UNIVERSITY of INDIANAPOLIS®

School of Occupational Therapy

The Weighted Ball Massage Protocol: A Deep Pressure Modality for Sensory Regulation

Emily Moore, OTS

May 1st, 2023

A capstone project submitted in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree from the University of Indianapolis, School of Occupational Therapy.

Under the direction of the faculty capstone advisor:

Laura Aust, OTD, MS, OTR

Abstract

Sensory integration in the school setting is crucial for students to be successful in the classroom. One role of an occupational therapist (OT) is to implement strategies for sensory regulation so children are able to be independent in their occupation as students. The weighted ball massage protocol (WBMP) is a modality that applies a deep pressure input to promote sensory regulation. There were 25 participants total in the study who received the WBMP with six receiving it once daily, three receiving it once a week and 16 twice daily. The results determined that the WBMP is an effective modality for sensory integration in the school setting. OTs would benefit from incorporating a deep pressure input modality, such as the WBMP, to increase sensory regulation in students.

Introduction

Sensory integration is the way in which people process sensory stimuli as it reaches the brain (Ayres & Robbins, 2005). Children who have difficulty detecting, modulating, interpreting and responding to sensory experiences may indicate a sensory processing disorder (SPD) condition (Miller, et al., 2007). SPD is in correlation with under or over responsiveness to sensory stimuli such as movement and touch sensations (Alibrandi, et al., 2014). Research shows an increase in children having difficulty with processing sensory stimuli resulting in a difficulty for them participating in their daily occupations (Lang, et al., 2012). School is one of the main occupations children are involved in therefore the more they are dysregulated, the less successful they will be in this environment. Therefore, it is beneficial for OTs to implement sensory interventions to improve sensory processing and integration for children to acquire appropriate adaptive responses to everyday stimuli (Kashefimehr, Kayihan & Huri, 2018).

For my doctoral capstone, I was placed at Fairfield Schools to implement a protocol developed by the OT at one of the elementary schools and determine its effectiveness. It is called the weighted ball massage protocol (WBMP) and it provides deep pressure stimulation to the student it is performed on in order to regulate them for participation in the classroom. There are other sensory breaks given to the students who need it, including jumping and crashing, swinging, ball walks etc. The WBMP is only provided to students that the OT believes would benefit from it. Data sheets have been used to track effectiveness but due to inconsistencies between staff implementing it and documenting properly it is unknown how effective this protocol is for sensory regulation.

OTs currently implement sensory modalities to students but there is minimal evidence of deep pressure therapies being used in the school setting that prove effective with regulation (Bestbier & Williams, 2017). The goal of my project was to do a program evaluation of the WBMP to determine if it is an effective modality for sensory integration. Surveys were provided to teachers to assess participation in classroom activities along with parents to see how the child was at home. After weeks of myself implementing this protocol and taking data, I compiled my findings with those from the surveys to determine if it was an effective modality. After concluding this project, my findings were indicative of this being an effective modality and I shared my findings with the OT and other staff members during dissemination.

Background

The population I completed my program evaluation on include students who attend an elementary school in Fairfield Ohio. Students' grades range from preschool to fifth grade although there are no fourth graders in my study due to not meeting inclusion criteria. All participants demonstrated difficulties with sensory processing and have either an individualized

education plan (IEP) or a 504 plan along with OT services. I implemented the WBMP on these participants five days a week, twice daily. Three participants attended separate pre-schools in the Fairfield area. They only received the WBMP paired with other heavy work modalities, such as brushing and vibrations, once a day, one day a week by the OT.

Majority of the participants learn in neurotypical classrooms with SPDs. Some participants have additional diagnoses varying from attention deficit/hyperactivity disorder (ADHD), fetal alcohol syndrome (FAS), oppositional defiant disorder (ODD), a rare chromosomal diagnosis and sensory issues. Five of the participants are a part of the social communication classroom with diagnoses of autism spectrum disorder (ASD). These participants received the WBMP once a day paired with swinging since they all were sensory seeking and required more input.

The primary challenge most students are facing in this school setting is overstimulation of their sensory systems which disturbs their daily functioning (Schoen, et al., 2019). Poor sensory processing can contribute to maladaptive behaviors which impacts their ability to participate in household routines, social relationships, and school occupations (Schaaf & Miller, 2005). This same article found that sensorimotor activities can help the nervous system change through interactions between an individual and their environment to shape their brain development (Schaaf & Miller, 2005). Recently, there has been a variety of deep pressure interventions OTs have used in the school to help with sensory processing.

The population for one study focused on children diagnosed with Autism and used somatosensory stimulation interventions because the deep pressure input that the children receive is found to be effective for sensory regulation (Hodgetts & Hodgetts, 2007). These somatosensory stimulation interventions incorporated; weighted vests, pressure vests and gloves, arm splints with

pressure arm wrappings, and massage therapy (Hodgetts & Hodgetts, 2007). Another study searched databases and found 15 of the articles listed compression garments, massage, sensorimotor interventions and positioning interventions as effective for addressing sensory integration (Paleg, Romness & Livingstone, 2018). Overall, deep pressure input interventions were found to be useful especially for those with sensory needs.

Although the WBMP is a modality that applies deep pressure input to the student, similar to the interventions mentioned above, it is not currently represented in the literature due to it being an upcoming intervention. Therefore, the OT requested a program evaluation of the WBMP modality to determine its effectiveness in regulating students with SPDs. In addition, we looked at some factors such as; gender, diagnosis, grade, consistency, combining with another modality and the duration it keeps a child regulated throughout the day to analyze how they impact findings.

The main goals the OT wanted to see at this site included; students demonstrating independence across all environments, emotional and sensory regulation, and obtaining the skills needed for school related performance. One article studied massage as an intervention for sensory regulation and concluded that the group that received the deep input massage intervention significantly improved their total motor, gross motor and sensory sensitivity behavior score (Lu, et al., 2019). If proven effective, the WBMP should meet all of the goals regarding students' success in the classroom as the massage intervention did in the study above. Another study looked at “Touchpoints” which is a device that activates the tactile sensory system through vibrations of the device to help reduce emotional and bodily distress for children with sensory oversensitivity (McGhee, et al., 2021). The main finding from this study concludes that using Touchpoints before bedtime helped increase the child’s ability to fall asleep and sleep latency (McGhee, et al., 2021). We paired a similar vibratory device to Touchpoints with the WBMP to the three pre-school

children in our study in order to determine if combining the protocol with other heavy work is beneficial for sensory regulation.

During the needs assessment, a significant barrier the OT reported is the failure of faculty to follow-through with interventions, specifically the WBMP and implementing it correctly and consistently. Research shows effectiveness of treatment is diminished when there is a lack of treatment integrity (Humphries, Snider & McDougall, 1997) therefore it is vital to have consistency when implementing sensory interventions. One study found that sensory modulation helped with the young children and their parent's sleep, relationships, self-care, academic performance, and independence in daily tasks (Williamson & Ennals, 2020). It is notable that somatosensory stimulation interventions, especially those that provide deep pressure input, are not only effective for sensory modulation at school but they also improve children's sleep and their relationships. If these somatosensory interventions that provide a deep pressure input are effective for sensory regulation, the WBMP should prove to be as well.

After reviewing the literature, findings indicate somatosensory interventions are effective. However, there is still limited evidence on how it impacts the student's performance in school, their ability to sustain focus, participation in the classroom and their behaviors at home. For my study, I used a pre/post survey for parents to fill out that looks at the student's sleep and their behavior after school. I also had teachers fill out a weekly form collecting data on their student(s) participation in class, completing seated work independently, and following directions. Instead of looking at academic performance, I am focusing on other ways to be successful in the classroom.

Theories

The Occupational Adaptation (OA) model and the Sensory Integrative (SI) frame of reference were utilized to help guide my DCE project. The OA model focuses on the interactive

process between a person and their environment along with the internal adaptive process that occurs when engaged in occupations (Cole & Tufano, 2020). My population's occupations consist of playing, learning, self-care, rest, sleep, and social participation. The OA model assisted in guiding my program evaluation by investigating if my population is experiencing dysfunction in any of these areas. This was assessed through surveys completed by teachers who have these students in the classroom, parents from what they experienced at home, and lastly the OT along with other staff members at the school my population frequently interacted with.

Sensory integration affects all of the occupations a person is involved in, especially with occupational performance at school with the participants in this study. The purpose of the SI frame of reference from an OT standpoint is to discover activities that involve the type of intense sensory input students need to normalize their sensory processing (Cole & Tufano, 2020). This theory guided the WBMP through data collection sheets that recorded behaviors before and after implementation, zone of regulation from student and teacher perspective, and the time of day it was received. These documents were able to record if participants were able to integrate their sensations by engaging in their age-appropriate occupations, such as classroom expectations.

Project Design & Implementation

The WBMP was created by the OT at the elementary school (see Appendix A). When her son was little, she noticed him having difficulty sleeping, outbursts when returning home from school and constant sensory dysregulation. She designed the WBMP to apply deep pressure, similar to a massage, that is less invasive through utilizing a ball instead of with hands. She created her own data sheets and listed individualized characteristics of each student when regulated and dysregulated, to be recorded before and after the modality (see Appendix B). She also added a portion about the zones of regulation to see if students are able to correctly identify

how they are feeling. She has implemented this for 20 years and requested a program evaluation to determine effectiveness.

There were 25 participants total in the study who received the WBMP with six receiving it once daily, three receiving it once a week and 16 twice daily. I implemented the WBMP to the 16 students twice daily, five days a week at the same time for consistency. Then, I filled out the data sheets twice a day per student to document behaviors and feelings before and after implementation. Five of the six students who received the WBMP once a day were a part of the social communication classroom therefore they also received swinging paired with the WBMP. Three students were preschoolers who received the WBMP once a week paired with other heavy work such as brushing and vibration. I also sent out teacher surveys to be filled out weekly to document the student's ability to participate in the classroom, sustained attention, remaining seated during classwork and following directions (see Appendix C). Lastly, I sent out a pre and post survey for parents to fill out regarding their child's behavior and sleep at home at the beginning and end of the study (see Appendix D and F). Each week all data sheets were calculated, analyzed then interpreted on a Google Sheets spreadsheet. The data calculated represents how often students were within normal limits, how often the modality was effective, how often it was not effective and the amount of times students were correctly able to identify the zone of regulation. A student in the green zone, meaning they are calm or happy, are considered within normal limits. If a student was sad, bored, excited, mad, silly or demonstrated other off-task behaviors and after their sensory breaks resembled being calm or happy, the modality was effective. All data was converted into percentages and recorded on a graph.

There were quite a few challenges I encountered during implementation of my project. The first issue was parent participation in my pre and post survey regarding their child's

behaviors at home. I only received a third of them back so it is unclear if the WBMP at school shows long term effectiveness in at home behaviors. Another challenge was having teachers fill out the weekly surveys in a timely manner. It is difficult for me to determine if the WBMP regulates students to be able to participate in the classroom if teachers are unable to report student's progress timely. Another huge barrier is being able to see students consistently to implement the ball rolling modality. Student absences, snow days, and two-hour delays are some of the reasons students were not seen consistently. Lastly, I included five students with ASD who are in the social communication classroom and there were many days some of them were extra wiggly or having meltdowns which made implementation difficult.

One of the main successes during implementation included student's willingness to participate in the WBMP multiple times a day. Another huge success is teachers were very understanding of the importance of sensory breaks therefore allowing me to pull their students out of class for my project.

Project Outcomes

At the beginning of the study, only two students were within the green zone 100% of the time during their sensory break (see Figure 1). At the end of implementation, six students were within the green zone 100%, and two were within the green zone 76-99% of the time (see Figure 4). When students were not in the green zone at the beginning of the study, the WBMP was effective, meaning they were able to get back to the green zone, with four students 100%, one 83% and three 50-75% of the time out of 19 students (see Table 2) (see Figure 3). At the end of implementation, the WBMP was effective for eight students 100% and four students 60-67% of the time out of 15 students (see Table 4) (see Figure 6). Initially, the WBMP was not effective 0-25% of the time 12 out of 21 times (see Table 1), which increased to 20 out of 21 times by the end

of the study (see Table 3). All of this data indicates that the WBMP is an effective modality for sensory regulation.

In addition to measuring the short term effectiveness, my study assessed the ability for students to correctly identify which zone of regulation they are in. At the beginning of the study, nine students identified the correct zone 76-100%, seven 51-75%, and one 26-50% of the time (see Figure 2). By the end of implementation, 13 students identified the correct zone 76-100% and three students 51-75% of the time (see Figure 5). Over the course of eight weeks students demonstrated the ability to correctly identify the zone of regulation they are in, meaning they are able to express how their bodies are feeling and noticing when they need a break.

Teachers were encouraged to fill out a survey at the end of each week for the eight weeks I implemented the WBMP. Data was then exported from the Google survey to a Google sheets document. Due to most teachers not consistently filling out the weekly surveys, I decided at the end of my project to discuss students' behaviors and performance in the classroom with their teachers and compare those findings to data collected from week one (see Appendix E). The biggest improvement seen is student’s ability to remain seated in the classroom. Also, there were some improvements made with students following directions. There were not many improvements with classroom participation, sustained attention to classroom tasks and ability to initiate tasks. Five teachers reported seeing no improvements in their students after receiving the WBMP over the course of eight weeks. On the contrary, five teachers noted less behaviors and their students being more calm in class, two teachers noticed an increase in work production, and two others reported an increase in participation. A few other teachers saw improvements with their students remaining on task, remaining seated and better body control. I included five students from the social communication classroom with diagnosis of ASD and their teacher

reported seeing improvements with transitions from preferred to non-preferred activities and less behaviors after consistently receiving the WBMP.

Parents were sent a pre and post survey regarding their child's behaviors at home and their ability to sleep. About 54% of caregivers filled out the pre-survey. When analyzing the data collected, 61.5% of caregivers were instructed in the WBMP from the OT with 31% of them implementing it at home with their children. When asked about children's behaviors at home, 84.6% report their child is full of energy, with 38.5% indicating their child is wiggly. In addition, 69.2% selected their child as happy . A little over half of caregivers report their student refuses to complete homework and a little less than half have outbursts. Caregivers also selected their students to be hyperverbal and whiny 23.1% of the time. Only three caregivers report their child is calm at home. Lastly, only one caregiver reported difficulty getting their child to bed each night with them also demonstrating difficulty sleeping throughout the night. After implementation, only about 33% of parents filled out the post parent survey. When reviewing the findings, 75% of those caregivers checked that their child is full of energy at home with 50% experiencing outbursts and refusal to complete homework. However, 62.5% also checked that their child is happy at home. When asked about bedtime, 88% of caregivers report having minimal to no difficulty with their child going to bed with 50% sleeping completely, 12.5% mostly and 37.5% average throughout the night. Caregivers were asked if any changes were seen in their child at home with 62.5% reporting yes and 37.5% reporting no. For those who selected "yes" they were encouraged to check the boxes where changes were seen. Majority of improvements were seen with transitions in the home with a handful of caregivers reporting less behaviors, improved sleep and that their child is happier.

Summary

Sensory integration is essential for children to independently participate in their occupations as students in the classroom. The OT at the school recognizes this and developed the "weighted ball massage protocol" which is a modality that provides deep pressure input to the student for sensory regulation.

In order to determine the effectiveness of the weighted ball massage protocol, 25 students were selected to be a part of the study with 17 receiving the modality at the same time twice daily. Student's all had SPD with some diagnosed with other conditions such as ASD, ADHD, FAS, etc. Data sheets were created to document the student's zone of regulation before and after receiving the weighted ball massage protocol to measure short term effectiveness. Teacher surveys were sent out weekly and at the end of the study they were interviewed to document their student(s) progress to measure long term effectiveness in the classroom. A parent pre-survey and post-survey were sent out to determine if consistency with sensory breaks at school carried over to at home.

When comparing data from the beginning of the study to the end, results showed an increase in students being in the green zone by the time of their sensory breaks meaning they were more regulated. Another finding showed when students were not in the green zone, they were more likely to return to the green zone after receiving the weighted ball massage protocol. Students also improved in their ability to correctly identify the zone of regulation they are in at the time of their sensory breaks. The main improvements teachers noticed within their classroom included seeing less behaviors and an increase in their students remaining seated during work time. Parents reported noticing their students being more calm at home and improvements in sleep.

Conclusion

Sensory interventions are vital for students who are dysregulated to be able to focus on their tasks in the classroom. By the end of the study, the majority of students increased their ability to identify the correct zone of regulation they were in before and after receiving their sensory break. Also, students were more regulated, in the green zone, by the time of their sensory breaks. During the times students were dysregulated, the weighted ball massage protocol was effective in regulating students back into the green zone. The main improvements seen within the classroom include less behaviors and an increase in students remaining seated during classwork. Some parents even noted seeing improvements in their child's sleep and report they are happier. Overall, it can be concluded that the WBMP is an effective modality for sensory regulation.

The OT at my site has been implementing this modality for many years knowing it was beneficial to the students but wanted to know specifics for effectiveness. Since my data shows the specifics, the OT is using my data to educate teachers and other staff members of the importance of consistent sensory breaks, and incorporating the WBMP more.

There is a lot of research proving the importance of sensory interventions to promote regulation in the classroom. However, there are not many deep pressure modalities utilized in the school setting. Since my study shows the WBMP is an effective deep pressure modality for sensory regulation, OT's in any pediatric setting, especially schools, would benefit from implementing this with students with SPD to help assist in their independence with their occupations at school.

References

Alibrandi, N., Beacock, L., Church, C., Des Moines, S., Goodrich, K., Harris, L., Sprague, C., Vrtovsnik, L., (2014). Perceptions and Awareness of Sensory Processing Disorder Among Head Start Personnel (Master's Thesis). Retrieved from UMI (1558942) http://gradworks.umi.com/15/58/1558942.html

Ayres, A. J., & Robbins, J. (2005). *Sensory integration and the child: Understanding hidden sensory challenges*. Western psychological services.

Bestbier, L., & Williams, T. I. (2017). The immediate effects of deep pressure on young people with autism and severe intellectual difficulties: demonstrating individual differences. Occupational therapy international, 2017, 7534972. https://doi.org/10.1155/2017/7534972

Cole, M. & Tufano, R. (2020). Applied Theories in Occupational Therapy: A Practical Approach (2nd Ed.). Slack, Inc.

Hodgetts, S., & Hodgetts, W. (2007). Somatosensory stimulation interventions for children with autism: literature review and clinical considerations. Canadian Journal of Occupational Therapy. Revue Canadienne d'ergotherapie, 74(5), 393–400. https://doi.org/10.2182/cjot.07.013

Humphries, T. W., Snider, L., & McDougall, B. (1997). Therapists' consistency in following their treatment plans for sensory integrative and perceptual-motor therapy. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, *51*(2), 104–112. https://doi.org/10.5014/ajot.51.2.104

Kashefimehr, B., Kayihan, H., & Huri, M. (2018). The Effect of Sensory Integration Therapy on Occupational Performance in Children With Autism. *OTJR : occupation, participation and health*, *38*(2), 75–83. https://doi.org/10.1177/1539449217743456

Lang, R., O'Reilly, M., Healy, O., et al. (2012). Sensory integration therapy for autism spectrum disorders: a systematic review. Research in Autism Spectrum Disorders. 2012;6(3):1004–1018. doi: 10.1016/j.rasd.2012.01.006.

Lu, W.-P., Tsai, W.-H., Lin, L.-Y., Hong, R.-B., & Hwang, Y.-S. (2019). The beneficial effects of massage on motor development and sensory processing in young children with developmental delay: A Randomized Control Trial Study. Developmental Neurorehabilitation, 22(7), 487–495. https://doi.org/10.1080/17518423.2018.1537317

McGhee, K., Kidney, E., Pou, K., Pruyn Bouley, H., & Reynolds, S. (2021). The Effectiveness of Bilateral Alternating Tactile Stimulation for Improving Sleep in Children with Sensory over-Responsivity. Occupational Therapy in Health Care, 35(4), 424–441. https://doi.org/10.1080/07380577.2021.1946734

Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., & Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *The American Journal of Occupational Therapy*, *61*(2), 135.

Paleg, G., Romness, M., & Livingstone, R. (2018). Interventions to improve sensory and motor outcomes for young children with central hypotonia: A systematic review. Journal of Pediatric Rehabilitation Medicine, 11(1), 57–70. https://doi.org/10.3233/PRM-170507

Schaaf, R. C., & Miller, L. J. (2005). Occupational therapy using a sensory integrative approach for children with developmental disabilities. Mental Retardation and Developmental Disabilities Research Reviews, 11(2), 143–148. https://doi.org/10.1002/mrdd.20067

Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Smith Roley, S., & Schaaf, R. C. (2019). A systematic review of ayres sensory integration intervention for

children with autism. *Autism research : official journal of the International Society for Autism Research*, *12*(1), 6–19. https://doi.org/10.1002/aur.2046

Williamson, P., & Ennals, P. (2020). Making sense of it together: Youth & families co-create sensory modulation assessment and intervention in community mental health settings to optimize daily life. Australian Occupational Therapy Journal, 67(5), 458–469. https://doi.org/10.1111/1440-1630.12681

Table 1

Week One: Data Collection–Data Sheet Findings

	WNL	Effective	Not Effective			Able to ID
76-100%	7	0	0		**76-100%**	9
51-75%	5	3	1		**51-75%**	7
26-50%	6	3	8		**26-50%**	1
0-25%	3	15	12		**0-25%**	0

Note. There were 21 students during week one. Numbers indicate how often students were WNL (in the green zone), how often the WBMP was effective (students who were not in the green zone but then were after) and how often it was not effective (students were not in the green zone and still were not) before and after their sensory break. The numbers on the right indicate how often students correctly identified the zone of regulation they were in before and after their sensory break.

Table 2

Week One: Effectiveness of WBMP not including those WNL

Percentage	Effective
76-100%	5
51-75%	3
26-50%	6
0-25%	5

Note. There were 21 students during week one. Two students were in the green zone (WNL) 100% of the time therefore they were not included in this table's data. This data looked at 19 students and assessed how effective the WBMP was at regulating them back to the green zone.

Table 3

Week Eight: Data Collection–Data Sheets Findings

	WNL	Effective	Not Effective			Able to ID
76-100%	8	1	0		**76-100%**	13
51-75%	5	2	0		**51-75%**	3
26-50%	4	6	1		**26-50%**	0
0-25%	4	12	20		**0-25%**	0

Note. There were 21 students during week eight. Numbers indicate how often students were WNL (in the green zone), how often the WBMP was effective (students who were not in the green zone but then were after) and how often it was not effective (students were not in the green zone and still were not) before and after their sensory break. The numbers on the right indicate how often students correctly identified the zone of regulation they were in before and after their sensory break.

Table 4

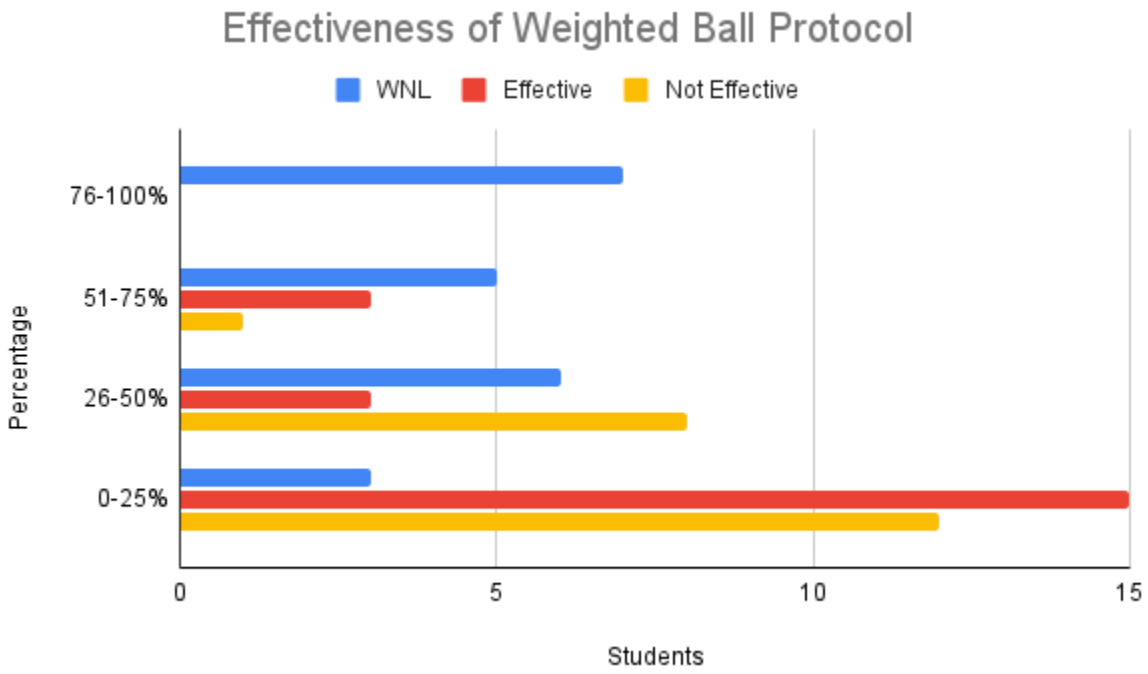
Week Eight: Effectiveness of WBMP not including those WNL

Percentage	Effective
76-100%	8
51-75%	4
26-50%	2
0-25%	1

Note. There were 21 students during week eight. Six students were in the green zone (WNL) 100% of the time therefore they were not included in this table's data. This data looked at 15 students and assessed how effective the WBMP was at regulating them back to the green zone.

Figure 1

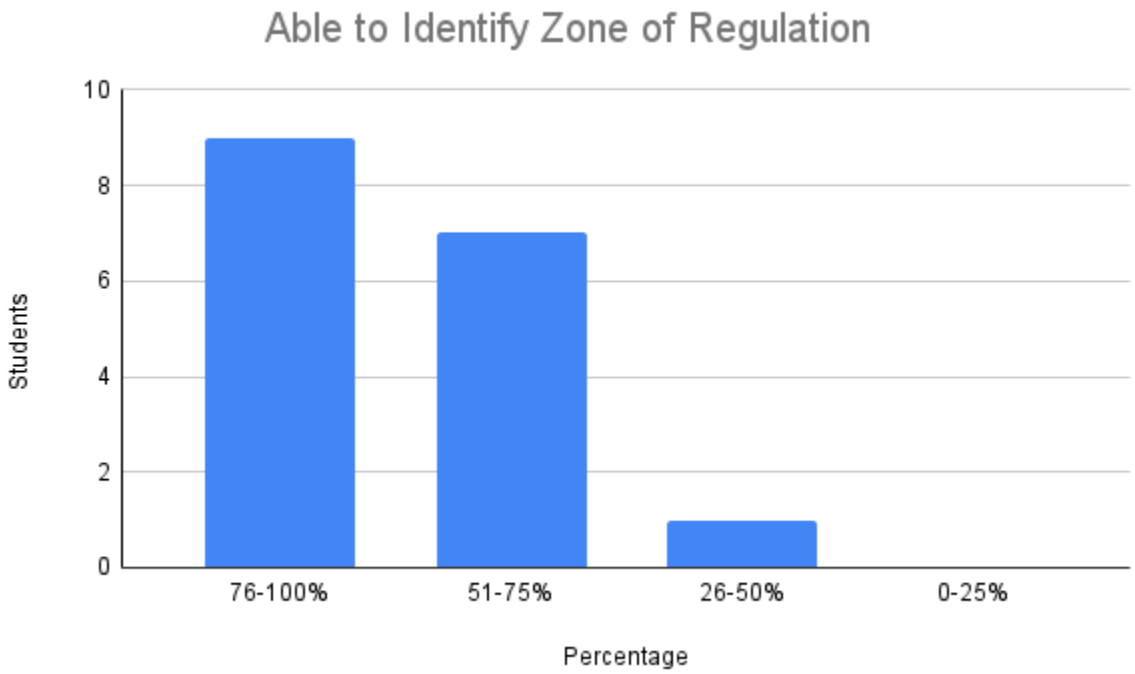
Week One: Effectiveness of Weighted Ball Protocol



Note. Graph represents data from Table 1, comparing how often the WBMP was effective, not effective and how often students were WNL before and after sensory break during week one.

Figure 2

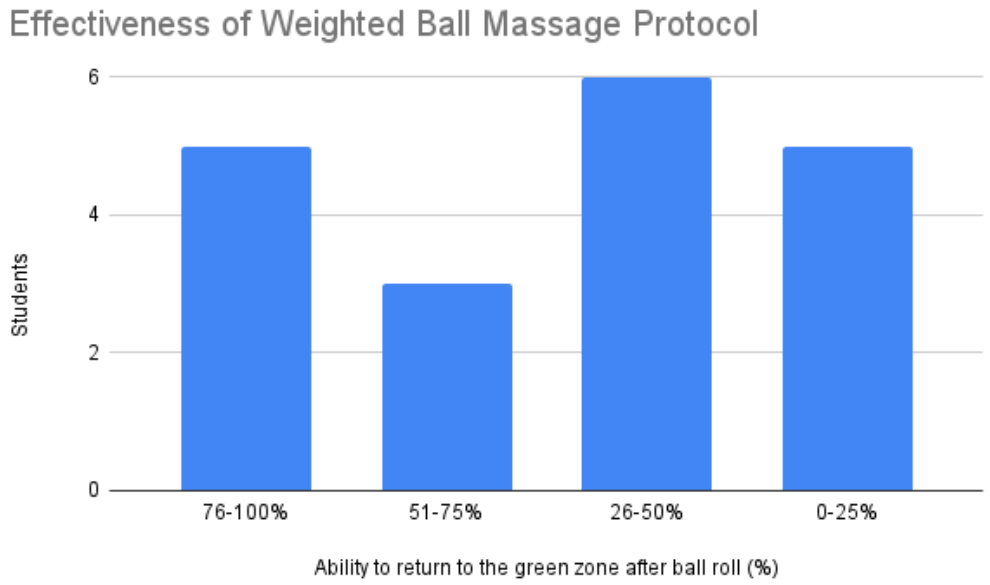
Week One: Ability to Correctly Identify Zone of Regulation



Note. Graph represents the percentage of students able to correctly identify the zone of regulation they are in during week one of implementation.

Figure 3

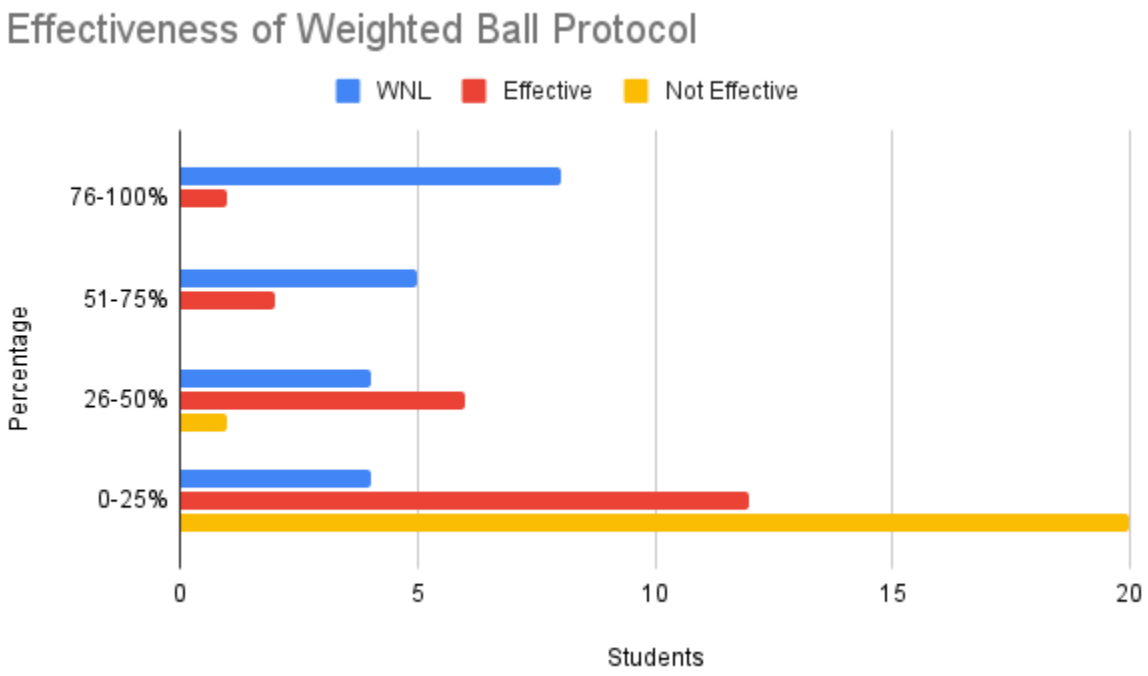
Week One: Effectiveness of Weighted Ball Protocol



Note. Graph represents data from Table 2, comparing effectiveness of the WBMP after removing those WNL.

Figure 4

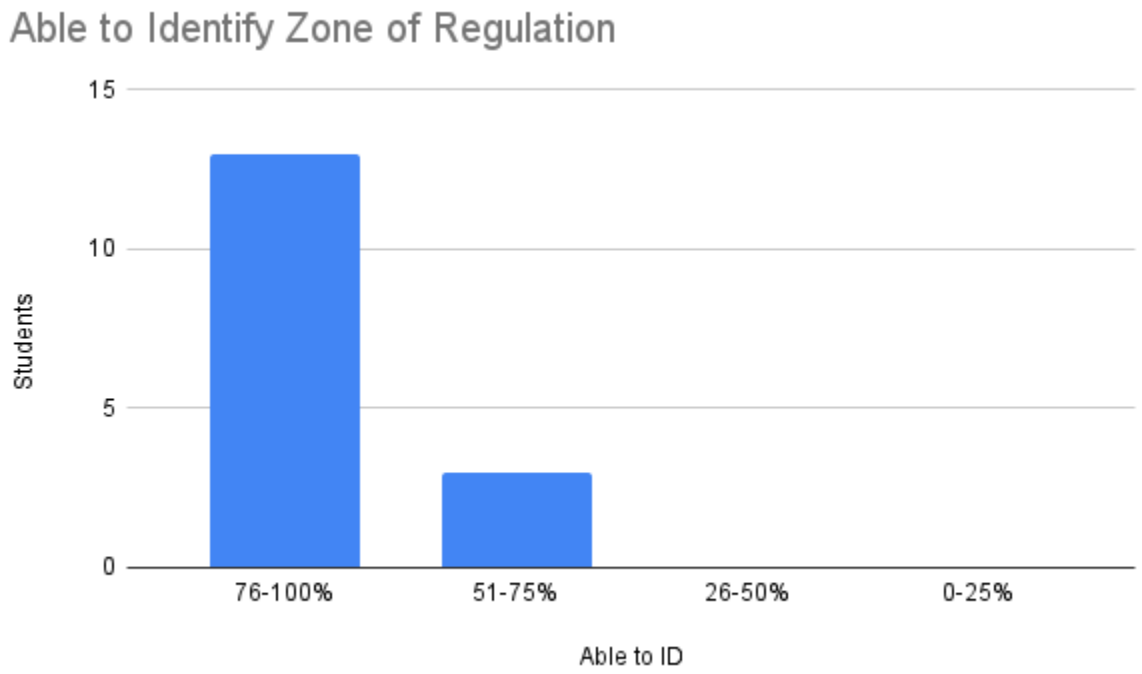
Week Eight: Effectiveness of Weighted Ball Protocol



Note. Graph represents data from Table 3, comparing how often the WBMP was effective, not effective and how often students were WNL before and after sensory break during week eight.

Figure 5

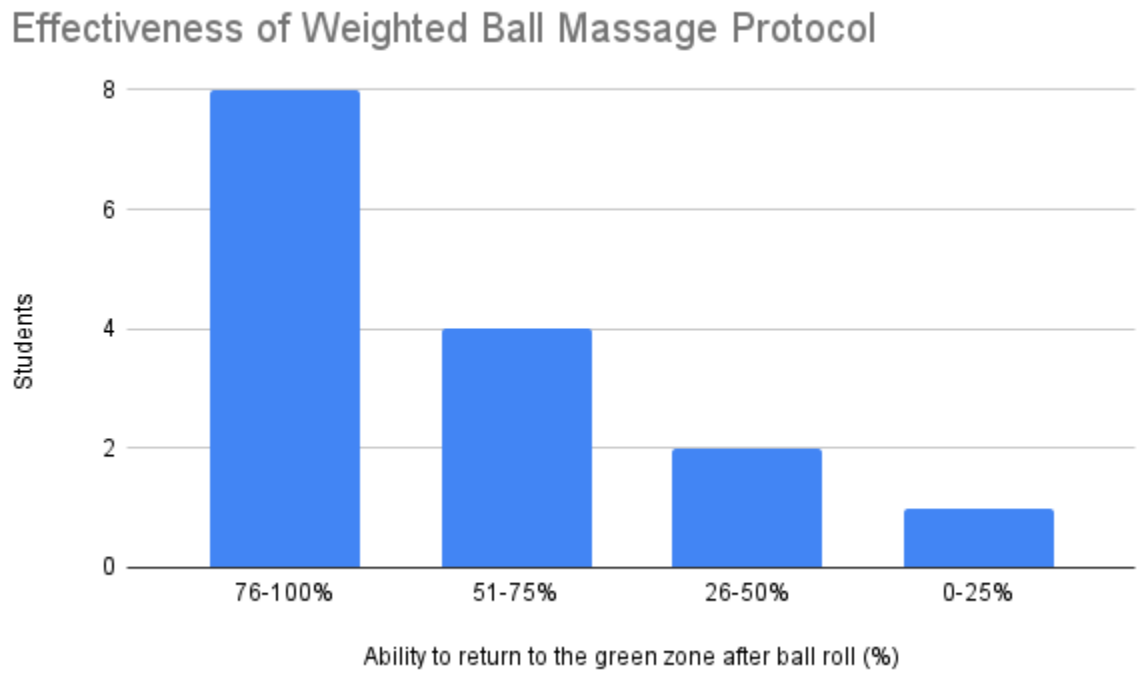
Week Eight: Ability to Correctly Identify Zone of Regulation



Note. Graph represents the percentage of students able to correctly identify the zone of regulation by the end of implementation.

Figure 6

Week Eight: Effectiveness of Weighted Ball Protocol



Note. Graph represents data from Table 4, comparing effectiveness of the WBMP after removing those WNL, after implementation.

Appendix A

Weighted Ball Massage Protocol (WBMP)

Use a 3, 4 5, pound ball which is found online. The ball should be close to 5-8% of the child's body weight and pliable.
*Important you must be in-service/trained by an Occupational Therapist prior to beginning this technique. Once you begin contact with the ball on the child do not break contact so the input can reach summation in the brain all at once.

START: Place the student on their stomach. Start at the child's waistband. Make a "v" on each side of the spine. Proceed from the middle of the spine to the lower back and up to the base of the neck. Roll the ball up and down the spine 10 times. Do not roll the buttocks area.
Next: Roll from the neck area to the shoulder and down the arm, firmly. Then, push 10 times to the back of the hand fast, using firm pushes (like cardiac compression). Come up the arm across the back to the other arm, roll down the arm and push 10 times on the hand. Come back up the arm, and then down the spine.
Then: Place your non-dominant hand on the back of the thigh firmly. Pick up the ball and roll down the back of the leg firmly.
Then: Push 10 times on the ankle in the resting position.
Now: Go down the foot 10 times, from the heel to the toes, slowly and firmly, proceed to the other foot and roll up and down the other foot 10 times.
Then: Come up the leg, rolling firmly across the back of the knee. Pick up your hand and place it on the back. Pick up the ball and roll up and down the back 10 times, making a "v" on each side of the spine.
Finally: have the student roll on his or her back. Hold their arm as to not break contact. Place the ball on the forehead and push or roll on the forehead, between and just above the eyebrows, 10 times. Ask the child if they want to repeat if they say yes. Push 10 Times and repeat as necessary up to 60 times.
Then: say, "all done."

It is important not to talk to the child other than counting or asking them how it feels during the protocol.

Candace Yates, MS,OTR/L
Occupational Therapist.

Appendix B

Weekly Data Sheets

Sensory Plan 2023
Documentation samplings: One to two times per week using varied days.

Student name:

Date Prescribed : 1/30/2023 **Frequency: 1-2 times a day, 4x per week**

(Please select from the below circled modalities for student's sensory plan. Try to schedule the modalities at the same time each day. You can use the same modality more than one time in a day.)
Use only modalities prescribed by the O.T.

Modalities Prescribed: **Ball Roll Swing Other: Heavy work**

Environment: Away from doors, and windows. Close to the teacher.

WEEKLY DATA:

Date: _____Time of modality: _____ Modality: Ball Roll Swing Heavy work job

Ball Used: **Texture:** **Smooth Rough** **Weight (lbs):** **3 4 5**

Behavior prior to modality:
Off task Wiggly Up moving around Running in place Spins On task Working

Student report: Red zone yellow zone blue zone green zone
Teacher report Red zone yellow zone blue zone green zone

Behavior during modality:
Wiggly Ticklish Laying flat (still) Sitting upward/propped

Behavior Immediately following modality:

Off task Wiggly Up moving around Running in place Spins On task Working

Student report: Red zone yellow zone blue zone green zone
Teacher report Red zone yellow zone blue zone green zone

_____
_____
_____
_____
_____

Signed _____

Appendix C

Weekly Teacher Surveys

Name of teacher: _____

Name of student: _____

How often has your student followed your directions this week?

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Student demonstrated ability to sustain attention to classroom tasks

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Child was able to initiate task(s)

- Independently
- Minimal cues
- Moderate cues
- Child never initiated any task(s)

Student remained seated during class work

- All of the time
- Most of the time
- Half of the time
- Less of the time
- Never

Student participated in class

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Off task behaviors displayed this week (if applicable): _____

Any other questions/comments/concerns regarding your student this week: _____

Appendix D

Pre-Parent Survey

Have you been instructed and trained in the ball rolling protocol by the OT?

- Yes
- No

How often do you implement the ball rolling at home with your child?

- Every day
- 4-6 days a week
- 1-3 days a week
- A couple times a month
- Never
- Other:_____

Check all that apply regarding your child's behavior at home:

- Full of energy
- Hyperverbal
- Refusal to do homework
- Whiny
- Wiggly
- Angry
- Outbursts
- Calm
- Happy
- Other:_____

How does your child respond when it is bedtime?

- Goes right to bed with no problems
- Has some resistance but ultimately goes to bed with few problems
- Demonstrates negative behaviors, overall difficult to get to bed nightly

How is your child sleeping at home?

- Excellent! Sleeps through the night
- Not bad! Mostly sleeps through the night
- Average! Sometimes sleeps throughout the night, sometimes unable
- Not good! Frequently has difficulty sleeping through the night
- Horrible! Never sleeps through the night

Additional comments/concerns about your child at home that you feel may be beneficial to my study:

_____

Appendix E

End of Implementation Teacher Reflection Interview/Survey

How often has your student followed your directions this week?

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Student demonstrated ability to sustain attention to classroom tasks

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Child was able to initiate task(s)

- Independently
- Minimal cues
- Moderate cues
- Child never initiated any task(s)

Student remained seated during class work

- All of the time
- Most of the time
- Half of the time
- Less of the time
- Never

Student participated in class

- 90-100% of the time
- 75-89% of the time
- 50-74% of the time
- 25-49% of the time
- 0-24% of the time

Overall, have you noticed any improvements in your student over the past eight weeks? If so, in regards to what? (i.e, remaining seated increased participation, completing classroom assignments, less behaviors, sustaining attention, etc.) _____

Any other questions/comments/concerns regarding your student this week: _____

Appendix F

Post-Parent Survey

Check all that apply regarding your child's behavior at home:

- Full of energy
- Hyperverbal
- Refusal to do homework
- Whiny
- Wiggly
- Angry
- Outbursts
- Calm
- Happy
- Other:_____

How does your child respond when it is bedtime?

- Goes right to bed with no problems
- Has some resistance but ultimately goes to bed with few problems
- Demonstrates negative behaviors, overall difficult to get to bed nightly

How is your child sleeping at home?

- Excellent! Sleeps through the night
- Not bad! Mostly sleeps through the night
- Average! Sometimes sleeps throughout the night, sometimes unable
- Not good! Frequently has difficulty sleeping through the night
- Horrible! Never sleeps through the night

I have implemented my project for 8 weeks (Jan 30-March 24). Have you noticed any changes in your child at home during this time? (Examples: behaviors, completing homework, sleeping better, more calm, transitioning better…etc.)

- Yes
- No

Please select all the changes you have seen (if any):

- Less behaviors
- Completing homework
- Improved sleep
- Child is more calm/better body control
- Transitions better
- Child follows more directions at home
- Child is happier
- None of the above, my child has remained the same at home
- Other:_____

Additional comments/concerns about your child at home that you feel may be beneficial to my study:

_____

Doctoral Capstone Experience and Project Weekly Planning Guide

Week	DCE Stage (orientation, screening/evaluation, implementation, discontinuation, dissemination)	Weekly Goal	Objectives	Tasks	Date complete
1 1/9-1/13	**Orientation**	Get accustomed to the site and meet students/develop a potential caseload.	1. Observe OT's caseload and meet/start building rapport with students. 2. Get familiar with the building and staff.	1. Read through student files. 2. Communicate with staff members to inform them of my project. 3. Create a weekly schedule with goals and plans for each week. 4. Create surveys for teachers/parents to fill out	**1/13**
2 1/16-1/20	**Screening/Evaluation**	Determine students on caseload, finalize project and get trained in the ball rolling protocol.	1. Continue to build rapport with students and staff 2. Make any final changes to MOU 3. Finalize project and which aspects of the ball rolling protocol we want to study	1. Create a schedule when to see students 2. Edit surveys for teachers/parents to fill out 3. Begin drafting data sheet 4. Continue updated searches of the literature for new findings 5. Get trained in ball roll protocol 6. Review students personal data sheets **Submit final MOU due 1/20**	**1/19**
3 1/23-1/27	**Screening/Evaluation**	Finalize entire project details and prepare all documents needed for implementation next week.	1. Continue to build rapport with students and staff 2. Review literature review and edit if needed	1. Finalize schedule for when students will be seen. 2. Finalize surveys for parents and staff	**1/26**

			3. Communicate with staff about their documentation needed weekly during implementation of project	3. Send out to teachers and caregivers to fill out weekly for 8 weeks 4. Final searches of literature for new findings 5. Finalize data sheet **Submit Introduction Draft due 1/23**	
4 1/30-2/3	**Implementation**	Implement ball roll protocol and recording data	1. Begin following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff **Submit Background Draft due 1/30**	**2/3**
5 2/6-2/10	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff **Submit Project: Design and Implementation Draft due 2/6**	**2/10**
6 2/13-2/17	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and	1. Implement ball roll protocol while following schedule	**2/17**

			implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff	
7 2/20-2/24	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff	**2/24**
8 2/27-3/3	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff	**3/3**
9 3/6-3/10	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball	1. Implement ball roll protocol while following schedule	**3/10**

			rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff	
10 3/13-3/17	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff **Submit Project: Outcomes Draft due 3/13**	**3/17**
11 3/20-3/24	**Implementation**	Implement ball roll protocol and recording data	1. Continue following schedule and implementing ball rolling protocol to students during sensory breaks 2. Continue communication with staff members 3. Continue building rapport with students on caseload	1. Implement ball roll protocol while following schedule 2. Record data on finalized data sheet 3. Obtain surveys from teachers/staff **Dissemination Plan due 3/20**	**3/24**
12 3/27-3/31	**Discontinuation**	Review and analyze data collected over the past 8 weeks to find significant findings	1. Found similarities/differences in data collected	1. Compiled all surveys from teachers from the implementation	**3/31**

			2. Noted significant findings in data collected	period and took notes 2. Compiled all surveys from parents from the implementation period and took notes 3. Listed all significant findings and similarities/differences on a handout for members during dissemination.	
13 4/3-4/7	**Discontinuation**	Finalize analyzation of data collected and draw conclusions	1. Continued drawing conclusions based on findings 2. Assembled powerpoint and scheduled a time to present.	1. Took the list of findings and drew conclusions. 2. Started writing the conclusion of the scholarly report. 3. Create powerpoint to show findings and present to site mentor	**4/7**
14 4/10-4/14	**Dissemination**	Disseminate project to site	1. Presented findings to site mentor and special education staff members	1. Scheduled a time to present findings 2. Discussed with site mentor findings and future recommendations for ball rolling protocol **Abstract, Summary and Conclusion Draft due 4/10**	**4/14**