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Stability balls as an intervention: effect of frequency and duration of out-of-seat behavior

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Stability Balls as an Intervention

Effect on Frequency and Duration of Out-of-Seat Behavior

By

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Chapter 1

Introduction

Lack of attention and focus in the classroom among elementary aged students has become an increasingly frustrating issue for educators and parents alike. National media coverage has documented the dramatic rise in cases of Attention Deficit Hyperactivity Disorder (ADHD). According to a 2011 study published by the U.S. Department of Health and Human Services, the percentage of children diagnosed with ADHD increased from 7.1% in 1998-2000 to 10.2% in 2007-2009 in the Midwest region. (Akinbami, L., Liu, X., Pastor, N. & Reuben, C.). At the same time, approximately 20% of schools across the country are cutting recess time in favor of more minutes in the classroom to meet guidelines of federal legislation such as No Child Left Behind. (Center for Public Education, 2007). With all of these factors in play, the ability for students to attend to instruction and class work is essential. Yet the lack of student focus is a commonly heard complaint of educators and parents alike.

In my own classroom, I have often wondered if there was a way to help restless students stay focused. Was there a way that I could incorporate the movement that their bodies craved in a manner that did not interrupt classroom instruction or cause a distraction for their peers? I often saw students half-seated in their chairs, causing a safety concern. Was there a safe way for them to be active within the classroom environment? As a result of my own inquiry, I came across a brief story that showed the use of stability balls as classroom seating. Thus, I decided to explore this idea. Would the use of stability balls as alternative classroom seating for elementary school students decrease the frequency of students leaving their seats and increase the total amount of time a student remained seated?

Purpose of the Study

The purpose of this study was to determine whether or not the use of stability balls as a classroom seating option in a third grade classroom increased the total time students spent properly in their seats. Using stability balls as chairs may allow for safe student movement while remaining seated. The hypothesis was that with this increased movement, students would be less restless and therefore able to remain attentive and focused. If successful, this easily implemented, relatively inexpensive strategy could be used by educators to improve time in seat in their classrooms. This study could also potentially be applied in special education classrooms and classrooms at the middle and high school level. Unlike other literature I have read, this study was quasi-experimental rather than anecdotal. Video evidence was collected prior to the implementation of the alternative seating and again afterward. Frequency of instances out of seat and total duration of out of seat time was determined for each situation.

Scope and Limitations

The research was conducted during one quarter of the academic year in a third grade classroom of a suburban elementary school. The majority of the students in the class were Caucasian, middle-class students. Several participants had documented special educational needs; several were of lower socio-economic status, and two were English Language Learners.

As this study was completed with third grade students, there were intrinsic variables that could not be controlled for. One factor was student attendance. Another was changes in medication for students already diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). A third factor was inability to control the physical space of the classroom. A final

factor that was not controlled for in this study was the classroom procedures and routines established by the teacher such as location of needed supplies that would necessitate a student getting out of their seats to retrieve and return them. One weakness that was anticipated in the study was that data would be collected through the use of video. Students might act differently in the presence of a video camera than they typically would during the course of a normal school day. This "performing" by the students could influence the results. Efforts were made by the researcher in advance of the study to familiarize the students with the presence of a video camera in the classroom to reduce the anxiety or affected performance of the participants of the study.

Definitions

Stability Balls: Large balls often used in therapeutic or athletic applications. Sometimes called therapy balls, yoga balls, Swiss balls, Gymnic balls, or exercise balls.

Out-of-Seat Behavior: When a student has at least one buttock off of a chair or stability ball.

Summary

With the ever-increasing demands placed upon student performance in the classroom, the increase in ADD diagnoses and the decrease in opportunities for students to engage in physical activity, this study looked at whether or not the use of stability balls as alternative classroom seating to allow movement opportunities for students was an effective way to increase time in seat for students. This study was conducted in a typical suburban third grade classroom for one quarter of a school year. Data were collected using video analysis of students' time in seat in the classroom.

Chapter 2

Literature Review

Turn on the TV, open a newspaper or magazine, or do a Google search, and you are likely to encounter an anecdotal story regarding the benefits school-aged children reap from sitting on a stability ball rather than a traditional classroom chair. However, despite decades of stability balls being successfully used in therapeutic settings, very little hard data supports the claims that this alternative seating option truly benefits students.

The history of the stability ball can be traced back to 1963, when Italian manufacturer Aquilino Cosani developed a technique for manufacturing large toy balls made of durable, burst resistant vinyl. These large colorful balls were sold throughout Europe under the brand names Gymnastik or Gymnic. Shortly thereafter, English physiotherapist Mary Quinton discovered these Gymnastik balls while in Bern, Switzerland and began using them in her intervention treatment programs for newborns and infants with cerebral palsy. During the late 1960s, Dr. Susan Klein-Vogelbach, the founding director of the physiotherapy school in Basel, Switzerland, was the first individual to use the balls with adults, particularly those having orthopedic problems. In 1989 physical therapist Joanne Posner-Mayer began instructing therapists on the neurological, orthopedic and fitness applications of stability balls. Today athletic trainers, strength coaches, personal trainers and physical therapists around the world use stability balls in fitness and rehabilitation programs.

Umeda and Deitz (2011) posit that due to the extremely unstable surface that balls provide, remaining in a sitting position on the ball requires that the nervous system detect the balance challenge presented, activate the core musculature, and remain alert and responsive to

prevent falling. The demands this places on the body may be the key to the ball's ability to promote positive behavioral changes. (p. 158). Interest in the area of using stability balls in the classroom began in the mid-1990s with Carla Hannaford's book, *Smart Moves: Why Learning is Not All in Your Head*. "Thinking and learning are not all in our head. Physical movement plays an important role in the creation of nerve cell networks, which are the fundamental ground of learning. (2005, p. 15-16). It was during this same period, that stability balls began to be widely used as a fitness tool in gyms across the country instead of solely as a rehabilitation tool of physical therapists. It is unsurprising then, that the movement ideas of Hannaford, and the tools of the therapists began bouncing into classrooms.

A study in 2001 by Witt at Tavis Elementary School in Fort Collins, Colorado was one of the first that examined the use of the stability ball as a chair in the classroom. This study looked for improvements in flexibility/range of motion, strength/stability, balance, posture, squirminess and ability to stay on task in 12 sixth-grade students. Focusing on her results for squirminess and ability to stay on task, as those subcategories most closely resemble the areas in the current study, 7 of 12 students reduced their squirminess, no students had more squirminess and five students showed no change, and in time on task, 5 of 12 students improved, no students decreased and 7 students showed no change. While all participants demonstrated improvement in at least one of the areas, the study did show mixed results for changes in classroom behavior. This study also used a very small sample size and was limited in age range and duration.

The majority of further studies looked at using the stability ball with students with special educational needs. According to Schilling, Washington, Billingsley and Deitz in their 2003 study, "It seems that one potential intervention approach to address the behavioral problems of

children with ADHD at school is to adapt the environment to meet the children's needs." (p. 41). This study was a single subject, A-B-A-B interrupted time series design with three participants in a fourth grade public school class. All 24 students in the class used the ball chairs, but data were collected only on the 3 students with ADHD. The three participants did increase their in-seat behavior and legible word productivity while seated on the balls. With only 3 participants, the limitations of this study were obviously the small sample size, as well as a short 12-week duration, and lack of comparison data for the other students that were seated on the balls but were not diagnosed with ADHD.

An oft-cited study by Schilling & Schwartz (2004) looked at using a stability ball as a chair with preschool children with diagnosed Autism Spectrum Disorder to improve their classroom behavior. "This intervention is an example of how the sensory-processing theory embraced by many physical and occupational therapists can be translated into effective practice in a classroom context." (p. 431). Results were positive, with all four participants in this single subject, withdrawal design study indicating substantial improvements in in-seat behavior and engagement. The teachers and students consistently reported a preference for the therapy balls vs. other seating devices. One interesting note is that while all four participants showed substantial improvements in their in-seat behavior and engagement, there was variety in the individual responses to the therapy balls.

Harlacher, Roberts and Merrell (2006) suggest that using therapy balls is one strategy that could be used for a whole class as a way to target negative behaviors seen in students with ADHD without the stigma of a targeted intervention.

Some of the limitations of the earlier Schilling & Schwartz study were addressed by Pfeiffer, Henry, Miller and Witherell (2008). Their study looked at the effectiveness of increasing attention to task with another alternative seating option, the Disc 'O Sit Cushion, a small inflatable disc that is placed on a student's chair to allow for some of the same movement as on a stability ball while the student remains on traditional chair. They also looked at more participants, a total of 63 second-grade students with demonstrated attention difficulty in the academic setting in this pretest-posttest experimental study. This study found that there was an increase in attention while engaged in sedentary tasks for participants seated on the Disc 'O Sit Cushions. These results seem promising, but one major methodological flaw may make these results less than reliable. All data in this study were collected through surveys. No observational data exist to back up these claims.

Recently, three more studies have sought to address reliability concerns and further the research of Schilling and Schwartz. The first, by Bagatell, Mirigliana, Patterson, Reyes and Test (2004), addressed some of the limitations of the Schilling & Schwartz study by using video recorded observations. The sample size and duration of the study remained small, with six participants, all diagnosed with Autism Spectrum Disorder; the length of the study was four weeks. A further limitation was that data collection and the intervention were done only during Circle Time. The small age range of the participants, all preschool or early primary students, further limited the study. "The results of this study do not affirm the results of a previous study conducted by Schilling & Schwartz (2004), which revealed substantial improvements in in-seat behavior and engagement and strong social validity. Instead, the results illuminate the complex nature of children with ASD, of behavior and learning, and of occupation and the importance of

using sophisticated clinical reasoning skills when making recommendations for intervention sin the classroom for children with ASD." (p. 910)

A 2011 study by Umeda & Dietz also looked at the effects of therapy cushions on classroom behaviors of children with Autism Spectrum Disorder. This was an extension of the research done using the Disc 'O Sit Cushion with a focus on students with ASD. It was an A-B-A-B-C design with two male participants. It found no clinically relevant changes in the in-seat or on-task behaviors of either participant with cushion use. "Possibly, therapy cushions lack a quality unique to therapy balls, resulting in cushions' decreased effectiveness as a form of alternative seating." (p. 158). The results of this study, though limited by the small sample size, and with only male participants, demonstrate that not all alternative seating options work for students with ASD.

A final study (Fedewa & Erwin, 2011) again looked at using stability balls as chairs with students with ADHD, and implication for on-task and in-seat behavior. This study used an A-B design with eight participants. It also was designed to address some of the limitations of the Schilling & Schwartz research. However, it had its own limitations with a slightly larger but still small sample size, short duration (12 weeks) and a short Novelty Effect window. The study did find that all children who participated had improved attention and lowered hyperactivity levels while using the stability balls, and that the greatest effect occurred for the children who had significant difficulties in attending before the intervention. Data also showed that teachers were satisfied with the effectiveness of stability balls in their classrooms. "Although at first the teachers were hesitant and doubtful regarding their students' increased movement on the balls, they soon discovered that students' behavior was improving." (p. 397).

These decidedly mixed results illustrate the need for further research. Very little data have been collected on students without disabilities participating in the intervention. Is using the stability ball as a replacement for a traditional classroom chair an intervention that should be used only with students with special educational needs? Do typically developing children have sensory needs that may be satisfied by using a stability ball as well? Is there an instrument that can measure which students would benefit from the intervention of a stability ball as a chair? The few studies that have been done show promise that stability balls as chairs work for some students to increase desired classroom behaviors such as in-seat and on-task behaviors. Are there other areas of behavior and academic performance that could be improved through the use of this intervention? This area of research is in its infancy. More questions have been raised than have been answered. The purpose of my study is to add another kernel of knowledge to this developing area of educational research.

Chapter 3

Methodology

Design

The design of the study was quasi-experimental. Data were collected to establish a baseline of both frequency and duration of student out-of-seat behavior. The independent variable was the type of seating used by the students, traditional plastic desk chair vs. stability ball, and the dependent variable was the frequency and duration of time in seat. Data were collected following a period of time to allow for the Novelty Effect to diminish.

The largest threats to internal validity as perceived by the researcher were the Novelty Effect, the Rosenthal Effect, and maturation of the participants. The Novelty Effect was controlled for by allowing a two-week period to pass after introducing the stability balls before beginning the experimental data collection. The Rosenthal Effect was controlled for through having a conversation with the participants at the beginning of the study. This researcher explained to the participants that they would be video-recorded while sitting on regular chairs and stability balls, but not revealing any information about the reason. Maturation of participants was controlled for as much as possible by conducting the research during a limited time frame in the latter part of the school year.

Keeping the setting for the study limited to one classroom throughout the entire research controlled for threats to external validity. All participants remained the same throughout the study. Data were collected primarily during writing and math periods, and there was limited school personnel change during the study.

Participants

The participants in this study were 26 third-grade students, ranging in age from 8 to 9 years old at a suburban public elementary school, 15 males and 11 females. Twenty-three participants were Caucasian, one was Hispanic, and one was Pakistani. One student had an identified Other Health Impairment (OHI), one was identified as having Autism Spectrum Disorder, and two participants were identified as English Language Learners. Twenty-five percent of participants were of low socioeconomic status as determined by participation in the school district's free and reduced lunch program.

Participants were assigned to the researcher's homeroom or math class. The researcher had signed parental permission for all participants. One student in the class was not included in the study due to the parent refusing consent because video recording was to be used. Confidentiality was ensured by random assignment of a number to each participant as an identifier for the duration of the study.

Materials

Materials needed for this study were 12 stability balls, a video camera, a posted list of rules (See Appendix A) and data recording sheets (See Appendix B). The researcher found that an online time calculator was also valuable. The online calculator used was found at: http://www.unitarium.com/time-calculator>

Procedures

Baseline data video recordings were obtained for two weeks by filming students while seated on traditional desk chairs. Recording sessions lasted for approximately 30 minutes each, and

were conducted primarily during math and writing class when students were expected to work seated at their desks for sustained periods of time.

Week three of the study was used to fit students to the stability balls, establish safety rules and develop a schedule for the use of the stability balls. Participants were fit to the balls by ensuring they could sit with their knees at a 90 degree angle with their feet flat on the floor. Participants were assigned to the stability ball that was inflated to properly fit their bodies. Two students were assigned to each ball. The participants and the researcher worked together to develop a list of safety rules for using the stability balls that was posted in the classroom. These safety rules were: Sit on the ball; No feet on the ball; Keep pencils and other sharp objects away from the ball; Little bounces are OK, but no giant ones; Treat the ball like it is furniture, not a toy; and You may switch from a ball back to a chair, but not during instruction time.

Since two participants were sharing each ball, a balanced schedule was established and posted in the classroom. Participants were assigned half of a day to sit on the stability ball. Whether that half of the day was the morning or the afternoon was determined by whether the day was an odd day or an even day. For example, participants 1 and 2 shared a stability ball. Participant 1 would use the stability ball in the morning on odd days and in the afternoon on even days while participant 2 would use the same stability ball in the afternoon on odd days and the morning on even days.

Weeks 4 and 5 of the study were used to diminish the Novelty Effect of the new seating equipment and no video recording was done during this time. The researcher helped reinforce the schedule by giving verbal reminders about who was assigned to a stability ball at the beginning of the school day and following lunch. The school district's spring break also

occurred for a week between weeks 4 and 5 of the study, so the actual duration of this period was 3 weeks. This schedule was intentional to control for any atypical participant behavior common in this age group in the weeks preceding and following a vacation.

Weeks 6 through 10 were used to collect data through video recordings while the students were using the stability balls. The researcher did not remind participants about when it was their turn to use the stability ball but did remind them to look at the schedule when questions arose. Video recording sessions were approximately 30 minutes in length, with some variability due to unexpected occurrences typical in an elementary school environment such as fire drills, and schedule changes. Recordings were done primarily during writing and math classes, times that the students were expected to be in their seats for the majority of the class period. The scheduled math class time was 75 minutes, so 2 recording sessions were often completed during one class period. The structure of the reading, spelling and science classes typically had students out of their seats for the majority of the time, so the researcher did not use these for recording and data collection. The writing class was conducted in the morning and the math class in the afternoon each day. The school does some grouping of students for math instruction. Of the 26 participants 5 were recorded only during the morning. These students were in the homeroom writing class but went to another classroom for math instruction. Four participants were recorded only during math class. These students were not in the homeroom and only joined the researcher's class for math instruction.

Data Collection and Analysis

Data collected were analyzed participant by participant. Data collected included the frequency a participant was out of seat for any reason and the duration of that out-of-seat

occurrence. Frequency was recorded using tallies and the duration was calculated using the running time display on the playback feature of the video camera. The video recording device was moved to several locations in the classroom throughout the study to capture as many students as often as possible. The participants also had different seat locations throughout the course of the study; this was not a part of the study itself, but rather a function of the structure of the classroom. Because recordings were completed frequently, occasional student absence was controlled for. The researcher did not analyze data until the conclusion of the study to control for any potential bias or alteration of the study in progress.

The video recordings of both baseline and experimental phases of the study were watched multiple times. In the first viewing, data were collected through the use of tally marks on the data recording sheet (see Appendix B) for each participant. Data were also collected regarding the time of day and subject (math or writing). Additional viewings of the videos allowed the researcher to record the start and end time of the out-of-seat behavior. The running time feature on the playback of the video camera provided the clock that was used. Once all times were recorded, total duration was calculated using an online time calculator. After total frequency and duration were recorded for each participant, the baseline and intervention data were compared for the group as a whole and by gender. Statistical data including maximum, minimum, range, and mean were computed for individual participants, the whole group and by gender, and are reported in chapter 4. Percentages were also computed to determine the change in frequency and duration of out-of-seat behavior between the baseline and intervention stages of the study. These results appear in chapter 4.

Data collected, both written and video were kept in a locked file cabinet when not in use by the researcher to protect participants' confidentiality. The results will be reported in both tabular and graph form in Chapter 4.

Chapter 4

Results

Analysis of Data

The data are discussed in multiple parts since both frequency and duration of out-of-seat behavior were analyzed. Participant movement was counted as out-of-seat behavior if the participant had at least one buttock off the chair. Examples of observed out-of-seat behavior included standing up, sitting on one foot, kneeling on a chair, and standing with one knee resting on the chair. Some instances of out-of-seat behavior were considered normal; therefore, the results of the intervention were not expected to reach zero. Table 1 shows the frequency of out-of-seat behavior collected during baseline observations, when all participants had traditional desk chairs.

Table 1

Baseline Frequency of Out-of-Seat Behavior

	All Participants	Female Participants	Male Participants
Mean	4.04	4.19	3.92
Median	4	4	3
Maximum	16	16	13
Minimum	0	0	0

The mean frequency of out of seat behavior was 4.04 per 30 minutes for all participants. There was some slight variation in the mean frequency between male and female participants, with females having a slightly higher mean of 4.19 occurrences of out-of-seat behavior compared to a mean of 3.92 occurrences for males. The median number of occurrences for out-of-seat behavior was 4 for the group of participants as a whole, 4 for female participants, and 3 for male participants. The minimum number of occurrences for out-of-seat behavior for all participants

was zero. The maximum number of occurrences of out-of-seat behavior was 16 for female participants and 13 for male participants.

The data for frequency of out-of-seat behaviors while participants were seated on the stability balls are shown in Table 2.

Table 2

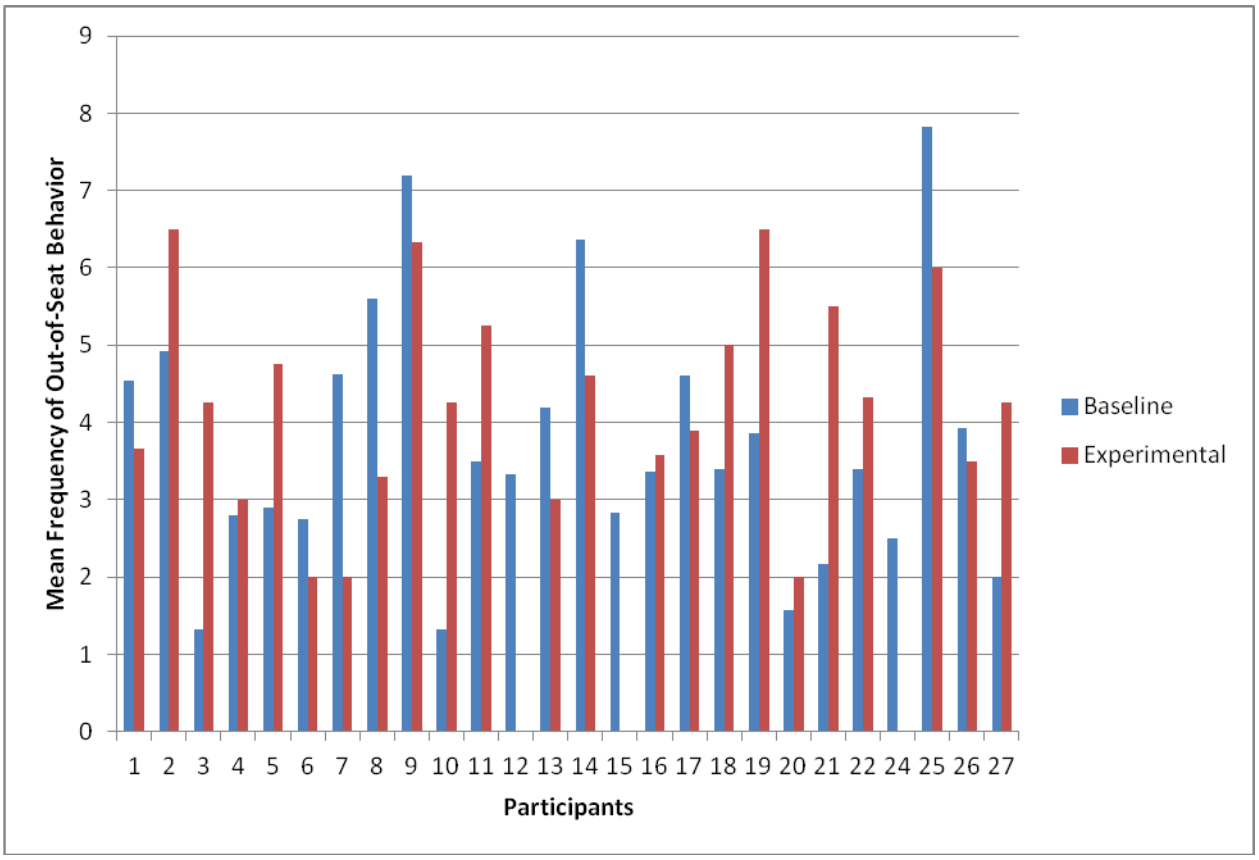
Experimental Frequency of Out-of-Seat Behavior

	All Participants	Female Participants	Male Participants
Mean	4.1	4.25	3.98
Median	4	4	4
Maximum	10	10	9
Minimum	0	0	0

The mean frequency of out-of-seat behavior for all participants was 4.1. For female participants the mean frequency was 4.25 and for male participants, the frequency was 3.98. The median frequency of out of seat behavior was 4 for both groups. The minimum frequency of out of seat behavior was zero for both groups. The maximum frequency of out of seat behavior for all participants was 10, for female participants the maximum frequency was 10 and for male participants the maximum frequency of out of seat behavior was 9. Figure 1 compares the mean frequency of out of seat behavior for each participant.

Figure 1

Mean Frequency of Out-of-Seat Behavior for All Participants



In Figure 1, for participant #12 no experimental data are shown. Participant #12 was a student with autism who communicated non-verbally through an augmentative communication device and required continuous one-on-one assistance. His schedule had him working directly with approximately eight different staff members each school day. Instruction was often provided in an alternative location. He occasionally used the stability ball, but not on a consistent basis or with any regularity so that data could not be collected. Participants #15 and #23 also lack experimental data. Both participants were male students that self-selected not to

use the stability ball as an alternative seating option. The reasons for their decision not to use the stability ball were not known.

Figure 2

Mean Frequency of Out-of-Seat Behavior for Females

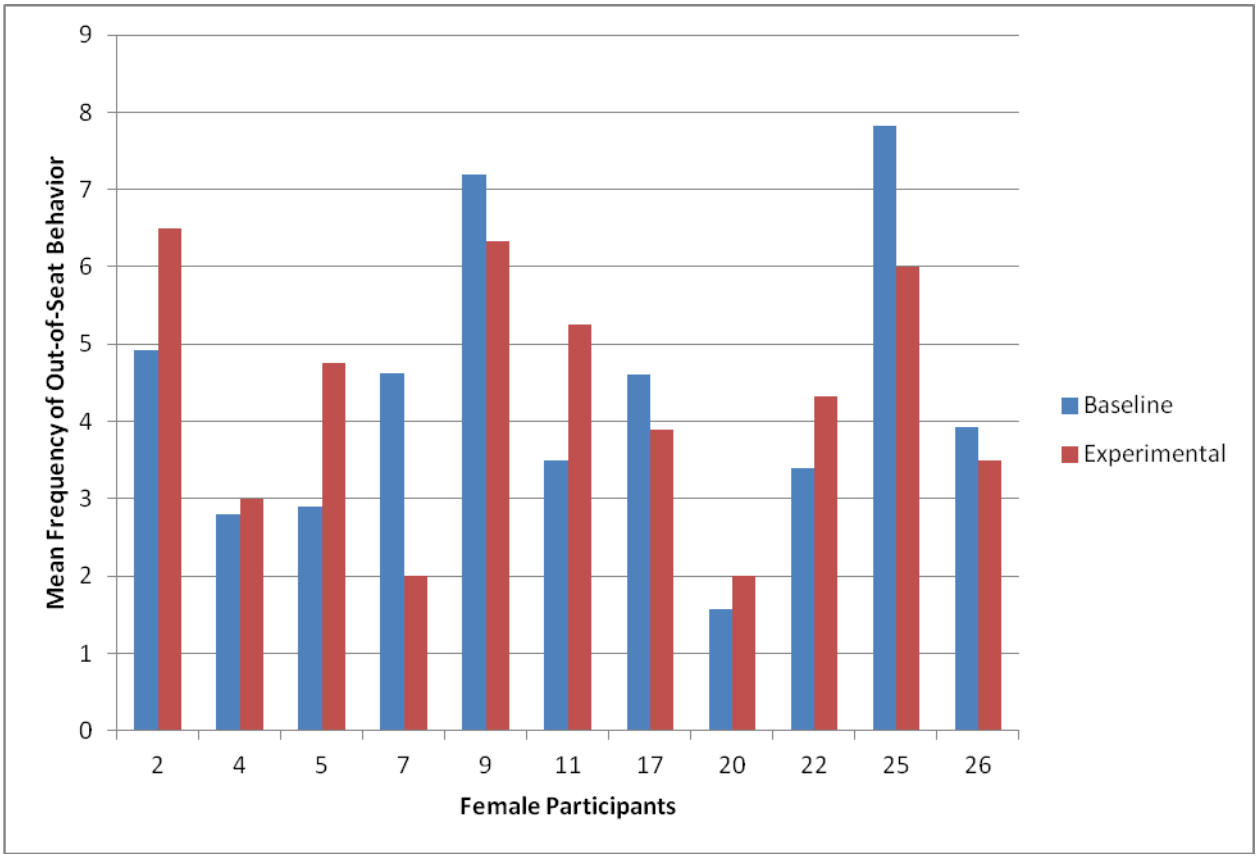


Figure 3

Mean Frequency of Out-of-Seat Behavior for Males

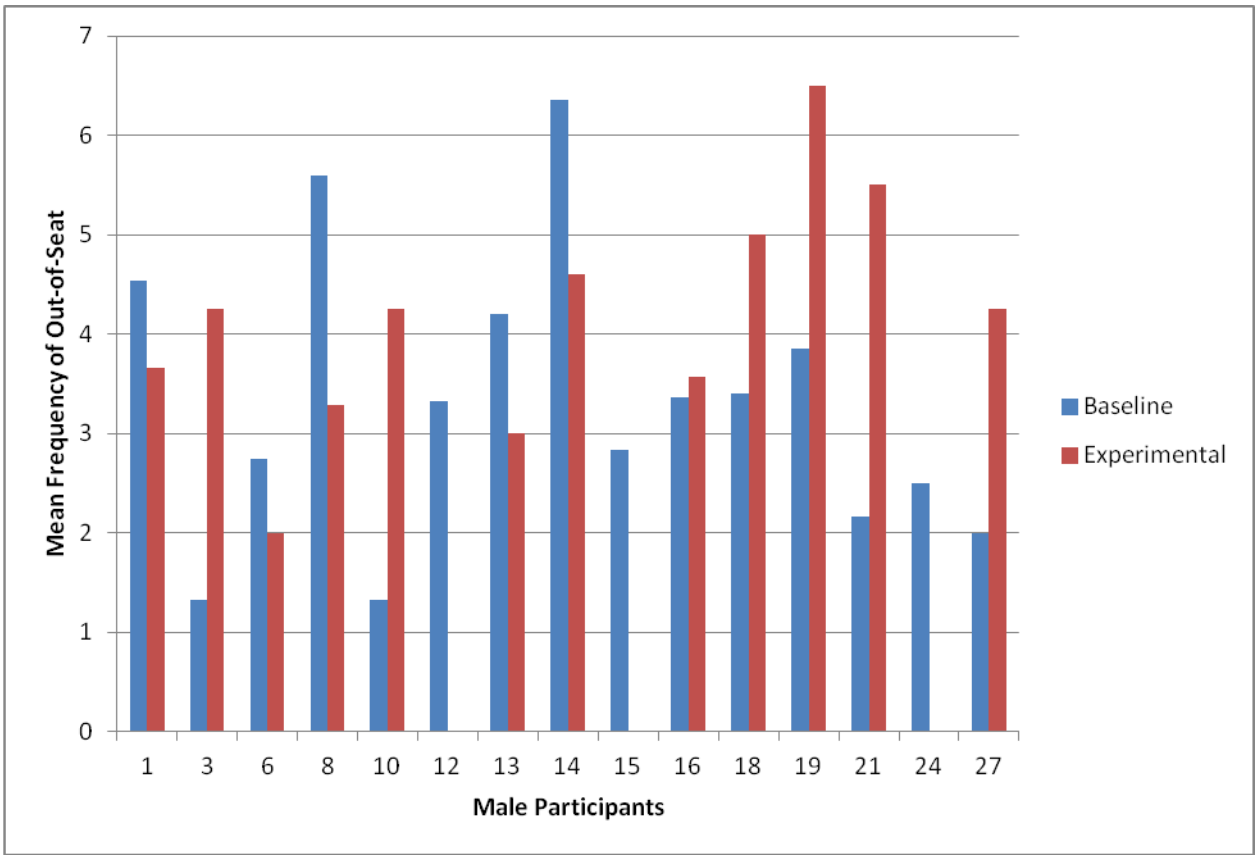


Figure 2 compares the mean frequency of out-of-seat behavior for female participants and Figure 3 compares the mean frequency of out-of-seat behavior for male participants. Participants in the experimental phase of this study had an overall mean frequency of out-of-seat behavior of 4.07, with female participants with an overall mean of 4.22 and male participants with an overall mean of 3.95.

The second analysis was the duration of time a participant remained out of seat. Table 3 illustrates the baseline data for duration of out-of-seat behavior.

Table 3

Baseline Duration of Out-of-Seat Behavior

	All Participants	Female Participants	Male Participants
Mean	7:37	6:40	8:18
Median	7:40	7:06	7:42
Maximum	15:20	13:20	15:20
Minimum	1:34	1:34	2:19

For the group the mean duration for out-of-seat behavior was 7 minutes, 16 seconds per session. The median duration was 5 minutes 43 seconds, with a maximum duration of 24 minutes, 27 seconds and a minimum duration of no time out-of-seat. Female participants had a mean duration of 6 minutes, 24 seconds of out of seat time. The median duration for female participants was 5 minutes, 17 seconds, with a maximum duration of 24 minutes, 27 seconds and a minimum duration of no time out-of-seat. For male participants, the mean duration for out-of-seat behavior was 8 minutes, 1 second. The median duration was 6 minutes, 20 seconds, with a maximum duration of 23 minutes, 49 seconds and a minimum duration of no time out-of-seat.

Table 4 illustrates the duration of out-of-seat behavior for participants while using the stability balls.

Table 4

Experimental Duration of Out-of-Seat Behavior

	All Participants	Female Participants	Male Participants
Mean	5:57	6:32	5:24
Median	5:45	7:41	5:29
Maximum	11:21	11:21	11:04
Minimum	0:41	0:41	2:03

The mean for the group was 5 minutes, 45 seconds. The median duration was 4 minutes, 23 seconds with a maximum duration of out-of-seat behavior of 21 minutes, 18 seconds and a

minimum duration of no time spent out-of-seat. For female participants, the mean duration for out-of-seat behavior while using a stability ball was 6 minutes, 23 seconds. The median duration was 6 minutes, 2 seconds with a maximum duration of 21 minutes, 18 seconds and a minimum duration of no time out-of-seat. For male participants, the mean duration of out-of-seat behavior while using stability balls was 5 minutes, 7 seconds. The median duration was 3 minutes, 38 seconds with a maximum duration of 16 minutes, 28 seconds and a minimum duration of zero, or no time out-of-seat.

Figure 4 compares the mean duration for out-of-seat behavior for all participants using both the traditional chair and the stability ball. As in Figure 1, participants #12, 15, and 23 have no experimental data for reasons previously discussed.

Figure 4

Mean Duration of Out-of-Seat Behavior for All Participants

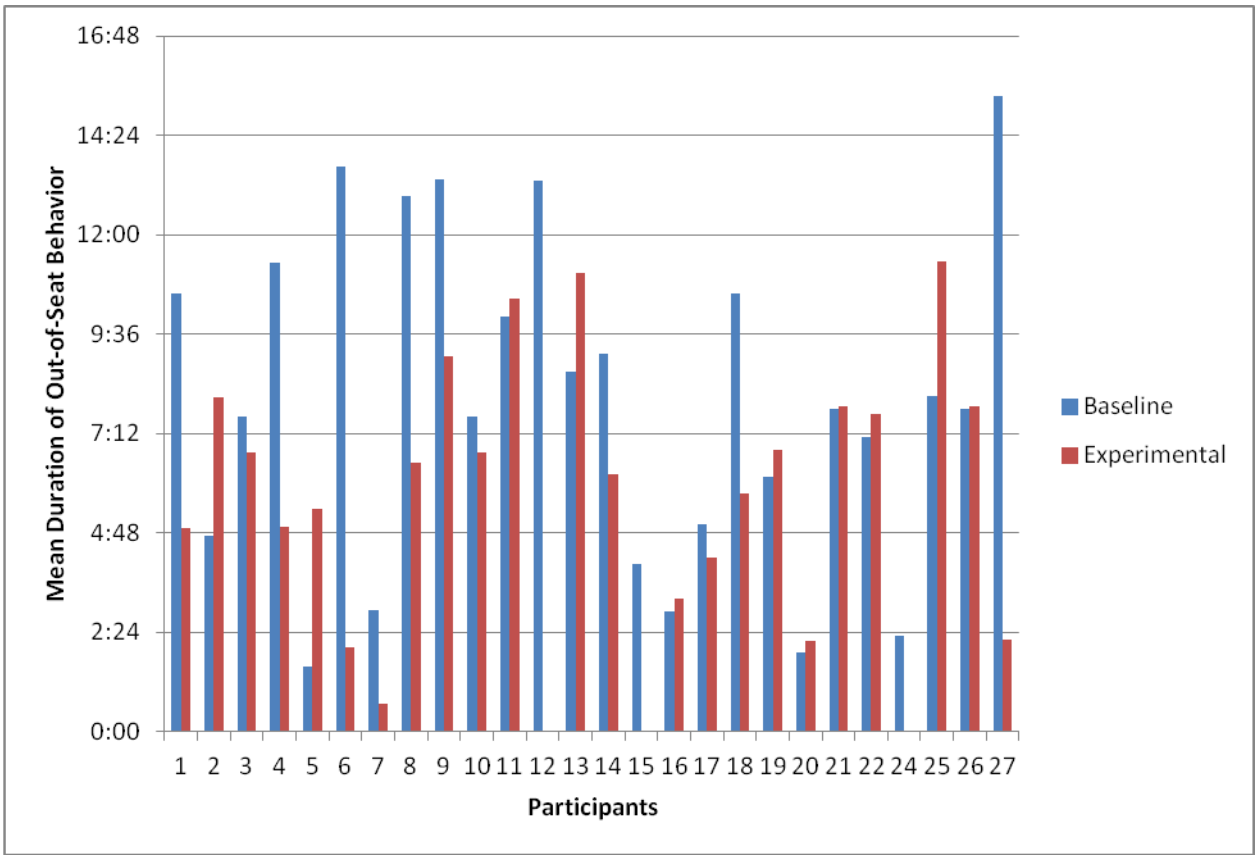


Figure 5 compares the mean duration of out-of-seat behavior for females, and Figure 6 compares the mean duration of out-of-seat behavior for male participants. Male participants # 12, 15, and 23 experimental data as discussed previously.

Figure 5

Mean Duration of Out-of-Seat Behavior for Females

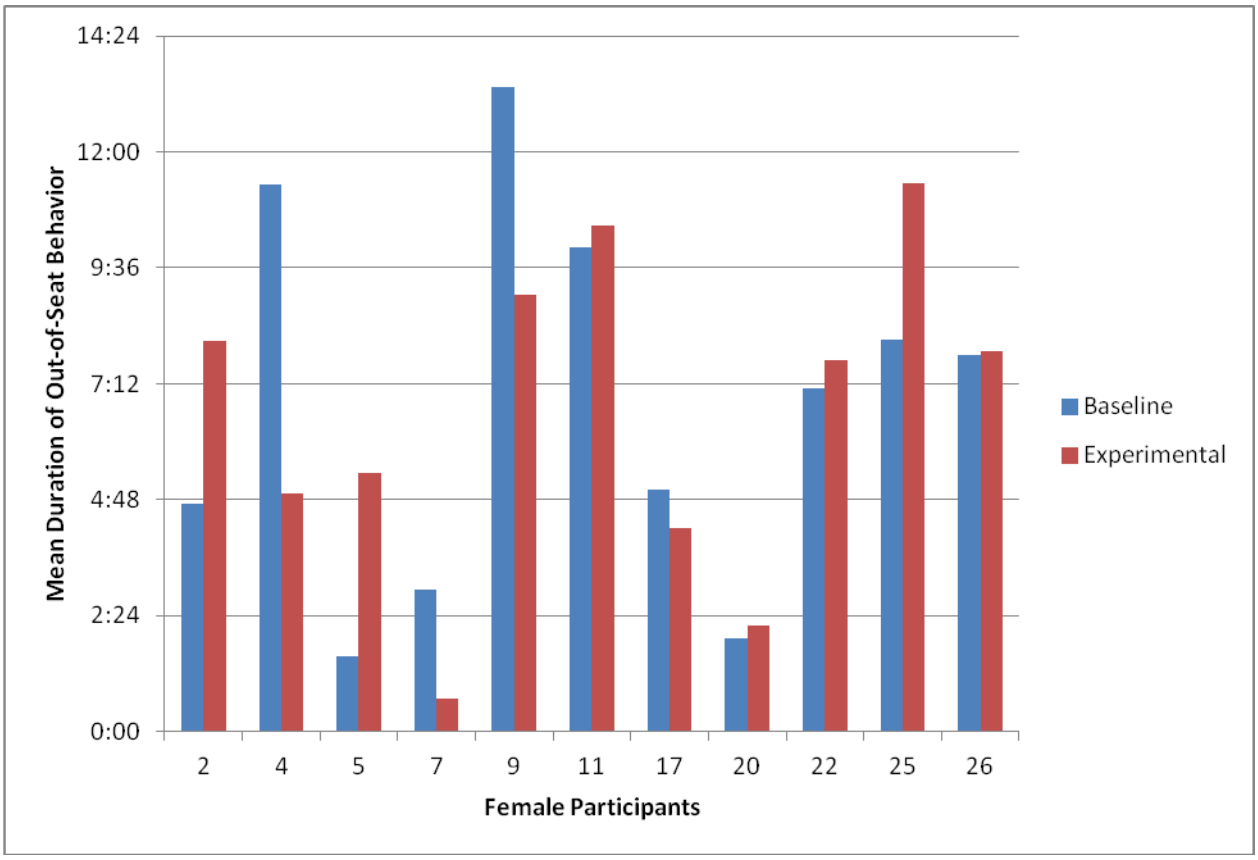
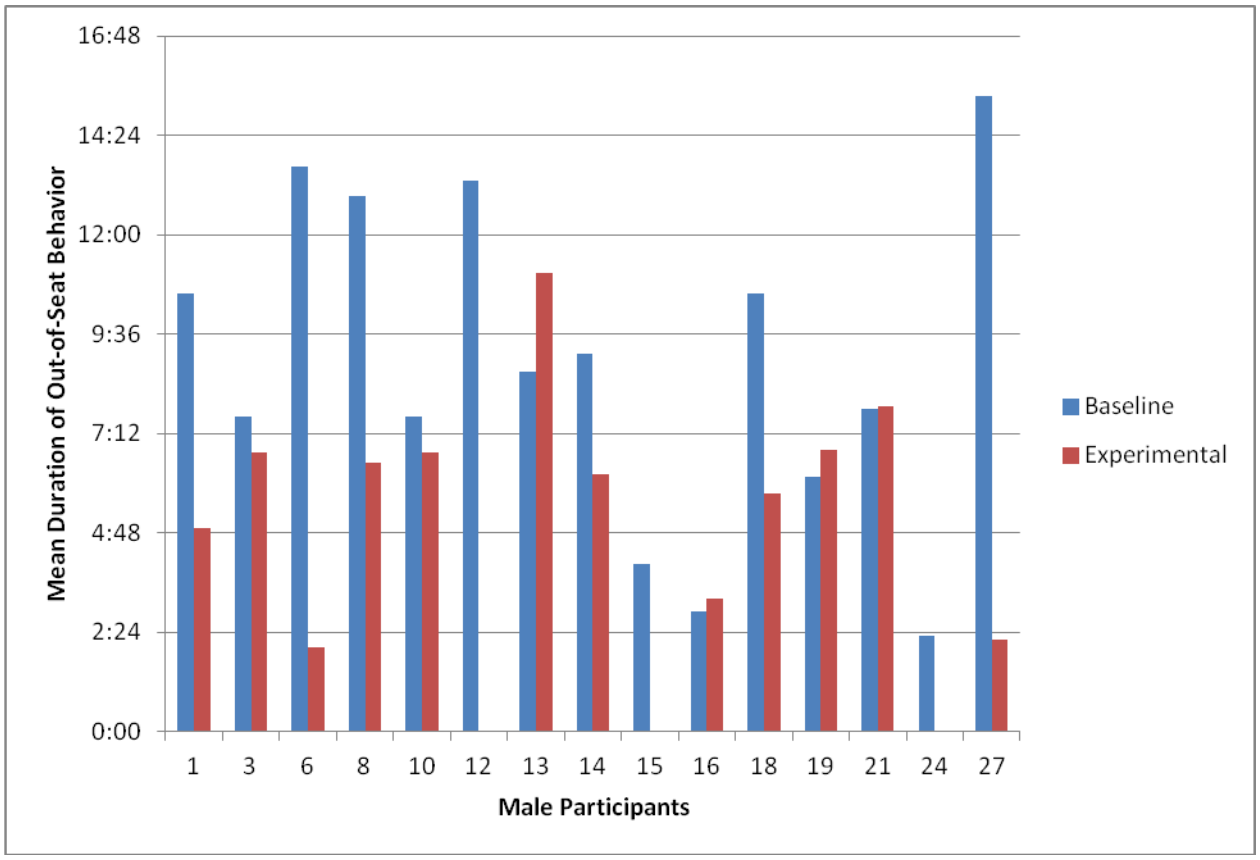


Figure 6

Mean Duration of Out-of-Seat Behavior for Males



Discussion of the Findings

According to the findings of this research, use of the stability ball as an alternative seating option for elementary aged students did not appear to have an effect on the frequency with which a participant demonstrated out-of-seat behaviors, but did impact the amount of time they remained out of seat. Tables 5 and 6 show the percentage of participants that demonstrated change in the duration of out-of-seat behavior.

Table 5

Change in Duration of Out-of-Seat Behavior by participant

	Participants using stability ball	Female Participants	Male Participants
Duration of out-of-seat behavior Increased (undesirable result)	17%	27%	8%
Duration of out-of-seat behavior Decreased (desirable result)	39%	27%	50%
Little or no change in duration of out-of-seat behavior	43%	45%	42%

*These data exclude the 3 participants who did not use a stability ball as a chair.

Table 6

Change in Duration of Out-of-Seat Behavior for All Participants

	All Participants	Female Participants	Male Participants
Duration of out-of-seat behavior Increased (undesirable result)	15%	27%	7%
Duration of out-of-seat behavior Decreased (desirable result)	35%	27%	40%
Little or no change in duration of out-of-seat behavior	38%	45%	33%
Participants self-selecting not to use stability ball as seating option	8%	0%	8%
Participant not using stability ball for other reasons	4%	0%	4%

Table 5 excludes those participants that did not use the stability balls during the experimental phase of the study, while Table 6 includes those participants. These data show that 50% of male participants that used the stability ball compared with 27% of female participants demonstrated a decrease in the duration of out-of-seat behavior, and that the decrease in duration was greater for males than females. Also, 17% of participants using the stability ball demonstrated an increase in duration of out-of-seat behavior. Twenty-seven percent of female participants using the stability ball increased the duration of out-of-seat behavior, while only 8% of male participants using the stability ball increased their out-of-seat duration. Therefore use of a stability ball as an alternative seating option is not an effective strategy for increasing the desired in-seat behavior for some students. However, use of the stability ball as an alternative seating option in the elementary school classroom can be an effective option for decreasing out-of-seat behavior, especially among male students. This study also revealed that for 43% of participants using a stability ball, there was little or no change in the duration of out-of-seat behavior. This finding was fairly consistent across genders, with 45% of female participants using the stability ball and 42% of males demonstrating only minor changes in their out-of-seat behavior.

Results for some participants in this study fell far from the means. For example, participant #26's baseline mean frequency of out-of-seat behavior was 2, which is below the 4.04 baseline mean frequency for all participants and the 3.92 baseline mean frequency for male participants. However, his baseline duration of out-of-seat behavior was 15 minutes 20 seconds, which was the maximum duration for any participant. Although he was not frequently out of his seat, when he was, he remained so for an excessive amount of time. His experimental data are equally

intriguing. His experimental mean frequency of out-of-seat behavior more than doubled from 2 to 4.25, which is above the experimental mean frequency for all participants of 4.1 and male participants of 3.98. However, although he was out of his seat more than twice as often, his mean duration of out of seat behavior decreased to just 2 minutes 13 seconds, which is well below the experimental mean duration for all participants at 5 minutes 57 seconds and the experimental mean duration for male participants at 5 minutes 24 seconds. One factor to note is that this participant was only in the researcher's math class, so he was recorded only during the afternoons. It is unknown if he would have had different outcomes had he been a member of the researcher's morning classes and recorded during those times.

Participant #6, also a male, had similarly dramatic decreases in his duration of out-of-seat behavior, with a mean baseline duration of 13 minutes 39 seconds and a mean experimental duration of 2 minutes 3 seconds. Unlike participant #26, participant #6 did not demonstrate a dramatic change in his mean frequency of out-of-seat behavior. His baseline mean frequency was 2.75 and his experimental mean frequency was 2, both well below the means for the entire group and male participants. Utilizing the stability ball as a chair proved to be an extremely effective strategy for this participant to decrease his duration of out-of-seat behavior. It would be unexpected, as previously discussed, to see a mean frequency any lower than 2.

Another male participant that demonstrated interesting and unexpected results was #13. Participant #13 was a male student that recently moved to the country from Pakistan. He had very limited English proficiency and, based on his limited acquisition of English, it was unlikely that he had a solid understanding of class and school rules and expectations. This study took place immediately following his move to the country. His baseline mean frequency was 4.2,

which is close to the group mean of 4.04 and baseline mean for males at 3.92. His experimental mean frequency dropped to 3,which is below the group mean of 4.1 and experimental mean for males at 3.98. His mean duration of out-of-seat behavior was what set his results apart from the others. His baseline mean duration of out-of-seat behavior was 8 minutes, 41 seconds, which is above the group mean duration of 7 minutes 37 seconds, and the baseline mean duration for male participants at 8 minutes 18 seconds. His experimental mean duration increased to 11 minutes 4 seconds, which was well above the experimental mean duration for the group at 5 minutes 57 seconds and for male participants at 5 minutes 24 seconds. He exhibited the maximum mean duration for all male participants, and the second highest mean duration of all participants. It is unknown if the use of the stability balls as a chair was an ineffective intervention for this student due to his limited proficiency in the English language and his lack of familiarity with the American school customs, or if this result would have occurred regardless of these factors. A repeated study including this participant would be recommended.

Female participants also presented with some interesting results. Participant #4 demonstrated results similar to those of male participants # 6 and 26. She also had a low frequency of out-of-seat behavior, during both the baseline and experimental phases of the study. Her baseline mean frequency of out-of-seat behavior was 2.8, increasing slightly to 3 during the experimental phase. As with the male participants, these frequencies were well below the baseline mean for the group at 4.04 and for female participants at 4.19, and the experimental mean for the group at 4.1 and for females at 4.25. Similar to the above-mentioned male participants, female participant #4 had a high baseline duration of out-of-seat behavior at 11 minutes 20 seconds, and showed a significant decrease in her duration of out-of-seat behavior

while seated on the stability ball, down to 4 minutes 56 seconds. These results lay outside the means for the group with a baseline mean duration of 7 minutes 37 seconds, and experimental mean duration of 5 minutes 57 seconds. They similarly deviated from the mean duration for female participants with the baseline mean duration at 6 minutes 40 seconds and the experimental mean duration at 6 minutes 32 seconds. This intervention was especially successful for this participant.

Another interesting female participant with results far outside of the means for the group was participant #9. She had relatively high frequencies of out-of-seat behavior during both the baseline and experimental phases of the study. Her baseline mean frequency was 7.2, and experimental mean frequency was 6.33. Her baseline mean duration was 13 minutes 20 seconds, which was the highest baseline mean for females. Her experimental mean did decrease to 9 minutes 3 seconds, but this was still far above the mean during the experimental phase of the study for both the whole group (5:57) and for female participants (6:32). It appeared that the use of the stability ball was effective in reducing the length of time this participant demonstrated out-of-seat behavior. Further study would be needed to determine if additional benefit would result from continued use of the stability ball, or if another intervention might be more beneficial for this participant.

The final female participant that demonstrated unexpected results was participant #24. She had relatively high mean frequencies of out-of-seat behavior in both the baseline and experimental phases of the study, 7.83 and 6 respectively. She demonstrated a slightly high baseline mean duration at 8 minutes 7 seconds, which increased to 11 minutes 21 seconds, the highest experimental mean duration. This participant was a member of the researcher's morning

class only, so it is unknown if her results would have been different had she also been in the researcher's afternoon math class.

Implications

According to the data from this study, use of the stability ball as an alternative seating option in an elementary school classroom proved to be a moderately successful strategy for decreasing out-of-seat behavior for male participants. Fifty percent of male participants that used the stability ball showed a decrease in the duration of out-of-seat behavior. Forty-two percent of male participants showed approximately the same duration of out-of-seat behavior while seated on a traditional chair or stability ball, and 8% of male participants demonstrated increased duration of out-of-seat behavior while seated on a stability ball. When looking at the data for all male students including those that did not use the stability ball in the experimental phase of the study, it was found that 40% decreased their out-of-seat behavior, 33% demonstrated little or no change, 7% had an increase and 12% did not use the stability balls. This finding was in contrast to the data for female participants; 27% of participants showed a decrease in duration of out-of-seat behavior and 27% an increase. Forty-five percent of female participants demonstrated little or no change in duration of out-of-seat behavior.

These data showed that frequency of out-of-seat behavior was not affected by the use of the alternative seating option of the stability ball for elementary school students. Further research focusing on reasons out-of-seat behavior occurs would yield valuable information that could allow for more targeted strategies to reduce its frequency. These data also showed that the duration of out-of-seat behavior was largely decreased or remained relatively unchanged for the vast majority of male participants, with only a small percentage demonstrating an increase in out

of seat behavior. This leads to the implication that the use of the stability ball as an alternative seating option for elementary school male students may be effective in decreasing out of seat behavior. Equal percentages of female participants demonstrated an increase as a decrease in duration of out-of-seat behavior, with the remaining participants showing little or no change in their behavior, resulting in the implication that use of the stability ball as an alternative seating option for elementary aged female students is not an effective strategy for decreasing duration of out-of-seat behavior.

Chapter 5

Conclusions and Recommendations

Results and Interpretation

The purpose of this study was to determine whether the use of stability balls as an alternative seating option in an elementary school classroom would reduce the frequency and duration of out-of-seat behavior of students.

Use of the stability ball as an alternative seating option in a third grade elementary school classroom did not appear to impact the frequency with which participants demonstrated out-of-seat behaviors. Participants as a whole had a baseline mean frequency of out-of-seat behavior of 4.04 and an experimental mean of 4.1. Female participants' baseline frequency mean was 4.19 with an experimental mean frequency of 4.25. Male participants had a baseline frequency mean of 3.92 and an experimental frequency mean of 3.98.

With the stability ball creating essentially no change in the frequency that participants were out of seat, other factors must be considered. Two that must be examined in this study are classroom procedures and teacher behaviors. The classes (math and writing) involved in the study had specific procedures in place that allowed and often required student movement. Classroom structures included the location of needed materials. For example, loose leaf paper was located in a basket on a countertop. Each time students needed a piece of paper, they had to get out of their seats to retrieve one. Students did have access to spiral notebook paper in their desks, but some tasks required the use of loose leaf paper. Another example of a needed material in a location that would necessitate students leaving their seats was the classroom dictionaries. These were located on a shelf in the back of the classroom. Each time students needed a

dictionary, they would have to leave their seats to get one, and then to return it. Both dictionaries and loose leaf paper were essential materials for students in writing class, which was often filmed for data collection purposes. A student also may have gotten out of seat to utilize the classroom wastebasket or get a supply of facial tissues. If lower frequency of out-of-seat behaviors is desired, changing classroom structures and locations of needed materials may make a greater impact than the use of stability balls as alternative seating.

The definition of seat behavior by the researcher may also need to be reexamined. Perhaps categorizing the instances of out-of-seat behavior as either purposeful (getting a dictionary or piece of paper) and non-purposeful (wandering the classroom) would help more clearly target the undesirable out-of-seat behavior of students. However, many participants appeared to leave their seats initially for a purposeful reason, but engaged in non-purposeful behaviors before returning to their seats. Future research should carefully consider and outline a more detailed definition of out-of-seat behavior, possibly including allowances for strictly purposeful out-of-seat behavior.

Another factor that may have impacted the frequency of out-of-seat behaviors was an uncontrolled classroom teacher variable. Throughout the study, the teacher had limited movement due to an injury that left her leg in a cast. She was most often positioned at her desk and students were required to leave their seats to come to her for assistance, to get questions answered, or to have work corrected. Had the teacher been able to circulate throughout the classroom and assist students at their desks rather than at her desk, there may have been a lower frequency of out-of-seat behavior overall. It is unknown if this variable equally impacted frequency of out-of-seat behavior for both genders, or equally impacted students seated in traditional chairs versus on stability balls.

The data on the duration of out-of-seat behavior for students seated on stability balls yielded interesting results. Overall baseline mean duration for out-of-seat behavior for participants seated on traditional chairs was 7 minutes, 16 seconds. Examining the results by gender showed a large difference between the two. The baseline mean duration of out-of-seat behavior for female participants was 6 minutes, 24 seconds, while for males it was 8 minutes, 1 second. Comparing the baseline data to the experimental data, it was observed that the overall mean duration for out-of-seat behavior for participants seated on stability balls decreased to 5 minutes, 45 seconds. This was a decrease in the overall mean duration for all participants of 1 minute, 31 seconds. Data by gender again yielded differing results. The mean duration of out-of-seat behavior for female participants seated on stability balls was 6 minutes, 23 seconds, which is only 1 second less than the mean duration during the baseline. For male participants it was 5 minutes, 7 seconds, a decrease of 2 minutes 54 seconds. These data demonstrated that use of the stability ball as an alternative seating option was effective in reducing the duration of out-of-seat behavior for male participants. This is not to say that use of the stability ball as an alternative seating option will work for every male student, or will not work for any female student.

Looking more closely at the data for individual participants, in Figure 5 it is possible to see large decreases in duration of out-of-seat behavior for female participants #4, 7 and 9. However, there are also large increases in duration for female participants #2, 5 and 24. Therefore, it can be concluded that use of the stability ball as an alternative seating option is effective in reducing the duration of out-of-seat behavior for female participants # 4, 7 and 9, and ineffective in reducing the duration of out of seat behavior for female participants #2, 5 and 24. The remaining female participants demonstrated only slight differences in duration of out of seat

behavior, so it can be concluded that neither the traditional student chair nor the stability ball were factors in the participant's duration of out of seat behavior. Other factors must be examined and manipulated if reduction of out-of-seat behavior for these participants is desired.

Taking a second look at individual data for male participants in Figure 6, it can be observed that only one male participant, #13, had a marked increase in out-of-seat behavior while using the stability ball as an alternative seating option. Several male participants, #3, 10, 16, 19, and 21, demonstrated small changes in duration of out-of-seat behavior. Thus a similar conclusion can be drawn regarding these participants as with the previously discussed female participants, that neither the traditional student chair nor the stability ball was a factor in the duration of out-of-seat behavior. Again, if reduction in duration of out-of-seat behaviors is desired other variables must be considered and manipulated. Male participants # 1, 6, 8, 14, 18, and 26 demonstrated marked decrease in duration of out-of-seat behavior while seated on stability balls. It can be concluded that use of the stability balls for these participants was an effective strategy for reducing the duration of out-of-seat behavior.

Also of note were the three male participants that did not use the stability ball as an alternative seating option. Two of the three self-selected not to use the stability balls. The reason for this decision is unknown. As seen from their baseline data (see Figure 6), the two (#5, #23) had a relatively short duration of out-of-seat behavior using the traditional chair. They had two of the three lowest baseline durations for male participants. Their durations remained among the lowest when compared to the experimental data for duration of out-of-seat behavior for males who used stability balls.

This study did not determine a level of frequency or duration of out-of-seat behavior that would constitute success or need for an alternative seating option. However, the desired outcome for students would be to have a short duration of out-of-seat behavior therefore increasing the likelihood of on-task behavior and greater potential for academic success. If this study had selected participants based on a high level of out-of-seat behavior, these two males would not have been included. Male participant #23 was a student with OHI, attention deficit disorder (ADD) who also experienced anxiety. His ADD was well controlled with medication throughout the duration of the study. Whether his health impairment impacted his not using the stability ball is unknown.

The third male participant, #12 in Figure 6, was the previously described student with autism. He did use the stability ball, but often as a sensory break rather than an alternative seating option. It is unknown if changes to the research design, including modifying the rotating schedule for use of the stability balls, providing training for the eight staff members working with him, providing use of the stability ball in other educational settings, or increasing the length of time of the study to account for his resistance to change would have yielded measurable results. He had a relatively long duration of out-of-seat behavior recorded during the baseline data collection period during which he utilized a traditional student chair. Further research, perhaps using a case study design, with this student or similar students would be recommended.

In summation, use of stability balls as an alternative seating option did not appear to reduce the frequency of out-of-seat behavior for elementary school students. The use of stability balls did appear to reduce the time spent out of seat for half the male students, and slightly more than one-quarter of female students.

Implications

This study showed that the use of stability balls as an alternative seating option for elementary school students could increase a student's in-seat behavior, therefore increasing the potential for academic success as a result of greater opportunity to be engaged in and attentive to instruction. This study showed a higher rate of reduction of out-of-seat behavior for male students utilizing stability balls as a classroom seat than for females. The implication of this finding is that use of the stability ball as an alternative seating option is an effective strategy to reduce the duration of out-of-seat behavior for the majority of male students, thus elementary school classroom should consider implementation of the use of stability balls as seats.

Recommendations

This researcher recommends that alternative seating options such as stability balls be utilized more frequently in elementary classrooms, especially as options for male students. It is also recommended that some form of evaluation for students be developed to determine which students would benefit from alternative seating options such as stability balls.

Further study is recommended in several areas. Future studies involving larger sample sizes in varying educational settings should be pursued, settings such as intermediate and high schools, to determine if alternative seating options are as or more effective in school settings with older students, and in educational settings with high rates of poverty. Further research should be done to determine other effective alternative seating options in addition to the stability ball investigated in this study. Future research should also evaluate the long-term benefits of use of alternative seating options for elementary students.

Further study should also investigate potential alternative seating options that would be better able to reduce duration of out-of-seat behavior for female students. Future research into using alternative seating options such as the stability ball with populations of students with disabilities and attention deficit disorder should be pursued in greater depth than what was done in this study.

This researcher also recommends changes to the methodology used in this study. Providing enough stability balls for each student to have access all day, every day, may yield different results, and could eliminate not understanding or following the alternating schedule used in this study. Another recommended methodological change would be to begin using the stability balls at the outset of the school year rather than in the latter half of the year due to the habits and routines of out-of-seat behavior that have already been well established.

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Appendix A

List of Rules for Classroom Use of the Stability Balls

1. Sit on the ball.
2. No feet on the ball. Keep both feet on the floor while seated on the ball.
3. Keep pens, pencils, scissors and other sharp objects away from the ball.
4. Little bounces are OK, but no giant ones.
5. Treat the ball like it is furniture, not a toy, even during indoor recess.
6. You may switch from a ball to a chair or a chair to a ball on your day, but not during instruction.

Appendix B

Data Recording Sheets

Data Recording Sheet: Participant #_____

Line	Subject	AM/PM	Frequency	Duration

1	Guidance	AM		
2	Guidance/Writing	AM		
3	Writing	AM		
4	Reading	AM		
5	Writing Research	AM		
6	Research	AM		
7	Math	PM		
8	Math	PM		
9	Math	PM		
10	Math	PM		
11	Reading Writing	AM		
12	Math	PM		
13	Math	PM		
14	Writing	AM		
15	Writing	AM		
16	Math	PM		
17	Reading	AM		
18	Writing	AM		
19	Math	PM		
20	Math	PM		

Film #	Subject/AM/PM	Frequency	Duration
