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Abstract

The effect of inflatable cushions (wiggle cushions) as seating on attention during circle time in typical preschool classrooms was tested using alternating periods of typical seating and wiggle cushions. Four classrooms (n=25) were utilized, with two randomly assigned to the intervention condition (n=15) and two as control (n=10). Data was retrieved from video recordings of a uniformly structured seven-minute period at the beginning of circle time completed within classrooms by the teachers for a four week time period. Engagement was rated using five subscales of the Child Behavior Rating Scale (Mahoney & Wheeden, 1999), a five-point Likert-type scale. Results indicated statistically significant improvement in Attention and Persistence subscales (p=.002, .026 respectively), with no effect on Affect, Involvement-Distractibility, and Joint Attention subscales (p=.319, .208, .186 respectively). Teachers provided positive feedback for the intervention, indicating social validity.

The Effects of Inflated Seating Cushions on Engagement in Preschool Circle Time

Introduction

Many preschools provide a fun, open, and supportive environment for children to learn through play and learning activities. Within the daily routines there are structured times to prepare the children for their future education. *Circle time* is one of these structured times, and most preschool curriculums reserve time in the day for this. During circle time, children are often expected to sit on the floor, on carpet squares/dots, or in chairs. The physical structure of circle time can be a full circle of children with a teacher included into the circle, or it can be a loosely organized group of children focused on adult presenters. Circle time curriculum differs and can include calendar, counting, weather, pre-literacy, and discussions as well as stories and songs. Circle time can last from a few minutes up to half an hour.

Merriam-Webster (2015) defines *engaged* as being involved in an activity or being greatly interested. *Student engagement* is defined as "the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught" (Hidden Curriculum, 2014). Many educators desire improved student engagement based on the belief that learning improves when students are interested and inquisitive. In order to learn one must attend to a task then practice.

Research has shown that attention can have an effect on children throughout their educational careers. Breslau and colleagues (2009) completed a longitudinal study of 693 children in the Detroit rural and suburban areas. At age six, researchers assessed intelligence, attention, internalizing and externalizing behavior problems upon school entry via a standardized teacher report measures. At the end of high school, age 17-18, researchers assessed the students' academic achievements in math and reading using a standardized test. The results of this study

suggested that attention problems at age six was the strongest predictor of math and reading achievement at age 17. The researchers suggested that interventions geared toward attention should be implemented at a young age to prevent against the long term impacts of poor attention.

As the education system evolves, enrollment into and the requirements of a formalized education are expected at younger years (Zubrzycki, 2011). There are three potential problems with this trend. First, formalized education goals often do not recognize the importance of social, communication, play, and arts development as prerequisites for higher thought processes (Zubrzycki, 2011). Second, children's attention spans develop with age. The Children's Physician Network (Schmitt, 2010) suggests that a normal attention span is three to five minutes per year age of the child. Lastly, children may have attention deficit or sensory processing disorders which are not yet identified, making their ability to attend for long periods of time even less than typical. Attention deficit disorders are difficult to diagnose before age five, and sensory processing disorders may not become evident until much later in life (Mayo Foundation for Medical Education and Research, 2011; 2012).

From birth, a child is learning from the sensory environment. Every experience involves input from multiple senses that must be compiled and decoded. When first engaged in a sensory learning experience, the brain focuses on and processes all sensory input. As the input is repeated, it becomes readily recognized and no longer requires the intense amount of processing. Sensory experiences are stored and used as scaffolding to help decode future experiences (Pape & Ryba, 2004). From ages three to seven years, children are developing their competencies in sensorimotor skills including those required for scissors, pencils, jungle gyms, soccer, hopscotch, zippers, and videogames. With practice, these too become automatic so that children can perform them with less conscious attention (Pape & Ryba, 2004; Parham & Mailloux, 2010). This allows

attention to be directed at the academic challenges presented. Pape and Ryba (2004) state that "during these formative years it is crucial that children be presented with opportunities to take in and actively participate in an environment that provides enriched sensory input" (p. 252).

The American Occupational Therapy Association (2012) identifies the job of the occupational therapy practitioner in the school systems as a *collaborative member of the team* to provide services to all students through initiatives aimed at the "individual, group, whole classroom, and/or school-wide" (p. 1). The Individuals with Disabilities Education Act (IDEA) of 1997 put an increased emphasis on all related services, including occupational therapy, to be implemented in the least restrictive environment in order to encourage integration of children with disabilities (Bazyk & Case-Smith, 2010). The majority of a students' time is spent under the direct supervision and instruction of a teacher. To best provide services for all students, an open collaborative relationship between the occupational therapy practitioner and teacher is necessary. Occupational therapy practitioners may make suggestions to modify the environmental form and occupation to improve engagement and performance, but it is teachers who will implement the strategies and notice changes, both positive and negative. Teachers can then report this valuable information to occupational therapy practitioners which can allow for modifications if necessary. This collaboration supports meeting the needs of all young learners.

One common modification used by occupational therapists for children with deficits in attention or sensory processing is the implementation of a therapy balls or inflatable seating cushion, often called *wiggle cushions*, either in place of or in addition to their usual seats. Wiggle cushions and therapy balls offer the ability to practice dynamic sitting balance, core muscle strength, and postural control while offering added movement and deep proprioceptive input (Pape & Ryba, 2004). Additionally, teachers often prefer the ball seating over typical seats,

suggesting social validity of this intervention (Fedewa & Erwin, 2011; Schilling & Schwartz, 2004; Schilling, Washington, Billingsley & Deitz, 2003; Umeda & Deitz, 2011). However, research on effectiveness is limited to only a handful of studies.

Schilling and Schwartz (2004) utilized a single subject repeated measures design with four young boys, ages three to four years, with autism spectrum disorder to assess the effects of therapy ball seating on engagement and on-task behavior for five to ten minute of the most difficult activity during the school day for each student. The researchers defined in-seat behavior as "any portion of the child's buttocks in contact with the seat portion of the chair" and four legs of the chair, or the ball and one foot, in contact with the floor (p. 427). Engagement was defined as "oriented towards appropriate classroom activity… or teacher and either interacting with materials, responding to the speaker, or looking at the speaker" (Schilling & Schwartz, 2004, p. 427). Data was collected using momentary real time sampling of the decided time period over three weeks. Data showed improvement for all students' engagement and three of the four students' in-seat behaviors. No statistical analysis was completed. All teachers and staff responded positively in a questionnaire at the end of the study, adding social validity to the intervention. The researchers suggest that therapy ball seats may address sensory deficits and afford students with autism spectrum disorder the ability to obtain an optimal state of arousal for learning.

Bagatell, Mirigliani, Patterson, Reyes, and Test (2010) used a single-subject design with six kindergarten and first grade male students diagnosed with autism spectrum disorder to assess the effects of therapy ball chairs on in-seat behavior and engagement during a 16-minute circle time for 19 days. In-seat behavior and engagement were both defined in accordance with Schilling and Schwartz (2004). Results were varied, but suggested that while on the therapy ball,

four of six students demonstrated decreased variability in in-seat behavior. Therapy ball seating did not appear to have an effect on engagement. During the last five days of the 19-day data collection period, Bagatell and colleagues allowed the students to choose their seating. Two of the six participants chose the ball seating at least four of five days, two chose the ball two of five days, and two chose their chair. The teacher reported that all children understood the choice making process except one who chose chair each day. While teachers were initially open to the use of therapy balls, upon completion of the study, they did not feel that their use was very effective. This study suggests that the effect of using dynamic seating may be variable, and also that more research is needed utilizing larger sample sizes, longer duration, and repeated measures.

Schilling, Washington, Billingsley, and Deitz (2003) used single-subject repeated measures design for three students with Attention Deficit Hyperactivity Disorder (ADHD) and their 21 fourth grade classroom peers to evaluate the use of therapy ball seating on in-seat behavior and legible word production. Students utilized ball seats during the 60-minute language arts period for a four-week time period. Data was taken from the middle 40 minutes of the session. Results showed increased in-seat and legibility on written assignments for the three students with ADHD under observation. The three participants with ADHD and all classroom peers reported via questionnaire that they thought the therapy balls were more comfortable, improved writing, and increased attention in class. Teachers also responded supportively, commenting that students were more focused, quieter, and calmer during the use of the ball chair.

Fedewa and Erwin (2011) used a single-subject design to assess the effects of therapy ball seating on in-seat and on-task behaviors with eight targeted fourth and fifth grade students

along with the other students present in the class. The targeted students either had a diagnosis of ADHD and were un-medicated or were identified by teachers as high or very high probability of ADHD. Ball seats were utilized by each student in the classroom instead of chairs for 12 weeks. The eight targeted students were observed using momentary time sampling for 30-minute time periods for 3 days per week. Results showed that over the 12-week period both in-seat and on-task behaviors increased steadily for the eight students under observation. Additionally, the Attention-Deficit/ Hyperactivity Disorder Test (ADHDT) scores completed by teachers before and after the intervention showed a drop for not only the eight students under observation, but also the general classroom. This can indicate that the effects of the therapy balls on hyperactivity and attention are noteworthy even for students without attention difficulties. Both teachers and students preferred the therapy balls as seating.

While two of the four studies above include the typically developing classmates of students with diagnoses, none of the research includes observation and analysis on the effects of the seating on their behaviors. Witt (2001) described the use of therapy balls as seating on twelve typically developing sixth grader volunteers in her class. After gradual introduction of the therapy balls, students were provided therapy balls as seating for approximately five hours per day for 15 weeks. The pre-test/post-test findings of seven motor tests indicated that all students demonstrated improvement on at least three of the motor tests, with nine of twelve improving in at least four of the seven tests. Nine students demonstrated decreased performance in at least one motor test. Statistical analyses were not done. Witt suggest that because of their positive effects on balance, postural control, joint range of motion, and on-task behavior, the implementation of therapy ball seats should been widened to include use with typically developing children.

The above studies used therapy balls as seating. Wiggle cushions offer similar dynamic seating but offer some features that balls do not. First, cushions are much smaller than the balls, allowing for easier storage, transportation among classrooms, and more discrete use. Second, the movement allowed is slightly different. While on therapy balls students can roll and bounce; wiggle cushions afford transitioning weight in different directions with less ability to bounce. Wiggle cushions, like therapy balls, offer deep pressure and vestibular input, but cushions also have "nubs" on one side to offer additional tactile input if desired. Last, wiggle cushions, unlike balls, can be utilized independently on the floor or can be placed on the chair seats. This offers some discretion for the children. It also can provide a solid base for those with decreased balance, core muscle strength, or coordination as the children are still supported by the stability of the chair or floor as opposed to the therapy balls' ability to roll (Umeda & Deitz, 2011). Anecdotally, wiggle cushions are more often suggested and used in classroom settings by occupational therapy practitioners for children with sensory processing and attention deficits; however, even less research is available as to the effectiveness.

Only two published articles were located on the effects of therapy cushions. Pfeiffer, Henry, Miller & Witherell (2008) observed 61 second grade students across six elementary schools who demonstrated attention difficulties as reported by the teacher. After a trial opportunity, the students in the experimental group were provided wiggle cushions to place on regular classroom seating for two hours per day for a two-week period. Using a teacher report measure, a statistical significant difference was found in the percentage of change from pre- to post-test in the experimental group compared to control group in the area of attention. This study suggests that wiggle cushions can be implemented as dynamic seating similar to therapy balls for children with attention difficulties.

Umeda and Deitz (2011) observed two kindergarten males diagnosed with autism spectrum disorder. This study utilized repeated measures design and an additional choice phase to investigate the effects of wiggle cushions on in-seat and on-task behaviors during math lessons over 13.5 weeks. The teacher described the cushions as an easy seating alternative that he would like to have available in his classroom; however, the data did not show substantial differences in in-seat or on-task behaviors.

The majority of research focuses on elementary aged children who have diagnoses. With educational standards and expectations moving to younger ages, it will be necessary to assess if these strategies work well for younger age ranges, such as preschool aged children, as well. Because of the difficulty in diagnosing an attention or sensory processing deficit in this age range, these strategies should be assessed as to their effect on all students. Enser (2011) conducted a study in which small groups of typical preschoolers attended a playgroup with a circle time component. In an A-B-A design, therapy ball seating during circle time did no harm to Attention, Persistence, Involvement-Distractibility, Joint Attention, and Affect. The current study continued this line of investigation and expanded the research of wiggle cushions as seating to assess the effects on engagement during structured circle time in typical preschool classrooms. This study aims to answer the question does sitting on a wiggle cushion have an effect on the engagement of preschool students during circle time.

Methods

This study was approved by the Institutional Review Board of the University of Toledo.

Design

This study used a repeated measures A-B-A-B with control group design. Phases were one week (five weekdays) in duration. During A phases, standard floor seating was available to

preschool children during circle time in their preschool classrooms. In the B phases, wiggle cushions were utilized during daily circle time in two of four randomly selected classrooms. The remaining two classrooms served as the control group. Circle time was conducted by the classroom teachers who coordinated with the researcher to develop a seven- to ten-minute standardized, structured outline. Circle time was recorded using video cameras inside the classrooms.

Participants

This study was conducted at Apple Tree Nursery School at the University of Toledo and included four of their preschool classrooms. Apple Tree provided early childhood education and high quality childcare. It was open to the community for enrollment. Each classroom had two teachers. Classrooms could enroll as many as 18 preschool children if the youngest was three years old. Classrooms were paired into suites by the presence of a sliding door between two classrooms.

Materials

The materials used with the experimental group during the intervention phase (B) included one Isokinetics Inc.™ Exercise Disc/Balance Cushion (De Queen, Arkansas) per student. Sessions were recorded by video cameras within the classroom. Wiggle cushions and video cameras were stored on site.

The children's parents/legal guardians were asked to complete and return a demographic questionnaire, the Conners' Parent Rating Scale (CPRS, Conner, 2009) to describe behavioral and attention skills, and the Sensory Profile (SP, Dunn, 1999) to establish sensory processing patterns.

The Conner's Parent Short (2009) asked questions about the child's behavior at home to assess behaviors that may be indicative of ADHD. Psychometric properties, including internal reliability and test-retest reliability, have been studied for all subsets. The Cronbach's alpha coefficient for internal consistency varies by subset from 0.728-0.942, and the test- retest reliability coefficient ranges from 0.60-0.90, all scores falling in the good to excellent range. The discriminant validity was found to differentiate ADHD individuals from both non-clinical and other clinical groups (Conners, 2009)

The Sensory Profile (Dunn, 1999) is a 125 item questionnaire that is filled out by the parent/caregiver to assess the child's response to sensory experiences. These are grouped into three main sections: sensory processing, modulation, and behavioral and emotional responses to characterize a child's sensory processing patterns. The Sensory Profile is widely used and has been developed and researched with both typical and clinical populations. Standard error of measurement for each subset has been calculated to be 0.92-2.58 indicative of small confidence intervals around each raw score. Convergent and divergent validity was also assessed using the School Function Assessment and meaningful correlations were found where hypothesized (Dunn, 1999).

Following from Enser (2011), researchers utilized the Child Behavior Rating Scale (CBRS, Mahoney & Wheeden, 1999) to assess engagement during the video-taped circle time. Based on personal communications with the authors of the CBRS, Enser individualized five of the original seven subscales including Affect, Attention, Involvement-Distractibility, Joint Attention, and Persistence, excluding Cooperation and Initiation (Enser, 2011). Likert scale whole points were used ranging from 1 (Very Low) to 5 (Very High) for each of the five subscales. Half points were utilized if a child's behavior differed for one minute or less from the

average score assigned. Affect was defined as the child's general emotional state during the interaction and varied from a great deal of distress (1) to often vocalizing, laughing, or smiling, never demonstrating negative affect (5). Attention was defined as the extent to which the child attends to activities during circle time and varied from never attending for more than a few minutes at a time (1) to participating without periods of inattention (5). Involvement-Distractibility was defined as the intensity with which the child was involved in the activity and ranged from obviously does not derive satisfaction from involvement (1) to highly involved and high motivated to engage in activities (5). Joint Attention was defined as the extent to which the child initiates interactions with the adult and ranged from never focusing on the adult or peer talking (1) to frequent attempts to involve the adult (5). Persistence was defined as the degree to which the child makes an effort to participate in activities and ranged from never demonstrating repetition of behaviors (1) to frequently practicing vocalizations or activities, making repeated attempts when difficult (5).

Throughout the experiment teachers were asked about their opinions of the cushions to assess social validity. Responses were recorded as field notes.

Procedure

Parents/legal guardians were asked to provide consent for data collection on individual children. After consent, the CPRS and the SP were sent home for parent completion. Two cameras were set up in each classroom before the data collection began to allow the children to adapt to their presence to reduce uncharacteristic behaviors due to novelty of the cameras. Classrooms were randomly assigned by suites to either control or experimental conditions.

Circle time was conducted by the teachers and the curriculum was structured for approximately the first eight minutes. Standardized circle time included the following aspects:

morning message, calendar, weather, a story, and song (See Appendix A). After completion of the structured curriculum, classroom teachers could continue circle time for the amount of time they saw fit and included any additional curriculum items. All children in the classroom were given the choice to attend circle time and to sit on the wiggle cushions (in classrooms assigned to that condition) whether they have been enrolled in the study or not. The choice to attend circle time was taken as assent to participate. Behavior ratings was only conducted and recorded for those children whose legal guardians provided consent. Reviews of the recorded circle time procedures occurred multiple times throughout the four-week time period by the researchers as a fidelity measure. Researchers met with teachers to discuss adherence to standardized structure and implementation of seating.

Data analysis

Demographic characteristics and scores from the standardized assessments are presented using descriptive statistics. Participants' engagement in circle time were rated from video recordings using the Child Behavior Rating Scale (Mahoney & Wheeden, 1999), with 5-point Likert-type subscales of Attention , Persistence, Involvement-Distractibility, Joint Attention, affect adapted for Enser (2011, Appendix B). To be included in data analysis, participants needed to be present at circle time and be visible on the video recording for a minimum of one session in each of the four weeks. In order to account for individual variability, scores on the CBRS subscales were averaged for each participant across each week. Differences in average CBRS subscale scores for both groups were tested using Multivariate Analysis of Variance (MANOVA) with effect size reported as partial η^2 (the ratio of variance accounted for by the effect). The significance of Pillai's trace was determined at $\alpha = .05$. Upon statistically significant results of the MANOVA for both groups, each group was separately analyzed. In the case of

significance, subsequent univariate analysis was conducted with the assumption of sphericity. An inter-rater was trained on the Child Behavior Rating Scale and utilized to assess inter-rater reliability for 11% of video recorded sessions.

Results

There were a total of 52 children enrolled in the four classrooms included in the study. Of these, the parents/legal guardians of 33 provided informed consent for videotaping and behavior rating. The parents/legal guardians of twelve participants returned demographic questionnaires and standardized tests. Twenty-five participants attended sufficient number of sessions and were visible on the video tape for behavior analysis so as to be included in data analysis (n=10, 15 for the AAAA and ABAB conditions, respectively). Of the twelve demographic questionnaires and standardized tests, nine of those students met the attendance requirement to be included in analysis. Where available, the demographic information for participants included in analysis are presented in Table 1 (n=9). Where available, scores from Sensory Profile (Dunn, 1999) and Conners' Parent Short Form (2009) for participants included in analysis are located in Table 2 and Table 3 respectively (n=9).

Each participant's CBRS subscale scores for each week of the study period were averaged to allow for individual variation. The average CBRS subscale scores for both groups are presented in Figure 1. In the MANOVA of the means of all CBRS subscale scores for both groups, there was a significant main effect of condition on engagement measured by the CBRS ($F(15, 9) = 727.341$, $n = 25$, $p < .001$, partial $\eta^2 = .995$). There was a significant within-subjects effect ($F(15,9) – 6.719$, $n = 25$, $p = .003$, partial $\eta^2 = .918$). There was no significant between-group effect ($F(5,19) = .296$, $n = 25$, $p = .208$), nor was there an interaction for group by condition ($F(5,9) = .648$, $n = 25$, $p = .456$). In repeating the MANOVA for each group

separately, there was no within subjects effect for the control group ($F(15, 75) = 1.770$, $n = 10$, $p = .055$, partial $\eta^2 = .261$), yet for the experimental group, there was a significant within-subjects effect ($F(15,120) = 1.780$, $n = 14$, $p = .045$, partial $\eta^2 = .182$). For the experimental group, the results of the within-subject univariate tests are reported in Table 4 and graphed in Figure 1, where the subscales of Attention and Persistence differed significantly across the conditions (see Figure 1 B and E, respectively).

Through video analysis it was noted that during experimental phases, participants were more likely to participate in the activity (singing, making attempts at movements, answering aloud) and were less likely to be having side conversations or off task interactions with peers. These finding suggest that during the weeks when children sat on wiggle cushions, their attention to activities and effort in participation was higher than the weeks during which the children sat on the floor.

Interrater reliability was calculated using a linearly weighted Kappa statistic. Agreement was substantial for all subscales (Attention= 0.76; Involvement-Distractibility= 0.76; Persistence= 0.72; Joint Attention= 0.78; Affect= 0.76).

Social Validity

In the beginning of the study, teachers that received the cushions indicated that the students were playing with them. Teachers reported the cushions were being used as "surf boards" and to bounce on. Observation of the video indicated that when the cushions were first introduced, students were moving their bodies while on the cushions more than they had done while seated on the floor. Students more frequently rocked side to side and front to back, and occasionally the students fell off the cushion from the movements. After only a couple days the novelty wore off and the teachers made comments including "it seems to be working for [student] there! Look at him." Teachers reported that students seemed to like the cushions and

that “they just sat right down”. At the end, teachers of the experimental classrooms reported that not all of the students need wiggle cushions, but they were very helpful for some. Teachers of the control group classrooms indicated that they would like to try the cushions in their classrooms.

Also of note is that one child refused to sit on the cushion through the majority of the four-week protocol. This participant’s data was excluded due to the child not being present and/or visible during each week.

Discussion

Circle time is one of the first introductions to structured lesson plans that preschool students have. The time spent sitting attending to an adult speaker only increases from preschool through the remainder of one’s educational career. Engagement is of the critical to learning. Without engagement, learning suffers and is frequently characterized as students who are “bored, dispassionate, [and] disaffected” (Hidden Curriculum, 2014, para. 1). Research has suggested that problems with attention upon entering school can have lasting effects on a child’s academic success (Breslau et al, 2009). As learning standards and pressures are being pushed to younger ages, it is important to set children up for success in their long term educational careers. This study addressed five subscales of engagement: Affect, Attention, Involvement-Distractibility, Joint Attention, and Persistence.

Previous research has assessed whether or not dynamic seating options (therapy balls or wiggle cushions) have an effect on outcomes of engagement including time in-seat, time on-task, and legibility. This study adds to the growing literature assessing the effects of these dynamic seating options for students. Results of this study are consistent with previous research that suggested that dynamic seating options can improve aspects of engagement (Bagatell, Mirigliani, Patterson, Reyes & Tests, 2010; Fedewa & Erwin, 2011; Pfeiffer, Henry, Miller & Witherell,

2008; Schilling & Schwartz, 2004; Schilling, Washington, Billingsley & Deitz, 2003; Witt, 2001). The results of this study also indicate that while only two of the five subscales of engagement were statistically significant, dynamic seating cushions did not have a negative effect on the other three subscales. This supports broad use of the intervention in preschool classrooms.

The comments of the preschool teachers throughout the four-week protocol are equally important as they offer social validity to the implementation of wiggle cushions as a class-wide intervention during preschool circle time. The results from this study support the findings of previous research suggesting that teachers prefer dynamic seating options and notice the improvement (Fedewa & Erwin, 2011; Schilling & Schwartz, 2004; Schilling, Washington, Billingsley & Deitz, 2003; Umeda & Deitz, 2011). As previously discussed, for school-based occupational therapists, an open collaborative relationship with teachers is imperative. Social validity and ease of use are extremely important to the longevity of interventions and adherence to protocol and must be considered when recommending interventions to be implemented by occupational therapists and other professionals (Sudsawad, 2005).

Limitations

This study was conducted at a single school with a small sample size; therefore, the results should be generalized with caution. Additionally, technical complications and errors resulted in days of missed data and participants not being visible, further limiting the sample size. Of the experimental classes, one class forgot to turn on the cameras one day during week three. Of the control classes, one class did not turn on the cameras two separate days (once each during weeks three and four), and one class did not turn on the cameras one day during week

three then three days during week four. The small sample size of students analyzed could lead to a Type II error in the subcategories of Affect, Involvement-Distractibility, and Joint Attention.

Throughout the research project other challenges to fidelity arose. Each of the four classrooms was instructed to complete circle time as typical in order to maintain a naturalistic environment. While three of the classrooms utilized some form of mat on the floor (two rooms utilized carpet squares, one utilized felt name pieces), in one control room the participants sat on riser style seating during circle time. In the rooms where participants sat on the floor, a tape square was needed on the floor to increase likelihood of student visibility, changing the naturalistic environment.

Demographic information along with Sensory Profile and Conner's Parent Rating Scale were only returned by nine of the 25 participants parents. This data has been included in Tables 2 and 3, but was unable to be accounted for in analysis due to the low return rate.

Lastly, during the research process, the new Conner's 3- Short Form was published. This assessment, utilized in this research, is standardized for children age 6+. Despite the fact that this data was not analyzed, it is important to note, as none of the participants in this study fell into this age category. Future research should utilize an assessment more appropriate to the age group in question.

Implications for Occupational Therapy

The results of this study support the implementation of wiggle cushions as dynamic seating in preschool classrooms to address student engagement as they may help to improve multiple aspects of engagement. This suggests that the movement afforded during stationary learning could be beneficial to attention in typically developing students of this age range. These results also indicate that wiggle cushions can be considered as an intervention method for whole

classrooms as data analysis suggests the cushions do not negatively impact any of the five measures of engagement assessed in this study.

In order to be a *collaborative member of the team* school based occupational therapy practitioners frequently work with teachers to implement changes within the classroom to improve engagement and performance (AOTA, 2012). Results of this study suggest that therapists working in a consultative model could suggest wiggle cushions as a strategy to be when teachers report lower engagement during circle time among students who are not yet identified as needing individualized services. Social validity results of this study indicate that while teachers noticed the increased movement when the cushions were novel, after a few days teachers began to notice the positive effects on attention. Effects of dynamic seating options should be carefully monitored and practices modified in collaboration with teachers to best provide for each student.

Future Research

Future research should continue to assess the effectiveness of wiggle cushions with children in this age group and as a whole classroom intervention. Additional research is needed in more age ranges and for longer amounts of time to see if there is a peak or plateau of benefits. Future research should also compare results of standardized tests such as the Sensory Profile and Conner's Parent Reporting Scale with effect size of the cushions to assess if some students benefit from the wiggle cushions more or less than others. A larger sample size and more advanced technology should be utilized to decrease data lost from human error and due to the limited vantage points in order to increase the amount of useable data and decrease the likelihood of Type II error.

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Appendix A

Lesson Plan

To be conducted by classroom teachers for an average of 7 minutes once per day for 20 days. Circle time should include, in any order: morning message, calendar, weather, story, and a song.

Appendix B

Child Behavior Rating Scale

1. Attention:

This scale assesses the extent to which the child attends to activities during circle time. While the child may or may not be actively involved in the activity, the child rated as demonstrating high attention remains in the activity for an extended duration. A child rated as low in attention may briefly participate in an activity and then physically remove them self from the group or engage briefly in another activity. A child receiving a low rating in attention may frequently change or avoid activities, never seeming to attend to an activity for more than a few minutes at a time.

Very Low (1): The child never attends during circle time for more than a few minutes at a time. He or she may be completely inactive, avoidant of the activities, or may constantly change activities.

Low (2): The child can be described as generally inattentive throughout circle time. Although the child sometimes participates, he or she is more often inactive, and/or avoidant of activities, peers, or leaders.

Moderate (3): The child attends to the activities during circle time about as often as he or she does not. The child has extended period of time in which the he or she participates in the activity as well as period engaged in avoiding or changing activities.

High (4): The child "stays with" the activities during the majority of the circle time. The child may have periods in which he or she is inattentive, but these are short and limited in number.

Very High (5): The child "stays with" the activities throughout circle time. The child participates without periods of inattention.

2. Persistence: (Practice/Problem Solving)

This scale measures the degree to which the child makes an effort to participate in activities. A child scoring high on persistence makes several attempts at tasks when interacting with the adult and peers in group. Persistence also reflects the extent to which the child practices actions and vocalizations. A child receiving a high score is continuously engaged in circle time. A child scoring low on the scale makes little effort to participate in the activities. He or she rarely practices behaviors or vocalizations and when encountering difficulty during the activity, quickly gives up.

Very Low (1): The child never demonstrates repetition of a behavior. The child may never attempt to engage with peers or adult during circle time and gives up easily.

Low (2): The child infrequently demonstrates repetition of a behavior. The child may occasionally make a second attempt to engage.

Moderate (3): The child has extended period in which he or she seems to be practicing behavior, but just as often has periods in which he or she does not practice. Similarly, there may be periods in which the child continues to try when having difficulty, but just as often there are periods in which he or she gives up quickly.

High (4): Although the child has some periods in which he or she quickly gives up or during which repetition of behavior is rarely seen, in general, the child can be described as high in persistence. The child is often observed to be practicing behaviors or make second and third attempts when having difficulty.

Very High (5): The child frequently practices vocalizations or activities. The child also may make repeated attempts at tasks when having difficulty. The child's persistence is a highlight of his or her behavior throughout the circle time.

3. Involvement- Distractibility: (Looking Around)

This scale reflects the intensity with which the child is involved in the activity. The child who is high in involvement is actively involved throughout the majority of the circle time. The child appears to be highly motivated to engage in the activities regardless of whether they are adult or child initiated. He or she is intent on participating in the activities and seems to derive satisfaction from the activities. The child who is low in involvement is either passively involved during the activity, attempts to avoid participation, or is highly distractible during the activity. This child may "stay" with the activity but seems to derive little satisfaction from involvement. This child may frequently look at the camera or leave the area.

Very Low (1): This child obviously does not derive satisfaction from involvement in the activities. The child shows a great deal of neutral affect as well as some distress or avoidance of the activity. When the child does participate in the interaction, the child seems to be "going through the motions" rather than actively participating. This child may be greatly distracted by other activities in the classroom.

Low (2): This child, for the most part, does not derive satisfaction from participation in the activities. This child may show largely neutral affect and may appear passive during the interaction. This child's behavior may appear to be largely "rote" during the activities. Or this child may subtly or overtly demonstrate un-involvement by being distracted during the majority of the circle time.

Moderate (3): The child derives some satisfaction from the activities. There are sustained periods in which the child seems intent on what he or she is doing or uses gestures or vocalizations to express satisfaction with the activity. There are also extended periods in which the child seems to be "going through the motions" or is disinterested in the activities.

High (4): The child can be described as highly involved. During the majority of the circle time, the child appears to derive satisfaction from participation in the activities.

Very High (5): The child is highly involved throughout the session. This child appears to be highly motivated to engage in the activities regardless of whether they are adult or child initiated. He or she derives a great deal of satisfaction from participating in the activities.

4. Joint Attention:

The extent to which the child initiates interaction with an adult is measured using this scale. The child receiving a high rating is frequently engaged with sharing behaviors such as vocalizations. This child tries to engage the adult by taking turns, or by using vocalizations, gestures, and facial expressions. A child scoring low in attention to adult may rarely focus on the adult and not attempts to engage the adult by taking turns or through vocalization or gestures.

Very Low (1): The child never focuses on the adult or peer talking or vocalizing, nor attempt to engage the adult by answering questions or participating.

Low (2): The child occasionally engages adult or peer by demonstrating eye contact. For the most part, however, the child does not attempt to share experiences with an adult.

Moderate (3): The child engages with the adult approximately half of the time. He or she demonstrates periods of eye contact or other sharing behaviors with peers, but equally demonstrates periods of inattention. High eye contact, no additional sharing behaviors or attempts to engage.

High (4): The child attends to the adult for the majority of circle time. He or she is often observed to actively share experiences and vocalizations.

Very High (5): The child frequently is focusing on the adult or peer talking. He or she often vocalizes while looking at another or attempts to share experiences by showing or offering toys or materials, or otherwise initiate activities with an adult. The child is characterized by frequent attempts to involve the adult.

5. Affect:

This scale reflects the child's general emotional state during circle time. A child receiving a high score overtly demonstrates positive affect and enjoyment whether it is directed toward an adult, peer, or activity itself. This child may frequently smile, laugh, or vocalize with an adult or peer during the activity. A child scoring low on this scale frequently demonstrates anger or distress during the interaction. This child may cry or throw materials.

Very Low (1): The child demonstrates a great deal of distress during the interaction. He or she may cry or throw materials.

Low (2): While the child does not demonstrate distress throughout the interaction, there are several sustained periods in which the child is distressed.

Moderate (3): The child, in general, displays low intensity enjoyment. Or this child can be generally characterized as sober or neutral in affect.

High (4): For the most part, this child can be described as happy. He or she may show some neutral affect, but most often appears to be happy during circle time.

Very High (5): This child often vocalizes, laughs, or smiles when interacting with an adult and peers. He or she never demonstrates negative affect.

Table 1

Demographic Information

	Number of Participants	Gender	Avg. Age	Diagnoses	Developmental Concerns?	Race	Avg. SES Score[a]
Experimental	5	3 M 2 F	4y 6.5 m SD 3m	1 Yes[b] 4 No	0 Yes 5 No	3 White 1 White/Asian 1 no response	45.75 1 no response SD 13.6
Control	4	3 M 1 F	3y 11m SD 10m	0 Yes 4 No	1 Yes[c] 3 No	3 White 1 Asian	53.6 SD 12.1

[a] Calculated utilizing Hollingshead, A.B. (1975).

[b] Child diagnosed with Sensory Processing Disorder

[c] Speech

Table 2

Participant Score Profiles Scores (Dunn, 1999)

Sensory Profile Section	Avg. Score	SD	Score Categories		
			Typical Performance	Probably Difference	Definite Difference
Auditory Processing	33.25/40	4.99	X------	-------|	
Visual Processing	38.25/45	4.62	X-----|		
Vestibular Processing	45.75/55	5.95	|-------	------X------	-------|
Touch Processing	76/90	10.30	X------	-------|	
Multisensory Processing	29/35	3.67	X------	-------|	
Oral Sensory Processing	48.63/60	8.23	X------	-------|	
Sensory Processing Related to Endurance/Tone	41.89/45	4.43	X------	-------|	
Modulation Related to Body Position and Movement	40.44/50	5.39	|------	------X------	-------|
Modulation of Movement Affecting Activity Level	23.22/35	2.68	X------	-------|	
Modulation of Sensory Input Affecting Emotional Responses	16.38/20	2.56	X------	-------|	
Modulation of Visual Input Affecting Emotional Responses and Activity Level	16.33/20	1.94	X------	-------|	
Emotional/Social Responses	73.11/85	6.70	X-----|		
Behavioral Outcomes of Sensory Processing	23/30	5.89	X------	----------	-------|
Items Indicating Thresholds for Response	12.88/15	1.96	X------	-------|	

Note: X indicates average score of participants. | indicates range of one standard deviation (n=9).

Table 3

Participants Conners' Parent Rating Scale- Short Form (2009)

Sections	Normative Avg Scores for Males age 6-11	Avg Scores, Male Participants	SD	Normative Avg Score for Females 6-11	Avg Scores, Female Participants	SD
Inattention	0-4	4.83	2.56	0-5	2	2.65
Hyperactivity/Impulsivity	0-6	8.50	3.94	0-6	3.33	2.89
Learning Problems	0-6	1.67	2.08	0-4	2	1.41
Executive Functioning	0-5	3.67	1.86	0-4	2.67	2.52
Defiance/Aggression	0-1	0.50	0.55	0-2	1.33	2.31
Peer Relations	0-2	0.33	0.52	0-1	0.67	1.15

Note: Scores for Conners' Parent Rating Scale- Short Form (n=9).

Table 4

Results of Within Subject Univariate Tests

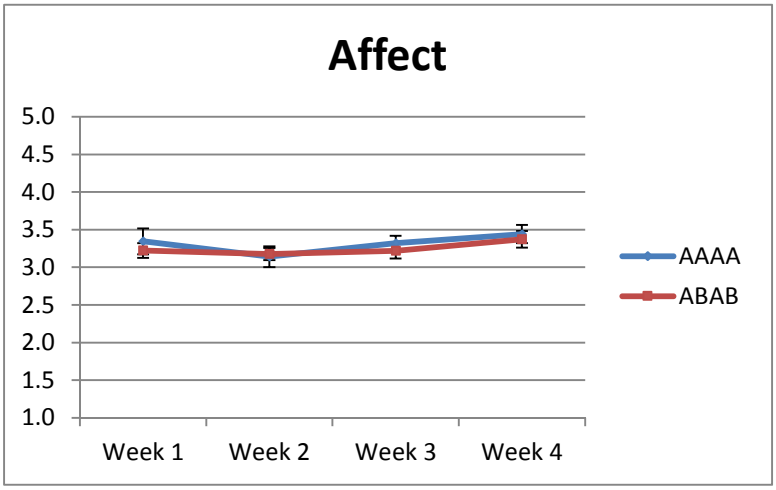
CBRS Subscale	F(*df*=3)	p	partial η^2
Affect	1.207	.319	.079
Attention	5.824	.002**	.294
Involvement-Distractibility	1.580	.208	.101
Joint Attention	1.687	.186	.107
Persistence	3.394	.026*	.195

Note. Average CBRS values (m +- SEM) for experimental group (n=15). *p< .05, **p< .01

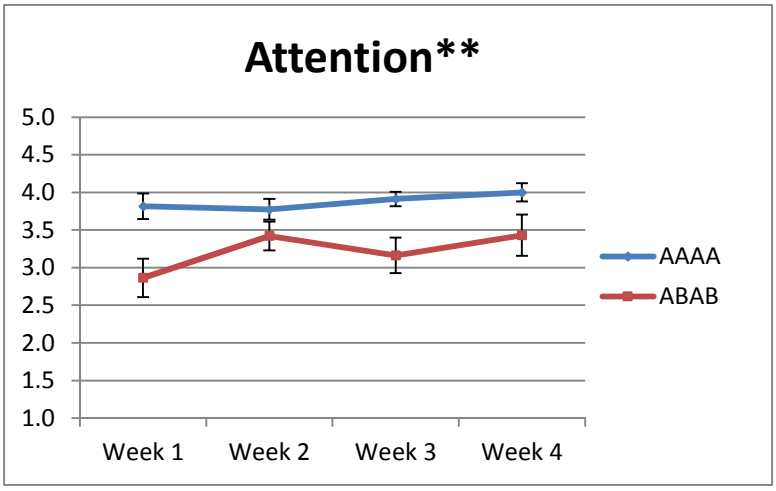
Figure 1

Average Child Behavior Rating Subscale Scores

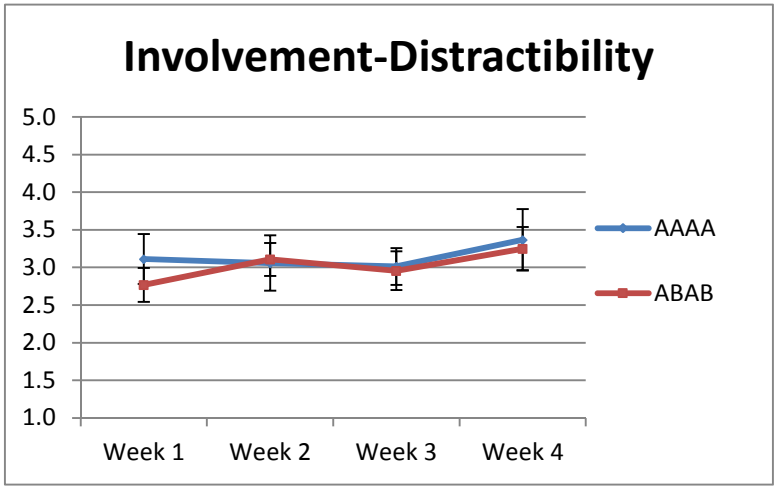
A.



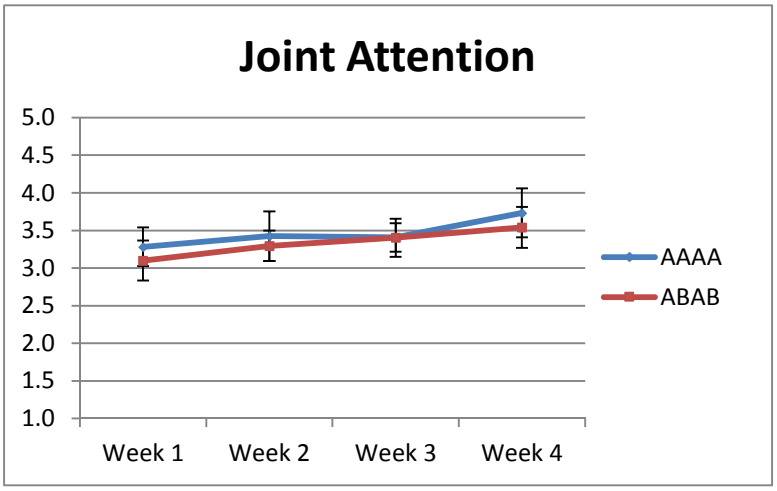
B.



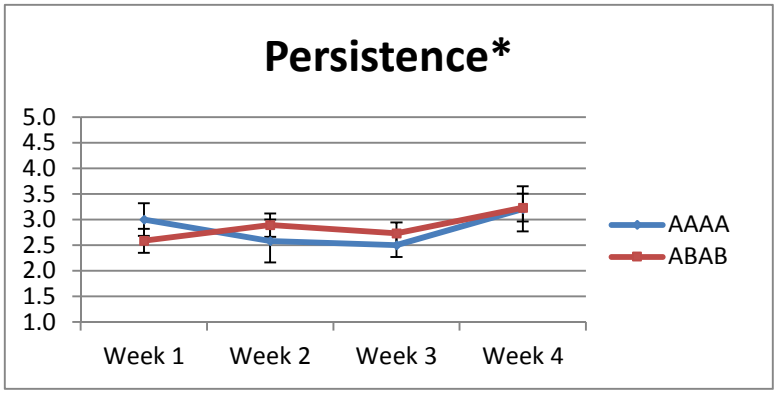
C.



D.



E.



Note. MANOVA differences in the means of all CBRS subscale scores for both groups (experimental n=15, control n=10) present with SEM bars indicating significant main effect of condition on engagement ($F(15, 9) = 727.341$, $n = 25$, $p < .001$, partial $\eta^2 = .995$) and significant within subjects effect ($F(15,9) – 6.719$, $n = 25$, $p = .003$, partial $\eta^2 = .918$) with no significant between group effect ($F(5,19) = .296$, $n = 25$, $p = .208$), nor interaction for group by condition ($F(5,9) = .648$, $n = 25$, $p = .456$).

*p< .05. **p< .01