Effects of Stability Balls on Behavior and Achievement in the Special Education Classroom

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Abstract

This action research project examines the effects of stability balls on student behavior and achievement in the special education classroom, in a 7-12 high school, in rural central Minnesota during the fall of 2007. Assigned to a reading or math classroom, 12 students, with varying disabilities, ages fifteen through eighteen participated. These disabilities included; Specific Learning Disability (SLD), Oppositional Defiant Disorder (ODD) and Seizure Disorder, Emotional Behavioral Disorder (EBD), Developmentally Cognitive Disabled (DCD), and Attention Deficit Hyperactivity Disorder (ADHD). Analysis of the data is supported with quantitative data collected for 12 weeks in an ABAB single-subject study. The findings of the study reveal an increase in students' on-task behavior, plus an achievement increase in fluency, comprehension, addition fact scores, subtraction fact scores, and math probe scores. Furthermore, the study finds stability balls to be socially valid. Results of this study provide relevant information for all educators, administrators, and students.

Action Research Committee

The members of the committee appointed to examine the action research of Victoria N. Bill find it satisfactory and recommend that it be approved.

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JoAnne Hinckley, Co-Chair

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Dr. Debbie VanOverbeke, Co-Chair

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Cheryl Zupanich Hanson

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CHAPTER 1

Introduction

The typical classroom in the United States has children sitting in hard chairs, listening to the teacher, and taking notes, as they lecture on the topic of the hour. How many of these children are struggling to sit still, let alone listen and take notes? Michael Gordon (2006) noted the challenges for children with Attention-Deficit/Hyperactivity Disorder (AD/HD), "The typical classroom is a terrible place for an AD/HD child…after all, we are asking children who have profound problems attending, organizing and controlling their actions to spend hours per day attending, organizing, and controlling their actions," (Zeigler, p. 12). This not only holds true for children with AD/HD, but many children with special needs. The United States Center for Disease Control and Prevention's latest study reported, of the children in the 4-to-17 year old range, 7.8 % have been diagnosed with Attention Deficit/Hyperactivity disorder, 65 % with Specific Learning Disability (SLD) and speech and language impairments, 9 % with mental retardation, and 3 % with Autism (Zeigler, 2006). Is there something we can do in the classroom to help these students become more successful? Stability balls may be part of the answer.

Physical therapists have been using stability balls since 1965 to help their students improve their mobility and to rehabilitate areas of their bodies. Stability balls are now making their way from the therapy rooms to the classrooms. Teachers are hearing anecdotal evidence and reading about studies that show stability balls are helping students focus and make gains in achievement. Teachers using the stability balls in their classrooms are stating they believe behavior has improved. In January 2008, in a supplement inserted into the *Brainerd Daily Dispatch*, Bev Dunphy, a kindergarten teacher

at Baxter Elementary, states, “the balls helped keep children focused.” She “believes the balls have improved the penmanship.” In October 2007, Heron Marquez Estrada reported in the *Minneapolis Star Tribune* article “Keeping students on the ball” that teachers at Zion Lutheran School in Mayer, Minnesota stated “the colorful balls help students’ concentration” and “they were far more attentive.” In *Advance for Occupational Therapists*, Beth Puliti quoted Jack Bennett, assistant professor of physical therapy at Maryville University in St. Louis, Missouri as stating that the use of stability balls “has shown that children who sit on the exercise ball have improved writing skills” He continued by saying children have a difficult time sitting for any length of time. Less restrictions and movement “influences cognition and alertness in the classroom” (2007). *Mayo Clinic News* (2006) reported that James Levine, professor of medicine at Mayo Clinic and child researcher Lorraine Lanningham-Foster have developed a “classroom of the future.” The key ingredient missing from the typical classroom is the chair. Students learn while kneeling on the floor, sitting on a stability ball, or leaning on a podium. The ongoing study is comparing the student in the regular classroom situation of last year to this year in the classroom of the future.

Will the stability ball make a difference for these students? Would sitting on a stability ball make a difference for special education students? There are many people who think there is not enough evidence to support using stability balls in the classroom. Kristy Holman (2005), a 4th year undergraduate occupational therapy student from the University of Western Sydney, conducted a study and found “insufficient evidence to support or refute the use of therapy balls as an alternate form of seating for improving classroom behavior of children with autistic/behavior disorders (p.1). Schiling,

Washington, Billingsley and Deitz (2003), in their study with AD/HD students, found gains with in-seat behavior and improvement with handwriting legibility (p. 43). At the conclusion of their study, the authors stated "the use of therapy balls for children with other diagnoses … merits investigation" (p. 44). This study will add empirical data on the effects of stability balls on students' behavior and achievement in the special education classroom.

Statement of the Problem

The purpose of the study was to determine if the use of stability balls affects student behavior and achievement in a special education classroom. The researcher investigated the possibility that the use of stability balls would increase time students are on-task and would increase student achievement scores. The study was also conducted to identify students' perceptions of the use of stability balls, as chairs in the classroom.

Research Questions

This action research study answered the following questions.

1. What are the effects of stability balls, when used as chairs, on student behavior in a special education classroom in central Minnesota?
2. What are the effects of stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?
3. What are the student's perceptions of their behavior and achievement when using stability balls as chairs in a Special Education classroom in central Minnesota?

Significance of the Study

Many students in the special education classroom have a difficult time focusing on their work, paying attention, and sitting still. This research investigated whether sitting on a stability ball will give students an outlet for their energy (slight bouncing), and increase the amount of time they are able to focus. Schilling et al (2003) stated future areas to be researched would be the "use of therapy balls for children with other diagnoses" and "student performance in a variety of academic areas." Therefore, this study was designed to meet this need and was completed in a high school special education classroom with students of different disabilities and diagnoses. This study looked at student achievement in reading and math.

This research project added empirical data to the field of behavior research, specifically; the affect stability balls have on behavior. It also added the empirical data on the effect stability balls have on achievement. Findings of the study will benefit special education teachers, general education teachers, administrators, and students.

Definition of Terms

The following definitions are provided to ensure understanding of these terms throughout the study. The researcher developed all definitions not accompanied by a citation.

Achievement. Achievement is "the quality and quantity of a student's work" (Merriam-Webster, 2007). In this study, achievement is an increase or decrease in percentage of correct answers on a fact test, assignment, or an increase or decrease in the number of words read correctly.

Behavior. Behavior is “the manner of conducting oneself” (Merriam-Webster, 2007). In this study, on-task behavior is defined as a student working, reading, writing, engaging in an assigned activity, or looking at the teacher.

Perception. Perception is “a result of perceiving: observation” (Merriam-Webster, 2007). In this study, perception is the way the students think and feel about the effects of using the stability ball on their behavior and achievement.

Stability ball. In this study, a stability ball is a heavy-duty rubber ball filled with air that is from 45 to 75 centimeters (20-30 inches) in diameter. The ball sat in a rubber ring filled with air to keep the ball in place when the student stood up. It was used to sit on. Additional synonyms and/or brand names for the stability balls are Swiss ball, Fit Ball®, Gymnic ball, Sit “n” Gym, Physic ball, therapy ball, Gymnastic ball, Aerobic ball, yoga ball, and physiotherapy ball.

Special education classroom. A special education classroom is a classroom in which the teacher is licensed to teach students who have qualified for special education services. Students come to the classroom for small group or individual direct instruction programs.

Student achievement. Student achievement is the increase of correct answers on a fact test, assignment, or increase in the number of words read.

Student on task behavior. On task behavior is when the student is working (reading, writing, doing activity as assigned), or looking at the teacher.

Limitations, Delimitations, Assumptions of the Study

This study has the limitations of:

1. The population of this study is limited to the students assigned to the math and reading groups used in the study. Findings should not be generalized to the larger population.
2. This study is limited to the time frame of 12 weeks, minus days school was not in session.

This study has the delimitations of:

1. Before the study was initiated, student's cooperation was discussed with them.
2. All of the testing, behavior observations, and work were done in one classroom, with one teacher conducting the testing and making the behavior observations.
3. The timed tests are AIMSweb probes, using a standard battery operated timer.

This study assumes:

1. All students participated and worked to the best of their abilities.
2. All students answered the questionnaire honestly and to the best of their abilities.

Organization of the Study

This study is organized into five chapters. Chapter 1 addresses the problem, the researcher's questions, the significance, limitations, delimitations, and assumptions of the study. Chapter 2 includes a brief history of stability balls and a review of the literature related to the research questions. Chapter 3 describes the action research design, the instrumentation, and the data analysis procedures. Chapter 4 presents the findings of the

quantitative and qualitative portions of this study. Finally, Chapter 5 summarizes the conclusions and provides recommendations for practice and further study.

CHAPTER 2

Do teachers want to find a way to help students focus and find learning exciting? Do they understand a student's "whole system must be active in order to take in the information, select what is important about the information, integrate it with existing patterns and finally, to anchor it with movement" (Hannaford, 2005, p. 99).

Hannaford (2005) quoted Theodore Roosevelt as saying,

> Every child has inside him an aching void for excitement and if we don't fill it with something which is exciting and interesting and good for him, he will fill it with something which is exciting and interesting and which isn't good for him (p. 144).

Stability balls in the classroom give students the movement they need without disrupting the classroom. Illi (1994), senior lecturer at the University of Basel, Switzerland, stated one of the benefits of sitting on the stability ball is "it creates attention and opens channels for the perception of one's own sensation." He goes on to say; "It improves, via improved blood circulation the effectiveness of all the organ systems, especially the brain, which undoubtedly is of interest to teachers" (p.1).

This chapter begins with a definition of a stability ball and then discusses (a) the history of stability balls and how they came to the United States, (b) importance of movement and sensory input to learning, (c) landmark research conducted with stability balls and students who have been diagnosed with AD/HD or Autism, (d) current research, as of January 2008, on stability balls in the classroom, (e) and a summary.

Definition of a Stability Ball

A stability ball is a heavy-duty rubber ball filled with air from 45 to 75 cm (20-30 in.) in diameter. They are available with or without four-2 inch rubber legs. The legs do not stabilize the ball, but prevent the ball from rolling away when the person rises. A rubber ring, filled with air, is also available to set the ball in, so it does not roll away when the person stands up. Stability ball, which is the generic term, are know by many names. Some of these names are: Swiss ball, fit ball, Gymnic ball, Sit "n" Gym, physic ball, therapy ball, gymnastic ball, Aerobic ball, yoga ball, exercise ball, Pilates ball, balance ball, birth ball and physiotherapy ball.

It is very important to find the right fit when purchasing a stability ball. If a person has the wrong fit, injuries can occur. To discern the proper size, the student should stand next to an exercise ball; the ball should be about the height of the student's knees. When seated on the ball, the student's knees should be bent at a 90-degree angle, with thighs parallel to the floor. Before purchasing a ball for students, check the chart for the recommended size.

History of Stability Balls

The stability ball originated in Italy in 1963, by the toy manufacturer, Aquilino Cosani. He had developed a special technique for manufacturing toys out of vinyl instead of rubber, marketing them primarily in Europe as the Gymnastik. Mary Quinton, an English physiotherapist, discovered the balls while she was working in Bern, Switzerland. She incorporated them into her treatment program for newborns and infants. When Quinton returned home to England, she introduced the balls to her colleagues, the Bobath's, who incorporated them in their rehabilitation programs. Carrière (1998) wrote, Dr. Susan Klein-

Vogelbach, founding director of the physical therapy school in Basel, Switzerland discovered their importance and began using them for adults with orthopedic issues. American physical therapists studying in Switzerland called the exercise balls Swiss balls, but the Bobath's are the ones given credit for bringing the Swiss ball to the United States. In 1989 Joanne Posner-Mayer, a physical therapist, introduced a series of seminars and workshops on the neurological, orthopedic and fitness applications of the ball according to Carrière (1998). In the late 1980s, Paul Chek, founder of the Corrective Holistic Exercise Kinesiology (C.H.E.K.) Institute, developed programs for rehabilitation and athletic training in California. Stability balls are now a common piece of equipment in fitness facilities, with entire classes based on the use of the ball
(Carrière, 1998, p. 1-12).

In parts of Europe, entire classrooms use stability balls. Since 1991 in Basel, Switzerland schoolteachers have taken courses on how to best manage stability balls in the classroom. Part of this course work included the learning about the monitoring process, which they recommend 6 times per year, to take into account the growing bodies of students. Teachers, whose classes were utilizing stability balls, were surveyed on the effect in regard to "tension and restlessness: 33% reported a decrease, 25% an increase, and 9% no change (33% did not respond)" (Carrière, 1998, p. 376). In the United States, stability balls are making their way into classrooms.

Importance of Movement and Sensory Input to Learning

Movement and the Brain

"The notion that intellectual activity can somehow exist apart from our bodies is deeply rooted in our culture" (Hannaford, 2005, p. 15). The harmful part of this idea is, it is the basis of many educational theories and practices, which hinder learning and students are not as successful as they could be. The teachers who believe these theories wonder why their students have glazed eyes and vacant stares when in a lecture hall or classroom. Hannaford (2005) stated,

> Thinking and learning are not all in our head. Our movements that not only express knowledge and facilitate greater cognitive function, they actually grow the brain as they increase in complexity. Our entire brain structure is intimately connected to and grown by the movement mechanism within our body. Physical movement plays an important role in the creation of nerve cell networks, which are the fundamental ground of learning (p 15-16).

Teachers and other organizations are beginning to recognize the importance of movement and physical activity to learning. Hannaford (2005) stated that The National Education Association is acknowledging the importance of the arts; especially drama/theater and music in the success students are showing in math and reading. Decreases in behavior issues, improved attendance, and interest in learning have also been attributed to art programs (p. 37). Hannaford (2005) continued, studies are being done to prove that students who are involved in these programs "score on average 40 to 60 points higher on verbal and 15 to 40 points higher in math parts of the SATs" (p. 73). She went on

to say, that gaining the most are minority and students who struggle in typical classroom settings (p. 73). She referenced the 2001 California Department of Education study on grades five, seven, and nine, which found "higher academic achievements were associated with higher levels of fitness" (p. 113).

Sensory Input

"Our whole body is designed as a fine tuned sensory receptor for collecting information" (Hannaford, 2005, p.35). Rivlin and Gravelle (1985) pinpointed 14 senses not previously thought of a senses in our bodies, examples are: "sense of magnetic orientation, atmospheric pressure, airborne ionic changes, UV, sense of wet and dry, etc" (p.11). Sensations from all of these receptors give our bodies the information it needs to create learning, ideas, and imagination (p. 35). Many students need a "hands-on" experience to really learn a new concept. Activities such as working in groups and lab work help students to make connections with previously learned and new information. Occupational and Assistive Technology therapists are recommending students have clay, play dough, therapy putty or stress balls to manipulate during class lecture time to help students more easily take in information (Knebel, Occupational/Assistive Technology Therapist, personal interview September 12, 2007). Could stability balls be a part of this sensory input students' bodies need to collect information?

Landmark Research on Stability Balls

Students with ADHD

Schiling, Washington, Billingsley, and Deitz (2003) conducted research on the "effects of therapy balls as seating on in-seat behavior and legible word productivity of students with attention deficit hyperactivity disorder (ADHD)". They also investigated the

social validity of stability balls by surveying teachers and students. The A-B-A-B style study looked at 3 fourth grade students with ADHD. The researcher found in-seat behavior and legible word productivity for the students increased after the use of stability balls for 12 weeks. Social validity findings indicated that generally the teacher and the students preferred therapy balls over normal classroom chairs or desks.

Students with Autism

Schilling and Schwartz (2004) conducted research on how stability balls affected classroom behavior in young children with Autism Spectrum Disorder. This three week single subject, withdrawal design study was used to investigate the effects of "therapy balls as seating on engagement and in-seat behavior of young children with Autism Spectrum Disorder (ASD)". Social validity was investigated to evaluate teacher's opinions regarding the intervention. Results indicated "substantial improvements in engagement and in-seat behavior when participants were seated on therapy balls" (p. 1).

Current Research, as of January 2008, on Stability Balls in the Classroom

Classrooms in Minnesota

Stability balls are showing up in classrooms around the state of Minnesota.

- Jake Zauchar's sixth grade class in Cold Springs is currently on year two with stability balls. He believes they improve students' outcome and is working on research to prove his theories (Zauchar, 2007, p 4-5).
- Beverly Dunphy's kindergarten class in Baxter is also using stability balls for the second consecutive year. She stated that she would not go back to regular chairs (M. Knebel, personal interview, May 12, 2007). .

- St. Paul Academy's entire school is sitting on stability balls. The school starting using the balls in 2005 in math classes. Estrada (2007) reports, Jenny Borovsky said the balls have "improved comportment and concentration in the classroom" (p. B1).
- Diane Norlin's fifth grade class at Pine-River-Backus Elementary School started using stability balls in January 2008. Norlin stated she had noticed "students are more alert during the school day and this alertness has improved their school work, including their handwriting" (Tweed, 2008, p. A5)
- Linda Henkel, a Pine River-Backus Title 1 teacher is also using the stability balls with her first and second grade students (Tweed, 2008, p. A5).

These Minnesota teachers are on the forefront of the research to find out if stability balls are part of the answer for students.

Many schools in Minnesota are writing grants to put stability balls into classrooms as the data about their success is spreading by word of mouth from teacher to teacher. Corinna Erickson, who teaches special education at the Wabasso Elementary School, wrote a grant the fall of 2007, for stability balls for their first and fifth grade classrooms. As funding becomes available, Wabasso would like to purchase stability balls for all of their students (C. Erickson, personal communication, September 19, 2007). A parent at Rippleside Elementary in Aitkin wrote a grant to purchase stability balls for a kindergarten, first, and a fifth grade class (L. Lehmann, personal communication, November 29, 2007).

Classroom of the Future

James Levine, MD, PhD, professor of medicine at Mayo Clinic and his colleagues, are conducting a study on the classroom of the future. Levine stated, “Anyone who either has a child or has spent 10 minutes with a child immediately realizes that children have a tendency to move a lot. If you suppress that, it can’t be good for a child” (Puliti, 2007). Levine and his colleagues have developed a classroom that introduced activity into the learning environment. The study collected data last year on the students at Elton Hills School in Rochester in a regular classroom. This year the students had chairs removed and conventional desks swapped for “standing desks,” which are similar to small podiums. To make the study feasible, laptops and wireless technology were incorporated into the classroom. Students lean on the podiums, kneel, or sit on an exercise ball. One of Levine’s colleagues, Jack Bennett, Med, PT, SCS, CSCS, and assistant professor of physical therapy at Maryville University in St. Louis stated, “The use of the exercise ball stimulates kinesthetic awareness and proprioceptive feedback; it improves trunk control and coordination of the limbs and forces the body to work at the level of its weakest part.

It has been shown that children who sat on the exercise balls have improved writing skills (Puliti, 2007). The students’ activity levels were measured ten times a second by an accelerometer-based system. The data collected in 2007 was compared to the data collected in 2006. Bennett stated, “Increased activity levels and enhanced physical fitness influence cognition and alertness in the classroom” (Pulitit, 2007). The classroom of the future is aspiring interest across the world, with 15 schools in the United States and 8 schools outside the country having contacted Levine and his colleagues. They have expressed their interest in the research data collected in the classroom of the future (Puliti, 2007).

Summary

Stability balls, as chairs, in the classroom may be part of the solution in helping student's behavior and learning. Schilling, Washington, Billingsley, and Deitz (2003) research with three students with Attention Deficit Hyperactivity disorder (ADHD) provided some support for the generality of the findings and is important since ADHD often coexists with other disorders. In addition, the teacher's and students' general preferences for therapy balls for seating supported the social validity of the intervention, making the stability ball compatible with inclusive educational practice and interdisciplinary teaming.

With the prevalence rate of Autism Spectrum Disorder on the rise, Schilling and Schwartz's (2004) research on alternative seating for young children with Autism Spectrum Disorder is timely. Their study found the intervention was effective with all participants, even though they have a variety of ability levels; the study encompassed a variety of settings, and included many different activities. This study provided one of the first empirically validated uses of sensory-based treatment for children with ASD in a classroom setting. Researchers caution not to over-generalize the findings. Therapy balls for seating appeared to provide children with ASD an opportunity to move while seated, while attaining and maintaining an optimal state of arousal for learning.

The classroom of the future is drawing attention from around the United States and other areas of the world. Many people believe the results of Levine and his colleagues' research is obvious. Levine, being a scientific researcher is waiting for the final evidence. In the meantime more studies are already ongoing, planned, or in the planning stages.

Many schools are beginning to see the possible effect stability balls have in the classroom. They are open to trying something different now that research studies are supporting the antidotal evidence that stability balls do affect behavior and achievement in the classroom for many different age groups of students and a variety of abilities.

This study added empirical data to the field of behavioral research, specifically; the affect stability balls have on behavior. It also added the empirical data on the effects stability balls have on achievement. Chapter 3 provides the methodology for this study.

CHAPTER 3

Research Methodology

"Movement activates the neural wiring throughout the body, making the whole body the instrument of learning" (Hannaford, 2005). Brain research has discovered, students need to move to learn. Schilling and Schwartz (2004) found that Switzerland has a program called "Moving Students are Better Learners," which comes from their belief that students are "less bored and better able to focus on classroom activities" when using a stability ball as a chair (p. 424). Schilling, Washington, Billingsley, and Deitz (2003), demonstrated "improvement in sitting behavior" and the teachers consulted in the study "supported the use of balls for the classroom seating" (p. 43). Schilling and Schwartz (2004) reported "improvement of both in-seat behavior and work production" (p. 424).

Both the Schilling and Schwartz 2004 study and the Schilling, Washington, Billingsley, and Deitz 2003 study were conducted on children in the preschool or elementary age group with specific disabilities. To add to the empirical knowledge of student behavior, this study was conducted on middle and high school students.

The purpose of the study was to examine the effects of stability balls, when used as chairs, on student behavior and achievement in a special education classroom. In addition, students' perceptions about the effect on their behavior and achievement when using a stability ball to sit on were examined. A single-subject ABAB design was used to collect the data on achievement and behavior. A survey at the end of the study was administered to collect information on the student's perceptions. Specifically, the study addressed the following research questions:

1. What are the effects of using stability balls, when used as chairs, on student behavior in a special education classroom in central Minnesota?

2. What are the effects of using stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?

3. What are the student's perceptions of their behavior and achievement when using stability balls as chairs in a special education classroom in central Minnesota?

This chapter describes the research methodology and procedures that were used to conduct the study. It addresses the following topics: (a) the population and sample of the participants, (b) the instrumentations used in the study, (c) the explanation of the data-collection techniques used to answer the research questions, and (d) a description of the data collection procedures, (e) a description of the data analysis, and (f) the summary.

Population and Sample

The population used in this study consisted of 8 Caucasian students assigned to a reading group and 4 Caucasian students assigned to a math group, in a special education classroom. Data were collected in a 7th through 12th grade public school in rural central Minnesota. The students ranged in age from 15-to-18 years old, with varying disabilities. There were 6 males and 2 females in the reading group and 3 females and 1 male in the math group. Sample behavior data were collected on 2 males and 2 females in each group. These students were chosen because of past behavior issues. Sample achievement data were collected on all students. The survey was given to all 11 of the students. A student was in both groups.

Instrumentation

Both quantitative (data collection on achievement and behavior) and qualitative (student survey) methodologies were used to determine the effects of stability balls, when used as chairs, on student achievement and behavior in a special education classroom.

The first test used with the reading group was a one-minute timed fluency test. In the timed fluency test a student reads a grade-level passage for one minute, while being timed. A fellow student followed along with a copy of the passage, marking errors as the first student read. When the timer beeped, the second student put a slash on the paper to indicate the last word the student read. The researcher was then able to count how many words the student read, subtracted the number read incorrectly, and had the number of words read correctly per minute. The students then changed jobs and the second student read for the first student. The researcher listened to different group of students reading each day to make sure the students were being accurate, with marking for errors and ending point. The second instrument used was a Maze test. A student silently read a grade-level passage for three minutes. As the student read, he encountered places in the sentences where he needed to choose the best answer out of three that fit in the sentence. The student circled his choice and continued on until the timer beeped. The teacher read the passage with the correct words inserted. Students put a line through the wrong answers. From the Maze test, the researcher was able to obtain a percentage of answers correct, by subtracting the number correct from the number of possible correct. The reading tests, fluency and Maze, are AIMSweb design, published by Edformation, Inc. The researcher used 8th grade level passages. The tests have a .60 to .80 range of validity (35) and .82 to .99 range of

reliability (Shinn & Shinn, 2002, p. 42). Researcher had access to AIMSweb probes as these are used in the high school classroom, where the research was conducted.

The first test the math students were given was a one-minute timed fact test, addition or subtraction. They were to write the answers as quickly as they could. If they made a mistake, they were to cross it out and write the correct answer. When the timer beeped, they were to put their pencils down. The researcher then read the correct answers, with the students putting a red line through the wrong answers. The researcher was then able to obtain a number correct per one-minute. The addition tests have a reliability of .72 to .98. The subtraction tests have a reliability of .70 to .99 (Shinn, 2004, p. 62). Saxon Math probes were the second type of test. These are five-minute tests designed from all the chapter tests at Level 2. The chapter tests were copied, each problem cut separately and put into a bag. The pieces were then randomly pulled from the bag and attached to a sheet of paper. Enough problems are pulled from the bag to cover three sheets of paper. Mark Markell, Ph.D., St. Cloud State (2006), stated probes should be long enough so that most students do not finish them. The Saxon Math probes are .83 to .93 reliable and valid. The administrations of the math probes were given as instructed by M. Markell Ph. D. (2006, p. 35).

Behavior data were collected on students with a duration recording form. The researcher carried two timers, one in each pocket. The timers were started at the beginning of the class period. When the student was off task, the researcher hit the timer button and the timer stopped. When the student was back on task the researcher hit the timer button again and the timer resumed. At the end of class, the amount of time on task was recorded (Appendix A). Behavior data were collected two days a week for 53 minutes.

The survey (Appendix E), developed by the researcher, (as a suitable published survey could not be found), was administered to students at the end of the study to determine the students' perceptions on the effect the stability balls had on their behavior and achievement. The questions were based on items discussed in other research studies (Schilling & Schwartz, 2004, p. 429, Schilling, Washington, Billingsley, & Deitz, 2003, p. 43). The school psychologist, occupational therapist, physical therapist, and two other special education teachers critiqued the survey prior to administration and found it to be a valid source of student data and social validity. The survey was administered through oral reading of the questions by the researcher in order to clarify the purpose of the survey and to answer any questions from the students.

Data Collection Procedures

The principal of the high school approved the study before proceeding (Appendix B). Permission was received from the parents of the students before the study began (Appendix C) and the students (Appendix D). One student gave his permission to participate in the study, but he indicated it was only because his mom said he had to cooperate. Permission to conduct the study was obtained from September 4, 2007, until November 21, 2007. Data were collected from two groups of students, one reading and one math.

For the reading group, a baseline on the reading fluency test and Maze tests were collected. It consisted of 6 group sessions. Students in the reading group were given one-minute timed grade level reading tests every other day class was in session to check fluency. They were given three-minute timed, grade-level Maze tests every other day class was in session to check for comprehension. Data were collected and charted until a baseline

was determined with students using classroom chairs. Behavior baseline data were collected, consisting of 8 sessions. Data were collected each day class met for 53 minutes, which consisted of teaching time and work time.

After baseline data were collected, the stability balls were substituted for the chairs. Students were given 3 days to acquaint themselves with using a stability ball. During this time, students and researcher decided on five simple rules for the use of stability balls. If rules were not followed, the student lost the privilege of using the ball for one week. Rules students helped write were: (1) keep both feet on the floor at all times, (2) beware of sharp objects, (3) throwing, kicking, or bouncing the balls is not allowed, (4) while bouncing, keep feet on the floor and butt on the ball, (5) one warning before ball is removed. Students were measured, as directed by research, to make sure they had the proper size ball for proper posture. In order to find the proper size ball, the researcher measured from the middle of the student's knee to the floor and observed that when sitting on the ball, the student's knees were bent at a 90-degree angle, with thighs parallel to the floor.

Data were collected for three weeks with students sitting on the stability balls. Then students used chairs for the next three weeks and stability balls for the last three weeks of the study.

For students in the math group, a baseline on the fact tests and math probes were collected, with students using chairs. It consisted of 6 sessions. Students were given one-minute timed fact tests, addition or subtraction, one every other day. The fact tests consisted of 84 addition facts or 84 subtraction facts. Data were collected and charted. Saxon Math Level-2 probes were given each day for six days to collect a baseline score. After a baseline was established, stability balls were used. Students were measured to make

sure they had the proper size ball for proper posture. Students were given three days to acquaint themselves with the stability balls. Data were collected for three weeks with students using the stability balls, and then students used chairs for three weeks, and the last three weeks stability balls were used.

Behavior data were collected on two male and two female in each group. The children charted had behavior issues in the past. Behavior for both groups was charted twice a week for 53 minutes, consisting of teaching time and work time. A baseline was found and charted.

The survey was administered to every student in both groups during class time. The survey was used to find out what students thought about using the stability balls and how they felt the use of the stability balls affected their behavior and achievement. The researcher clarified the instructions and answered any questions students had about the survey.

Data Analysis

Research question one stated, “What are the effects of stability balls, when used as chairs, on student behavior in the special education classroom in central Minnesota?” To answer this question a baseline was established, and then an average of time on task was collected during each phase of the study. Percentages were used to illustrate the effects of using a stability ball on student behavior.

Research question two stated, “What are the effects of stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?” To answer this question, a baseline was established using chairs. Data were collected during each phase of the study to see how stability balls effected achievement. Words read

correct per minute were used to determine fluency, errors read per minute were used to determine error rate, and words chosen correctly divided by the number of possible correct was used to determine a percentage illustrate the effects of using a stability ball on student achievement.

Research question three stated, “What are the student’s perceptions of their behavior and achievement when using stability balls in a special education classroom in central Minnesota?” To answer this question, the researcher had the students in both groups fill out a survey, which was completed in class. The researcher compared questions of similar content to find a correlation.

Summary

Chapter 3 describes the research methodology of the study. The assigned sample description of students in the middle school and high school with a variety of disabilities and the instruments used for data collection have been described so any researcher who would want to replicate this study would have the information needed. Chapter 4 presents the findings of this study.

CHAPTER 4

Results

The purpose of this study was to identify the effects of stability balls on student behavior and achievement. Student's perception on their behavior and achievement were also surveyed. The researcher has attempted to answer the original research questions:

1. What are the effects of stability balls, when used as chairs, on student behavior in a special education classroom in central Minnesota?
2. What are the effects of stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?
3. What are the student's perceptions of their behavior and achievement when using stability balls as chairs, in a special education classroom in central Minnesota?

Chapter 4 presents the results of this study. It includes the following topics: (a) the demographic data regarding the population, (b) findings related to each research question, and (c) a summary of the results.

Demographic Data

The demographic characteristics of this study were divided into two groups. The groups consisted of students assigned to the class, not a random group. The first group was a reading group, which included 6 males and 2 females, all Caucasian. Their ages ranged from 15-to18 years. The second group was a math group, which included 1 male and 3 females, all Caucasian. Their ages ranged from 15-to-17 years. All of these students attended a small rural school, which included both junior and senior high in one building. The classes took place in a special education classroom. Tables 1, 2, and 3 reveal the demographic data of the participants.

Table 1

Reading Class Demographic Data

Grade Level	Male	Female	Frequency	Percentage
12 th Grade	2	0	2	25.0
11 th Grade	2	1	3	37.5
10 th Grade	2	1	3	37.5
Totals	6	2	8	100.0

Table 1 reveals that the twelfth grade students comprised 25% of the class, with 100% of them being male. Eleventh grade students comprised 37.5% of the class, with 66.6% being male and 33.3% being female. Tenth grade students comprised 37.5% of the class, with 66.6% being male and 33.3% being female. For the total class, males comprised 75% and females comprised 25%.

Table 2

Math Class Demographic Data

Grade Level	Male	Female	Frequency	Percentage
11th Grade	0	3	3	75
9 th Grade	1	0	1	25
Totals	1	3	4	100

Table 2 reveals that eleventh grade students comprise 75% of the class, with 100% of them being female. The ninth grade male student comprises 25% of the class. For the total class, males comprise 25% and females comprise 75%.

Table 3

Student Disabilities Data

Student	Disability Category/Diagnosis	On Medication
A	Learning Disability (SLD)	No
B	Learning Disability (SLD)	No
C	Learning Disability (SLD)/Social Anxiety	Yes
D	Learning Disability (SLD)	No
E	Learning Disability (SLD)/Attention Deficit Hyperactivity Disorder (ADHD)	No
F	Learning Disability(SLD)	No
G	Oppositional Defiant Disorder , Seizure Disorder (OHD)	Yes
H	Emotional Behavioral Disorder (EBD)	No
I	Oppositional Defiant, Seizure Disorder (OHD)	Yes
J	Developmentally Cognitively Disabled (DCD)/ Selective Mutism, Attention Deficit Hyperactivity Disorder (ADHD)	Yes
K	Developmentally Cognitively Disabled (DCD)/ Attention Deficit Hyperactivity Disorder (ADHD)	Yes
L	Developmentally Cognitively Disabled (DCD)	No

Table 3 shows the disability category the students from the study were qualified under, plus their primary diagnosis. The last column shows if the student was on medication for the diagnosis.

Findings Related to the Research Questions

This section presents data to answer the researcher's questions to the study. The data were collected from September 4, 2008 to November 21, 2008 by the researcher. Research question one asked, what are the effects of stability balls, when used as chairs, on student behavior in a special education classroom in central Minnesota? Table 4 shows the average increase/decrease in the on-task behavior time of the students.

Table 4

Effects of Stability Balls on On-Task Behavior

Student	Baseline	Ball	Chair	Ball
Student C	60%	75%	70%	85%
Student E	40%	60%	40%	65%
Student G	40%	55%	40%	60%
Student J	60%	75%	65%	80%

Student C's on-task behavior improved in both phases of the study where the students used the balls for chairs. When using the chair, the student decreased on-task time by 5%. Student E's on-task behavior improved 20% when using the ball the first time and 25% during the second time on the balls. The student's percentage of on-time task when

using the chair remained the same. Student G's on-task behavior improved 15% during the first time using the ball and 20% during the second time, with a decrease of 15% during the chair phase. Student J's on-task behavior improved 15% during each time the stability ball was used and decreased 10% during the chair phase.

The students' on-task behavior improved for all 4 students, from 15%-20% during the first stability ball phase, an average of 16.25% increase. All 4 students' on-task behavior decreased 5%-20% during the chair phase, an average of 12.50% decrease. The 4 students' on-task behavior improved 15%-25% during the second stability ball phase, an average of 18.75% increase.

Research question two asked, what are the effects of stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota? Tables 5-10 reveal the data collected from the study to show how using a ball as a chair affects achievement.

Table 5 shows the fluency (average words correct per minute), error (average number of errors per minute), and comprehension (average percent correct) scores throughout the study.

Table 5

Effects of Stability Balls on Achievement in Fluency, Error Rate, and Comprehension

Conditions	Student A	B	C	D	E	F	G	H
Baseline: Chair								
Fluency	116.00	114.25	92.00	152.50	143.25	110.25	90.25	99.75
Error rate	1.25	1.50	2.50	.58	1.35	1.00	.75	.75
Comprehension	88.50	90.25	92.35	95.25	90.35	90.50	80.00	78.75
Treatment: Ball								
Fluency	119.00	117.86	96.63	160.43	159.13	113.57	94.60	106.00
Error rate	1.20	1.34	2.00	.25	1.00	.75	.17	.50
Comprehension	90.75	93.26	97.16	99.59	94.62	94.29	88.00	83.72
Baseline: Chair								
Fluency	122.14	116.34	94.00	159.25	147.14	110.38	102.00	109.00
Error rate	1.25	.38	2.33	.15	.86	.43	.25	.20
Comprehension	95.11	96.45	95.90	98.63	96.03	93.30	89.00	95.18
Treatment: Ball								
Fluency	129.67	121.25	113.29	165.67	166.60	120.00	107.29	114.50
Error rate	.70	.14	1.29	0	.97	.83	.14	0
Comprehension	96.09	99.29	99.00	99.30	99.30	99.00	98.20	96.88

Note: Fluency=average words correct per minute. Error rate=average number of errors per minute, Comprehension=average percentage correct

Fluency scores for 5 students increased during each of the phases of the study. For 3 students, fluency scores increased from the baseline to the first ball treatment, decreased during the second baseline, and then increased again during the treatment. Error scores for 3 students decreased from the baseline to the first ball treatment, increased from the first treatment to the second baseline, and then decreased again from the second baseline to the

second treatment. Error scores for 3 students decreased throughout the study. For 2 students, error scores decreased from the baseline, to the treatment, again to the baseline, but increased from the second baseline to the treatment. Comprehension scores for 5 students increased throughout the study. For 3 students, comprehension scores increased from the baseline to the first treatment, decreased from the treatment to the second baseline, and then increased from the second baseline to the second treatment.

Table 6 shows the students average increase or decrease in fluency, errors, and comprehension when moving from Baseline 1 to Treatment 1, from Treatment 1 to Baseline 2, and from Baseline 2 to Treatment 2.

Table 6

Increase or Decrease in Fluency, Error, and Comprehension

Area of Achievement Condition	Student A	B	C	D	E	F	G	H
Fluency								
B1 to T1	+3.00	+3.61	+4.63	+7.93	+15.88	+3.32	+4.35	+4.97
T1 to B2	+3.14	-1.52	-2.63	-1.18	-11.99	-3.19	+7.40	+3.00
B2 to T2	+7.56	+4.91	+19.29	+6.42	+19.46	+10.45	+5.29	+5.50
Error								
B1 to T1	-.05	-.16	-.50	-.33	-.35	-.25	-.58	-.25
T1 to B2	+.50	+.96	-.33	+.10	+.14	+.32	-.08	+.30
B2 to T2	-.55	+.24	+1.04	+.15	-.11	-.40	+.11	+.20
Comprehension								
B1 to T1	+2.25	+3.01	+4.81	+4.34	+4.27	+3.79	+8.00	+4.97
T1 to B2	+4.36	+3.19	-1.26	-.96	+1.41	-.97	+1.00	+11.46
B2 to T2	+.98	+2.84	+3.10	+.37	+3.27	+5.70	+5.50	+1.70

Note: B1= first baseline chair use. T1= first stability ball use. B2= second chair use. T2= second stability ball use
Fluency=average words correct per minute. Error =average number of errors per minute. Comprehension=average percentage correct

The learning growth score expected is .50 correct words per minute, per week or 2% over the 12 week study (Romsdahl, 2006, p. 23). All 8 of the students' fluency scores increased when moving from Baseline 1 to Treatment 1, from 3.00 to 15.88 correct words per minute, an average of 5.96 correct words per minute. The average word per minute for 5 of the students decreased from 11.99 to 1.18, an average of 4.10 words per minute, when moving from Treatment 1, using the stability ball, to Baseline 2, using the chair. The other

3 students increased from 3.00 to 7.40 when moving from Treatment 1 to Baseline 2. This is more than the expected learning growth rate by 1 to 5.40 correct words per minute. Student fluency rates improved for all 8 students from 4.91 to 19.46 correct words per minute, when moving from Baseline 2 to Treatment 2, an average of 9.86 correct words per minute. This is more than the expected learning growth rate by 2.91 to 17.46 correct words per minute.

Student error scores decreased for all 8 students when moving from Baseline 1 to Treatment 1, from .58 to .16 errors per minute, an average of .31 errors per minute. This means all 8 of the student decreased in the number of errors per minute they made while reading. Student error scores for 6 of the students increased from .10 to .96, when moving from Treatment 1 to Baseline 2. This means the students increased in the number of errors they made during the one-minute timed reading test. Student error scores decreased for 2 students, .33 and .08, when moving from Treatment 1 to Baseline 2. This means the students decreased the number of errors they made during the one-minute timed reading test. Student error scores for 5 students increased from .11 to 1.04 when moving from Baseline 2 to Treatment 2, an average of .348. Student error scores decreased for 3 students, .55 to .11, an average of .33.

All 8 student comprehension scores increased when moving from Baseline 1 to Treatment 1, from 2.25 to 8.00 words correct, an average of 4.43 words correct. Comprehension scores increased for 5 students from 1.00 to 11.46, when moving from Treatment 1 to Baseline 2. This means the students increased the number of words per minute they comprehended during the three-minute timed reading test. Student comprehension scores for 3 students decreased from 1.26 to .96 correct words, an average

of 1.04 correct words. Student comprehension scores increased for all 8 students from .37 to 5.70 correct words, when moving from Baseline 2 to Treatment 2, an average of 2.93 correct words per minute.

Table 7 shows the average fluency, error, and comprehension scores, with Treatment 1 & 2 averaged together and Baseline 1 & 2 averaged together for comparison.

Table 7

Average Fluency, Error, and Comprehension Rates

Student	Fluency Treatment 1&2	Fluency Baseline 1&2	Error rate Treatment 1&2	Error rate Baseline 1&2	Comprehension Treatment 1&2	Comprehension Baseline 1&2
A	124.34	119.07	.95	1.25	93.42	91.81
B	119.56	115.30	.74	.94	96.28	93.35
C	104.96	93.00	1.65	2.42	98.08	94.13
D	163.05	155.86	.13	.37	99.45	96.99
E	162.87	145.20	.99	1.11	96.96	93.19
F	116.79	110.32	.79	.72	96.60	93.30
G	100.95	96.13	.16	.50	93.10	84.50
H	110.25	104.38	.25	.48	90.30	86.97

Note: Treatment 1 & 2 on the stability ball are averaged together for comparison purposes to Baseline 1 & 2, on the chair

Averaged student fluency scores increased during Treatment 1 & 2 over Baseline 1 & 2 from 4.26 to 17.60 correct words per minute, an average of 7.93 correct words per

minute. All of the averaged scores were more than 4 correct words per minute with 2 students above 10 correct words per minute. Averaged error scores for 5 students decreased during Treatment 1 & 2 over Baseline 1 & 2, which means the students had fewer errors. The averaged error scores decrease from .34 to .12, which is an average of .23 errors per minute. The 3 students who had an increase, from .07 to .77 averaged .35 errors per minute. Error scores for all the students were small, with all but 1 student averaging less than 1 error per 2 minutes. All 8 students averaged an increase in comprehension scores during Treatment 1 & 2 over Baseline 1 & 2, from 1.61 to 8.60, an average of 3.74 correct words. Averaged comprehension score for 1 student was above 8 correct words.

Table 8 shows addition, subtraction and math probe average scores during the Baseline 1, Treatment 1, Baseline 2, and Treatment 2.

Table 8

Effect of Stability Ball on Addition, Subtraction, and Math Probes

Area of Achievement Condition	Student I	J	K	L
Addition				
Baseline 1	10.50	12.35	9.25	7.00
Treatment 1	12.34	15.29	10.00	8.00
Baseline 2	13.13	21.00	13.75	13.50
Treatment 2	17.75	21.88	15.13	15.13
Subtraction				
Baseline 1	11.75	8.25	24.50	4.25
Treatment 1	14.13	9.38	26.60	6.38
Baseline 2	16.40	10.00	28.00	10.67
Treatment 2	21.80	20.40	37.50	13.71
Saxon 2 Probes				
Baseline 1	7.25	5.00	7.50	2.50
Treatment 1	8.00	6.00	9.00	3.34
Baseline 2	8.60	7.50	9.34	4.00
Treatment 2	13.30	13.40	11.00	12.00

Note: The addition and subtraction are average scores correct in one minute. The math probes are average scores correct in three minutes.

Average addition scores increased throughout the study, from .75 to 2.94 facts correct per minute. The average increase was 3.88 addition facts correct per minute. Average subtraction scores increased throughout the study, from 1.1.3 to 2.38 correct facts per minute. The average increase was 1.94 correct subtraction facts per minute. Average math probe scores increased throughout the study, from .75 to 1.50 correct math problems. The average increase was 1.02 correct math problems.

Table 9 shows the increase in the addition, subtraction, and math probe scores.

Table 9

Amount of Increase in Addition, Subtraction, and Math Probes

Area of achievement Condition	Student I	J	K	L
Addition				
B1 to T1	+1.84	+2.94	+.75	+1.00
T1 to B2	+.79	+5.71	+3.75	+5.50
B2 to T2	+4.62	+.88	+1.38	+1.63
Subtraction				
B1 to T1	+2.38	+1.13	+2.10	+2.13
T1 to B2	+ 2.27	+.62	+1.40	+ 4.29
B2 to T2	+5.40	+10.40	+9.50	+3.04
Math Probes				
B1 to T1	+.75	+1.00	+1.50	+.84
T1 to B2	+.60	+1.50	+.34	+.66
B2 to T1	+4.70	+5.90	+1.66	+8.00

Note: B1= first baseline chair use. T1= first stability ball use. B2= second chair use. T2= second stability ball use

Average student addition scores increased for all 4 students throughout the study. When moving from baseline 1 to treatment 1, the students increased an average of 1.63 correct addition facts per minute. When moving from treatment 1 to baseline 2, students increased an average of 3.94 correct facts per minute. When moving from baseline 2 to treatment 2, students increased an average of 2.13 correct facts per minute. The largest

increase was during the treatment 1 to baseline 2 phase, though all of the increases were small.

Average student subtraction scores increased throughout the study. When moving from baseline 1 to treatment 1, students increased an average of 1.94 correct subtraction facts per minute. When moving from treatment 1 to baseline 2, students increased an average of 2.15 correct subtraction facts per minute. When moving from baseline 2 to treatment 2, students increased an average of 7.09 correct subtraction facts per minute. The largest increase was during the baseline 2 to treatment 2 phase, with a significant increase.

Average student Saxon Math Probe scores increased in all 4 students throughout the study. When moving from baseline 1 to treatment 1, student increased an average of 1.02 math problems correct. When moving from treatment 1 to baseline 2, student increased an average of .78 correct math problems. When moving from baseline 2 to treatment 2, student increased an average of 5.07 correct math problems. The largest increases were during the treatment phases of the study.

Table 10 shows the average addition, subtraction, and math probe scores.

Table 10

Average Addition, Subtraction, and Math Probe Scores

Student	Addition T1&T2	Addition B1& B2	Subtraction T1&T2	Subtraction B1&B2	Math Probe T1&T2	Math Probe B1&B2
I	15.05	11.82	17.97	14.08	10.65	7.93
J	18.59	16.68	14.89	9.13	9.70	6.25
K	12.57	11.50	32.05	26.25	10.00	8.42
L	11.57	11.25	10.05	7.46	7.67	3.25

Note: T1= first stability ball use. T2= second stability ball use. B1=first use of chair. B2= second use of chair. T1&T2, both on the stability ball are averaged together for comparison purposes to B1 & B2, on the chair

Students' average addition facts correct per minute was higher for all 4 of the students during the treatment phases of the study. Student average subtraction facts correct per minute was higher for all 4 students during the treatment phases of the study. Student's average correct math problem score was higher for all 4 students during the treatment phases of the study.

Research question three asked what are the student's perceptions of their behavior and achievement when using stability balls as chairs, in a special education classroom in central Minnesota? Figures 1-8 shows data collected from the student survey on student's perceptions about the use of stability balls. The survey asked students 16 questions with the choice of strongly agree (*SA*), agree (*A*), undecided (*U*), disagree (*D*), or strongly disagree (*SD*).

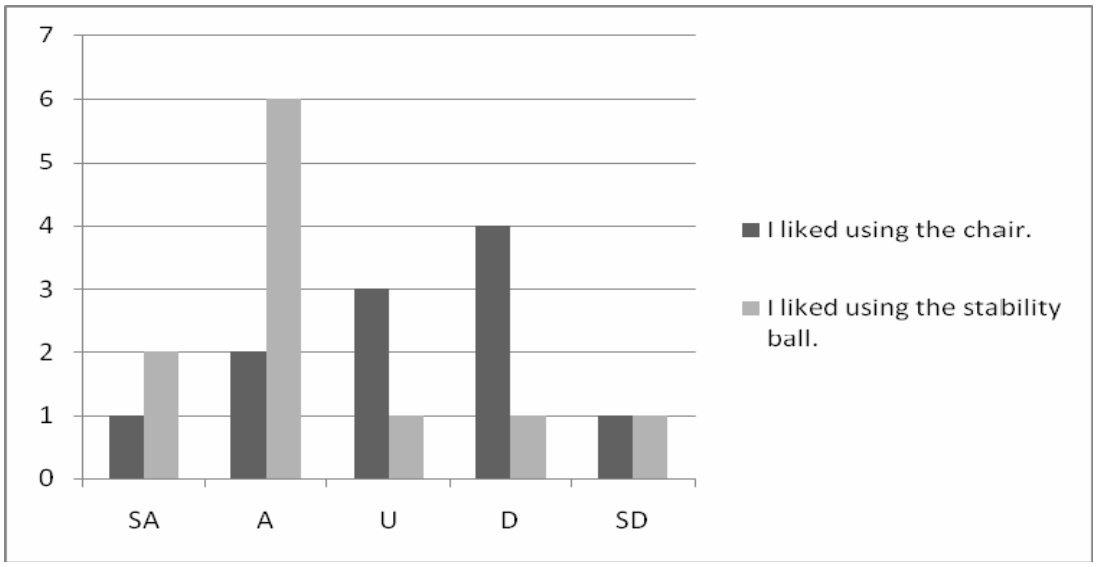

Figure 1. Student perception of using stability ball and chair.

Figure 1 shows students perceptions on how they liked using a chair or a stability ball, using information from questions 1 and 2 from the survey. The figure shows that 8 out of 11 student either were undecided or did not like the chair and 8 out of 11 students did like the stability balls.

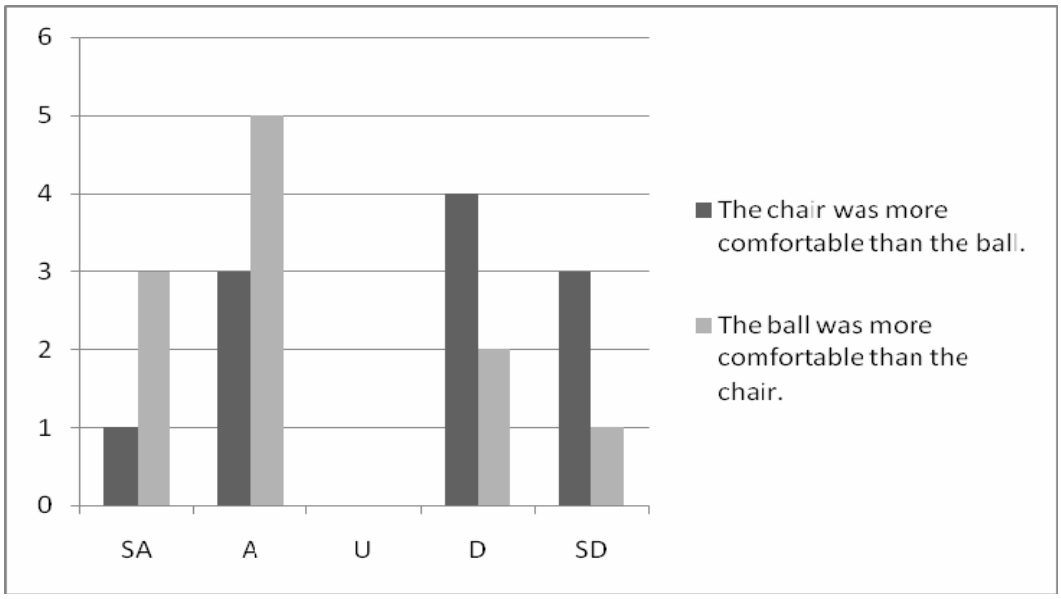

Figure 2. Student perceptions on the comfort of stability ball and chair.

Figure 2 shows the perception of students on the comfort of the stability balls and chairs using data received in questions 3 and 4 of the survey. The figure shows more students, 8 out of 11, thought the stability balls were more comfortable than the chairs.

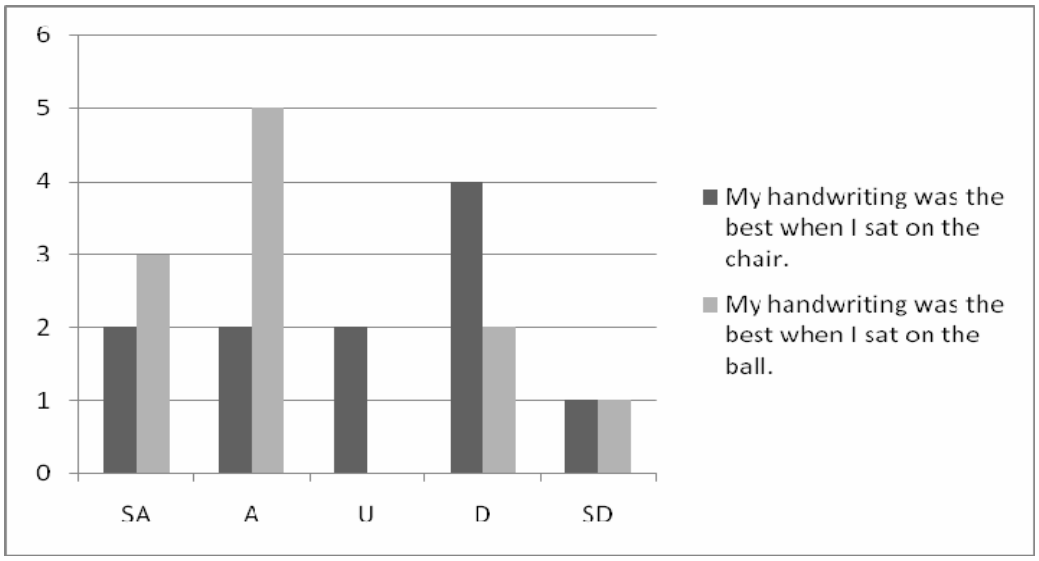

Figure 3. Student perceptions on handwriting.

Figure 3 shows student perceptions on handwriting when sitting on the stability ball and chair, using data from questions 5 and 6 on the survey. Most students, 8 out of 11, thought their handwriting better when using the stability balls, than when using the chair.

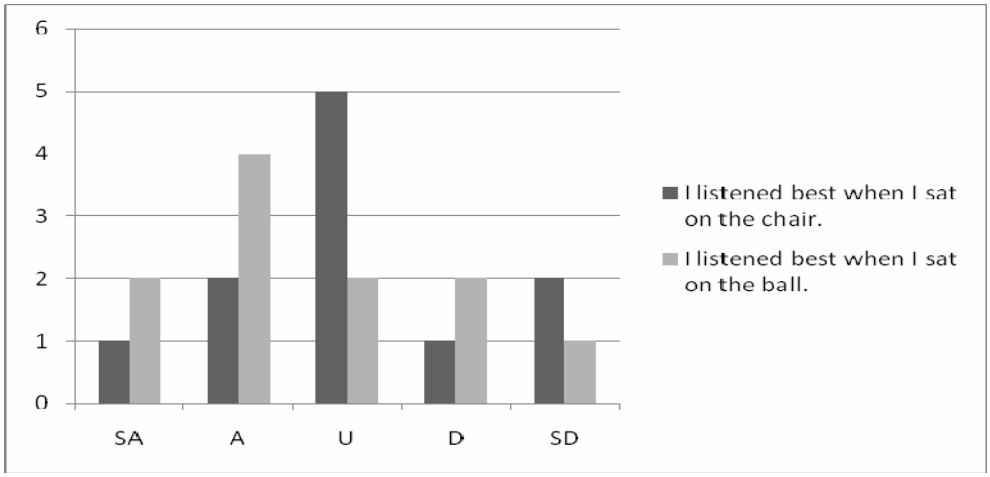

Figure 4. Student perceptions on listening.

Using data from questions 7 and 8 on the survey, Figure 4 shows students' perceptions of when they listen best, sitting on the stability ball or sitting on a chair. The data collected showed 6 out of 11 students believed they listened better on the stability ball, while 3 out of 11 thought they listened better on a chair. A large group, 5 out of 11, was undecided about their listening when sitting in a chair, while only 2 out of 11were undecided about listening while sitting on a ball.

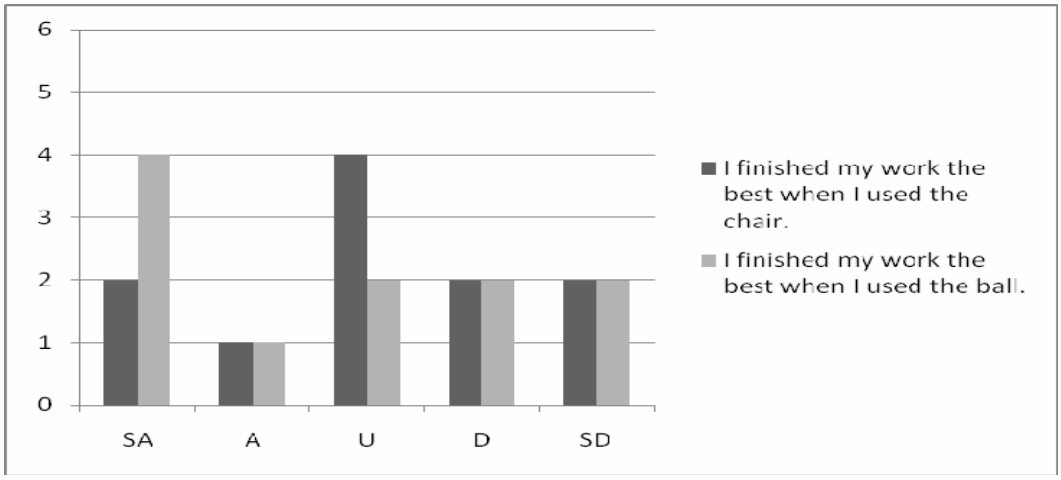

Figure 5. Student perceptions on finishing work.

Using the data from questions 9 and 10 of the survey, Figure 5 showed students' perceptions of when they finished their work the best, sitting on a stability ball or sitting on a chair. The data collected showed 5 out of 11 students believed they finished their work better when using a stability ball, while 3 out 11 believed they finished their work better using a chair. About a third of the students, 4 out of 11, were undecided about whether sitting on a chair helped them finish their homework, while 2 out of 11 were undecided about whether a stability ball helped them finish their work.

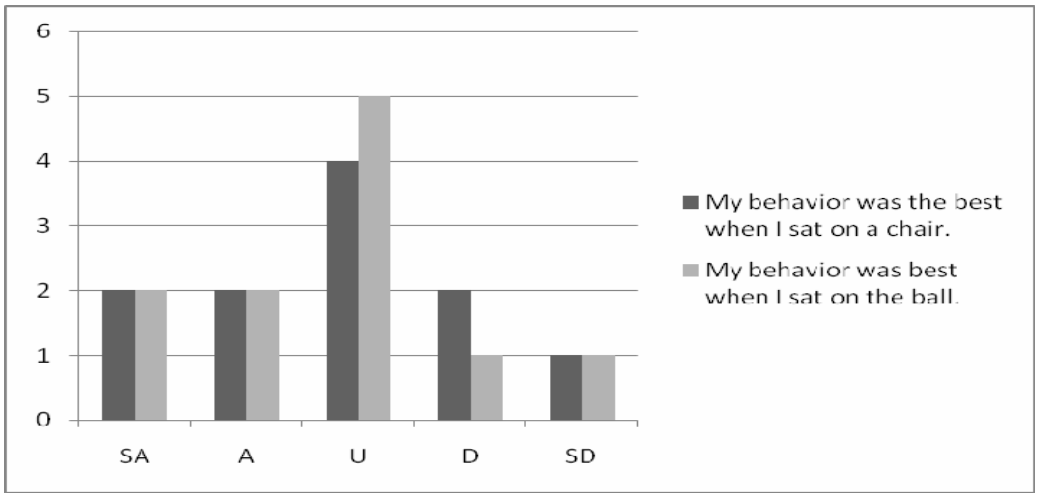

Figure 6. Student perceptions on behavior.

Using data from questions 11 and 12 of the survey, Figure 6 showed students' perceptions of their behavior when sitting on a ball or a chair. The data collected showed 4 out of 11 students' believed their behavior was better on a ball, while 4 out of 11 thought their behavior was better when using a chair. A large group, 5 out of 11, was undecided about whether using a stability ball effected their behavior, while 4 out of 11were undecided about the effect of using a chair had on their behavior.

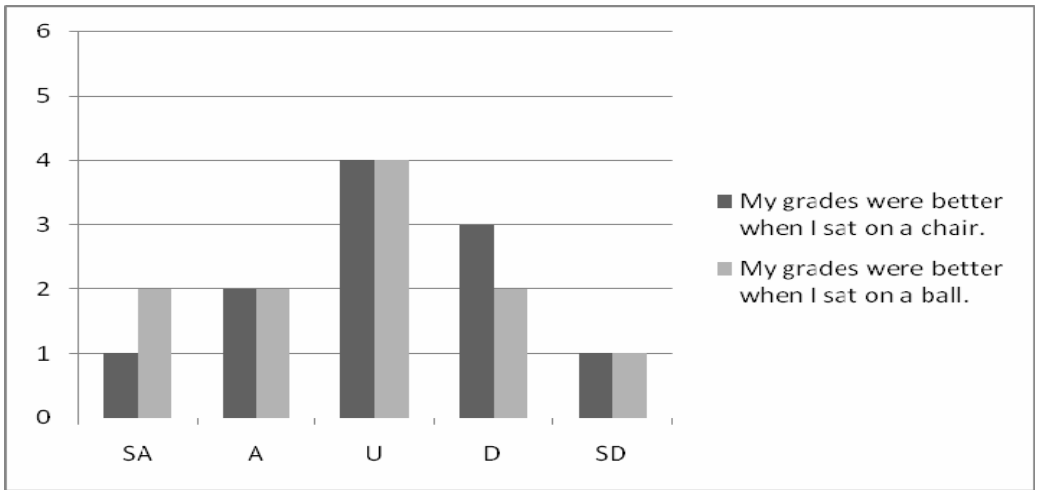

Figure 7. Student perceptions on grades.

Using data from questions 13 and 14 of the survey, Figure 7 showed students' perceptions of when their grades were the best, when sitting on a stability ball or a chair. The data collected showed 4 out of 11 students believed their grades were better when sitting on a stability ball, while 3 out of 11 thought their grades were better when sitting on a chair. In both groups, 4 students were undecided about whether a stability ball or a chair had any effect on their grades.

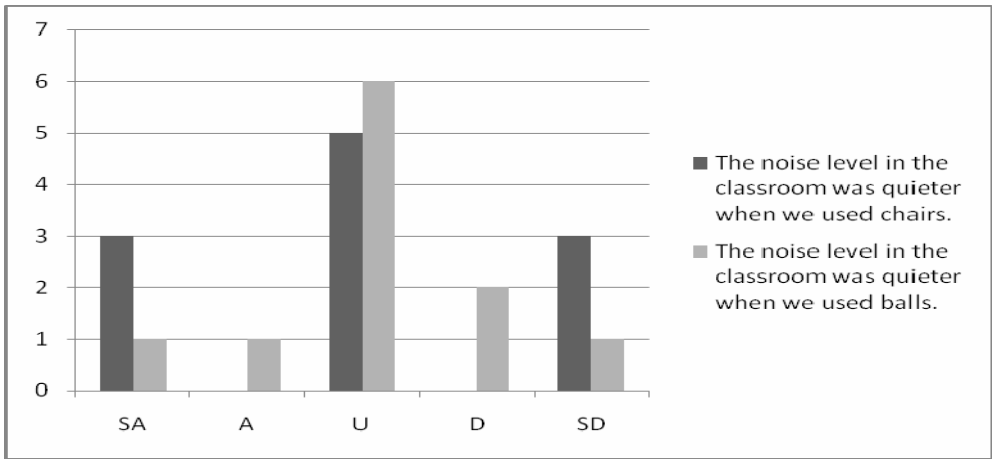

Figure 8. Student perceptions on noise level.

Using data from questions 15 and 16 of the survey, Figure 8 showed students' perceptions of when the noise level in the classroom was the quietest, when sitting on stability balls or chairs. The data collected revealed 2 out of 11 students thought the noise level was quieter when using balls, while 3 out of 11 students thought the noise level was quieter when using the chairs. The majority of the students were undecided about the balls or chairs affecting the noise level in the classroom.

The overall students' perceptions of the balls are as varied as the students themselves. Most students liked using the balls as chairs (73%) and found them comfortable (73%). Some of the students (36%) thought their handwriting was better when using a chair, but a greater percentage (73%) thought their handwriting was better when on the ball. Students' perception on their listening was mixed as was finishing their work. Students' perceptions of their best behavior and grades when on the balls or chairs were about the same. The noise level was mixed with 27% thinking it was quieter on the chairs; 18% thinking it was quieter on the balls, and 46%-55% undecided.

Summary

Chapter 4 provided data to answer the research questions of this study. It was found that on-task behavior improved for all four of the students in both sections of the study where they used stability balls. In the reading classroom, average fluency rates improved for 7 out of 8 students with 2 students having a significant increase of more than 10 words per minute. Average error rate decreased for 6 students. Error rates were very small for all the students, with most averaging less that 1 error per 2 minutes. Average comprehension rates improved for 5 students, with 3 averaging 2% or more and 1 averaging more than 4% growth. In the math classroom, student addition scores improved for 1 student by almost 2 correct facts per minute, while 3 students improved by a greater number than expected. Student subtraction scores improved for 3 students from almost 2 correct facts per minute to 5 correct facts per minute. Math probes improved for all 4 students by 1/2 to almost 4 problems correct per 3 minutes.

Student perceptions about the use of stability balls in the classroom are mixed. A majority of the students liked using the balls and found them comfortable. Many students thought their handwriting was better when sitting on stability balls. Students' perceptions on the effect stability balls have on their listening, finishing their work, behavior, grades, and noise levels is inconclusive. Chapter 5 summarizes the study and presents conclusions, discussion, and recommendations based on the findings.

Chapter 5

Summary, Conclusion, Discussion, and Recommendations

Chapter 5 is organized into four sections. The first section presents a summary of the study, including the results of the study. The second section presents conclusions drawn from the results of the data analysis. Section three contains a discussion that explores the results and conclusions of the study. The final section focuses on recommendations for practice and further study.

Summary

This study examined the effects of stability balls on students' behavior and achievement in the special education classroom, in a central Minnesota high school. Students' perceptions on the effect a stability ball has on their behavior and achievement were explored.

Background of the Study

A typical classroom has hard chairs, students listening to a lecture or taking notes, all the while trying to sit still and be quiet. How are teachers to help students be successful who have a problem with one or more than one of these issues? Stability balls are making their way into classrooms across the country. Teachers have been hearing anecdotal evidence and are now reading studies that show stability balls as being a help to some students. Are they part of the answer? Studies are now taking place in many states and here in Minnesota to find out if stability balls have an effect on student behavior and achievement. Some of those studies are; Zauchar's 6th grade classroom (Zucher, 2007, p.4-5), Dunphy's kindergarten classroom (M. Knebel, personal communication, March 6, 2007), Norlin's 5th grade classroom (Tweed, 2008, p. A5), Henkel's Title I room (Tweed,

2008, p. A5), and Erickson's special education classroom (C. Erickson, personal communication, September 19, 2007).

Purpose

The purpose of the study was to determine if the use of stability balls affects student behavior and achievement in a special education classroom, in a rural high school. The researcher investigated the possibility that the use of stability balls would increase time students are on-task and would increase student achievement scores. The study was also conducted to identify students' perceptions of the use of stability balls, as chairs in the classroom, on their behavior and achievement.

Methodology

A single-subject ABAB design was used to collect the data for the achievement and behavior, with the Baseline 1 (A) using chairs, Treatment 1(B) using the stability balls, Baseline 2 (A) using chairs, and Treatment 2 (B) on the stability balls. The assigned students were in two groups, a reading group and a math group. AIMESweb probes were used to score the reading group on fluency, error rate, and comprehension. AIMESweb probes were used to score the math group on addition, subtraction, and math probes. Four students, who in the past had behavior issues, were observed for on-task behavior and scored on a percentage basis. A survey at the end of the study was given to collect information on the student's perceptions. Students were asked about how they liked using the ball or chair and the comfort of the ball compared to a chair. Students were asked about their perceptions on the effect stability balls and chairs had on their handwriting, listening, finishing work, behavior, and their grades. Last of all, students were asked about their

perceptions on the noise level in the classroom when using balls/chairs. Specifically, the study addressed the following research questions:

1. What are the effects of using stability balls, when used as chairs, on student behavior in the special education classroom in central Minnesota?

2. What are the effects of using stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?

3. What are the student's perceptions of their behavior and achievement when using stability balls as chairs in a special education classroom in central Minnesota?

Results

Data analysis revealed the following results:

1. Student on-task behavior increased on average 15% to 20% from the baseline to treatment1. Their on-task behavior decreased on average 5% to 20% when students moved to the chairs, baseline 2. Students increased their on-task behavior on average 15% to 25% during treatment 2 of the study. Overall, the students' on-task behavior increased when using the stability balls as chairs.

2. Student achievement was looked at in three areas of reading: fluency, error, and comprehension scores. Five student's average fluency scores decreased when moving from treatment 1, using a stability ball, to baseline 2, using the chair, and 3 student's average scores increased. All the student's average fluency scores increased when moving back to the stability balls, even when the 2% expected learning growth was subtracted. Average error scores for 6 students increased when moving from the ball to the chairs, and 2 students' average error scores decreased. When moving from the chairs to the balls, 5 average student error scores increased and 3 student error scores decreased. The average

comprehension percentages for 5 students increased when moving from the stability balls to the chairs and 3 student scores decreased. When moving back to the stability balls, all 8 students average comprehension percentages increased, with 5 of the students improving by more than the expected 2% learning growth.

3. Student achievement was looked at in three areas of math: addition facts, subtraction facts, and Saxon Math probes. All 4 student average addition scores increased when moving from the stability balls to the chairs, with 3 of them by more than the expected 2% learning growth. All 4 of the students increased again when they moved back to the stability balls, with 1 by more than 2%. When looking at subtraction, all 4 student average subtraction scores increased, with 2 students by more than the expected 2% when moving from the stability balls to the chairs. When the students went back to the stability balls their average subtraction scores increased, with all 4 by more than the expected 2% learning growth. The Saxon Math probes revealed all 4 students increased in the number of problems correct, but none by more than 2% when moving from the stability ball to the chair. All 4 student's average scores increased when moving back to the stability balls, with 3 of them by more than 2%.

4. Social validity was looked at for the use of stability balls in the classroom. Of the students in the study, 73% indicated they liked using the stability balls and found them comfortable. The researcher had one student who was opposed to the study throughout the entire time of the study, even though he gave his permission to participate and the use of his data. By looking at figures 7 and 8, students seemed undecided if the stability ball helped their behavior or achievement.

Conclusion

The conclusions for the study are listed as follows, in response to research question numbers one through three:

1. Stability balls may be part of the answer for teachers to help their student be more successful in the classroom.

2. Student behavior may improve when using stability balls as chairs.

3. Most student average fluency rates and comprehension rates may improve when using a stability ball.

Discussion

Stability balls are making their way into classrooms around the world. Switzerland has used them for many years, as they believe movement equals learning. Teachers need to look at different ways to help student become more successful in the classroom. This study shows that stability balls may be part of the answer. Behavior documentation reveals all of the student behavior improved when sitting on the stability balls. Any student a teacher has behavior issues with should think about trying a stability ball to help the student. Schiling, Washington, Billingsley, and Deitz (2003) found in-seat behavior and legible word productivity, students increased after the use of stability balls for 12 weeks (p. 1). Schilling and Schwartz (2004) found “substantial improvement in engagement and in-seat behavior” after 3 weeks of using stability balls (p.1). Not only was behavior affected, but achievement in fluency, comprehension, addition facts, subtraction facts, and Saxon math probes improved. Overall, in this study, average addition fact scores, subtraction fact scores, and math probe scores increased. Tweed (2008) stated “students are more alert during the

school day and this alertness has improved their school work, including their handwriting" (A5). Teachers may be surprised by the results.

This study found stability balls to be socially valid. Students asked to use the stability balls when they came to work in the special education classroom, where the research was conducted.

When starting a class on stability balls it is important to remember to fit each student to the right size ball. Students should be a part of the rule making process, with 4-5 rules for using the stability balls. Teachers need to be aware in the beginning that student bouncing is distracting, but they should easily adjust. Students will need a few days to adjust to the balls if the teacher plans to use them full-time. The study had the students for 54 minutes at a time so there was no need to switch from balls to chairs because of stiff backs.

Recommendations

Recommendations for Practice

This researcher recommends teachers purchase a few stability balls for their classrooms and have students with behavioral problems try them. Finding grant money to outfit the whole classroom would be a great addition to the over all atmosphere of the classroom.

Recommendations for Further Study

This study was limited to the perceptions of 11 students in a rural high school in a special education classroom. The results and conclusions of this study suggest that there is a need for further research. The following studies are suggested.

1. A larger sample size needs to be sought to add more validity to the findings.

2. A more diverse population of students needs to be sought to see if the findings are the same for different ethnic groups.

3. Mainstream classrooms at different levels of schooling such as high school, middle school, elementary school, and kindergarten needs to be sought to add more validity to the findings.

4. The survey questions asked of the students need to be set up differently, as the questions need to have the students make a choice between which they prefer, chairs or stability balls.

References

Carriere, B. (1998). *The Swiss ball: Theory, basic exercise and clinical application.* Berlin: Springer-Vertag.

Estrada, H.M. (2007, October 28). Keeping students on the ball. *Minneapolis Star Tribune*, pp. B1, B7.

Hannaford, C. (2005). *Smart moves: Why learning is not all in your head* (2 nd Ed.). Salt Lake City: Great River Books.

Holman, K. (2005). There is insufficient evidence (level 4) to support or refute the use of therapy balls a s an alternate form of seating for improving classroom behavior of children with autistic/behavioral disorders. Unpublished master's thesis, University of Western Sydney, Sydney, Australia.

Illi, U. (1994). Balls instead of chairs in the classroom. Swiss Journal of Physical Education, 6, 37-39.

Mayo Clinic News (2006). Retrieved on June 10, 2007 from http://www.mayoclinic.org/levine-classroom-future.

Merriam-Webster Online Dictionary. (2007). Retrieved on July 12, 2007 from http://www.merriam-webster.com.

Puliti, B. (2007). Standing room only. *Advance for Occupational Therapists.* 23 (1). 40.

Rivlin, R., & Gravelle, K. (1984). *Deciphering the senses: The expanding world of human perception.* NY: Simon & Schuster.

Romsdahl, N. (2006). *Software guide: AIMSweb progress Monitor teachers.* Edformation, Inc. Retrieved on September 1, 2006, from https://www.aimsweb.com.

Schilling, D. L., & Schwartz, I. S., (2004). Alternative seating for young children with autism spectrum disorder: Effects on classroom behavior . *Journal of Autism and Developmental Disorders*, *34*(4), 423-432.

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.

Schinn, M. R., (2004). *Administration and scoring of mathematics computation curriculum-based measurement (m-cbm) and math fact probes for use with aimsweb.* Edformation, Inc. Retrieved on September 1, 2006 from http://www.aimsweb.com.

Schinn, M. R., & Shinn, M. M. (2002). *AIMSWEB training workbook: Administration and scoring of reading curriculum-based measurement (R-CBM) for use in general outcome measurement.* Retrieved on September 1, 2006, from http://www.aimsweb.com.

Tweed, J. (2008, March 14). These ‘chairs’ have an air about them. *Brainerd Daily Dispatch*, p.A1, A5.

Zeigler Dendy, C. A., (Ed.) (2006). CHADD educator’s manual on attention-deficit/hyperactivity disorder (AD/HD) an in-depth look from an educational perspective. Lynchburg, VA: Progress Printing.

Appendix A

Duration Recording Form

Duration Recording Form

Student's name: _____ Teacher: _____

Subject(s)/Period(s):_____

Date: _____

Behavior definition (in specific, observable terms):

Observation (amount of Time): _____

Date	Time When Behavior Began	Time When Behavior Stopped	Length of Time the Behavior Lasted

Appendix B

Principal's Permission Letter

Date: July 18, 2007
To: Principal
Public High School
Town, MN 56431

Dear Mr. Principal:

As part of my Master's Program through Southwest Minnesota State University, I am conducting a study to determine "The Effects of Stability Balls on Students' Behavior and Achievement in the Special Education Classroom." In order to complete this study I am asking your permission to make some changes within my classroom, all at my time and expense.

The purpose of the study is to examine the effects of stability balls, when used as a chair, on student behavior and achievement in my special education classroom. In addition, students' perceptions about the effect on their behavior and achievement are to be examined as well. A single-subject ABAB design will be used to collect the data for the achievement and behavior. A survey at the end of the study will be given to collect information on the student's perceptions. Specifically, the study addresses the following research questions:

1. What are the effects of stability balls, when used as chairs, on student behavior in the special education classroom in central Minnesota?
2. What are the effects of stability balls, when used as chairs, on student achievement in the special education classroom in central Minnesota?
3. What are students' perceptions of their behavior and achievement when using stability balls as chairs in a special education classroom in central Minnesota?

I would enjoy meeting with you to explain this study in greater detail. If you have any questions, please feel free to contact me at home at (phone number) or after school starts in my classroom. Also, feel free to contact my Southwest Minnesota State University committee chair.
Thank you for your interest and cooperation in this study.

Sincerely,

Researcher, Victoria Bill

Appendix C

Parental Permission Letter

Date: July 18, 2007

To: Parent(s)/Guardian(s)

Re: Action Research Study

Dear Parent(s)/Guardian(s),

I am your child's reading and math instructor this year at the XXXXXXXl. I am pursuing my Master's Degree through Southwest Minnesota State University. My final action research project is to examine the effect of stability balls on students' behavior and achievement in my special education classroom. With your consent, I will be having your child sit on a stability ball during some class periods from the beginning of the school year until Thanksgiving break. Also, I will be asking your child to complete a survey to gain insight into his/her attitude about the use of the stability ball as a chair. The instruction your child will receive will not change.

A stability ball is a heavy-duty rubber ball filled with air from 45 to 75 cm (20-30 in.) in diameter. Students will be measured for proper fit of a stability ball. The stability ball will be used as a chair. Rules for the proper use of the ball will be established on the first day of use.

I am requesting your permission to include your child in this study. If you agree to allow your child to be part of this study, please sign, date, and return the permission form below, by August 30, 2007. All names and information in the study will be kept confidential. If you would like a copy of the results of the study, please contact me.

If you have any questions, please feel free to contact me during the school day in my classroom at XXXXXXXXXX or before school begins in the fall at home at XXXXXXXXXX. You can also contact me by email at XXXXXXX.
Thank you for your interest and cooperation in this study.

Sincerely,

Researcher, Victoria Bill
Researcher's title

Yes, my child has permission to participate in your study.

_____ _____

Parent Signature Date

Appendix D

Student Permission Script

Consent Script for Students

(Teacher):

You have been chosen to assist me with some of my homework that I am doing through Southwest Minnesota State University. I am working on an action research project, which is to determine the effects of stability balls on student behavior and achievement in my classroom. I will be having you use the regular chairs to sit on and administering a few timed tests or probes. After I collect data for a few weeks, I will then have you use stability balls and I will again collect data for a few weeks. You will then go back to using regular chairs so I can collect data for a few more weeks and last you will use the stability balls a again for a few weeks. You will be asked to complete a survey concerning your thought on how your behavior and achievement was affected by using the stability ball.

All of the information I receive from you will be confidential, including your name. You do not have to do this if you do not want to. Would you like to help me and be part of this homework study?

Student Response: Yes _____ No _____

Appendix E

Student Survey

Stability Ball Survey I.D. _____

Please complete the following survey as honestly and to the best of your ability. The survey will provide valuable information regarding this classroom's learning environment. Your information and opinion are highly valuable. Your responses to the survey will be kept confidential. This is a voluntary survey; if you wish not to participate you are not required to do so.

Thank you for your time and participation.

Please indicate your level of agreement with each statement by marking the appropriate number on the scale of 5 to 1. A score of 5 means you strongly agree with the statement, while a score of 1 means you strongly disagree with the statement.

Age _____
Grade _____
Male _____ Female_____

Questions	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
1. I liked using the chair.					
2. I liked using the stability ball					
3. The chair was more comfortable than the ball.					
4. The ball was more comfortable than the chair.					
5. My handwriting was the best when I sat on the chair.					
6. My handwriting was the best when I sat on the ball.					
7. I listened the best when I sat on the chair.					
8. I listened the best when I sat on the ball.					
9. I finished my work the best when I used the chair.					
10. I finished my work the best when I used the ball.					
11. My behavior was the best when I sat on a chair.					
12. My behavior was the best when I sat on the ball.					
13. My grades were better when I sat on a chair.					
14. My grades were better when I sat on a ball.					
15. The noise level in the classroom is quieter when we use chairs.					
16. The noise level is quieter in the classroom when we use balls.					

Comments: