Utilization of an Exercise Ball in the Classroom:

Its Effect on Off-task Behavior of a

Student With ADHD

by

Kathryn M. Horgen

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Dr. James Lehmann

Digitally signed by Dr. James Lehmann
DN: cn=Dr. James Lehmann, c=US
Date: 2009.12.16 07:51:43 -08'00'

Validity unknown

Dr. James Lehmann
Research Advisor

The Graduate School

University of Wisconsin-Stout

December, 2009

The Graduate School
University of Wisconsin-Stout
Menomonie, WI

Author: **Horgen, Kathryn M.**

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ABSTRACT

The purpose of this research study is to investigate the effects of utilizing an exercise ball in place of classroom chair on the time-on-task behavior of a student with Attention Deficit Hyperactivity Disorder. A small amount of research has already been done which concluded exercise balls are one form of alternative treatment for this disorder which could significantly decrease the amount of time a child with ADHD spends off-task during a class period. Although this treatment method has not been indicated as an effective treatment method in and of itself, physical activity has been proven to improve focus and attentiveness in students with hyposensitivity, a condition with similar symptoms to those of ADHD.

A single subject study was conducted over a four week period during which the student alternated weekly between sitting in a classroom chair and sitting on an exercise ball. The subject participated during a reading period of one hour each day, being videotaped for later observation. A recording instrument was developed by the researcher for tallying

off-task behavior, as well as any need for teacher redirection. The researcher also identified the type of off-task behavior, so as to analyze safety and practicality of this treatment method. Finally, an informal assessment of student feedback regarding the seating choice allowed the researcher to adequately identify any risk of social rejection that could occur.

The results of the research indicated a positive response to this alternative method in all objective areas. Analysis of the data showed a significant decrease of off-task behaviors when the subject utilized the exercise ball as a seat. Peer response was overwhelmingly positive as the researcher had to repeatedly remind students that the ball was only for the subject during the research period. Safety was of little concern after the first day of the study. This treatment method proved to be effective, safe, and budget-friendly, making it a viable school-based treatment option alone, or as a supplement to medication treatment.

The Graduate School

University of Wisconsin Stout

Menomonie, WI

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Chapter I: Introduction

Disabilities in the school have long altered the daily routine, expectations, and graduation rates of the general education classroom. Attention deficit hyperactivity disorder (ADHD) is no exception. Teachers and parents work tirelessly to encourage and procure socially acceptable transitions to and from school while securing the best interests of the child. In the ideal world, ADHD would be seen as a trait of diversity, a difference that is accepted and understood wherever the child may travel.

In the ideal school setting, students would all be gifted and talented, producing above average work and surpassing the expectations of each particular grade level standard. They would be active throughout the day, expending, in productive ways, the extra energy they possess. They would be aware of their actions, control urges of impulsivity, and emulate only the positive behaviors modeled by their peers throughout the facility.

Each classroom would have stations conducive to active learning, including standing work areas, interactive materials and lessons, and alternative seating choices to the standard classroom chair. In the ideal school, students would have physical education multiple times a week, massage and behavioral therapists available at all times throughout the day, and a multitude of sensory tools to aid in attentiveness and focus.

Unfortunately, learning, behavioral, and emotional disabilities are very real challenges to both the students who possess them and the educators and parents responsible for meeting their needs. Since the late 1930's ADHD has been a controversial topic (Murphy & Hick-Stewart, 1990), and it continues to be so yet today. Skeptics, such as Armstrong (2009), challenge the medical diagnosis of ADHD, and rather attribute its

prevalence to the lifestyle changes our nation has undergone since the turn of the millennium, including failures by parents and educators to provide adequate nurturing and instruction. Concurrently, researchers have tried to link the cause of ADHD to brain activity, food additives, head injuries, and in utero cigarette smoke exposure (Walker, 2008a). To this day, however, no single cause of this disorder has been identified.

Without a known cause, treatment methods, medication use, and prevalence of this disorder continue to inundate the literature and research in many medical and educational journals. Parents and doctors are challenged daily with meeting the diverse needs of children with ADHD. Medications range in efficacy in different children, causing one child to respond positively to its use and another to exhibit minimal functionality.

Identifying the best practices in schools, while conforming to the federal mandates of the Individuals with Disabilities Education Act (IDEA), is no easy task either. This challenge was only compounded by the introduction of the No Child Left Behind (NCLB) Act, which maintains the expectation that all students, regardless of disability, primary language, or family factors, such as low-income or homelessness, can render the same proficient results as their upper-class counterparts, nationwide.

Given the current economic status, it seems reasonable that parents and educators are seeking relatively inexpensive, yet effective, alternative treatment methods for children with ADHD. Parents have identified many therapies, including diet, yoga, counseling, music, and behavior modification to be beneficial in the management of their children's disabilities. Schools have implemented such treatment methods as teacher-training, classroom management training, environmental modification, counseling, and

behavior modification to encourage age-appropriate behaviors and increased productivity.

The current trend to structure classrooms around an inclusive model substantiates the reasoning behind the movement to manageable school-based treatment of ADHD. Students who are removed from the classroom display more unacceptable behaviors than those who remain in the class throughout the day. Additionally, self-esteem and peer relationships suffer when a child with disabilities is taught in an environment different that their peers. Providing alternative treatment methods to students with ADHD allows them to participate in a healthier learning environment with the expectations of increased performance and sociability. Students need to continue to be supported in the classroom setting, and it is of utmost importance to evaluate all potential treatment methods so as to reduce the long-term effects that this disorder can have on education, job acquisition and retention, and family and peer relationships.

Statement of the Problem

Educators are challenged with meeting the instructive and social needs of students with ADHD, without a one-size-fits-all approach to treatment, or the budgetary allowances for extravagant technologies and interventions. Schools must identify viable, effective, and secure strategies to aid in the treatment of the symptoms of hyperactivity, impulsivity, and inattentiveness. While medication can be utilized in the treatment of ADHD, not all families choose this form of treatment, nor is medication effective for all children with this disorder. Schools must be prepared with alternative therapies so as to provide the best possible education to this population.

The prevalence of ADHD in children is at an all-time high and the cost of illness (COI) is substantial, with health care expense ranging from $790 to $5518 annually, per child (Pelham, Foster, & Robb, 2007). The estimated educational cost for educating a child with ADHD from kindergarten to grade 12 is over $5000 annually. These totals do not account for the thousands of dollars spent each year on crime, substance abuse, and delinquency produced by this population.

Treatment of ADHD, as indicated in the above paragraph, bears significant cost. Medication does not always yield the desired responses, and behavioral therapy is not always available, nor financially suited to those with this disorder. Alternative treatments, which may help lessen the financial burden to parents and schools, need to be investigated for their effectiveness and applicability.

Purpose of the Study

The purpose of this study was to investigate the use of an exercise, or stability, ball in place of the standard classroom chair, to determine what, if any, effects it has on the time-on-task behavior of a student with ADHD. The hypothesis of this research project is that the exercise balls will increase attentiveness and focus, thus increasing time-on-task. This study will provide one source of research in the area of alternative therapy for ADHD, and is intended for informational purposes to other teachers and professionals who may work with students of this population.

Research Objectives

The research dedicated to the use of exercise balls as an alternative treatment method for ADHD is minimal, from which not a single investigation of its use with non-medicated students was identified. The objectives of this study are to:

1. Assess the effectiveness of an exercise ball in place of a chair for the purpose of increasing time-on-task behavior of a non-medicated student with ADHD during an instructional period during which seat work is necessary.
2. Determine whether the exercise ball is a practical strategy, justifying the cost of the ball, as well as safety of use in a third grade classroom.
3. Conduct informal observation of peer response to identify whether this seating method has any affect on social acceptance or peer relationships.

Assumptions of the Study

The primary assumption of this study is that there is a population of students who have been diagnosed with ADHD who have either opted to not have medication as a source of treatment, or have not had adequate response to medication treatment. This researcher also assumes that the parents of such subjects would want their children to participate in this study, and to be part of the decision-making process for implementing the research procedures.

Definition of Terms

Basal Metabolic Rate (BMR). is the rate at which the body burns calories when at rest.

Co-morbid. When more than one disease or disorder exists at the same time causing a greater impact than the primary disease alone, it is said that the disorders are co-morbid.

Cost of Illness (COI). The cost of illness is the "tangible resource consequences on an illness" (Pelham, et al., 2007, p 122), such as medical bills and time lost from work, rather than the cost of pain and suffering.

Hyposensitivity. Hyposensitivity is when an individual experiences less than normal response to external stimuli.

Non-Exercise Activity Thermogenesis (NEAT). Non-exercise activity thermogenesis is "the energy expended for everything we do that is not sleeping, eating, or sports-like exercise" (Levine, 2004, p 82).

Overweight. "Overweight is defined as a BMI at or above the 95th percentile for children of the same age and sex." (Centers for Disease Control and Prevention, retrieved Sept, 2008).

Sensory Integration Dysfunction (SID). Sensory integration dysfunction is the inability of the brain to integrate sensory input from the five senses.

Time-on-task. The portion of a time period during which the subject is working on the assigned task or activity is called time-on-task.

Vestibular. A vestibular activity is one in which the vestibular system in the brain is activated to help in the maintenance of balance, upright positioning, walking, and movement.

Limitations of the Study

The study of how the exercise ball impacts the time-on-task behavior of a child can only be analyzed during the school day, during a brief portion of the day due to the unknown stress that such seating may cause on the child's back. Additionally, personal choices and how the student uses the ball during his seated time, limit the study and how the ball will affect the student's time-on-task behavior.

This study was also limited in duration. The time allotted for observation was a four-week period with two control weeks and two experimental weeks. This time frame overlapped with Thanksgiving, breaking the observation into two sections, between which the student was out of routine for four days. Therefore, results of the study may be skewed by the effects of a break in schedule.

Finally, the study of a single subject significantly limits how the study's results can be generalized for other children of the same population. The subject of this study has no co-morbid conditions and is not medicated at this time for ADHD. The variables presented here differentiate this subject from the majority of students with ADHD, decreasing the ability to generalize this study.

Chapter II: Review of Literature

Attention deficit hyperactivity disorder (ADHD) is present in many classrooms today. Parents and educators are challenged with the treatment methods and medications that best meet each child's needs, as well as allow for full functioning in the classroom and life in general. The balance of treatment methods is sensitive to the individual, and the side-effects, social repercussions, and behavioral modifications of such methods must be examined prior to and throughout the treatment period for safety and effectiveness.

Exercise balls (also known as therapy or stability balls) are burst-resistant elastic PVC inflatable balls primarily used in physical therapy and exercises training. These balls come in various sizes (35 cm to 75 cm) and must be appropriately measured for beneficial use. The modification made to exercise balls implemented for seating in the classroom is four foot-like extensions used to help keep the ball from rolling. Research on the use of exercise balls in the classroom as an alternative or supplemental treatment

for attention deficit hyperactivity disorder (ADHD) is rather modest. However, one particular study concluded that there was a decrease in the frequency of the primary behaviors of this disorder in all three subjects when seated on the exercise ball rather than a classroom chair (Schilling, Washington, Billingsley, & Deitz, 2003). Additionally, the response surveys completed by a sample of 24 children in this study indicated favor for the exercise balls over classroom chairs, with 17 students expressing preference for the balls, two in favor of classroom chairs, and two students indifferent to the choice of seating device.

Unfortunately, most of the studies found on this topic have been done with students who are identified and medically treated with a form of stimulant, therefore, lacking evidence that the behavior changes in children with ADHD are a direct result of the seating changes. This study is done in an effort to identify what, if any, effects are present when a child with the aforementioned disorder utilizes an exercise ball, rather than a classroom chair.

Prevalence and Treatment of ADHD

ADHD is diagnosed by its primary disorder symptoms of hyperactivity, impulsiveness, and inattentiveness (Peacock, 2002). Students in a classroom would display such symptoms in many ways. Hyperactivity is identified in a classroom by the characteristics of continuous movement or excessive activity. Not only does this frequently interfere with the learning of peers who sit in close proximity to a child with this disorder, but organization and work completion also suffer. Whereas hyperactivity presents itself in an inability to sit still, impulsivity is the inability for a student to think before acting, responding to impulse without concern or thought of the possible

outcomes. The third symptom, inattentiveness, can be identified in two ways in the classroom. First, students can display outward signs of inattentiveness through frequent physical response to distractions, (i.e. looking around the room, at other students, at posters or pictures, at students passing by). Alternatively, students may daydream or gaze fixedly so as to present the impression that the student is on-task, while actually lost in thought and unable to attend to the material at hand.

Diagnosis is the responsibility of a trained health care professional, such as a family practitioner, pediatrician, psychiatrist, psychologist, neurologist, or mental health worker. Peacock (2002) disclosed that the proper diagnoses of ADHD would be based on the understandings that the symptoms: occur in two or more settings; have existed for at least six months prior to diagnosis; were recognized before age 7; interfere with the child's everyday functioning; and are more frequent and severe than what is considered normal for the child's level of development.

Teachers and parents are integral parts of the diagnosis of ADHD as they perform the initial observation of students in the referral process. This observation is sometimes viewed as skewed or subjective due to the role of the parents and educators as the primary caregivers (Leo, 2000). These are the people who deal most directly with the behaviors and seek a quick, inexpensive fix to help alleviate behavioral problems, decrease frustrations and challenges with instruction, and boost academic outcomes through improved performance.

Prevalence

Diagnosis of ADHD remains a controversial topic. Rowland, Lesesne and Abramowitz (2002) identify ADHD as "the most common neuro-developmental

childhood disorder" (p. 162). However, Walker (2008) stated that, "even though most in the scientific community now acknowledge that ADHD has a biological component, there is still much that is not understood about its causes. No single cause of ADHD has been determined" (p. 33). Thus, diagnosis of this disorder, without the ability to test for its presence is, by some, considered superficial and subjective (Leo, 2000).

Regardless of the cause of this disorder, the diagnosis of ADHD has risen significantly in the past decade, with the U.S Department of Health and Human Services reporting an average increase of 3% each year from 1996 to 2006 in children (4 to 17 years of age) with this disability (Pastor & Reuben, 2008). According to recent prevalence rates provided by the Centers for Disease Control and Prevention (2008), approximately 7.8% (4.4 million) of American children have been diagnosed with ADHD.

Impact of ADHD

Newcorn and Donnelly (2009) stated ADHD "is often highly impairing and carries adverse functional consequences related to academic achievement/occupational attainment, family/peer relationships, psychological development, and behavioral function" (p. 199). Salmeron (2009) recognized the social failure that children with ADHD suffer due to a lack of peer acceptance of the behaviors exhibited by the youth with this disorder. Verbal outbursts, defiant and deviant actions, impatient reactions, and intrusiveness are behaviors Salmeron, a family nurse practitioner, identified. These actions result in peer rejection and low self-esteem. Behaviors which carry into adolescence may include unsafe driving, sexual activity, substance abuse, and antisocial disorders (Newcorn & Donnelly, 2009).

Familial challenges exist for parents and siblings alike. According to Attention Deficit Hyperactivity Annual Report (2001), mothers of children with ADHD suffered the majority of physical and emotional abuse, a perplexing finding since the mothers are typically the ones whom the same child loves intensely. Although no fault can be directed to the child, marriages are often stressed and exhausted due to the added tensions of identifying best methods for raising the child. As expected, this could often lead to separation and divorce, emotional avoidance, and a feeling of helplessness on the parents' parts. In addition to the parent stress, the behaviors of a child with ADHD can cause siblings to feel alone, alienated, or victimized, often resulting in depression or psychological impairment (Attention Deficit Hyperactivity Annual Report, 2001).

In the school setting, students with ADHD are challenged with task completion, attention to details, organization, and completion of multi-step directions (Attention Deficit Hyperactivity Report, 2001). While many of these challenges can be behaviorally treated, follow-through on the parts of the student, parents, and educators are time-consuming and take a relatively long time to show positive impact. Salmeron (2009) recognized concern of work completion which causes parents and teachers to increase emphasis on this particular issue, applying much of the focus of behavior modification to this one strain of needs. Increased stress and anxiety compound the concerns for the students, leading to potential avoidance and dislike for education.

Eriksson, Welander, and Granlund (2007) investigated the negative affect having a disability, such as ADHD, can have on autonomy and participation in adult-structured and activities throughout the day in an elementary school. The researchers concluded that students with disabilities are less likely to participate, regardless of the structure of the

activity or lesson. Observations indicated that the greatest exclusive period for children with disabilities occurred in math, usually due to the need for extra support services. The research concurrently found that math displayed the highest difference in engagement between students with disabilities and those without, making the connection that increased exclusion resulted in decreased engagement (Ericksson et al, 2007). A decrease in engagement would only widen the academic gap between students with disabilities and those without. Thus, inclusive methods which allow for structured instruction to students with disabilities in the general education classroom would provide greater academic opportunities than removal for remediation.

The study conducted by Eriksson, Welander, and Granlund (2007), also concluded that the peer relationships for students with disabilities suffered. Students with ADHD were observed to be the last ones selected for games, alone during free times, and overlooked when peer activity selection was allowed. For a child with ADHD, peer relationships are difficult to maintain since a child with ADHD will likely forget an offensive incident before a non-ADHD student will. This results in uncertainty in friend identification as well as an understanding of why the friendship was lost (Attention Deficit Hyperactivity Disorder Annual Report, 2001). Since the child does not understand the dynamics of the occurrence, he or she may exhibit frustration with self or others, creating more difficulty with peer relationships and decreasing self-esteem.

Medication Treatment

According to the National Institute of Mental Health (NIMH), there are several types of medication available for the treatment of ADHD (2008).

Table 1

Medications and Approved Ages for the Treatment of ADHD in Children

Trade Name	Generic Name	Approved Age
Adderall	amphetamine	3 and older
Adderall XR	amphetamine (extended release)	6 and older
Concerta	methylphenidate (long acting)	6 and older
Daytrana	methylphenidate patch	6 and older
Desoxyn	methamphetamine hydrochloride	6 and older
Dexedrine	dextroamphetamine	3 and older
Dextrostat	dextroamphetamine	3 and older
Focalin	dexmethylphenidate	6 and older
Focalin XR	dexmethylphenidate (extended release)	6 and older
Metadate ER	methylphenidate (extended release)	6 and older
Metadate CD	methylphenidate (extended release)	6 and older
Methylin	methylphenidate (oral solution and chewable tablets)	6 and older
Ritalin	methylphenidate	6 and older
Ritalin SR	methylphenidate (extended release)	6 and older
Ritalin LA	methylphenidate (long acting)	6 and older
Strattera	atomoxetine	6 and older
Vyvanse	lisdexamfetamine dimesylate	6 and older

According to the Centers for Disease Control and Prevention (2009), there were approximately 2.5 million youth (56% of those diagnosed with ADHD) taking

medication for this disorder. This translates to nearly 9.3% of all American youth age 9-12 are medicated for ADHD. Most medications prescribed for treatment of ADHD are stimulants, but there are non-stimulants and antidepressants prescribed on occasion, when stimulants are not effective (Kollins, Barkley, & DuPaul, 2001).

Stimulants affect the central nervous system, causing the effects of increased: blood pressure, heart rate, activity, alertness, and thinking processes (Kollins, Barkley, & DuPaul, 2001). Although counterintuitive, stimulants have a calming effect on children with ADHD (National Institute of Mental Health, 2009). For many children, they also reduce hyperactivity and impulsivity. For children with inattentiveness issues, medications can increase a child's ability to focus, work, and learn in a general education environment. Of the stimulants available, methylphenidate is being prescribed to over 90% of stimulant medication consumers (Kimko, Cross, & Abernethy, 1999). Common side effects of this drug include insomnia, loss of appetite, growth delay, nausea, and in rare cases, sudden cardiac arrest (Newcorn & Donnelly, 2009). Due to its effect on dopamine levels, this drug also carries with it a risk of abuse, one reason parents choose not to administer it as a treatment method.

Non-stimulant medications are reuptake inhibitors of norepinephrine, which helps balance levels of two brain chemicals: norepinephrine and dopamine (Carlson, Kruer, Ogg, Mathiason, & Magen, 2007). Non-stimulants, namely atomoxetine, carry little risk of dependency or abuse due to their lack of dopamine effect (Hosenbocus & Chahal, 2009). Additionally, research conducted by Hosenbocus and Chahal (2009) concluded this type medication has no side effects when discontinued, but does carry a lag period of

anywhere between 6-10 weeks, with no consistent method of prediction as to whether or not the patient will respond to the medication.

While antidepressants have not been approved by the FDA for the specific treatment of ADHD, they are occasionally prescribed, primarily for adults, for such treatment (National Institute of Mental Health, 2008). Due to their effects on the nervous system, particularly on certain neurotransmitters, antidepressants have been identified as effective for the management of ADHD symptoms (Kollins, Barkley, & DuPaul, 2001). As one would suspect, this form of medication is used only when children do not respond to stimulant medication, or when the prescribed child suffers from psychological, emotional, or behavioral problems, as well as ADHD.

Behavioral Treatment

In addition to medication, behavior therapy has been shown to have significant impact on ADHD primary disorder behaviors (Hoffman, 2009). Behavioral treatment is that which is provided with the purpose of changing the behaviors associated with ADHD (National Institute of Mental Health, 2008). This type of treatment may be presented to the child, the parents, the educators, or any combination of the three. The National Institute of Mental Health (2008) noted the key components of behavioral therapy for school-age children range from daily living skills to social skills, organization to communication. Parents are trained to recognize and praise positive behaviors, understand appropriate response and consequence, and implement strategies, such as "time-outs". Upon intervention by behavior treatment specialists, schools can add additional steps, resources, and practices to their current behavior management system. Collegial staff development of strategies could greatly increase community response to

students with ADHD. Parent/teacher meetings could provide a promising atmosphere in which to share program concerns or suggested strategies. When possible, a resource staff such as a guidance counselor or school psychologist could develop a school-wide plan to help maintain consistency for students throughout the school and district. In order to garner full effects, however, it must be a joint effort between parents and staff to create the most beneficial educational and behavioral plan.

One study underway at the Department of Pediatrics at the University at Buffalo School of Medicine and Biomedical Science, presented preliminary findings which indicated a reduction in medication use in subjects whose parents and educators have undergone ADHD awareness training and skill development to monitor ADHD behavior more closely (Hoffman, 2009). A second study directed by Hoffman (2009) indicated subjects who received medication treatment prior to the introduction of behavior therapy were less likely to follow through with later parent training. The suggestion of these research findings, should they continue to emulate the preliminary findings, is the need for behavioral therapy treatment at the beginning of diagnosis. Utilization of such research in the schools would allow institutions to develop behavior treatment programs for parent and teacher-training purposes. Even as a supplemental treatment method to medication, behavioral treatment would increase student productivity, peer relationships, academic outcomes, and overall student success.

Combined Treatment

The Multimodal Treatment Study of Children with ADHD (MTA) determined that combined treatment (that which provides medication management and behavioral therapy simultaneously) resulted in greater response than either form of treatment,

medication or behavior, provided independently (MTA Cooperative Group, 1999; National Institute of Mental Health, 2008). In addition, subjects of combined treatment received lower daily doses of Ritalin than those subjects who were treated with medication management only. Since methylphenidate has been found to be a stronger stimulant than cocaine (Latitudes, 2002), thus causing controversy over its use, it would be expected that parents would want to reduce the dosage, if not completely eliminate the need for this medication.

Alternative Treatment

A significant population of individuals and families of those with ADHD seeks complementary and alternative medicine (CAM) for treatment (Rojas & Chan, 2005). In a research review of some of the complementary and alternative methods for ADHD treatment, Rojas and Chan (2005) found that very few CAM treatments have been researched enough to indicate them as effective treatment methods. They did, however, recognize the value of some alternative methods in assisting parents who are seeking alternative or supplemental treatment to medication only. Some of the recognized therapies include yoga, massage therapy, "green" space therapy, and exercise balls which provide promising, although strictly preliminary, results.

As the director of the Himalayan Institute Total Health Center, Demers (2009) explains to patients who seek alternative treatment for ADHD that, "parents who have reduced their child's intake of sugar, refined foods, and foods with chemical additives (food dyes, preservatives, MSG, etc.) report significant improvement in their child's behavior over four to eight weeks" (p. 20). She expounds that symptoms of disruptiveness and inability to focus improve when the patient eats, "plenty of cooked

vegetables and whole grains, along with moderate amounts of protein and organic unrefined oils" (Demers, 2009, p. 20). Further recommendations by Demers include supplemental use of B-complex vitamins and fish oils, which are indicated to improve mood, focus, and brain function.

Viola and Noddings (2006) recognized the use of yoga as an activity that helps children regain focus and/or control. According to Viola and Noddings, "yoga develops a child's musculoskeletal system, improved his posture, and provides him with integrating tactile, vestibular, and proprioceptive sensory experiences, promoting the healthy development and functioning of his nervous system" (p. 45). Due to its extensive impact, yoga can be used as a preventive or corrective activity. Therefore, students with ADHD could utilize this alternative method throughout the day in the classroom to counter symptoms of their disorder, regaining focus, control, and attentiveness (Viola & Noddings, 2006).

Massage has also been identified for its beneficial role in the treatment of sensory integration dysfunction (SID), a disorder which impacts one's ability to integrate stimuli gathered by the five senses (Viola & Noddings, 2006). Demers (2009) supports this form of treatment and recommends daily oil massages during over-stimulating periods of the day, such as meal times, bed times, and transition times to and from school. The reception of massage therapy relaxes a child's body, transferring it from a state of what Demers identifies as "fight-or-flight" to that of a nourishing, restorative state (2009).

A study conducted by Kuo and Faber Taylor (2004) concluded that green outdoor activities, those which took place outside and did not include built or fabricated structures for implementation, significantly reduced symptoms of ADHD in both group and

individual or pair settings. The explanation given by Kuo and Faber Taylor (2004) for why a child with ADHD would benefit from green space therapy details the need for attention restoration due to attention fatigue. Children with ADHD suffer from overstimulation, causing directed attention strains on the brain to be substantially higher than non-ADHD children. Therefore, when a child has the opportunity to rest and reduce the amount of directed attention needed for completing a task, behaviors of impulsivity and inattentiveness are reduced due to a decrease in stimuli filtration needs (Kuo & Faber Taylor, 2004).

Exercise ball. Children who suffer from sensory integration dysfunction have been found to benefit significantly from the vestibular activity of sitting on an oversized playground ball (Viola & Noddings, 2006). Viola and Noddings indicated that children with hyposensitivity, a condition similar to ADHD in its symptom of hyperactivity, need sensory stimulation in order to complete tasks that require focus and attentiveness. Sitting on a ball allows the child to expend energy while receiving stimulation in a passive form, rather than seeking stimulation from disruptive activities.

Utilization of the exercise ball in place of a classroom chair was studied in a general education classroom setting with three subjects diagnosed with ADHD (Schilling, Washington, Billingsley, & Deitz, 2003). The findings indicated an overwhelming positive response to the balls, not only for the students diagnosed with ADHD, but also those children of the general education population, and the educators thereof. All three students identified with ADHD showed increased time-on-task, as well as improved penmanship (Schilling et al., 2003). The therapists involved in the study acknowledge the

positive affect that the exercise ball has on students with ADHD, as well as other students with sensory input needs.

Since this study, Harlacher, Roberts, and Merrell (2006) have recognized the use of this alternative therapy as a beneficial class-wide intervention for students with ADHD. According to Harlacher et al., the use of the exercise ball is beneficial in its reduction of disruptive behaviors and increase in physical movement for all of the students in the class. The researchers concluded that this method is a socially viable form of treatment, though expense may be of concern when trying to implement this methodology in large groups.

School-based Treatment

School-based interventions are those which are implemented in the classroom or school to help in the treatment of a disorder. For ADHD treatment, school-based interventions have shown positive effects on the behavior of students with ADHD. One study included analysis of interventions such as, "token economy, extinction, response cost and time out, self-instructions, reinforced self-evaluation, training in social abilities, assessment for parents and teachers, and training in study skills or instructional management procedures" (Miranda, Jarque, & Tarraga, 2006, p. 45). The findings support the research of MTA (MTA Cooperative Group, 1999; NIMH, 2008) in that a combined approach of behavioral treatment and medication management was the most successful in reducing the frequency of the primary behaviors of students with ADHD. With this knowledge, treatment of ADHD must become an effort on the part of many, with multiple facets of therapy and interventions being implemented on a daily basis.

School-based interventions in the treatment of ADHD are imperative to the academic success of the students who struggle with this disorder (Jitendra, DuPaul, Someki, & Tresco, 2008). The MTA study indicated that medication and behavioral therapy have little impact on the educational achievements, validating the concern for school-based interventions (MTA Cooperative Group, 1999). School-based methods of intervention can exist in the forms of behavior therapy, counseling, teacher and parent-training, environmental modification, and increased physical activity time. Many of these strategies strive for changes in student behavior, but consideration of academic needs must also be addressed.

While interventions that assist in modification of behavior possess benefits to the population of students with ADHD, Jitendra, DuPaul, Someki, & Tresco (2008), suggested expert instruction in the critical academic areas of reading and math. When possible, one-on-one instruction is most beneficial for reducing the frequency of behaviors, as well as providing immediate feedback on student performance and progress. The interventions carried beyond the intensive subject-specific tutoring may be teacher-mediated, peer-mediated, or computer-assisted. Regardless of the style, however, all interventions should be practical, feasible, and easy to implement so as to increase teacher participation and buy-in of fully servicing students with ADHD.

Health Benefits of Using Exercise Balls

There is a common understanding that physical fitness improves with increased physical activity. The reality that over 15% of American children age 6-11, nearly 18% of Americans age 12-19, and 66% of Americans over 20 are overweight (U.S. Department of Health and Human Services, 2008) indicates a severe need for increased activity.

While methods for increasing activity levels can be implemented in numerous ways, utilization of an exercise ball in place of a classroom chair may be another option.

Increase in Physical Health

Doctors at Mayo Clinic have classified activities into two categories: exercise and non-exercise activities (Levine & Kotz, 2005). Levine and Kotz studied what they call non-exercise activity thermogenesis (NEAT), or the energy expended during activities that are not exercise related. Such activities would include walking the dog, playing with children, or even using an exercise ball instead of a chair while working at a desk. By choosing to sit on an exercise ball, one is choosing to increase the amount of energy his/her body expends, therefore increasing the activity level.

Adults are not the only ones who could benefit from increased activity either. Researchers at the University of Nebraska, Omaha have noted the positive impact of physical activity in children on their bone mass density, even to the point of decreasing the risks of osteoporosis later in life (White, Flohr, Vener, Feinauer, &Ransdell, 2005). Increased physical activity also supports the rehabilitation of children with chronic diseases. According to the research conducted by White et al (2005), this knowledge of the impact of physical activity on healthy children supports the theory that increased physical activity would likewise combat the side effects that children with cancer endure during treatment and life thereafter. Utilization of an exercise ball, instead of a chair, in the classroom would then be considered beneficial to both the physical activity levels as well as the rehabilitation of childhood diseases.

While physical activity and physical fitness go hand-in-hand, recognizing how exercise balls improve physical fitness is important in assessing the impact of their use

throughout the day. Like most pieces of exercise equipment, exercise balls help target a particular region of the body. Exercise balls are well-known for their ability to improve abdominal and back fitness, but the impact the balls have on balance and the musculoskeletal system must also be addressed.

According to the Journal of the American Chiropractic Association (2007), the benefits of using exercise balls in your fitness routine and as a daily sitting choice include improvements in balance, core strength, posture, and even athletic ability. These same benefits are seen by therapists and trainers as well. An article by Dylla and Forrest (2007) identified exercises on the exercise ball specifically designed to counter the stressful seating positions of dental hygienists. Many professions require sitting in a certain space and position for extended periods of time, and use of an exercise ball can strengthen parts of the musculoskeletal system and back that are naturally weaker than other parts of the body (Dylla & Forrest, 2007). Exercising with an exercise ball, trains the core muscles, which extend from your hips to your shoulders, and link the upper and lower body (Melone, 2007).

Increase in Attentiveness and Brain Function

In addition to the musculoskeletal and core strength benefits of using the exercise ball, teachers and doctors have noted the psychological and neurological benefits of using the exercise balls instead of chairs in their classrooms. Rodolph, a fifth-grade teacher at Donaldson Elementary School in Arizona, discussed how the increased activity through sitting on the balls increases blood flow and therefore brain function (Matas, 2006). Tucson chiropractor Susan Wenberg often prescribes the use of exercise balls as chairs to help stimulate people who tire easily while working as well as provide an outlet for extra

energy in those patients who are fidgety. Both instances support how the exercise ball increases work completion and therefore the feeling of accomplishment, leading to an overall improved mental wellness.

There is no doubt that the use of an exercise ball is a great way to improve the overall health and well-being of an individual. Of course, as Dr. Wenberg noted, the exercise ball is not for everyone (Matas, 2006). There are always risks associated with the implementation of a new exercise routine or device, so it is undoubtedly important to consider the concerns with using the exercise balls as chairs.

Concerns with Use of Exercise Balls as Chairs

While the health benefits associated with using exercise balls are easily identified and measured, the concerns regarding the use of such balls in place of office and classroom chairs are less identifiable to the common user. Many physicians, chiropractors, and ergonomic specialists have documented viewpoints that those outside the medical and health fields might never consider.

Compression of Intervertebral Discs

The primary concern, as identified by ergonomic specialist Pajot (2005), is the compression of the intervertebral discs of the lower back for extended periods of time (as cited in Budnick, 2005). While activating the trunk musculature is beneficial in muscle toning and increasing core strength, sitting for such extended periods, while activating the muscles connecting the lower ribs with the pelvis, can lead to increased fatigue and undue stress on the spinal column. According to one study, participants complained of more lower back pain from sitting for one hour on an exercise ball than for the same amount of time in an office chair (Gregory, Dunk, & Callaghan, 2006). However, it is

also noted that as with any change in activity, gradual introduction of the stability ball is necessary for use without unnecessary or additional pain (Merritt & Merritt, 2007). Moreover, the individual's ability to accept change must be considered when implementing the use of a ball in place of an office chair, so as to reduce the likelihood of back discomfort.

Lack of Support

In addition to the stress placed on the lower back due to sustained use of the postural muscles, the lack of back support while using an exercise ball significantly decreases the ability to sustain upright posture for extended periods of time (University of Canberra, 2006). Furthermore, upright postures cannot be maintained when reaching and moving, again reducing the effectiveness of exercise balls to produce better posture.

Falling

The Australian Capital Territory (ACT) WorkCover has identified the exercise ball a hazard in the workplace for reasons including those aforementioned, as well as concerns with falling (2002). Due to the fact that employees cannot rotate easily and navigate freely around their workspace, getting on and off the ball significantly increases the chances of falling. While there are alternatives to the standard exercise ball, ACT WorkCover felt the adaptations would render the use of the exercise ball in the workplace counterproductive, in addition to a reduction in the support given to the buttocks and thighs.

There are, undoubtedly, concerns associated with the use of exercise balls in lieu of office and classroom chairs. Risks connected to safety, musculoskeletal health, and discomfort in the back are all important aspects to be considered when implementing

alternative seating methods. Therefore, the risk to benefit ratio must be determined in order to implement such practice.

Chapter 3: Methodology

This research project will be done to analyze the effects, if any, of using an exercise ball in place of a classroom chairs for a non-medicated student with ADHD. The study will be conducted with a single-subject observation during a one-hour reading period. The observations will alternate between one week of baseline observation during which the student is seated on a classroom chair, and one week of experimental seating on the exercise ball. The duration of the observation period will be four weeks. Upon completion of the observation period, the researcher will review the video, tally time-off-task behavior and compile the daily and weekly data for analysis.

Selection and Description of Sample

The researcher selected a candidate from her third grade classroom who is identified with the diagnosis of ADHD with no co-morbid disorders or learning disabilities. The subject was selected due to absence of medication during observation period, as well as agreement to the intervention method. The subject is a Caucasian boy, age 8, of average academic ability, with strength in the areas of reading and language. His primary disorder symptoms are inattentiveness and hyperactivity.

Instrumentation

The instrument utilized in this study was a time-on-task survey developed by the researcher. This assessment is a simple survey of student off-task frequency, type of off-task behavior, and necessary teacher re-directions over a one hour time period. Since this

instrument is not a formal assessment, the validity and reliability are unknown at this time.

Data Collection Procedures

This study was conducted over a span of four weeks during which a one hour reading period was videotaped each day. The video served as a constant monitor on the subject and allowed for uninterrupted instruction by the teacher, so as to maintain the integrity and continuity of observation. The researcher documented all time-off-task behavior, the type of behavior exhibited, and whether or not teacher re-direction was needed. Off-task behavior will be identified as the subject: (a) being off of his chair or ball, (b) talking to a peer during instructional or work time, (c) playing in his desk or with materials not related to class work, (d) looking around the room for a period greater than 5 seconds, (e) performing a task other than that which the class is working on. Teacher redirection will only be tallied when the teacher is speaking directly to the subject regarding one of the aforementioned off-task behaviors.

Data Analysis

The statistics used to analyze the effectiveness of the use of the exercise ball were gathered from the time-on-task survey. The researcher utilized the number of off-task behaviors during each one hour period to produce a percentage of time spent off-task during the 60 minute time frame. The daily percentages were then compiled to generate a weekly percentage for comparison between baseline and experimental outcomes.

Limitations

There are few limitations that could complicate the methodology of this study, but of most concern is that of student participation throughout the entire observation period.

Should the subject reject the implementation of this study, continuation of observation would cease. Additionally, teacher variation in methods of instruction may impact the amount of seated work time, therefore affecting the period of time during each observational period during which the subject is seated on the exercise ball. Finally, subject illness, home/family circumstances, and attendance may affect the authenticity of the study.

Chapter IV: Results

The purpose of this study was to investigate the effectiveness of utilizing an exercise ball instead of a classroom chair to increase time-on-task behavior and decrease academically-impacting symptoms of a child with ADHD. A single 8 year old subject was monitored via video during a one hour reading period each day of the week. This occurred for five days with the subject seated in a classroom chair, five days using an exercise ball instead of a chair, and repeated in sequence for another ten days. The researcher identified five common behaviors exhibited by this child which were considered off-task. An instrument on which to collect the data was created for each of the 20 days of observation. Through compilation of daily records, frequency of off-task behavior, safety and viability of alternative method, and informal class were identified.

Item Analysis

The first objective of this research was to identify of the effectiveness of this alternative treatment method for increasing time-on-task behaviors during seated work times. The daily occurrences of off-task behavior are shown in Table 2 which indicates that the subject was off-task more during seated work time in a classroom chair than when seated on the exercise ball. Under each day listed, column A indicates the total

number of times that the student was identified as being off-task. Column B indicates the number of times the off-task behavior had to be redirected by the teacher. Since this study was done to identify the frequency of off-task behavior, a percentage of time was not calculated, as tracking of time spent off-task was not assessed. However, the frequency of teacher redirection was identified and the study concluded a reduction in the need for redirection.

Table 2

Off-task Behavior Frequency during Instructional Period

	Day 1		Day 2		Day 3		Day 4		Day 5		Average	
	A	B	A	B	A	B	A	B	A	B	A	B
Chair	47	7	39	4	51	8	45	2	31	5	42.6	5.2
Ball	31	7	26	2	28	1	19	1	24	0	25.4	2.2
Chair	40	6	28	2	35	4	38	4	33	3	38.4	3.8
Ball	30	4	21	0	25	2	29	2	23	0	25.6	1.6

This research did not utilize a formal assessment to determine safety and viability in the classroom, but did evaluate the types of off-task behavior which further allowed for subject safety assessment. The exercise ball itself was acquired through the researcher's school's Physical Therapy department, who indicated the exercise balls to cost approximately $14-$45 depending on model and size. To ensure proper fit, the physical therapist on staff measured and inflated the ball to the specific measurements of the subject. Height and weight were used in this process, and the methods for measurement and inflation were determined to be easily learned, thus eliminating the need for

intervention on the part of the physical therapists for future implementation in the classroom. The researcher observed only three incidences in which the subject precariously utilized the exercise ball as a seat, all of which occurred on the first day of its use. Upon verbal intervention, the risky behaviors ceased and the observational period continued without further incidence.

The final objective of this study was to informally assess peer response to the use of the exercise ball instead of a classroom chair. This researcher observed only positive response with several requests for permanent acquisition for this seating option for all students. An additional ball was added to the classroom which increased availability to other students throughout the observational period. All students showed positive response to the exercise balls' presence and a waiting list to employ them during instructional periods was made. Brief verbal surveys of the subject and peers were done on the part of the researcher to ensure no negative reactions were present.

Chapter V: Discussion

Research of the current alternative methods for the treatment of ADHD has indicated beneficial impact on the symptoms of inattentiveness and lack of focus. Effectiveness has been documented in many complementary and alternative treatment methods including diet therapy, yoga, massage therapy, green space therapy, and use of exercise balls for seating. Unfortunately, only a few studies have been directed at these methods and further investigation is needed. This study was conducted in the efforts of substantiating the conclusion that exercise ball use instead of a classroom chair has positive affects on the primary symptoms of ADHD.

Limitations

The limitations of this study revolve primarily around time constraints. Only during school hours can this research be completed, and of those hours, only a brief period can be examined due to unknown variables of physical safety with this form of alternative seating. Personal choices on the part of the subject impacted duration of this seated time. Thanksgiving break divided the observational period into two major sections, possibly impacting reliability of data due to a change in routine.

Finally, the study of a single subject limits applicability to other children of the ADHD population. The subject of this study possessed no co-morbid disorders and was not medicated for ADHD. The variables presented here differentiated this subject from the majority of children with ADHD, decreasing the ability to generalize this study.

Conclusions

The collection of data in this study indicates a significant impact from the use of an exercise ball on the off-task behavior of a non-medicated student with ADHD. Off-task behaviors were substantially fewer when seated on the exercise ball instead of the classroom chair. In addition, the frequency of teacher redirection was dramatically reduced during the exercise ball-use periods.

Safety and viability of this form of alternative treatment for ADHD is positively recognized. The exercise balls are comparably priced to classroom chairs which can be found online for as little as $25.18 for a 14 inch chair (Worthington Direct, 2009). Although exercise ball life would be presumably shorter than a classroom chair due to the structural difference of the two, initial cost would be less. Further investigation of pricing would be necessary to determine actual cost difference. Like the classroom chair, an exercise ball is easily stored under the desk, and should rolling be identified as a concern,

companies like Gymnicballs (2009) and WittFitt LLC (2009) supply classroom sets of exercise balls with peg-like stabilizers on the bottom.

Completion of this study indicated a positive response by all parties involved. Subject and peers enjoyed the use of the alternative seating choice and student recommendations to continue use of the exercise ball confirmed the researcher's conclusion of student satisfaction.

Recommendations

While this researcher feels that this study has been successful, she also recognizes the need for additional investigative measures. Further investigation of alternative treatment methods are suggested as this single form may or may not be beneficial to all students with ADHD, including those who are medicated, and those with co-morbid disorders. In addition, physical response to sitting on an exercise ball for an extended duration should be identified prior to introduction of this seating choice as a permanent option. Finally, cost-to-benefit ratio analysis may be necessary so as to petition for budgetary support of this modification in classroom seating. However, it is with confidence this researcher extends this study as one indication of this alternative treatment method's success.

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