

REVIEW OF AN ALTERNATIVE SEATING FOR ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) CHILDREN

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ABSTRACT

One of the reasons for a child's academic success is his or her ability to attend to tasks given by the teacher in the classroom and meet the expectation with minimal distraction. For children with Attention Deficit Hyperactivity Disorder (ADHD), one of the biggest issues faced by them is their inability to sit focus and pay attention in the classroom. Without the treatment, ADHD children will face the serious physical injuries and also may impact his or her individual's life, including academic difficulties, social skills problems, and strained parent-child relationships. No treatment has been found to cure this disorder, but many available treatments can reduce the symptoms of ADHD. However, studies that examine the alternative treatment such as seating therapy for ADHD children are still very minimal. The aim of this study is to review various existing alternative seating use in the classroom for ADHD children. The objective of this study is to identify the existing alternative seating and analyze how they use the alternative seating as an intervention for children with ADHD. The study is conducted through a literature review of books, journal articles, and online resources, focusing on the intervention, improvement and treatment of ADHD children. The findings outline the effectiveness of alternative seating in treating ADHD children in reducing their behavior problem such as in-class sleeping behavior and hyperactivity levels. The findings also showed increasing in safety levels and on-task behavior. In addition, there is an increased the class environment in monitoring teaching and learning. Currently, there is still no National Policy specifically for children with disabilities. Therefore, the significant contribution of this study is towards the establishment of the National Policy specifically for children with disabilities; ADHD. The application of therapy treatments for the ADHD children should be spell in the National Policy for Children with Disabilities, to change the conventional treatment using medication that comes with side effects to their health.

KEYWORDS: ADHD, Alternative treatment, Seating, Therapy, Children.

1. INTRODUCTION

Attention deficit hyperactive disorder (ADHD) is the most often diagnosed neurobehavioral disorder in childhood (Kauffman, 2001). It has become the number one psychiatric disorder among America's children, estimated to affect 3 to 5 percent of school-age children. Experts believe that 2 million children in the world have ADHD. It affects children as well as adults but is far more common in boys than girls. According to Mulligan (2001), children recognized with ADHD often experience significant academic and sensory motor problems that make typical school activities a challenge for them. Goldstein (1992) identified that ADHD children have difficulty in the classroom. Barkley (1990) determined that children with ADHD often fail to complete assignments or underachieve academically. However, studies that examine the alternative treatment such as seating therapy for ADHD children are still very minimal especially in Malaysia context. In Malaysia, there is still no National Policy for Children with Disabilities. The policies of services and programs for the health, rehabilitation, education, protection and advancement of children with disabilities are developed from two distinct focus of attention: the child with disabilities as a "person with disabilities" and the child with disabilities as a "child." (Children with Disabilities in Malaysia - Mapping the Policies, Programmes, Interventions and Stakeholders, May 2013)

Therefore, the aims of this study is to review various existing alternative seating use in the classroom for ADHD children. The objective of this study is to identify the existing alternative seating and to analyze how people who interact with children with ADHD; teachers use the alternative seating in the classroom as an intervention for children with ADHD. By this study, several findings on alternative therapy can be achieved and recommended as a part in National Policy for Children with Disabilities. Background of ADHD; subtypes and its treatments are introduced as well. Studies on past research on alternative seating, focusing on the intervention, improvement and treatment of ADHD children to understand the advantage and disadvantages of each seating. Line-up study is done for further observation on the effectiveness of all alternative seating. Several variables gained from the result of the analysis on effectiveness of the alternative seating are proposed for the research findings and recommendation.

2. BACKGROUND STUDIES

2.1 SUBTYPES OF ADHD

DSM-IV (APA, 2000) diagnostic guidelines named three subtypes of ADHD: (1) Predominantly hyperactive-impulsive type (that does not show significant inattention), (2) Predominantly inattentive type (that does not show significant hyperactive-impulsive behavior) and (3) The combined type (that displays both inattentive and hyperactive-impulsive symptoms). These symptoms appear early in a child's life. Many ordinary children may have these symptoms, but at a low level. It is recommended that a child receive a thorough examination and appropriate diagnosis by a well-qualified professional to recognize the ADHD. To be diagnosed with the disorder, a child must have symptoms for 6 or more months and present before the age of 7 years.

The characteristic of hyperactive child commonly will appear anxious, have a struggle in staying seated or playing silently, and act as if driven by a motor (APA, 1994, Barkley, et al., 2006). Children displaying impulsivity often have difficulty involving in tasks that need taking turns. Other common behaviors of the ADHD children including they are intent to bursting out answers to questions instead of waiting to be called. Also, the children are also flitting from one task to another without finishing. The inattention component of ADHD affects the educational experience of these children because ADHD causes them to have the obstacle in attending to detail in directions, sustaining attention for the duration of the task, and misplace important and needed items. In addition, these children often fail to give close attention to details, make careless mistakes, and dislikes tasks requiring sustained mental effort (Banhatti & Dwivedi, 2009).

2.2 TYPES OF TREATMENT

No treatments have been found to cure this disorder, but many available treatments can reduce the symptoms of ADHD (R. A. Barkley, 1998; National Institute of Mental Health, 2011). Available treatments for ADHD include medication, behavioral therapy and play therapy or a combination of treatments. The combination of several treatments of interventions also known as a multi-modal treatments programs for children. According to several research studies and reviews, has been determined as an effective treatment procedure for ADHD children (Young & Amarasinghe, 2010; Du Paul & Weyandt, 2006; Litner, 2003; Mautone et al, 2011; Greenburg et al 2003). In this paper, the researcher will highlight the effectiveness of alternative seating underplay therapy treatment from the previously selected literature review.

3. LITERATURE REVIEW

In the 1960s, balance balls were developed for physical therapy purposes. Today's, the balance balls are recommended for children who have trouble paying attention in school. The doctor ordered the balance balls to help children to reach their full potential and capability in the classroom, especially for those with sensory processing disorders, Attention Deficit Hyperactivity Disorder.

Around the same time that fitness fans began using balance balls (also called exercise balls, stability balls or therapy balls) in their exercise regimens as a way to strengthen abdominal and back muscles, ball chairs were developed as a way to strengthen core muscles and improve posture while sitting. During the 1980s, some occupational therapists began recommending them to educators for classroom use, deeming them particularly helpful for children with special learning needs. Then in 2003, a study was published in the American Journal of Occupational Therapy concluding that in students with ADHD, sitting on therapy balls improved behavior and legible word productivity. In other words, students using ball chairs were able to sit still, focus, and write more words clearly.

Mayo Clinic (2007) find that a study on the benefits of a chair less classroom. In the Mayo study, which focused on improving learning and reducing obesity by making children more active, researchers found that the ability to move around more while sitting made the students more attentive. Mayo Clinic communications consultant Bob Nellis told the Minneapolis-St. Paul Star Tribune that he believes this is because kids are able to burn off excess energy by bouncing on a ball.

Some kids need more movement than others. And for some kids with a sensory processing disorder or ADHD, being in motion allows their brains to be engaged. Diana Henry, an occupational therapist said that "There is a neurological pathway that goes from your body's balance and movement system to your alert system in your brain. Movement actually allows for alertness and attention,"(2009). Children with decreased discrimination of perceptive and vestibular (movement) input often exhibit poor balance, poor posture, constant moving and fidgeting and poor attention (Nackley, 2001).

That's where ball chairs come in. In response to the ball's instability and in order to remain balanced while sitting on one, the body instinctively and continually engages core muscle groups. Constant movement is required in order to stay seated on the ball. And that movement, however slight, helps them focus. When a child sits on a ball chair, they are able to direct their natural kinetic energy and need for movement in a positive way, because the child on a ball chair has to constantly move his body on the chair to maintain his balance. So rather than squash a child's innate need for movement, ball chairs channel their physical energy in a positive way, allowing them to focus on their work more completely and reach their full potential as learners.

The use of an alternative seating has been an emerging and popular intervention school-based occupational therapy practice (Honacker, 2008) and also at home usage. Darcy Lewis, a mother of two sons with ADHD in Riverside, mention that they have started using a ball chair at home. She explained that her child felt less fidgety and more relaxed when they sit on a ball. She also realized that her child is more able to focus on homework and conversation among the family members. Parents like Lewis are utilizing the concept of classroom ball chairs and allowing their child to use one in a home setting. The usage of the ball chair needs to be controlled by the parent's teachers. The small children only allow to use children's size ball, not the adult size ball to ensure the safety and reduce physical injuries. Therefore, Henry state that it is important that the ball fits the child and will reduce the physical injuries for the children. According to Schilling and Schwartz, (2004), studies on classroom seating suggest that sustained setting in regular classroom chair is unhealthy for children's bodies, particularly their back.

In a study by Mulligan (2001), teachers were surveyed to identify which classroom strategies were implemented and perceived as useful in helping to improve attention in children with attentions issued in the school setting. Movement breaks have been designated as one of the effective strategies by classroom teachers. Providing movement while sitting may provide consistent input without the frequent need to get out of one's seat. Occupational therapy literature suggests that using dynamic seating systems in the classroom is one strategy to improve a student's sensory modulation and attention (Kimball, 1999).

Previous literature and research suggest an association between attention and physical stimulation (Dunn et al., 2002), sensory stimulation (Baker et al., 2001), exercise (Azrin et al., 2006), and some general movement (Mulrine et al., 2008). Literature indicates positive effects of alternative seating for children with attention-deficit hyperactivity disorder (ADHD) and pervasive developmental disorders (PDD) for attention and classroom behaviors (Schilling & Schwartz, 2004; Schilling et al., 2003). Although relationships between each are suggested, there has not been adequate research conducted on each topic, and there is little agreement about the most significant research to lead. Current research is inadequate regarding the possible relationship between alternative seating and young children's attention and emerging literacy skills. Birch state that "Empirical support for the power of multi-sensory techniques remains elusive in recent studies" (2005). The questions that remain unanswered regarding alternative seating and skill acquisition include whether or not an association exists between alternative seating and learning.

The brain and the body work in conjunction while learning. For students to learn, they must be paying attention and have a certain level of arousal. The body experiences less proprioceptive and kinesthetic feedback when it does not move, possibly decreasing attention causing a state of under arousal (Pfeiffer et al., 2008). Sitting for long periods of time may cause students to lose focus. It is also important to consider the effect of ergonomics on children's learning, for example; poor posture can significantly decrease lung capacity and impair circulation to nerves, muscles, and the brain (Milanese & Grimmer, 2004). The use of an alternative form of seating to ensure proper positioning that will help a student's ability to focus. With a better focus for longer duration in class, the students will learn more efficiently in reading and language arts.

4. METHODOLOGY

The study is conducted through a literature review of books, journal articles, and online resources, focusing on the intervention, improvement and treatment of ADHD children. Four (4) samples of an alternative seating have been reviewed and the details of the intervention done and its result on the effectiveness of seating in treating ADHD children and how it may lead to reducing behavior problems of ADHD children are put in the line-up for a comparative study. Several findings on the advantages from the intervention of alternative seating are proposed in the conclusion and recommendation, for future studies.

Sample Review 1: Therapy Balls

The study examined the use of Therapy Balls for classroom seating as an intervention for children with ADHD. The design of Therapy Balls is basically like a common balls that can be obtained in the market. In-seat behavior in the chair and the ball was measured using momentary real-time sampling following each 10-second interval. Legible word productivity was measured by a method described by Hasbrouck et al. (1994) that involves using a window card to expose only one word at a time starting at the end of the document and progressing to the beginning so that words were read out of context. During the baseline and intervention phases of the study, each student either sat on a ball fitted to their size (intervention phases) or a chair (baseline phase) for a 60-minute language art class. The writing assignment done during the language art class was used to measure legible word productivity. This study provides evidence that the use of therapy balls for students with ADHD may help facilitate in-seat behavior and legible word productivity. Data were graphed and visually analyzed for differences between phases.

Sample Review 2: Disc 'O' Sit cushion

This study identified the effectiveness of a type of dynamic seating system, the Disc 'O' Sit cushion, for improving attention to task among second-grade students with attention difficulties. Sixty-three (63) second-grade students are the respondents. Using a randomized controlled trial design, 31 students were assigned to a treatment group, while 32 were assigned to a control group. The treatment group participants used Disc 'O' Sit cushions for a 2-week period of the school days. The teachers have completed the assessment of Behavior Rating Inventory of Executive Functioning (Gioia, et al., 1996) for each participant before and after the intervention. As a result, an analysis of variance identified a statistically significant difference in the attention to the task before and after the intervention for the treatment group. The results of the study also show a preliminary evidence for the use of the Disc 'O' Sit cushion, as an occupational therapy intervention to increase attention in the school setting.

Sample Review 3: Therapy Balls with Back Rest

This study is done to investigate the P300 in electroencephalography (EEG) and the reaction time in children with attention deficit hyperactivity disorder (ADHD) during an auditory oddball task when sitting on a classroom chair or therapy ball. Fifteen (15) ADHD children with a mean age of 8.6 ± 2.1 years and 14 healthy children with a mean age of 8.7 ± 2.0 years were used as a subject in this study. All of the children were asked to sit on a chair or therapy ball and perform simultaneously the oddball auditory task. A portable 40-channel EEG system and a sound operating system were employed to record and analyze the EEG and button reaction time signals. As a result, the ADHD group had shown a significantly longer reaction time than the control group. ADHD children seated on a therapy ball showed a significant improvement in reaction time compared with when seated on the chair. In the parietal lobe, the ADHD group had a significantly delayed P300 latency during chair seating compared with the control group. The ADHD group showed a significantly shorter P300 latency time when seated on a therapy ball. The therapy ball has a significant advantage for enhancing the attentional ability in children with ADHD.

Sample Review 4: Stability Balls

The authors evaluated the effects of stability balls on the in-seat and on-task behavior of students with attention and hyperactivity concerns. Using a single-subject A-B continuous time-series design, eight students in the 4th and 5th grades has been observed three times per week for 12 weeks. They analyzed data collected from standardized measures and classroom observations for mean differences across pre-intervention and post-intervention phases. Results of the stability ball intervention revealed the increase in levels of attention, decreased levels of hyperactivity, and increased time on task and in-seat or the ball. Findings from the social validity questionnaire demonstrated that teachers preferred the stability balls over chairs. This study provides further proof for the effectiveness of stability balls in the general education classroom for children who show difficulties with attention and hyperactivity; ADHD.

5. RESULT AND FINDINGS

Four (4) samples studies have been analyzed, focusing on the intervention, improvement and treatment of ADHD children. The result showed that different seating design contributed to different kinds of children responses on behavior; movement patterns, sitting positions and ability to focus. The result also showed the children behavior affected classroom environment; safety, monitoring. Several variables that represent the advantages and effectiveness of the alternative seating are proposed for the research findings and recommendation in future study.

Findings Sample 1: Therapy Balls

The findings of this study prove that the use of therapy balls for a student with ADHD as an alternative classroom seating option. This study demonstrated that the intervention was effective with three students with ADHD who varied regarding gender, concomitant diagnoses, and medications. The result from observation reported that student shows the different movement pattern such as bouncing, gently rocking while seating on the therapy balls. Other than that, the use of the therapy ball immediately addressed safety issues. On the chair she was in constant movement, often out-of-seat and, when seated, she showed many extreme and dangerous sitting positions; tipping her chair and balancing on the top of the backrest. Oppositely, by sitting on the ball, she needed to keep at least one foot in contact with the floor to maintain sitting balance, thus minimizing classroom disruption and safety concerns. Lastly, for some students, seating on therapy balls decreased in-class sleeping behavior. This variation in movement patterns will reflect responses to changing sensory needs. A person's sensory needs continue changes due to affected by interactions with tasks, environments, and people (Brown et al., 2001; Cohn et al., 2000; Dunn, 1997; Dunn & Brown, 1997; Mulligan, 2001). Also, the teacher's and students' general preference for therapy balls for seating supported the social validity of the intervention.

Findings Sample 2: Disc 'O' Sit cushion

Decreasing in attention to task has been identified as interfering with learning in the elementary school setting (Williams & Shellenberger, 1996). This study aims to determine the efficiency of a sensory-based intervention, a dynamic seating system, to improve a student's attention to task within the classroom setting. The result of this study indicated that using Disc 'O' Sit cushion increased attention to task in second-grade students, also improve the child's systematic person problem solving and supports appropriate self-regulation.


Findings Sample 3: Therapy Balls with Back Rest




The result shows that children with ADHD have indeed poorer attentional ability than healthy children. Also, therapy ball has a significant advantage in improving the attentional ability of ADHD children, thus enhancing indirectly the learning effect. The findings of this study also verify that changes in learning environment have a positive effect in enhancing the ability of ADHD children to focus and maintain attention.

Findings Sample 4: Stability Balls

The results show that all children had improved attention and decreased hyperactivity. However, the impact of using the stability balls can be seen most of the students who had significant difficulties in attending including focusing and sitting before the intervention. The result showed that eight students who are with 92% of attention and hyperactivity problems showed a dramatic effect on increasing in focus in class. The children also improved in of in-seat and on-task behavior due to the intervention. Table 1 summarized the findings of this study based on the sample types and its photos, intervention and children's responses on behavior and effects on classroom environment upon the using of the alternative seating.

Table 1: Comparison samples of alternative seating

References	Method	Sample Size	Type of Seating	Photos of the Seating	Intervention	Summary of Results
Schilling et al. (2003)	Single Case Design (A-B-A-B)	24 students in 4th grade: 3 children with ADHD	Therapy Balls Vs Chairs		Chair and ball phases of in-class seating. Measured within the context of study: seating behavior, word legibility, and social validity.	By using the therapy balls, the students showed increases in seated practice, word clarity, comfort, competence in attending and listening, able to complete the class task, and shows focus and relax body movement.

Pfeiffer et al. (2008)	Pretest-posttest experimental design	31 students were assigned to a treatment group, and 32 were assigned to a control group	Disc 'O' Sit Cushion		The Disc 'O' Sit cushion, is one of the dynamic seating systems for improving attention to task among second-grade students with attention difficulties.	Statistically significant difference in the attention to the work before and after the intervention for the treatment group. The results of the study provide preliminary evidence for the use of the Disc 'O' Sit cushion as an occupational therapy intervention to improve attention in the school setting.
Wen-Lan Wu et al. (2012)	Controlled trial design	15 ADHD children and 14 healthy children	Therapy Balls with Back Rest		The effects of therapy balls on their in-seat behavior.	Significant improvement across all subjects in engagement and in-seat behavior when the children were seated on therapy balls. Social validity findings also mentioned that teachers preferred the therapy balls in their class activities.
Fedewa and Erwin (2011)	Single Case Design (A-B-A-C)	8 children with attentional difficulties (5 diagnosed with ADHD)	Stability Balls		Increases in on-task and in-seat behaviors in four students when seated on stability balls.	Stability ball intervention revealed increased levels of attention, decreased levels of hyperactivity, and increased time on task and in the seat or on the ball.

The findings of the research can be categorized in three (3) kinds of variables on advantages and effectiveness of the alternative seating for ADHD. The details are as follows;



Figure 1 Therapy Balls

Increased safety in seating in the classroom

Using the therapy balls, student shows the different movement pattern such as bouncing, gently rocking while seating on the therapy balls. The students will keep a minimum of one foot in contact with the floor to maintain sitting balance, thus minimizing classroom disruption and increased their safety concerns. This helps the students to keep focusing on their task in class as well, avoiding the unnecessary activities such as running, jumping and other unrelated action during the class hours. In other words, it can help the in-seat behavior of the ADHD children during the class time. (Figure 1)



Figure 2 Therapy Balls with Back Rest

Improved on-task behavior in classroom

Several of movement patterns occur due to the student's movement using therapy balls. These actions reflect responses to change the students' sensory needs due to they are affected by interactions with tasks, environments, and people. The whole body; brain and other body parts need to work in conjunction while learning especially during the time that needs students to pay more attention to the learning contents. However, sitting for long periods may cause students to lose focus and sometimes falls asleep. As such, to increase the concentration level of the students during class, there is a need for constant movements that can boost up the students' focus level, and it is proved that also decrease in-class sleeping behavior. Furthermore, the using of therapy balls channels students' energy towards an affirmative action. As such, those will help the class monitoring in teaching and learning. (Figure 2)



Figure 3 Stability Balls

Decreased hyperactivity levels of students in classroom

By using stability balls, it showed an improvement attention and reduced hyperactivity levels of the students when the stability balls were implemented in the classroom. In other words, the focus ability of ADHD children is improved, thus enhancing indirect learning effect. Furthermore, the usage of therapy balls on ADHD children also one of the effective way for the collaboration between students and teachers. (Figure 3)

6. CONCLUSION & RECOMMENDATIONS

The use of therapy seating on the ADHD children have shown a significant improvement on response in the children behavior; movement patterns, sitting positions and ability to focus. Moreover, many therapy seating are found effective during the intervention in the classroom and this condition has increased the class environment; monitoring and safety. The alternative seating has 2 types of design; balls and cushion. The most effective therapy seating is using ball, either with additional accessories; with back seat and legs or without additional accessories; ball only. Most of the alternative seating using therapy balls showed increasing in on-task behavior due to children able to focus on their classroom activities. It also help to increase the in-seat behavior of the ADHD children during the class time, as well as reduced the hyperactivity level of the children. In relation, this condition increased safety of ADHD children on seating behavior in the classroom. As such, it also improved the class monitoring activity by the teachers.

Findings from the study indicates that the usage of therapy balls on ADHD children also one of the effective way for the collaboration between students and teachers. In addition, the productivity and performance of the ADHD children will increase. Teachers who are looking for competent strategies to improve the ADHD children behavior and self-modulation are recommended to apply these alternative seating approaches. The usage of the treatment equipment and tools such as alternative seating in improving teaching and learning in the school environment for children with disabilities; specifically ADHD is essential. Therefore, this study recommended that it is a need to spell it out in the National Policy for Children with Disabilities. Alternative seating for ADHD children not only improve their behavior, increase the teaching and learning especially in the class environment as well as help to reduce the conventional treatment using medicine. These could help the multiple peoples who involved in the ADHD children teaching and learning process including parents.

REFERENCES

- American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington, DC: American Psychiatric Association.
- Arnold, L. E. (1999). Treatment alternatives for Attention-Deficit/Hyperactivity Disorder (ADHD). *Journal of Attention Disorders*, 3, 30-48.
- Banhatti, R., & Dwivedi, K. (2009). Practical Management of Attention Deficit Hyperactivity Disorder (ADHD). *Eastern J. Psychiatry*, 12, 60-63. Retrieved from <http://www.indianpsychiatryez.org>
- Barkley, R. (2006). *Attention Deficit-Hyperactivity Disorder*. Guilford Press: New York.
- Barkley, R. (1990). *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: Guilford.
- Billingsley, F., White, O., & Munson, R. (1980). Procedural reliability: A rationale and an example. *Behavioral Assessment*, 2, 229-241.
- Brown, C., Tollefson, N., Dunn, W., Cromwell, R., & Filion, D. (2001). The Adult Sensory Profile: Measuring patterns of sensory processing. *American Journal of Occupational Therapy*, 55, 7582.
- Children with Disabilities in Malaysia - Mapping the Policies, Programmes, Interventions and Stakeholders, May 2013.
- Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and their families: A conceptual model. *Infants and Young Children*, 9, 23-35.
- Dunn, W., & Brown, C. (1997). Factor analysis on the Sensory Profile from a national sample of children with our disabilities. *American Journal of Occupational Therapy*, 51, 490-495.
- Gioia, G., Isquith, P., Guy, S., & Kenworthy, L. (1996). *Behavior Rating Inventory of Executive Function*. Lutz, FL: Psychological Assessment Resources.
- Goldstein, S., & Goldstein, M. (1992). *Hyperactivity-Why won't my child pay attention?* New York: Wiley.
- Hasbrouck, J., Tindal, G., & Parker, R. (1994, Winter). Objective procedures for scoring student's writing. *Teaching Exceptional Children*, 18-22.
<http://www.nimh.nih.gov>
- Jensen, C. (2004). Medication for Children with Attention-Deficit-Hyperactivity- Disorder. *Clinical Social Work Journal*, 32, 197-214.
- Kauffman, J. (2001). *Characteristics of Emotional and Behavioral Disorders of Children and Youth (7th Ed.)*. Columbus: Merrill Prentice Hall.
- Kimball, J. (1999). Sensory integration frame of reference: postulates regarding change and application to practice. In P. Kramer & J. Hinojosa (Eds.), *Frames of Reference for Pediatric Occupational Therapy (2nd ed., pp. 169-204)*. Philadelphia: Lippincott Williams & Wilkins.
- Mulligan, S. (1996). An analysis of score patterns of children with attention disorders on the Sensory Integration and Praxis Tests. *American Journal of Occupational Therapy*, 50, 647-654.
- Mulligan, S. (2001). Classroom strategies used by teachers of students with attention deficit hyperactivity disorder. *Physical & Occupational Therapy in Pediatrics*, 20, 25-44.
- Nackley, J.L. (2001). Sensory diet applications and environmental modifications: A winning combination. *Sensory Integration Special Interest Section Quarterly*, 24(1)1-4.
- Schilling, D.L., & Schwartz, H.S. (2004). Alternatives seating for children with autism spectrum disorder: Effect on classroom behavior. *Journal of Autism and Developmental Disorders*, 34, 423-431.
- Schilling, D.L., Washington, K., Billingsley, F.F., & Deitz, J. (2003). Classroom seating for children with attention deficit hyperactivity disorder : Therapy balls versus chairs. *American Journal of Occupational Therapy*, 57, 534-541.
- Williams, M., & Shellenberger, S. (1996). *How does your engine run?* Albuquerque, NM: Therapy Works.

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