined as following the directions of the Lead Researcher (e.g., playing with a toy/activity or following appropriate academic directives). In order for occurrence to be recorded, both behaviors must have been occurring for the entire duration of the interval.

Minute	Child's Pseudonym and Date (only need to record once)	Interval 1 :00-:10	Interval 2 :11-:20	Interval 3 :21-:30	Interval 4 :31-:40	Interval 5 :41-:50	Interval 6 :51-:00
1		Y N	Y N	Y N	Y N	Y N	Y N
2		Y N	Y N	Y N	Y N	Y N	Y N
3		Y N	Y N	Y N	Y N	Y N	Y N
4		Y N	Y N	Y N	Y N	Y N	Y N
5		Y N	Y N	Y N	Y N	Y N	Y N
6		Y N	Y N	Y N	Y N	Y N	Y N
7		Y N	Y N	Y N	Y N	Y N	Y N

8		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
9		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
10		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N