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Alternative Seating for Young Children with Autism Spectrum Disorder: Effects on Classroom Behavior

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A single subject, withdrawal design was used to investigate the effects of therapy balls as seating on engagement and in-seat behavior of young children with Autism Spectrum Disorder (ASD). In addition, social validity was assessed to evaluate teachers' opinions regarding the intervention. During baseline and withdrawal (A phases) participants used their typical classroom seating device (chair, bench or carpet square). During the intervention (B phases) participants sat on therapy balls. Results indicated substantial improvements in engagement and in-seat behavior when participants were seated on therapy balls. Social validity findings indicated that the teachers' preferred the therapy balls. This study suggests therapy balls as classroom seating may facilitate engagement and in-seat behavior and create opportunities to provide effective instruction.

KEY WORDS: Autism; sensory strategies; school based interventions; classroom behavior; dynamic seating; early childhood.

INTRODUCTION

Autism Spectrum Disorder (ASD) once considered a rare disorder is now one of the most prevalent developmental disorders among children (Rogers, 1998). ASD occurs at a higher rate than Down syndrome, diabetes, and childhood cancer (Huebner, 2001). The Center for Disease Control reports the prevalence of ASD 1 per 250 children (Bertrand *et al.*, 2001) and many epidemiologists consider this to be a conservative estimate. This current increasing rate of ASD, coupled with the intensity of intervention required by children with ASD presents a daunting challenge to public education. Although children with ASD exhibit a wide variety of behaviors and developmental levels, difficulty with engagement, attention, and appropriate behavior in the classroom are common and interfere with students ability to participate in the educational mainstream.

Most interventions conducted in classrooms to increase engagement, attention and appropriate behavior of children with ASD have been based on traditional models of classroom management. Although functional behavior assessments (FBAs) are part of the law and are common practice, most behavior intervention plans reflect "obtain" or "avoid" as the function of the behavior and often ignore the sensory issues that may underlie the behavior. Sensory needs as a possible motivator of behavior may be ignored or not addressed due to lack of knowledge in assessment and intervention strategies. One reason that children with ASD may have limited success with some intervention strategies is that they do not address the sensory issues that may underlie the behavior that is perceived to be disruptive (Ayres, 1972; Dunn, 2000). In taking a sensory processing approach to modifying the behaviors associated with ASD, educators want to provide children with an opportunity to modulate sensory input, while maintaining the level of appropriate behavior required at school. Although these sensory-based treatments do not have an empirical

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base of support in classroom use (Dawson & Watling, 2000; National Research Council, 2001; Watling, Deitz, Kanny, & McLaughlin, 1999), they enjoy widespread popularity among field-based clinicians and parents (Watling *et al*., 1999).

Sensory processing theory comes primarily from the disciplines of occupational and physical therapy and relates to "the brain's handling of sensory information for the purpose of enabling a person's engagement in occupations" (Johnson-Ecker & Parham, 2000, pp 494–495). The primary occupation, that is the normal daily activities of children, is that of student. School and related activities such as engagement to task, listening, and playing with peers are examples of the primary occupations of children. Sensory processing theory suggests that typically developing individuals have the ability to modulate sensory input as necessary to adapt to and be successful in constantly changing environments. Research has found that children with ASD respond differently to sensory stimuli than their typically developing peers (Baranek, 1998; Dunn, 2001; Elliot, 1990; Kientz & Dunn, 1997; Watling, Deitz, & White, 2001). Greenspan and Wieder (1997) in an extensive chart review of 200 children with ASD, found 95% exhibited sensory modulation difficulties. These children often engage in perseveration or stereotyped movements in an attempt regulate their sensory systems (Baranek, Foster, & Berkson, 1997; Lovaas, Newson, & Hickman, 1987; Quill, 2000). In addition, sensory processing deficits in children with ASD also appear to be associated with deficits in their ability to attend, engage in play and sustain interaction (Greenspan & Wieder, 1997a; Koomar & Bundy; 1991; Wieder, 1996; Williamson & Anzalone, 1997). Furthermore, Greenspan and Wieder (1997b) suggested that deficits in sensory processing might be a causative factor for social disengagement and off-task behavior. Therefore, a priority for children with ASD and others with sensory processing problems is to provide them successful strategies for self-modulating sensory input.

Sensory modulation strategies can provide the central nervous system with the type of sensory stimuli that bodies require to attain and maintain an optimal state of arousal for learning (Huebner, 2001; Kimball, 1999; Mulligan, 2001; Trott M., Laurel, M., & Windeck, S., 1993; Williams & Shellenberger, 1994). Arousal implies a continuum of alertness from low arousal associated with mental lethargy and drowsiness; to high arousal associated with hyperactivity and distractibility (Huebner, 2001). Consequently, modulation of arousal is critical for optimal engagement, attention and learning (Royeen & Lane, 1991; Williams & Shellenberger, 1996). A therapy ball for seating is one strategy that may provide a child with ASD an opportunity to attain and maintain an optimal state of arousal.

Therapy balls, because they are a type of dynamic seating, may provide children with ASD an opportunity to both actively move and maintain an optimal arousal level while maintaining a healthy, safe, and productive posture. Studies on classroom seating suggest that sustained sitting in regular classroom chairs is unhealthy for children's bodies, particularly their backs (Illi, 1994; Lear & Pomeroy, 1994; Schroder, 1997; Witt & Talbot, 1998). European researchers investigating the ergonomics of classroom furniture have found that when children are in inflexible seating they often assume extreme postures in their attempts to move (Schroder, 1997). European schools have been using therapy balls and other types of dynamic seating devices in the classroom as chairs to improve back health since at least 1988 (Illi, 1994). Currently, a private school in Florida is making the transition to therapy balls in place of chairs while conducting longitudinal studies on the back health of their students (Witt & Talbot, 1998).

Although all these studies using balls as chairs have focused on posture and back health, most include anecdotal reports of improvement in attention, maintained sitting, and school performance. In Switzerland where therapy balls originated, they have a program called "Moving students are better learners". The program name is based on the philosophy that students sitting on therapy balls are less bored and better able to focus on classroom activities. Swiss teachers report that when students are seated on therapy balls "there is a decrease in noise, hyper kids can jiggle without moving furniture, and the class is generally calmer" (McBride, 1993, p 1A). Currently therapy balls are being used as the primary seating in over 5,000 classrooms in Switzerland (Spaudling, Kelly, Santopietro, & Posner-Mayer, 1999). In addition, Witt and Talbot (1998) reported that children in a private Florida school who began sitting on therapy balls demonstrated overall improvements in work habits, particularly in attention and classroom behavior. Likewise, Schilling and her colleagues demonstrated improvements of both in-seat behavior and work production of fourth graders with ADHD when seated on therapy balls vs. chairs (Schilling, Wash-

ington, Billingsley, & Deitz, 2003). In addition, the teacher stated that she believed that the students were much more productive when using the balls and thought their test scores would be impacted in a positive manner. These extremely positive findings were pleasantly surprising to the research team, but they also set the occasion for further investigation.

The purpose of this study was to extend the findings by Schilling *et al.* (2003) by examining the use of therapy balls for seating as an intervention for children with a diagnosis of ASD. Three specific research questions were addressed. First, what effect does using therapy balls as chairs have in-seat behavior? Second, what are the effects of sitting on therapy balls on engagement? Third, what were teachers' perceptions of the use of therapy balls for classroom seating?

METHOD

Participants

All participants in this study were preschool children with ASD who attended a public-school funded preschool program located on a University campus. All children participated in an integrated preschool classroom for 12 hours a week and a specialized program for children with ASD 8 hours a week. The participants, four males (three Caucasian and one Asian) ranged in age from 3 years 11 months to 4 years 2 months. Each had a physician's diagnosis of Autism Spectrum Disorder. These children were selected to participate in this study based on teacher reports that indicated difficulty with in-seat behavior and maintained engagement to task. Specific concerns regarding in-seat behavior varied for each participant, thus the setting and tasks were matched to the needs of the individual students.

Ryan (all names are pseudonyms) age 4 years 2 months enjoyed decoding text and numbers. He had an extensive vocabulary, would initiate conversation with familiar adults and could accurately respond to "how" and "why" questions pertaining to social situations and emotional states. He displayed a sense of humor, and although he did not initiate to peers, he would respond to their overtures. Ryan displayed difficulty remaining seated in the classroom chair and would generally stand during tabletop activities. While standing he would often assume unhealthy postures, such as balancing on one foot, standing on the tips of his toes, or lying on the table with his feet dangling. In addition, while in these inappropriate positions he was not able to attend to task or peers.

Sam, age 3 years 11 months, enjoyed imaginary play with small cars or small animal figures. Cognitively he displayed age-appropriate skills, however, he demonstrated moderate delays in social and communication skills. Sam required adult prompting to facilitate peer interactions. He displayed generalized low tone as demonstrated by poor lip closure, drooling, and an overall flexed posturing. As a result, his teachers had him sit on a bench without a backrest in an attempt to facilitate upright sitting posture. When using the bench, Sam would rarely sit and instead would either stand or kneel on the bench.

Luke, age 4 years 2 months enjoyed participating in movement activities such as chasing other children, using the swing, and bouncing on the small trampoline. Luke had mild cognitive delays and could engage in conversation with adults if motivated. However, oppositional behavior to routine and requests was a major concern for him. Luke required visual supports to structure his day and understand what was expected in a task. In addition, adult supervision with high levels of prompting was required during small group table activities. Unlike the other study participants who were frequently out-of-seat, Luke remained in seat (buttocks in contact with the chair) but would lean forward placing his upper body and head under the table. Furthermore, if staff were not directly engaged with Luke (working with another child) during small group table time, he would frequently leave the area. Luke had a specialized program to address oppositional behavior. When he did not follow a repeated request, he was given a verbal warning followed by a "3-count". If the oppositional behavior continued, a contingent effort task (i.e., placing plastic bottle caps in a basket) was implemented.

David age 3 years 11 months enjoyed music, movement activities and numbers. He preferred to play alone and required adult facilitation for peer interactions, such as turn taking or requesting toys. Although David had limited verbal skills and used visual supports for communication he could identify, count and recite numbers up to 25. David demonstrated the greatest difficulty with in-seat behavior and engagement when seated on the floor during circle time in the classroom. David required

a staff member seated nearby or he would roll on the floor, face outside the circle away from the teaching activity, or roam about the room.

Setting

The intervention was implemented at school in settings individualized for each participant. School settings included an integrated preschool classroom (nine children with a diagnosis of developmental delay and six children with a diagnosis of ASD) and an extended day program serving only children with a diagnosis of autism spectrum disorder. The teacher to student ratio in the integrated preschool was 1–4 and the teacher to student ratio in the extended day program 1–2. Data on two of the participants were collected during participation in the extended day program while data for the other two participants was conducted in their integrated preschool class.

Intervention for Ryan was implemented in the extended day program during art activities. This art session occurred at the same time every day, immediately following his recess. However, the length of time required to complete each art activity varied daily. Therefore, data collection sessions ranged from a minimum of 5 minutes to a maximum of 10 minutes per session.

For Sam, intervention was implemented in the extended day program during reciprocal play activities that occurred while seated at a table with one other child and the teacher. This table time for Sam was immediately before his recess. Although the type of activities varied daily, all of Sam's data collection sessions were consistently 10 minutes in length.

Luke's intervention occurred during small group table time in his integrated preschool class (seven peers and two adults) that occurred immediately following his lunch. Activities at this time were generally art, however, one day a week was cooking, that involved turn taking with pouring and stirring. The group activities varied daily, however, all data collection sessions were 10 minutes in length.

David's intervention was implemented during circle time in the classroom, the final activity in his school day. During circle the entire class including teaching staff sat on the floor, the children on carpet squares. Circle activities included listening to the teacher reading a picture book and/or music activities. Circle time varied in length and therefore the data collection sessions ranged from a minimum of 5 minutes to maximum of 10 minutes.

Design

This study used a single subject withdrawal design (Kazdin, 1982) within the natural classroom setting across four students with a diagnosis of ASD. The intervention was delivered in an A-B-A-B design for three participants and a B-A-B for 1. The B-A-B design was used to demonstrate the effectiveness of this intervention without an initial baseline, a situation more similar to how a classroom teacher might implement the intervention (Cooper, Heron, & Heward, 1987).

Procedures

Pre-baseline Activities

After parental consents were obtained, each participant was individually fitted for a therapy ball. Therapy balls were individually fitted to a diameter that assured each child could sit comfortably with his feet flat on the floor with knees and hips flexed at 90°. The therapy balls used in this study had molded feet (Sit 'n' Gym™ by Gymnic) that extended when the ball was not in use to prevent rolling away.

Next, the time of the day and the activity in which each of the participants would use the ball for seating were determined via teacher interview. Each participant's teacher was asked to identify the activity and time of day that seemed to be most difficult for the child in the areas of in-seat behavior and engagement. Since participants' schedules and curriculum were not altered, the duration of the activity varied in length of time. In addition, all staff within each participant's classroom were instructed to give no prompts on sitting behavior throughout the duration of the study. Staff intervention would occur, however, if a student exhibited a behavior that would be potentially harmful to the child, his peers, or teacher (e.g., throwing materials, aggression). Otherwise, the teachers' classroom management style, expectations, and activities were not altered.

Baseline and Withdrawal Phases

During baseline and withdrawal phases (A) classroom activities, teacher behaviors, and seating devices were not altered. Each child was observed at the same time daily and data were collected on seating behavior and engagement. Once baselines for both variables were stable, the participant's

commonly used seating device (chair, bench, or carpet square on the floor) was removed and the intervention initiated.

Intervention Phases

All intervention phases were implemented for a minimum of two school weeks. During the intervention phases (B), each participant continued to be observed at the same time daily and data continued to be collected on seating behavior and engagement. The only change during this phase was the implementation of the therapy balls for classroom seating. No specialized training was provided to the students or teachers. Teachers were instructed to prompt children to sit on their balls only if behavior was deemed dangerous or destructive. No changes in schedules or activities were made to accommodate the intervention.

Data Collection

Data were collected on two variables: sitting and engagement. Data on these behaviors were collected using momentary real time sampling (Richards, Taylor, Ramasamy, & Richards, 1999). In-seat behavior as either in-seat or out-of-seat and engaged or nonengaged. In-seat behavior for chair and bench were defined as any portion of the participants' buttocks in contact with the seat portion of the chair (Sugai & Rowe, 1984) and the four legs of the chair in contact with the floor. For the one participant sitting on the floor for circle in-seat behavior was defined as the child being in an upright position with any portion of his buttocks in contact with the floor. On-ball behavior included any portion of the participants' buttocks in contact with the ball, the ball in contact with the floor, and a minimum of one foot in contact with the floor.

Engagement was defined as when the student was oriented towards the appropriate classroom activity such as instructional materials, activity, or teacher and either interacting with the materials, responding to the speaker, or looking at the speaker. In group activities, engagement also included orientation and responding to peers in the activity. Nonengagement was defined as when the student was not oriented toward the appropriate classroom activity, such as instructional materials, activity, or teacher. For example, staring at persons or objects not related to instruction.

For Luke, one additional variable, frequency of oppositional behavior was measured. Oppositional behavior was defined as refusal to follow a routine teacher request that resulted in the staff to employing Luke's individualized consequence. The consequence for oppositional behavior was a warning, a teacher counting out loud to three, and then the implementation of a mild aversive procedure, contingent effort (e.g., placing plastic bottle caps into a basket.). Data on this variable were collected using a frequency count across the entire session.

All other data were collected using momentary real time sampling in which the recorders wore wireless headsets to hear a pre-programmed 10 minute tape that announced "record" and the interval every 10 seconds. Wireless headsets allowed the recorders freedom of movement for observing and for recording signals to be heard at the exact same moment by two data collectors. Session times varied since data were collected in the natural environment without curriculum changes and the length of time teachers remained at tasks varied. As a result data collection sessions ranged from a minimum of 5 minutes to a maximum of 10 minutes. Three data collection sessions were scheduled each week, however student absences or changes in the school schedule (e.g., holidays, field trips) resulted in variability in the number of sessions (data points) that occurred in a week. During the intervention phases, the staff implemented the intervention even though no data were being collected.

Reliability

Inter-observer agreement was examined a minimum of once per phase for each of the participants. Inter-rater agreement for in-seat behavior ranged from 95% to 100% ($\bar{X}$ = 98%) and for engagement ranged from 82% to 100% ($\bar{X}$ = 90%), as calculated by point-by-point agreement.

Social Validity

Social validity was determined via a staff questionnaire that was completed at the conclusion of the study. For each participant their classroom teacher and the teaching assistant completed the brief questionnaire regarding the typical classroom seating device (chair, bench, or carpet square) vs. the ball. A total of eight questionnaires were completed.

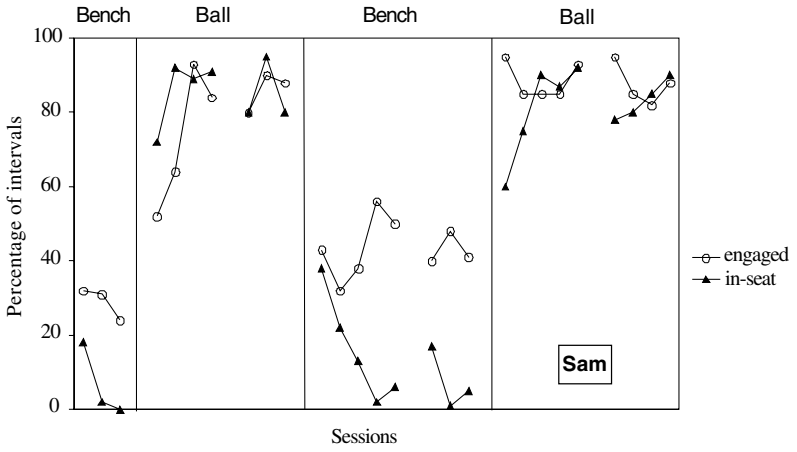

Fig. 1. Percent of intervals Sam was in-seat and engaged during reciprocal play activities.

RESULTS

In-seat Behavior

The results for the participants are shown in Figs. 1–4. These results indicate that all participants displayed marked improvement in classroom behavior during the use of therapy balls for classroom seating. For Sam, Ryan, and David the positive changes in in-seat behavior were both immediate and substantial. Likewise upon withdrawal of the therapy balls and return to typical classroom seating participants displayed an immediate decline in in-seat behavior returning to their respective baselines.

Luke presented differently from the other three participants. Out-of-seat behavior was never a concern for Luke, and is substantiated by his data. Staff were extremely concerned, however, about his extreme oppositional behavior. During the intervention phases Luke demonstrated improvements by an increase in his engagement and a decrease in oppositional behavior. Oppositional behavior was measured by the frequency of the administration of the contingent effort task. These data are displayed at the bottom of Fig. 4. During use of the ball for seating (15 sessions) Luke demonstrated no occurrence of oppositional behavior that resulted in the implementation of his specially designed behavior plan. However, during use of the chair for seating (withdrawal phase) Luke was oppositional and required implementation of his behavior plan on one or more times per session (in three of four sessions). In addition, while on the ball during small

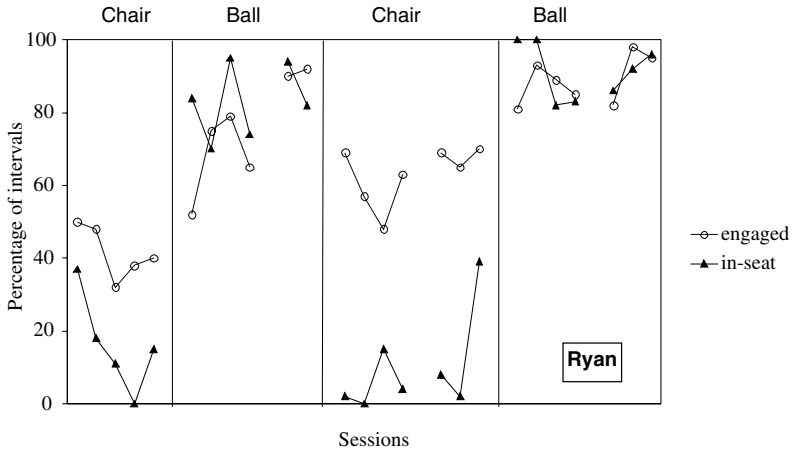

Fig. 2. Percent of intervals Ryan was in-seat and engaged during art activities.

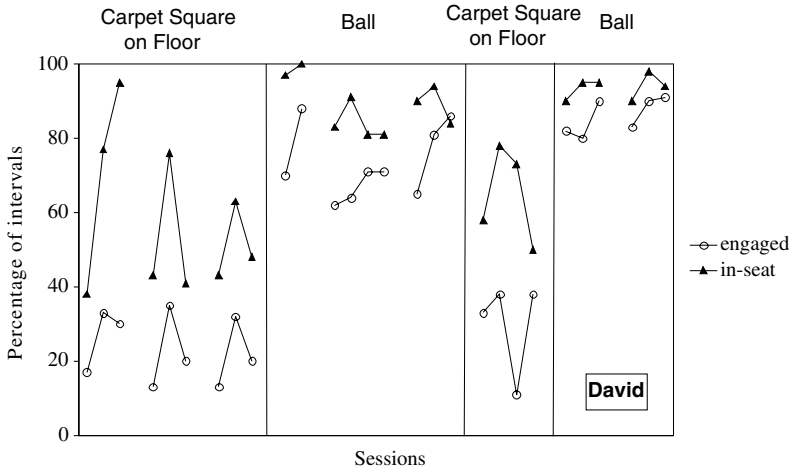

Fig. 3. Percent of intervals David was in-seat and engaged during circle time.

group he did not leave the table area even when not engaged directly with the staff. Although Luke remained seated when on the ball, he bounced continuously. The bouncing did not appear to interfere with engagement and he would independently stop bouncing to perform more complex tasks, such as stirring or pouring during cooking.

Engagement

The second area assessed was engagement. As noted in Figs. 1–4, engagement for all four participants increased substantially during therapy ball phases. Although participants bounced or gently rocked while seated on the ball, they all displayed improvement in engagement. As reflected in the data, the movement while seated on the therapy ball did not interfere with the participants' engagement to task. Upon withdrawal of the therapy balls and return to typical classroom seating, all participants demonstrated an immediate decline in engagement and returned to their respective baseline levels.

Social Validity

Teachers and staff working with the participants were given a satisfaction survey questionnaire at the completion of the study. All staff responses strongly supported the use of balls for classroom seating.

Staff working with David reported increased independence and noted him self correcting,

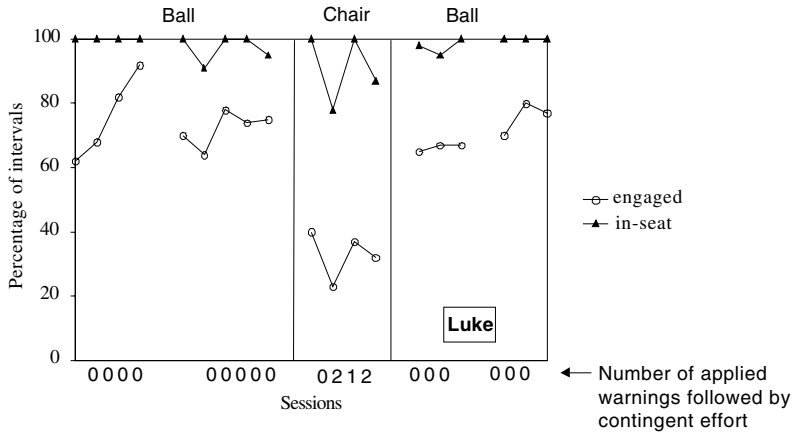

Fig. 4. Percent of intervals Luke was in-seat and engaged during small group table activities and the number of applied warnings followed by a contingent effort task as the result of oppositional behavior per session.

demonstrated to staff when hearing David several times tell himself "sit down" during the use of the ball for seating. Additionally, David appeared to demonstrate a preference for the ball as he would immediately upon presentation of the ball, take it and sit without request or prompting.

The staff working with Ryan had the greatest range of responses. Although they supported the use of the ball for seating they felt that Ryan showed no difference in his restlessness, whether seated on the ball or the chair. However, they reported that Ryan completed tasks better when seated on the ball, but that the bouncing was sometimes distracting.

Similarly, staff working with Sam supported the use of therapy balls for seating but reported that although "verbal thinking increased" at times Sam would start a sentence over at each new bounce. All staff working with Sam reported an increase in his attending, completion of tasks, and interaction with peers when seated on the ball. In addition, staff noted strengthening of Sam's trunk and a decrease in his drooling.

Luke's teacher commented that "student did not escape by going under the table at all while on the ball". One staff member reported that initially she found it difficult to work with Luke on the ball since he was continually bouncing, but was able to adapt as she also found Luke to be more engaged and socially responsive during nonpreferred table tasks.

Teachers and staff unanimously reported via the questionnaire that they would like to have the balls available for seating in their classroom, and following completion of this study they continued to use therapy balls for seating not only for the study participants but other students in their class. In addition, the parents of at least two of the participants have also ordered balls for use at home.

DISCUSSION

Findings of this study indicated substantial improvements in in-seat behavior and engagement across all four participants when seated on therapy balls. In addition, the teachers and students consistently reported a preference for therapy balls vs. other seating devices. This study also demonstrated that the intervention was effective across participants with varied ability levels, across a variety of classroom settings, and activities. It is important to note that not all students responded in the same manner. Variations in movement on the ball occurred both between students and within an individual not only day to day but possibly within the same session. Luke for example bounced vigorously throughout the study when seated on the ball, stopping and sitting still only during complex motor tasks. Whereas, Ryan when seated on the therapy ball, was either very still or gently rocking. However, regardless of the amount or type of movement demonstrated by children when seated on the therapy balls, their engagement improved.

In addition to the positive outcomes documented by the observational data, teacher and parents reported many positive behaviors. Sam's school therapist reported toward the completion of the study that Sam's trunk strength had increased and his drooling had decreased. However, it should be noted that when Sam initially used the ball for seating his drooling appeared to increase. Sam's teacher reported that when seated on the therapy ball, he was more responsive. Also, at the completion of the study Sam's mom reported when he would see a ball, he would immediately and independently get the ball and sit on it.

Although not directly measured there were repeated indicators that David preferred the ball to sitting on the floor during circle. First, when David's ball moved off of the carpet square he would get off the ball, adjust it and sit down independently. This was periodically accompanied by his saying "Sit". This verbal self-correction did not occur when he was sitting on the floor. Second, on more than one occasion when David saw the ball he would immediately and without prompting get the ball, take it to his sitting area, sit and remain seated waiting for the activity to begin. Third, when using the ball David was able to sit independently during circle time and did not need on-going adult supervision. In addition he would raise his hand without prompting and participate appropriately with his peers in activities such as singing songs or listening to a story.

Ryan would also adjust the ball without prompting while working at the table. However, when not engaged in the activity (e.g., task completed or waiting for materials/instruction) he would often rock on the ball and appear to be exploring and playing with his balance and the movement of the ball. For Ryan, sitting on the therapy ball not only increased his engagement but also, appeared to increase the speed at which he responded to and

completed tasks. The teacher would often expand the task for Ryan when seated on the therapy ball, whereas, when using the chair Ryan completed fewer activities and required more prompting.

Luke, unlike the other participants, bounced continuously while seated on the ball. Although Luke bounced throughout each session, and appeared nonengaged, he appropriately participated in the activities and accurately responded to peers and staff. In addition, the staff noted that throughout the duration of this study, when on the therapy ball, Luke no longer required continuous adult interaction and the need for prompting during nonpreferred activities decreased.

Although the results of this study provide one of the first empirically validated uses of sensory-based treatment for children with ASD in a classroom setting, one must be cautious not to over-generalize the findings. The substantial improvements in in-seat behavior and engagement support the need for broad-based replication. Additionally, the study raised the following questions.

The effect of this intervention overtime must be investigated. Children in this study sat on the therapy balls for a maximum of 10 minutes a day, for a period of 3 weeks. What if children used therapy balls for an extended period of time? Future research might examine the effects of extending the daily 10 minute session time to 30 minutes daily. Similarly, future studies might examine the effects of extending the use of the ball beyond 3 weeks to an entire school year. Is there a possibility that participants might accommodate and return to baseline behaviors? Therefore, a next step would be to extend the length of the intervention session and the duration of the phases. In an extended study, one might also examine children's seating preferences by offering children a choice of seating devices (typical seating vs. a therapy ball). If given a choice would children be consistent and would they choose to use the ball for a portion of the day or the entire school day?

In addition, a sample size of four was not extensive enough to establish the generality of effects observed in this investigation across a broad range of children with ASD. Children with ASD are complex and exhibit a wide variety of behaviors, developmental levels, and sensory needs. How do we choose which children with ASD will most benefit from the use of a therapy ball for classroom seating? To date, no single intervention has been identified that is appropriate for all children with ASD. The children included in this study were selected by their teachers and all demonstrated difficulty with appropriate classroom behaviors such as engagement, attention and sitting behavior. Further investigation is necessary to identify the criteria for identifying which children with ASD this intervention will be most effective.

This study indicated that the therapy balls were an effective intervention for improving both in-seat behavior and engagement for young children with ASD, but did not address why they were effective. Therapy balls for seating is a sensory-based intervention that appeared to address some of the sensory deficits of children with ASD. As sensory-based strategies are based on theory, we can only hypothesize as to why this intervention was effective. Therapy balls for seating appeared to provide children with ASD an opportunity to move while seated and therefore, attain and maintain an optimal state of arousal for learning.

This intervention is an example of how the sensory-processing theory embraced by many physical and occupational therapists can be translated into effective practice in a classroom context. This study also demonstrated how the integration of basic theories from two disciplines, specifically occupational and physical therapy and education, can create an effective behavioral support strategy that can be easily implemented by classroom teachers.

In conclusion, it is important to note that this study was conducted at a setting in which high quality instructional strategies for children with ASD were employed. Sitting on therapy balls does not replace those, but may provide increased opportunities for teaching. We neither advocate sitting on therapy balls as a replacement for highly structured intervention using evidence-based practice, nor are we suggesting that this intervention is appropriate for all children with ASD. Therapy balls for seating in the classroom are not teaching children with ASD, but appear to have created opportunities for high quality instruction to be effective for children with ASD.

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