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Effects of Stability Balls on Children with Autism Spectrum Disorder

Patricia A. Krombach

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The Effects of Stability Ball Seating on Children with Autism Spectrum Disorder

by

Patricia A. Krombach

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
Department of Applied Behavior Analysis
College of Behavioral and Community Sciences
University of South Florida

Major Professor: Raymond Miltenberger, Ph.D.
Kwang Sun Blair, Ph.D.
Kevin Murdock, Ph.D.

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ABSTRACT

Children with ASD often display behavior problems that can lead to daily academic and social disruptions. Many teachers and therapists have sought to create classroom interventions that improve the length of time a child stays seated and focused on the required task. This has led to the introduction of stability balls as an alternative seating method for children, both on the autism spectrum and with other needs. This study used a multiple baseline design and duration data to evaluate the effects of stability ball seating on attending and in-seat behavior for children with ASD who received ABA therapy in their homes. The intervention replaced their standard seating method with a stability ball. In the final phase participants chose their own seating method before beginning table work to assess preference. Following intervention the stability ball was found to increase both attending and in-seat durations for children with ASD

CHAPTER 1: INTRODUCTION

The Centers for Disease Control and Prevention now estimates that one in 68 children will be diagnosed with Autism Spectrum Disorder (ASD) each year (Baio, 2010). Children with ASD can present with behavior problems that make participating in normal classroom and other daily tasks a challenge. These problems often occur when asked to attend to relevant stimuli or engage in adult-directed tasks, and can make staying seated for any period of time more difficult (Bagatell, Mirigliani, Patterson, Reyes, & Test, 2010). Al-Eisa, Buragadda, and Melam (2013) suggest that children with ASD may seek physical activities rather than staying seated. Al-Eisa et al. also have suggested that in order to learn, the brain must achieve an optimum state of arousal. To achieve this optimum state of arousal interventions have been recommended in the classroom and at home (e.g., Schilling & Schwatz, 2004). Due to the rising number of children with an ASD diagnosis, it is crucial to create learning environments that are effective for this population (Schilling, Washington, Billingley, & Deitz, 2003). One method that has received some attention in current research is using stability ball seating in the classroom.

Stability balls are used for a variety of reasons including exercise and, most recently, as a seating option to help children pay attention (Jakubek, 2007). According to Schilling and Schwartz (2004), this type of seating is a cost-effective intervention that allows children to engage in minimal physical activity while maintaining an optimal arousal level suggested by researchers. It is important to note that staying seated and focused on tasks is critical while in

school, but it is equally important during other times of the day when the child is at home, or in therapy settings. Therefore, Schilling et al. (2003) suggest this type of seating adjustment is a method of adapting the child's environment in a manner that meets the child's specific needs, and that the movement allowed on a ball seat provides motivating factors for staying seated to fulfill energy and stimulation needs of many children.

According to Schilling et al. (2003), teachers noted that their children remained in seat for longer periods of time while seated on stability balls compared to time seated while on a normal, four- legged chair. This observation piqued the interest of researchers, and a study was conducted to determine the effects of stability ball seating for children in a classroom.

Schilling and Schwartz (2004) used stability balls during a circle-time routine, replacing the carpet squares originally used to mark a child's designated seat. The authors showed that participants had considerable improvements in desired behaviors while on the ball seats. This study used a reversal design and displayed the desired control over behavior based on the introduction and subsequent removal of the ball chairs for all four children. Despite the mild bouncing that occurred while seated on the balls, each child with ASD showed an increase in engagement for tasks. This study also found the teachers in this classroom unanimously preferred the ball seats to the standard seating because of the notable behavior improvements for each student.

In a subsequent study, Fedewa and Erwin (2011) looked at both on-task and in-seat behavior for children with attention and hyperactivity concerns. This study found improvements in attending for each participant. The study points to the ability of the child to remain active while staying seated as the reason for the improvement in attending. Momentary time sampling was used as a data collection method to score the percentage of in-seat-behavior and on- task

behavior. The study found that the average participant increased to a level of 100% for in-seat and 79% of on-task behavior. Finally, the study looked to teacher reports for acceptance and success of intervention and found ample support.

Despite several successful studies completed with stability balls, some limitations were observed. Time is frequently noted as a limitation among the published studies using stability balls. Schilling et al. (2003) stated that short study length was an obstacle. The length of a study is important, because the novelty of the stability balls may have adverse effects on student behavior, resulting in more problematic behavior initially, while participants engage in exploratory behaviors. It is possible that such behaviors may dwindle as they become accustomed to the ball. Conversely, the novelty of the ball may cause the child to engage in desired behaviors while the ball is still unfamiliar, but after an extended period of sitting on the ball problem behaviors may re-emerge once the newness wears off. Previously, the length of time spent on the ball has been limited as well, because the natural teaching environment meant that tasks ranged from 5 to 10 min per session (Schilling & Schwartz, 2004).

Bagatell et al. (2010) pointed to the use of stability ball seating only in circle time, rather than in other contexts, as a limitation. This limitation has now been addressed, but the setting is still a common limitation, because all studies have been done in a school setting. This intervention has not been conducted in other settings such as after-school tutoring centers, in home therapy, and homework settings. These settings are important areas where children are required to sit in chairs for extended periods of time and to engage in adult-directed tasks. Thus, investigating such seating changes in other locations is necessary to prove the benefits of alternate, modular seating options such as stability balls.

Furthermore, the use of stability balls seating has predominantly been applied to populations of typical adults or children (Al-Eisa et al., 2013; Haskell, 2011; Wu et al., 2012). While the bulk of literature on this intervention falls with typical populations, some research has been conducted on populations with attention or hyperactivity concerns, although this is still limited. This type of study has only been conducted on children with autism one time, indicating a need for replication. Schilling and Schwartz (2004) conducted this study in a classroom setting on children with ASD. Prior to this study similar research had been conducted by Schilling et al. (2003) with children with ADHD. Each of these studies was conducted in school settings and with small numbers of participants. Although all previous studies showed improvements in desired behavior, replication and continued research is beneficial.

By replicating Schilling and Schwartz (2004) and getting similar results this study was able to solidify the effects on behavior caused by the stability ball use and show the ability for the intervention to generalize to other individuals, ages, and settings. The purpose of this study was to look at the effects of stability ball seating on attending and in-seat behavior for children with an ASD diagnosis. Furthermore, the study assessed the students' choice of stability balls versus typical chairs for their seating. By introducing a seating option that allows for movement and modulation the children were expected to choose the ball seat over a typical chair and be less likely to get up in an effort to seek energy release through other activities (e.g., Schilling & Schwartz, 2004). By implementing a phase in which the subjects selected the seating device of their choice the participants exercised autonomy. Furthermore the selection may also have functioned as a reinforce itself (Tiger et al., 2006). The ability to choose has produced increases in task engagement and decreases in disruptive behavior (Dunlap et al., 1994). The current study will add to the literature by showing the effects of stability balls and participant preferences. It

was hypothesized that this change in seating will help to lessen problem behaviors both in the home setting as it did in classroom settings. This study addressed previous limitations in this area of research by including a more diverse population of children with ASD, a new (in-home) setting, an extended research time frame, and a choice phase.

CHAPTER 2:

METHOD

Participants and Setting

The study included four children, ages 4 to 12 years who received behavior therapy sessions through a private company providing behavioral services to children with autism and individuals with disabilities. The students all had ASD and were referred by parents or therapists for showing difficulty in attending during seated tasks, as well as showing difficulty remaining seated for more than 5 min. The children needed to be able to sit upright on a ball without assistance in order to be included in this study. Participants needed to have a receptive language repertoire, capable of complying with one step directions. Students with physical disabilities, unable to sit upright on a ball, or who were unable to complete simple compliance tasks were not included.

Consent was received from the parents and guardians of each participant after a meeting in which the study was thoroughly explained. During this time parents and guardians were asked to sign a consent form allowing their child to be video recorded during the study.

Recruitment was conducted in the Tampa Bay area via communication with a therapist from the agency, by word of mouth, and posting flyers on the company's website to inform parents and caregivers of the study.

The study took place in the environment where the child had been encountering problems during therapy sessions in the home. This also meant that the time of therapy was unique for each participant. The individual room set-up varied from setting to setting depending on what

was available at each home and the individual differences are detailed below. Each setting included a chair, table, and a stability ball that was supplied by the researcher along with a camera and tripod. Each therapist was responsible for a timer to measure session length.

Alex was 12 years and 2 months old at the onset of the study and had ASD, Tuberous sclerosis, low tone cerebral palsy, and febrile seizures. He received in home verbal behavior therapy 4 days a week from an assistant behavior analyst (BCaBA). He was referred to the study, because his therapist reported he had trouble attending during table time activities and would not stay seated for an extended time. His therapy sessions occurred at a table and chair that was facing a wall in the family room. The chair was a white laminate folding chair with four legs connected with a cross bar and an open back. The table was triangular, white, laminate table with three legs measuring 12 in x 23 in x 19.5 in.

Alex had a behavior plan for vocal stereotypy and head hitting that involved interruption of vocal stereotypy behaviors with simple two motor imitation compliance tasks and blocking head hitting. If the child hit his head five or more times a helmet was placed on his head. Non-compliance with tasks was addressed with least-to-most prompting, implementing physical prompting only when needed to gain compliance. During table work a token economy board with six tokens was used on a variable ratio schedule.

Daniel was a 4 years, 5-month-old boy with ASD who lived at home with his parents and received ABA therapy 4 days a week from two behavior analysts (BCBA's). He was referred to the study because of trouble staying seated during table time with non-preferred activities. His therapy sessions took place at a square, white and blue plastic table that had four legs, and measured 26.8 x 34 x 25.2 in. His chair was matching and had four legs connected with a cross bar.

Daniel's behavior intervention plan (BIP) called for setting expectations, using simple one-step instructions, restricting access to preferred items based on appropriate behaviors and providing praise for appropriate behaviors. During tantrums, head-hitting was to be blocked and attention limited, avoiding eye contact and vocal interactions as well as restricting access to desired toys and activities. If a tantrum occurred, the therapist waited until the child was quiet before redirecting to the task and providing praise for completion. During table time activities a token board was used with a FR2 schedule. Four tokens earned access to a 15-min break from the table.

Brandon was a 6 year, 1 month old boy with ASD and considered to be non-verbal. He lived at home with his mom, dad and sibling. He received in home behavioral services 2 days a week with a verbal behavior, table time component. His BCaBA referred him to the study because the child presented with difficulty sitting still or remaining seated for extended periods of time. He often engaged in escape maintained behavior. His therapy sessions took place at a square, Disney themed folding table that had four collapsible legs, and measured 26.8 x 34 x 25.2 in. His chair was matching in pattern and had four legs connected with a cross bar.

Brandon had a behavior intervention plan that outlined blocking self-injurious or head hitting behaviors and redirection to on task behaviors. Demands were to be restated until compliance was achieved. After the first demand was placed and the child did not engage in appropriate behavior the therapist was to restate the demand and use a demonstrative prompt and finally restate the demand paired with physical guidance if necessary.

Carl was a 7 year, 4 months old boy at the onset of this study and had ASD. He lived at home with his mother and father and received behavior therapy 3 days a week. His BCBA referred him for difficulty attending to work and often engaging in attention seeking behaviors

distracting him from staying seated or completion of work. His therapy sessions took place at a square, grey and red plastic table that had four legs, and measured 26.8 x 34 x 25.2 in. His chair was matching and had four legs with a cross bar.

Carl's behavior intervention plan stated that before beginning tasks the therapist must clearly state the expectations for the child in a stepwise fashion. Problem behaviors that were attention seeking were to be ignored and prompts were to be represented at a fixed rate of 5s until the child complied. Gestural and physical prompting was also acceptable if needed. A visual timer was also in place during table activities and the child was able to choose reinforcers before beginning a task.

Materials

In the intervention phase, each participant was given an inflated stability ball between 45cm and 85cm in diameter. The size of the ball was determined by the apparent angle of the child's knee bend when seated on the ball, the desired angle was 90 degrees. The target behaviors were observed via a video recording device that was positioned in the room for each setting. The recording device was turned on for the duration of the session and data were collected from the recording. The camera was located so that the child's physical seated position could be observed. This was to ensure contact with the ball was observed. Also the camera needed to see the face of the child so that attending could be observed. Each therapist was responsible for camera set up. A phone application called "Tracing Pro" was used to record the duration of target behaviors. The phone application allowed for data to easily be categorized by participant, with separate colors and labels. It also allowed for easy tapping motion to turn on and off the timers in coordinated with the child's changing behaviors.

Target Behaviors

The target behaviors observed during this study were categorized as in-seat behavior and attending behavior. These behaviors were consistent with the target behaviors from previous studies. In addition therapist behavior was recorded descriptively.

In-seat behavior. In-seat behavior on the ball was defined as any part of the participants' buttocks remaining in contact with the ball and the ball simultaneously remaining in contact with the floor. This also includes having at least one foot placed on the floor for stability (Schilling & Schwartz, 2003). Should a child fall from the ball or bounce the ball off of the ground the timer was stopped until the behavior was corrected.

In-seat behavior in the chair was defined as placing any portion of the participant's buttocks in contact with the seat portion of chair, at least one foot in contact with the ground, and all four-chair legs in contact with the ground.

Attending behavior. Based on the definitions from Schilling and Schwartz (2003), attending behavior was defined as the participant oriented towards the therapist or the appropriate task and materials. This includes the appropriate interaction with the materials, responding to the speaker or looking at the speaker. Students were attending when they are interacting with materials in accordance with therapist directives. Students were not attending when they were orientated towards other activities, items, and behaviors that did not coincide with the therapist's directives.

The therapists' behavior that was recorded included, a) the type of task the therapist asked child to work on during the session, b) the number of times the therapist prompted the child to get back in the seat (or back on the ball), c) the types of prompts used to get the child back in the chair or on the seat, and d) the number of times the therapist responded to problem

behaviors in the session (see Appendix 2). Student tasks ranged from reading sight words to receptively identifying pictures, numbers, letters, completing puzzles or other simple activities, varying from child to child. Therapist behavior was discussed prior to starting the intervention to ensure that he or she was following the behavior plan to fidelity and a fidelity check occurred at consistent intervals throughout the study. The fidelity scores never fell below 81% for the behavior of any of the therapist in this study. For the sessions that fell below 85%, a booster training session for the therapist occurred via phone to redirect to the behavior plan. In the training session the therapist was alerted to inconsistencies and asked to identify the correct responses. Correct identification qualified the therapist to continue BIP implementation. Each time the therapist correctly identified their mistakes and the needed corrections. This was observed several times for both Daniel and Carl.

Data Collection and Interobserver Agreement

Data were recorded from video on the two target behaviors. The amount of time the child engaged in the behavior was recorded and divided by the time of the session to generate the percentage of time the target behaviors occurred. Sessions depended on the tasks developed by the therapist conducting the session, and they varied from 5 min to 16 min depending on the child. For data collection purposes, a session began once the therapist placed the first demand on the child and ended when the child was given a break or the video ended. Session type and length was consistent across baseline and interventions sessions. At least two data sessions were conducted each week for each child involved. A second observer collected data independently from the video for 42% of sessions across all phases. Inter observer agreement was calculated by comparing the recorded data from each observer and calculating a percentage of agreement. Agreement was defined as the two observers scoring the target behaviors as occurring or not

occurring during each second of the observation period. IOA for attending was 93% and the IOA for in-seat was 90% across all phases. IOA scores ranged from 70% to 100%.

Social Validity

The social acceptance of this intervention was assessed with two methods. The first was by providing a Likert scale to the therapist and parents to assess acceptability, ease of implementation, practicality, and effectiveness. This form was the scale developed by Fedewa (personal communication, June 16, 2015). This was given to the adults involved in the study at the end of the intervention phase. (see Appendix A for the social validity scale)

Secondly, the social validity of this intervention was tested through a third phase of the intervention in which the students involved were allowed to choose their preferred seating type. In this phase the child was directed to come to the table to sit but could choose between the ball seat and a normal four-legged chair for four to five sessions. This was used to evaluate child preference towards the ball versus chair.

Design

This study evaluated the intervention in a non-concurrent multiple baseline across participants design with an ABC sequence. The study had three phases for each participant - baseline, intervention, and a choice phase.

Baseline. The participants began this phase with no intervention or changes made to their typical therapy session. Children sat in chair during the baseline phase. In baseline and intervention phases, if the child engaged in problem behavior, the therapist responded to the behavior as determined by the behavior intervention plan that was already in place for each child. The therapist conducted his or her session the same way he or she usually did. If the child got out of his seat the therapist first verbally prompted the child to return to the seat and then showed a

visual cue for returning to the seat and, if needed, physically redirected the child to the seat. The different levels of prompting were recorded on a separate data sheet for baseline and intervention phases. Each behavior intervention plan is detailed in the Participants section.

If a therapist provided a participant with break time that was away from the table this time was deducted from the session time. If duration of the session then fell below 5 min this video could not be scored. If a child was awarded a break at the table and the therapist stopped interacting with the child at this time, the duration of the break was removed from the total time because the child was no longer seen as under therapist directives.

Intervention with ball. During intervention the child was asked to sit on the ball for the work session. While the student was on the ball the therapist directed the student to engage in similar tasks to baseline. All interactions with the child were the same as in baseline. If the child engaged in problem behavior the therapist responded to the behavior as determined by the behavior intervention plan that was already in place for the child. The therapist conducted his or her session the same way he or she usually did. If the therapist viewed bouncing or ball related activities as unsafe he or she responded to the behavior by first vocally prompting the child to “sit your bottom on the ball and place your feet on the floor,” and then following the same strategy listed above by visually cueing the child to sit correctly and, finally, physically prompting the child to sit correctly.

Intervention choice phase. This phase allowed for the child to choose between the ball or chair at the beginning of each session. The ball and chair were both presented at the work table and each time the child was directed to the area for work he or she was asked to choose between the two. The one that was not chosen was removed and the child commenced working. Once the child chose a seating option it was used for the duration of the task demand sequence

but he or she could choose a new seat after the break. This allowed the child to choose between seating options within one day, however for each data collection session the seating remained consistent. The choice process was not included in the video footage used for data collection.

CHAPTER 3:

RESULTS

The children observed in this study demonstrated low or variable percentages of in-seat behavior and low or variable attending during baseline observations. During baseline none of the participants achieved 100% in-seat or attending during any of the sessions. The percentages varied from participant to participant with the lowest of 0% and the highest of 92% for in-seat. The attending percentages ranged from 35% to 96%. The data revealed a substantial increase in the target behavior for each participant once allowed to sit on the ball. The extended data collection period and sustained changes in behavior demonstrated that the effects of stability ball seating were not the result of novelty. See results in Figures 1, 2 and 3.

The results showed in-seat behaviors ranging from 0% to 92% with a mean of 46% for Alex during baseline. The duration of his attending behavior was also variable, ranging from 35% to 84% with a mean of 61%. His percentages increased and became stable throughout intervention and into the choice phase. He averaged 99% and 80% for in-seat and attending respectively. During the choice phase Alex chose to sit on the ball all but one session, maintaining an average of 98% in-seat and an 83% for attending. For the session that he chose the chair, in-seat and attending percentages dropped considerably to 55% for in seat and 60% for attending. Alex received an average of 1 prompt per session to stay seated during baseline and the average dropped to an insignificant rate during intervention. He was prompted to attend an average of 9 times per session while in the chair and the number was cut in half to an average 5

times per session while on the ball. The drop in prompting required by the therapist supports the ball as a useful intervention.

The results showed attending and in-seat behavior ranged widely for Daniel in baseline, averaging 46% for in-seat and 79% for attending. During intervention his percentages increased and became more stable. Although there was a low data point in the intervention the rest of the data are considerably higher than the baseline data. He averaged 84% for in-seat and 90% for attending during intervention. Therapists prompted Daniel to remain seated an average of 5 times a session while seated on a chair. The average dropped to 3 prompts per session when Daniel was on the ball. However the prompts for attending jumped from an average of 6 to 8 times a session for the intervention phase. During the choice phase Daniel chose to sit on the ball four out of seven sessions. During the choice phase, the mean percentage of in seat was 78% on the ball and 41% in the chair while the mean percentage of attending was 79% on the ball and 62% in the chair. Daniel's therapist asked to end participation in the study after seven choice sessions due to circumstances unrelated to the study.

During Daniel's intervention several dips in behavior are noticeable. The first dip occurred in the stability ball phase and was correlated with therapist reports of difficulty identifying reinforcers. The second dip while seated on the ball was correlated with lower treatment integrity scores for the therapist. This was also the case for the lowest data point in the choice phase while seated on the chair.

The results showed attending and in-seat behavior fluctuated for Brandon in baseline, averaging 35% for in-seat and 74% for attending. During intervention his percentages increased and became more stable. He averaged 86% for in-seat and 90% for attending. Brandon showed a drastic increase in-seat behavior from baseline to intervention with almost no overlapping data

points. His attending rates in intervention and choice phase were also higher and continued on an upward trend until the end of the study. The therapist needed to prompt Brandon an average of 8 times per session to stay seated during baseline. During intervention this number rose to an average of 10 times per session, however, the number of prompts to stay seated decreased as the study continued. The average number of attending prompts dropped from 4 prompts during baseline to 2 per session during intervention. During the choice phase Brandon chose to sit on the ball four out of 10 sessions indicating a slight preference for the normal chair over the stability ball. During the choice phase he had a mean in seat percentage of 90% while on the ball and 87% while in the chair. For attending, he had an average of 95% on the ball and an average of 87% in the chair. These lower rates in the chair suggest that using a ball seat is a more beneficial seating method.

Results for Carl showed in baseline, averaged 71% in-seat and 81% attending. After intervention his percentages increased to near 100% at first but a steep decline occurred when he began playing on the ball for attention. As the therapist responded to the behaviors with fidelity his scores began to climb back up. He averaged 86% in-seat and 90% for attending. Carl often remained in his seat but used the table to hold himself in a position with his feet suspended in mid air. The therapist often gave prompts to put his feet on the floor but during these moments he could not be counted in seat because he did not meet the in seat definition. During each baseline session Carl required an average of 6 prompts to stay in his seat and an additional 6 prompts to attend. Once seated on the ball his therapist only prompted him an average of 3 times to stay seated and 2 times to attend to tasks during intervention. Ultimately, cutting the number of prompts used in half. After several dips in behaviors, due to problem behavior, Carl was able to achieve a level of in-seat and attending that were higher than baseline levels. During the

choice phase Carl chose to sit on the ball 100% of the sessions resulting in a mean of 92% for attending and 90% for in-seat. As a result his data, both in intervention and choice phase displayed an upward trend.

The social validity scale, given to parents and therapists involved in the study, revealed that all agreed that the stability ball was a beneficial way for their student to expel excess energy during seated activities (mean = 4.5). The parents were in favor of using the ball for seated activities (mean= 3.25) and stated the behavior of the participant improved while seated on the ball (mean = 3.5). One parent circled all ones (strongly disagree) for each item. Three out of five therapists stated they would not use the ball going forward for such activities. Therapist reported that the stability ball helped their child stay seated longer than a conventional chair (mean= 3.8). Several adults did note that the ball could be a potential reinforcer for the participant. Some adults stated that the ball was a safety concern for their children who did not have spatial skills and often bounced too fast once they began the motion. Every therapist also noted that at times they did not allow access to the ball seat because there was too much problem behavior happening that day prior to the table time activities. Each therapist and two parents stated that the ball would be beneficial for some children but not all. The reactions of the therapist and parents in the study were based off of perception, graphic feedback was not provided until the study concluded.

CHAPTER 4:

DISCUSSION

The results of this study show that the ball seating was beneficial in increasing both in-seat and attending behaviors for children with ASD. The increases in behavior maintained over time and occurred regardless of functioning level. The ball seating was chosen most often by three of four participants and all engaged in movement while on the ball seat. Overall, parents were very supportive of the seating choice but therapist found the bouncing to be distracting and at times dangerous. Unlike previous studies, this intervention was not found to be a socially valid intervention method by the therapists involved. While target behaviors increased during intervention, the ball did not eliminate the occurrence of maladaptive behaviors. The data may suggest use of the ball in a reinforcing capacity for the children with ASD. It may be beneficial for children to earn a ball seat as a reward if they comply with academic requirements

The study gathered data for 15- 20 weeks of intervention. The extended time line was beneficial in ruling out novelty effects. The higher behavior levels were consistent for the duration of the intervention phases for each participant. As time went on each participant reached their highest levels near the end of the study, suggesting that continued use would lead to better behavior while on the ball. During the choice phase Daniel displayed a dip in behavior rates and this may be, in part, related to irregularities in schedules because of Christmas break. The therapist reported inconsistencies with scheduling due to travel.

Brandon chose to sit on both the ball and the chair, displaying no clear preference between the two seating options. A visual inspection of his data shows there was no reversal in

his behaviors when seated on the chair. The improvements in seated behavior may be a result of learning. Sitting on the ball was only possible with feet on the floor and bottom on the ball and therefore may have taught the child the correct way to sit, thus generalizing the behavior to the chair. It is also thought that the child encountered more reinforcement for attending while on the ball because he was engaging in less out of seat behaviors and more compliance. Therefore, he learned that attending to the therapist resulted in more opportunities for reinforcement.

During the study each participant fell off the ball at one point. This represented a danger associated with the mobility of a ball. For two children this acted as a natural consequence potentially resulting in spatial awareness in relation to the ball. These students avoided falling for the remainder of the study. However, it appeared Daniel and Carl began falling off the ball to evoke attention or to escape work. For Carl this behavior was remedied with planned ignoring and repeated prompts in accordance with his behavior plan. Due to the tile flooring in Daniel's therapy environment falling was deemed a safety concern and the ball was placed on a circular base designed to contain the ball but still permit bouncing.

Future research could look into establishing criteria for the use of a base (e.g., number of falls from the ball or number of times playing on the ball). Such criteria would make it less subjective and would also allow for behavior skills training to teach the child to use the ball safely. Furthermore, removal of the base and comparing rates of attending and in-seat behaviors for each participant both with and without a base would be beneficial for this body of research.

Another point of interest is two of the participants were directed by therapist to stop bouncing while on the ball. The therapists were placing typical demands on the participants who were bouncing at a relatively high rate on the ball. The therapist chose to direct the child to "stop bouncing" in an effort to gain compliance and help the child attend. The video in question was

not included for Carl because of a lack of visual clarity. In the case of Daniel the decision was made to include the data. Both therapists were reminded that they could prompt the child to sit with their feet on the floor and bottom on the ball if they were worried about safety, but such direct language about bouncing was not advised.

Replacing the standard chair with a stability ball resulted in higher rates of attending and longer in-seat durations during table time activities. The rates of behaviors continued to rise as time went on. This study was not able to pinpoint the reason for the increase in desirable behaviors among participants. Several theories could be investigated in future research. First, bouncing and other ball movements may be conceptualized as a competing response for “self-stimulation,” or automatically reinforcing behaviors that may have made attending more difficult. Another possibility is that the ball required better body positioning in order to remain upright and this may have made attending more achievable than when the child was in a relaxed posture possible on a standard chair. Future research should investigate body alignment and attending.

Several limitations in this study should be addressed. The first limitation was that there were only four participants and all were males. Future research should evaluate the ball seating with a more diverse population. Other limitations with data collection occurred. This study relied on the therapist to set up and record data with the video camera and tri pod provided by the researcher. After an initial training and written directions, the process of recording was left to the therapist and several issues arose as a result. At times the angle of videos made seeing both feet difficult, and other times the child’s face was not completely visible. These videos could not be used. Occasionally videos were uploaded that did not contain 5 min of table time activities with

instruction from the therapist. Those videos had too much break or reinforcer time and could not be used.

It should be acknowledged that parents were asked for their opinions regarding stability ball use but were not directly involved in the study. This is a limitation and means that their opinions were based on observation and possible feedback from the therapist involved. Only one parent, the mother, was asked to fill out the rating scale and for each participant. Future research could look at generalization and assess the behaviors of children under stimulus control of parents while on the ball.

Despite its limitations, this is the first study to evaluate the use of ball seating in an in-home, therapeutic setting including children with an ASD diagnosis with such a diverse age range. The length of the study was also a significant improvement upon prior research. The current study was the first of its kind to involve specified behavior plans for each participant ensuring that each reaction was catered to the individual need of the child. This study also added to research as the first of its kind to involve board certified behavior analysts and assistant analysts as participants responsible for carrying out BIP for each child involved in the study.

Future research should focus on the function of the problem behavior for the possible participants. Each participant should have a functional analysis conducted before beginning the study to evaluate results of intervention in relation to with the function of the maladaptive behavior. Another direction for future research would involve comparing the ball seat to other interventions that provide energy outlets for participants (e.g., antecedent exercise). Because researchers suggest that the use of the ball may allow the participant to “expel energy,” if antecedent exercise were as effective as ball seating, it might provide support for the hypothesis that the ball works by expelling energy (e.g., Al Eisa et al., 2013; Schilling & Schwarz, 2004).

Future research may also focus on the differences in elopement behaviors from a typical chair verses a ball. Finally, conducting this study with an older age group would advance the research.

Future research should investigate what it is about the ball that causes the increase in attending and in-seat durations. Research should look into differences in physical exertion, body alignment, or a competing response. This may be done using EMG recording to measure the core engagement of the participants' muscles while on a chair and compare to engagement on a ball. Perhaps it is the increase in muscle use that requires children to be alert, helping them achieve the optimal arousal level suggested by researchers (Al-Eisa, et al., 2013; Shilling & Schwartz, 2004). Increased attending and in-seat behavior may also be a result of the child's increased attending to body position that is needed to avoid falling off the ball. Perhaps this increased attention to sitting helped focus attending to the task and away from problem behavior. This hypothesis should be investigated further.

Stability Ball Effects

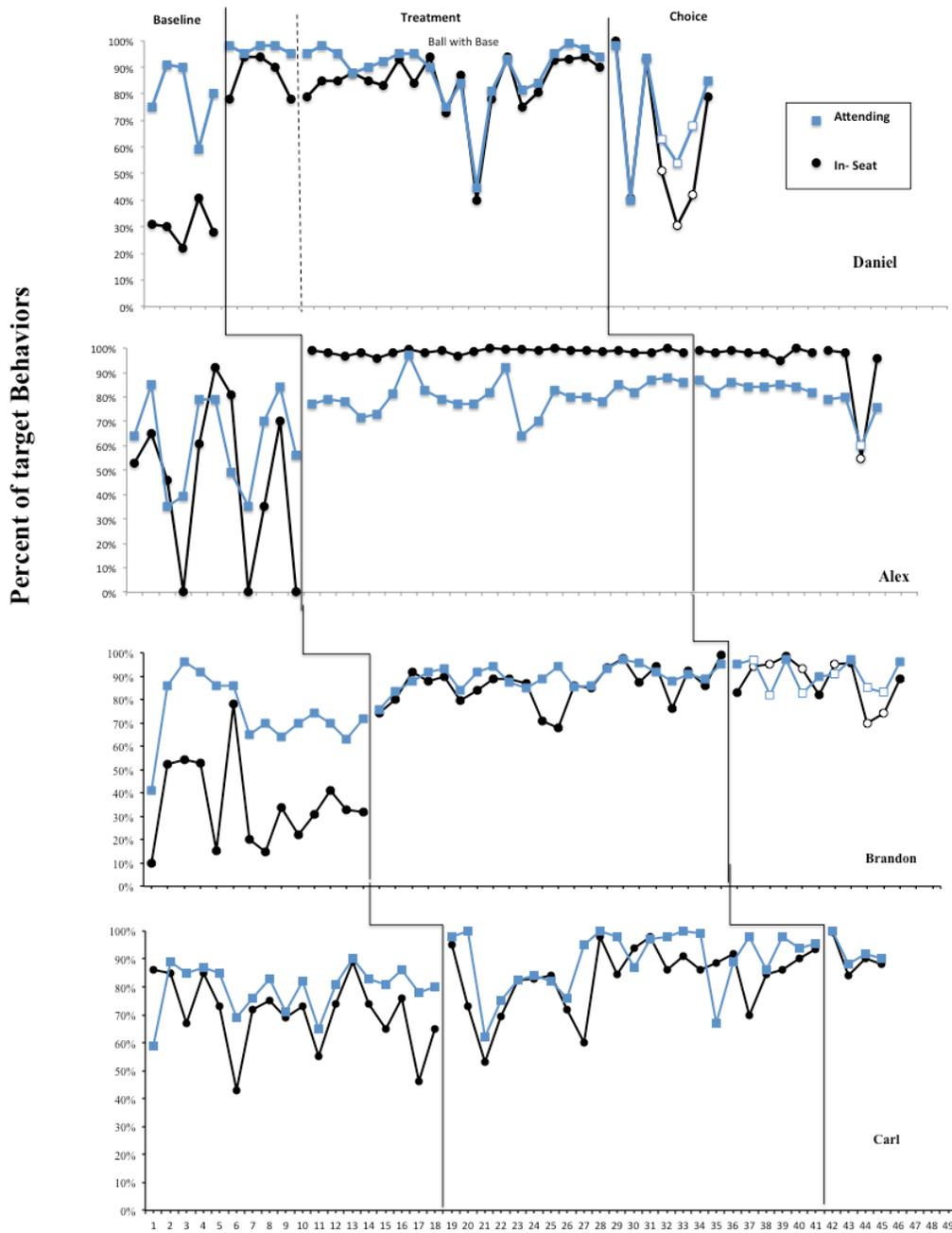


Figure 1. The circular data points depict percentage of time students remained seated. The square data points depict the percentage of time students were attending. In the choice phase, solid data points indicate the choice of the ball and open data points indicate the choice of the chair. The detached data points in Alex data are due to a two-week gap in therapy as a result of illness.

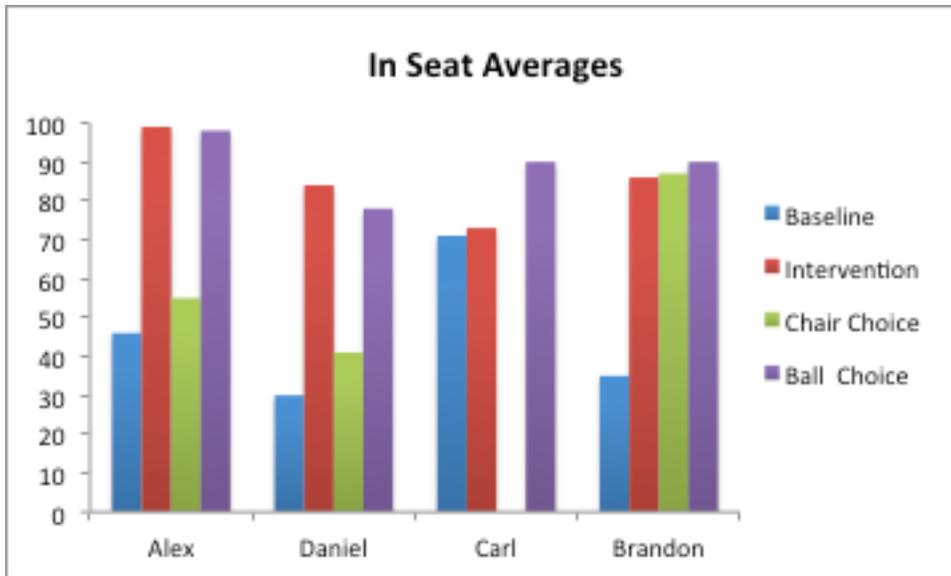


Figure 2. The blue data depict percentage of time students were in-seat during baseline. The red data depict the percentage of time students were in-seat during intervention phase. The green data indicate in-seat duration when chair was chosen. The purple data path indicates in-seat duration when the ball was chosen.

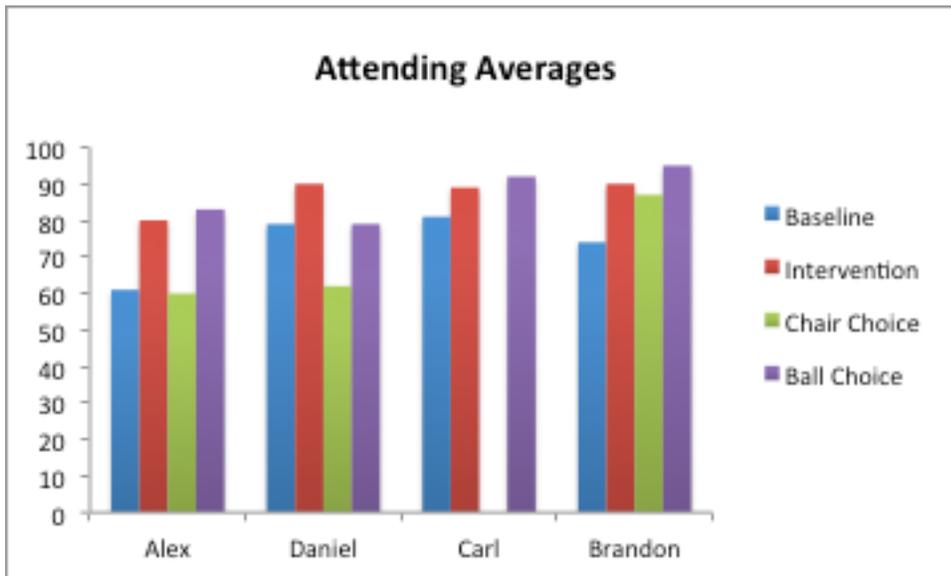


Figure 3. The blue data paths depict percentage of time students were attending during baseline. The red data depict the percentage of time students were attending during intervention phase. The green data indicate attending when the chair was chosen. The purple data path indicates the percentage attending when the ball was chose

CHAPTER 5:

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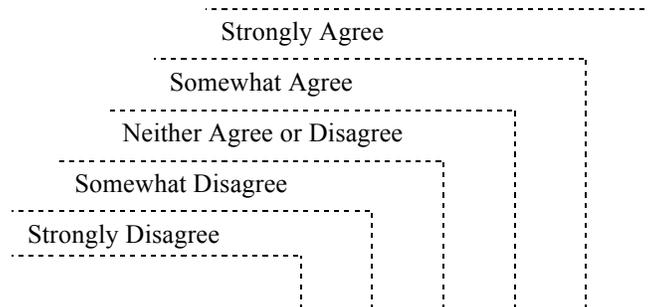
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**CHAPTER 6:
APPENDICES**

Appendix A: Stability Balls in the Classroom

Stability Balls in the Classroom

Please indicate to what extent you disagree or agree with the following statements. There are no right or wrong answers, only your perception of whether the stability balls had an effect on the following areas. After the statements, please feel free to include additional information below regarding your thoughts in using stability balls in the classroom. Thank you for your time!



- | | | | | | |
|--|---|---|---|---|---|
| 1. Stability Balls helped my students focus on the task at hand (seat-work, listening to directions, etc.) | 1 | 2 | 3 | 4 | 5 |
| 2. Stability Balls allowed my students to release some of their pent up energy. | 1 | 2 | 3 | 4 | 5 |
| 3. Stability Balls helped my students with work completion. | 1 | 2 | 3 | 4 | 5 |
| 4. My students were able to stay “seated” longer while staying on task using the Stability Balls. | 1 | 2 | 3 | 4 | 5 |
| 5. Students listen and pay attention more when sitting on Stability Balls. | 1 | 2 | 3 | 4 | 5 |
| 6. I would like to use Stability Balls instead of chairs for the majority of the class day. | 1 | 2 | 3 | 4 | 5 |

- | | | | | | |
|--|---|---|---|---|---|
| 7. Stability Balls are great for providing the students with subtle physical activity while still allowing them to engage in work. | 1 | 2 | 3 | 4 | 5 |
| 8. Having Stability Balls in my classroom was fairly easy to manage after students and myself got accustomed to them. | 1 | 2 | 3 | 4 | 5 |

Please take a moment to include any additional thoughts on the use of stability balls in the classroom (Should they be used? Under what circumstances? What are the advantages and disadvantages to using them in the classroom?)

1. Type of Task delivered:

The child is seated at a small table and on a ball.
The child is working with a number puzzle and Identification cards

2. Number of prompts for in-seat behavior

Verbal: 1 "Sit up" 2- "Sit down"
Gestural/ Demonstration:
Physical: 1- The child let the table and was physically guided back onto the ball.

3. Number of responses to pbx:

The child gets up and walks away 1 time; the child is prompted to come back by the therapist saying, "sit down."

4. Notes: The length of this video is 7:39. The child met the criteria for "in-seat" behavior for 6:23, 83% of the time. The child met the criteria for "attending" behavior for 6:46, 88% of the time.

Appendix C: IRB Approval Letter



RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

8/31/2015

Patricia Krombach
ABA-Applied Behavior Analysis
13301 Bruce B. Downs Blvd
Tampa FL 33612

RE: **Expedited Approval for Initial Review**
IRB#: Pro00023279
Title: The Effects of Stability Ball Seating on Children with Autism Spectrum Disorder

Study Approval Period: 8/28/2015 to 8/28/2016

Dear Ms. Krombach:

On 8/28/2015, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
[Method 8/18](#)

Consent/Assent Document(s)*:
[parental consent.pdf](#)
[Therapist consent form.pdf](#)

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This research involving children was approved under the minimal risk category 45 CFR 46.404: Research not involving greater than minimal risk.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

A handwritten signature in black ink, appearing to read "Kristen Salomon", followed by a horizontal line.

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board

Appendix D: Permission Letter

 **Patricia Krombach** <pak1@mail.usf.edu> 6/16/15 ☆  
to Alicia.fedewa ▾

Alicia,

Hello! I am a current grad student at the University of South Florida pursuing my master's in ABA. Part of my graduation requirements include completing a thesis study and I am hoping to assess the effects of stability ball seating on attention and in-seat behavior for children with Autism Spectrum Disorder. I have read over your 2011 study and would like to incorporate a Social Validity Questionnaire in my study as well. Would you be willing to grant me access to your questionnaire?

Thank you for your time and consideration.

...

 **Fedewa, Alicia** <alicia.fedewa@uky.edu> 6/16/15 ☆  
to me ▾

Patricia,

Of course, please see attached! Best of luck with your research!

Alicia

Alicia Fedewa, PhD, NCSP
Licensed Psychologist
Associate Professor
Department of Educational, School, and Counseling Psychology
University of Kentucky

 **Patricia Krombach** <pak1@mail.usf.edu> 3:33 PM (27 minutes ago) ☆  
to Alicia ▾

Hi Alicia,
I contacted you last fall to access your Likert Scale used to assess teacher opinions of stability ball use in the classroom from your research. I am hoping to publish my research and was curious if I could reprint your scale in my publication within the appendix sections?

...

 **Fedewa, Alicia** 3:43 PM (17 minutes ago) ☆  
to me ▾

Hi Patricia,

I'm so sorry as I don't recall receiving your email! Yes, of course you can re-print our scale. I assume you have a copy of it, correct?

All the best to you!

Alicia