Development of Resources to Improve Sensory Regulation in the Classroom

Hannah Rizzo

Dr. Annie Derolf, Capstone Coordinator

Dr. Pamela Hess, Faculty Mentor

Department of Occupational Therapy, Indiana University

Abstract

The purpose of this doctoral capstone project was to develop and provide sensory based resources to teachers, occupational therapists, and families throughout a large Florida school district to improve student regulation. Through the needs assessment, it was discovered that the school system had a goal to decrease maladaptive behavior and suspensions. To support this goal, four resources were created; a teacher's handbook to sensory processing and regulation, a sensory pathway that students can utilize for regulation, newsletters for families on sensory processing and activities to support development, and a list of equipment to purchase to support the creation of a sensory library. Trainings were provided to teachers on how to utilize the handbook created.

Introduction

A regulated child is a child who is ready to learn. Displays of dysregulation in the classroom, such as physical and verbal aggression, elopement and non-compliance, disrupt student learning, create an unsafe environment, and can lead to suspensions. The Florida school district established a goal to decrease the amount of school suspensions that occur leading to an increased focus on behavior management throughout the district. Occupational therapy can play a key role in making progress toward this goal. While many look at maladaptive behavior on a superficial level, occupational therapists understand behavior on a deeper, holistic level and provide a perspective rooted in neuroscience. This capstone project is focused on disseminating this knowledge and helping teachers, staff, and families to understand and implement strategies that lead to sensory and emotional regulation in the classroom. In alignment with the district's goals, the desired outcome is that regulation strategies will not only decrease maladaptive

behavior that can lead to suspension and time away from instruction, but also improve overall performance and engagement in the classroom.

Needs Assessment

A needs assessment was initiated to determine the occupational therapy needs of the school district. The process included a site interview and observation, development of a community profile, and review of the literature. The literature review was conducted through various search engines and journals including Pubmed and the American Journal of Occupational Therapy. The site interview and observation was conducted with two occupational therapists, who served as the capstone student's site mentors, at the school district across several weeks. The community profile was developed through a combination of the site interview and a review of public data.

The capstone project aimed to address the sensory and regulation needs of all students in the district. The capstone student had observation time and hands-on experience at 6 of the 64 schools in both general education and self-contained classrooms. Each school has a different student population and unique characteristics which provided the capstone student with a more holistic understanding of the district.

One elementary school serves students in 3rd through 5th grade in rural Florida. Through discussion with the site mentor, the capstone student learned that students often come back to class dysregulated from free time during recess and P.E. Additionally, the site mentor reported that many of the students come from working class families where children are left unsupervised after school resulting in excessive screen time which she believes leaves them tired and dysregulated the next day. The site mentor believed that these students would benefit from more

structured, age-appropriate movement breaks before instruction. The site mentor reported that there are a few teachers who implement movement strategies, but not all of them.

One school serves students in kindergarten through 8th grade in rural Florida. This school is one of the higher performing schools in the district. The site mentor expressed that her primary concern at this school is the high expectations put on kindergarten students who are still developing regulation skills. She reported that she often receives inappropriate referrals for sensory processing concerns where the behavior the student is displaying is developmentally appropriate. The site mentor believed teachers throughout the district could benefit from education on sensory and regulation milestones.

One elementary school serves students in preschool through 5th grade in urban Florida. Through discussion with the site mentor, the capstone student learned that the school is located in a particularly high crime area. Many of the students experience housing and food insecurity. It was imperative to use a trauma informed approach when working with these students. Many children who have experienced trauma have increased signs of anger and emotional volatility, non-compliance, aggression, and sensory sensitivities compared to their peers (Whiting, 2018). Unfortunately, these misunderstood expressions of trauma can escalate into suspension at school. Whiting (2018) suggests that sensory-based approaches are likely helpful in helping individuals with trauma and mental health challenges learn to regulate their emotions, develop body awareness, and modulate their own arousal levels. The school does offer a calming room that students can visit up to 2 times a day for 5 minutes each visit. It is well utilized by the students and offers dimmed lighting, calming music, rocking chairs, ball chairs and areas for crafting, reading, and building.

One alternative school serves students in kindergarten through age 22. The school specializes in education for students with intellectual disabilities and medical complexities. It boasts a large campus with lots of open green space and is one of the few schools with an indoor gymnasium. Through observation at the school and discussion with the site mentor, it's clear there is a significant need for structured sensory and movement breaks throughout the day. While walking through the campus, the capstone student noted students who had eloped from their classrooms and students who were experiencing meltdowns. Again, the site mentor reported that there are a few teachers who are able to meet the sensory needs of their students, but many are not educated.

There was a course for teachers on sensory processing created by a previous capstone student in 2020, but it is no longer utilized due to lack of time to carryover. Barriers to meeting student regulation needs include a lack of staff availability to complete continuing education, staff perception of feasibility of intervention, limited funding, and outside factors impacting student wellbeing. After the needs assessment was completed, it was determined there was a need to educate teachers, staff, and families on sensory processing and development in an accessible format and strategies to use with the entire class that are effective, free, and simple and quick enough to be built into the daily school routine.

Literature Review

Sensory regulation intervention looks very different in the school setting compared to a clinical setting. In the school setting, there is often no fancy equipment nor is there much time to implement intervention. The primary purpose of the literature review was to explore the effects

of sensory processing dysfunction on school participation and determine evidenced based intervention options for sensory regulation in the school setting.

It's hypothesized that sensory processing is associated with other higher functions required for participation in school such as cognitive and executive functioning. One comparative study (Pastor-Cerezuela et al., 2020) that supports this theory analyzed whether sensory processing dysfunction can predict cognitive and executive dysfunction in a group of children with level 2 autism spectrum disorder (ASD) in the school setting. Two groups of students were compared, 40 autistic students and 40 neurotypical students from 5 to 8 years old. Measures used were the Auditory Attention and Speed Naming subtests of the Nepsy-II, a Stroop type interference task, the Labyrinths subtest of the Labrev, the Verbal Expression and Auditory Sequential Memory subtests of the Illinois Test of Psycholinguistic Aptitudes, the Visual Sustained Attention and Immediate Recognition subscales of the Leiter-R, and the Sensory Processing Measure. To determine if sensory processing characteristics explained variance in the executive and cognitive measures, multiple regression analyses were performed. After controlling for the possible effect of ASD severity, statistically significant results showed that sensory processing difficulties predicted cognitive and executive dysfunctions in inhibitory control, auditory sustained attention, and short-term verbal memory. A limitation of this study is that it only included students with level 2 ASD.

Because the goal of school-based occupational therapy is to improve access to education, it's important to look at what role sensory intervention plays in achieving that goal. One study (Benson et al., 2016) surveyed occupational therapy practitioners (OTP) to determine how OTPs saw the role of sensory intervention in the school and what the current practice trends are in this area. Ninety four school based occupational therapists participated in the study. Mean and

frequency distributions were used to analyze quantitative data, and cross-sectional and categorial indexing with peer debriefing were used to analyze the qualitative data. 47.73% of participants indicated that sensory interventions are effectively meeting student needs, whereas 18.14% of participants indicated that sensory interventions have limited effectiveness due to limitations in the school setting. 13.64% of participants said that lack of carryover was a limitation to the effectiveness of sensory interventions. Difficulty with carryover is a theme that was brought up many times during the needs assessment. It's clear that interventions implemented in the classroom need to be simple and non-disruptive to the daily routine in order to be carried over by teachers and staff. OTPs also expressed that parent collaboration is beneficial, but challenging due to limited interaction (Benson et al., 2016). As schools vary by state and district, the results of this study may not be generalizable as 94% of OTPs were from Pennsylvania. As these OTPs emphasized, sensory based intervention in the school setting needs to be a collaborative effort to be effective which is why the capstone project targeted teachers, staff, and families.

The American Occupational Therapy Association's official document (Smith et al., 2015) on occupational therapy for children and youth using sensory integration theory and methods in school based practice lists some examples of potential interventions and how they apply to occupational therapy's scope of practice. The capstone student used the create and promote health and participation approach throughout the capstone experience by creating educational material and resources on sensory processing's role in learning and behavior. The capstone student also used the prevent barriers to participation and improve safety approaches by promoting increased physical activity to improve student wellbeing and academic performance. The capstone student also had the opportunity to use the other approaches listed which are establish or restore performance patterns, maintain student ability to engage in and cope with

school-related activities, and modify activity to help students compensate for deficits through hands-on clinical work with the students.

Sensory diets, or variations of sensory diets, are a commonly used intervention in sensory based occupational therapy. A sensory diet is an individualized plan that provides the sensorimotor experiences necessary for the individual to participate in daily life (Pingale et al., 2017). Because they are individualized, they are notoriously difficult to implement in a school setting. One qualitative study (Mills et al., 2017) looked at the opinions of teachers on Sensory Activity Schedule (SAS) intervention, a variation of a sensory diet, for autistic students. The SAS intervention included 5 key components. The student's atypical processing and associated difficulties with classroom tasks were confirmed. Sensory activities were selected in accordance with the student's sensory needs and preferences. Examples of activities were bouncing on a therapy ball, lycra body sock, shoulder squeezing, squashing with a bean bag, spikey wooden foot roller, and being rolled over a therapy ball. The occupational therapist promoted application of activities before performance of specific classroom tasks. The OT, teacher, and family collaborated on goal setting, and the therapist provided teacher training and support. Training included education on sensory assessment, the impact of sensory elements on task performance, and how sensory activities may be beneficial. Teachers had access to the OT throughout the study to problem solve any concerns. Lastly, it was ensured that the intervention fit into the context of the student's daily routine making use of available space, staffing and equipment.

Nineteen teachers from 7 different autism specific schools participated in the study (Mills et al., 2017). Semi-structured interviews were used to obtain the teacher's subjective experience during the intervention. Emergent and priori coding procedures were used to code the 19 interview transcripts. In response to what was beneficial about the SAS intervention, teachers

reported that it provided new ideas for activities for individual students as well as the whole class. Teachers reported improved student ability to sit and focus on school work. Teachers also appreciated the ongoing support from the OT throughout the intervention.

A majority of teachers expressed at least some difficulty implementing the SAS intervention (Mills et al., 2017). Challenges reported included getting students to do the activities correctly, finding time to implement the intervention and record data, and having enough staff to implement the intervention while attending to the rest of the class. Based on the feedback collected in this study, teachers are open to intervention that may help their students and perceived benefits to the intervention. However, intervention could not be implemented as accurately and consistently as hoped due to contextual factors in the school day. Limitations of this study include that it is not representative of general education teachers or teachers with larger class sizes and the possibility of bias due to the fact the OTs who designed the intervention conducted the interviews. (Mills et al., 2017).

Following up on this study, Mills et al. (2020) looked at the impact of SAS on autistic student's classroom performance in a pilot randomized control trial. Thirty students who attended autism specific schools were randomized to the intervention group, which received SAS intervention and usual teaching, or the control group which received usual teaching only. Usual teaching included environmental supports and structured teaching approaches, positive behavior support, individualized planning, family involvement, curriculum, transition and inclusion, mental health and wellbeing, and multidisciplinary team involvement. Only students who presented with atypical sensory processing that impacted their school performance were recruited. To confirm atypical sensory processing in each recruited student, occupational therapists conducted an assessment involving parent and teacher completion of the sensory

profile school companion 2 and classroom and playground observation. As previously described, the SAS intervention is tailored to each student and implemented with a consultation model. In this study, intervention was implemented for about ten minutes before a classroom task and was provided for seven to eight weeks.

Outcomes were measured by the perceive, recall, plan, and perform (PRPP) stage one task analysis and goal attainment scaling (GAS) (Mills et al., 2020). Established goals were related to functional school skills such as task completion, transition, self-care, and socialization. Data was collected at baseline and at conclusion. Independent samples t-tests and Cohen's d were used to analyze the data. PRPP stage one task analysis data showed a mean change of 13.42% in the intervention group and 3.09% in the control group which was statistically significant with a large effect size of $d = 0.97$. These results indicate that the students in the intervention group improved more on task performance than the control group. A statistically significant difference between the groups was also found on the GAS post-intervention scores . The intervention group achieved a mean of 1, whereas the control group achieved a mean of -0.18. This indicates that the students receiving SAS intervention displayed better goal achievement than the control group. Limitations of this study include a small sample size and limited generalizability due to the study being conducted in autism specific schools. The results from the study show that individualized, sensory intervention before task performance may increase autistic students' ability to engage in classroom tasks.

A single subject A-B-A study (Pingale et al., 2017) examined the effect of sensory diets on student's sensory processing, psychosocial skills, and classroom behaviors. Three children with identified sensory processing difficulties in 1st and 2nd grade special education participated in the study. The SP 2 Caregiver Questionnaire and Teacher Questionnaire were used to

determine eligibility. The Vineland Behavior Adaptive Behavior Scale 3rd edition was used to determine the student's performance difficulties.

Each phase of the study, initial baseline, intervention, and post-intervention baseline, were implemented for 2 weeks (Pingale et al., 2017). The intervention consisted of an individualized sensory diet for each student. Sensory diets were implemented for 5-7 minutes three times a day and included at least 3 multisensory activities. Three target behaviors were measured for each participant in individual and group contexts. To analyze the data, binomial tests were used to determine if changes in target behavior were statistically significant.

Participant 1 was a 6.7 year old boy, with ASD, who displayed difficulty with visual and movement stimuli and had avoidant and bystander patterns (Pingale et al., 2017). Target behavior for participant 1 included reduction of non-purposeful movement, non-compliance, use of redirection by teaching staff to maintain engagement in activity. In the intervention phase, participant 1 had a statistically significant decrease in non-purposeful movement in both contexts and non-compliance and use of redirection in the group context.

Participant 2 was a 8.3 year old boy, with ASD, who displayed difficulty with visual, movement, and touch stimuli and had seeker and avoidant patterns (Pingale et al., 2017). Target behavior for participant 2 were also reduction of non-purposeful movement, non-compliance, and use of redirection. In the intervention phase, participant 2 had a statistically significant decrease in use of redirection in both contexts. Non-compliance decreased in the intervention phase, but was not statistically significant.

Participant 3 was a 6.6 year old boy, without a specific diagnosis, who displayed difficulty with visual, movement, and touch stimuli and had seeker, registration, and sensory

patterns (Pingale et al., 2017). Target behavior for participant 3 were reduction of non-purposeful movement, interrupting behavior, and off-task behavior. In the intervention phase, participant 3 had a statistically significant decrease in non-purposeful movement and off-task behavior in both contexts. He also had a statistically significant decrease in interrupting behavior, but only in the individual context.

Of important note is that none of the participants returned to baseline during the post intervention phase of data collection suggesting a possible transient effect of the sensory diet intervention (Pingale et al. 2017). Additionally, all participants experienced a significant reduction in non-purposeful movement or sensory seeking behavior. A limitation of this study is that the primary investigator both delivered the intervention and analyzed the data.

While much of the research found is on individualized sensory intervention for neurodivergent children, there are some studies that examine whole class intervention on student performance in general education. One randomized control trial (Wild et al., 2018) looked at the effectiveness of a sensory based intervention called BrainWorks on students classroom performance. The study took place in a rural, economically disadvantaged elementary/middle school. Students were divided between a control group (24), usual teaching, and the intervention group (22), BrainWorks. The BrainWorks program consists of multiple elements. Students received “brain breaks” defined as short opportunities to move the whole body and consisted of mostly proprioceptive activities followed by two “belly breaths.” Frequency of brain breaks was determined by grade level. “Sensory breaks” were implemented twice per day which were defined as longer opportunities for movement. Examples of sensory breaks included yoga, exercises, and movement songs. Students were also instructed on how to identify their sensory needs by using the BrainWorks tools. Lastly, the OT researcher provided sensory equipment and

modifications on an as needed basis. One teacher from each grade was selected to undergo training and implement the intervention. Teachers received ongoing support from the OT across the 10 weeks of implementation.

Outcome measures included the Sensory Processing Measure (SPM) and the Behavioral Assessment System for Children 2 (BASC-2) (Wild et al., 2018). Students significantly improved on both the SPM and BASC-2. The SPM T score was 3.71, and the BASC T score was 6.1. The most dramatic area of improvement was social participation including working well with others, handling frustration, maintaining eye contact, and maintaining personal space. Students also improved in organization of materials, problem-solving, sequencing of tasks, and auditory processing. The primary limitation to this study is a small sample size recruited from only one school district. This study shows that whole class intervention may also be effective in improving sensory regulation and performance in the classroom.

One randomized control trial looked at the effects of different types of movement breaks on students' on task behavior, academic achievement, and cognition (Mavilidi et al., 2019). Eighty seven elementary students were recruited from one school to participate in the study. Three classes were randomly assigned to the movement breaks only group, the movement breaks and mathematics combined group, and the mathematics only/control group. All groups were shown a prerecorded video provided by the researchers for 2 minutes before their lesson and 3 minutes in the middle of their lesson. The movement breaks only group was shown a video with physical exercises to imitate. The movement breaks and mathematics combined group was shown a video with the physical exercises to imitate and a series of simple math equations to solve at the same time. The mathematics only group was shown a video with just the series of

math equations to solve. Exercises in the movement break videos included punches, squats, skipping, jumping jacks, jogging on the spot, lunges, skater jumps, and push ups.

An observation tool adapted from the Behaviour Observation of Students in Schools and the Applied Behavior Analysis for teachers was used along with momentary time sampling to measure off task behavior during instructional time (Mavilidi et al., 2019). Achievement in mathematics was measured by the Individual Basic Facts Assessment Tool Stage 2. Students' attitudes toward mathematics was measured using a modified version of the Programme for International Student Assessment scales. Executive function was measured using the Eriksen Flanker test and the n-back task. Analysis of the data was conducted using linear mixed models and Cohen's d.

The study (Mavilidi et al., 2019) found statistically significant results for improved on task behavior in both the movement only and the movement and mathematics combined groups. Mathematic performance was also significantly improved in the movement only group compared to the control group. However, the same effects were not observed in the movement and mathematics combined group suggesting that a short break from academic instruction may be beneficial. There were no differences found in children's attitudes towards mathematics. The small sample size is a limitation of this study. This study indicates that students in general education can benefit from sensorimotor activities embedded in their school routines.

Occupational therapists have an important role to play in supporting the sensory and emotional regulation of students so they can focus on their education and prevent suspension which pulls them out of the classroom and puts them at risk for falling behind academically. Occupational therapy's scope of practice allows intervention on many levels including education

and training of staff, individualized sensory intervention, and whole class sensory intervention. When working in a school district where there are high suspension rates and many students come from poverty and traumatic experiences, occupational therapists can promote occupational justice by taking a trauma informed lens and addressing maladaptive behavior as nervous system dysregulation. There is a need to reduce the suspension rate in the school district which means there is also a need to meet the sensory and emotional needs of the students in the district. Because of this underlying need, occupational therapy is a crucial part of the team in addressing this goal.

Model/Theory

The project was guided by both the occupational justice framework and sensory integration theory. When students are suspended, they are removed from their classroom and are not able to access their education. This is an occupational justice issue. Breaking generational cycles of poverty becomes even harder to do when students are removed from their education.

While school-based occupational therapists can't change what's going on at home, they can work toward making school a supportive environment. Sensory integration theory provides a more informed lens when a student displays undesirable behavior. Instead of resorting to suspension, occupational therapists can address the behavior proactively by meeting the regulation needs of the student.

Plan and Process

Based on the needs assessment and literature review, the identified need was sensory processing education and resources for teachers, staff and family. See Table 1 to reference the

goals and objectives created to meet the identified need for the capstone project. The plan for the evaluation of the project included assessing whether the goals and objectives were met as well as analysis of the surveys to assess learning and satisfaction of teachers and OTPs with the education and resources provided.

Table 1

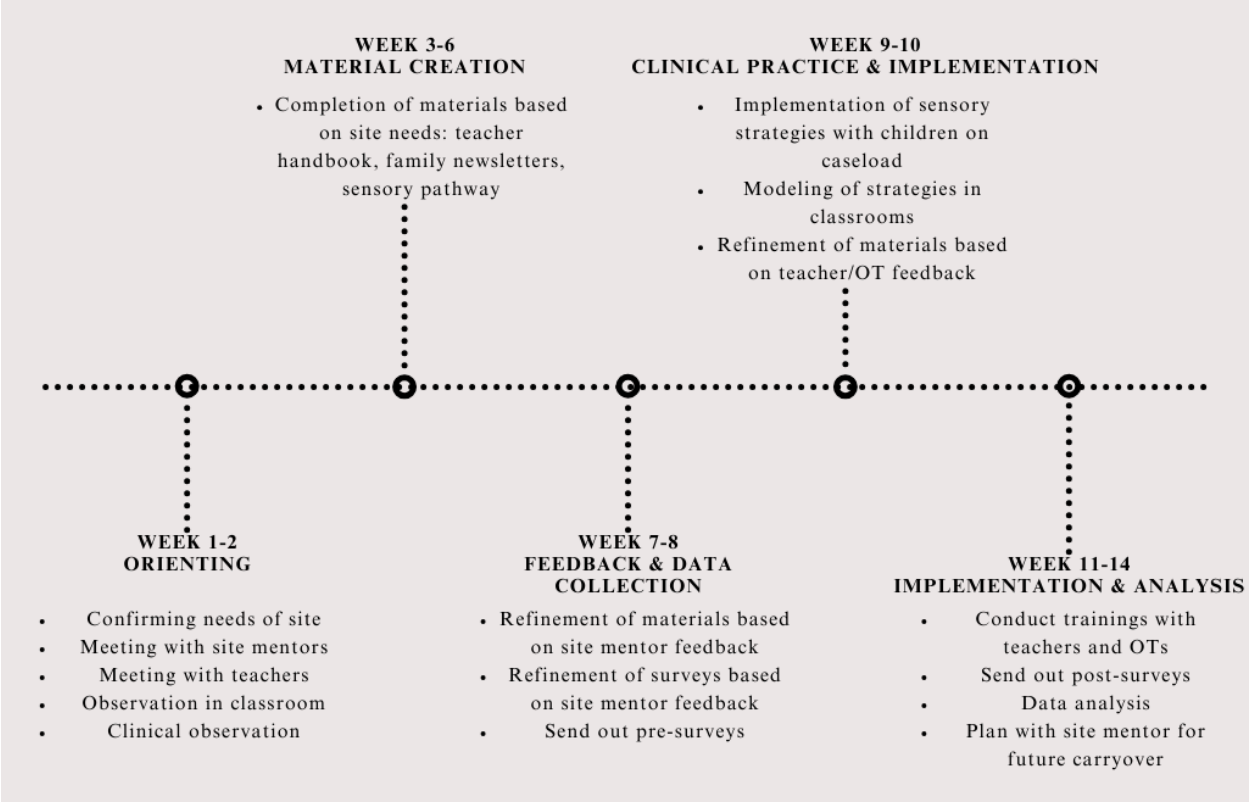
Capstone Goals and Objectives

Goal	By the end of program implementation, teachers will identify one sensory strategy they will try with their classroom.
Goal	By the end of program implementation, occupational therapists will identify one resource or strategy they will provide to teachers or families.
Objective	By the end of program planning, OTD student will create one material for teachers on the impact of sensory processing on learning and behavior.
Objective	By the end of program planning, OTD student will create one material for teachers on sensory strategies to use in the classroom.
Objective	By the end of program planning, OTD student will create one material for families on sensory processing.
Objective	By the end of program implementation, OTD student will complete at least one training for teachers on sensory processing.

See Figure 1 for a timeline of the capstone project.

Figure 1

Timeline of Capstone Project



Time spent during the 14 weeks of the capstone project also included meetings with Andrea and Loni, Dr. Hess, and Dr. DeRolf to ensure progress with the project and address any challenges. Because the focus of the capstone project changed upon week one, significant time was spent refining the needs assessment and literature review.

Implementation

Surveys were sent out to gather perceptions and opinions on sensory processing and behavior concerns in the classroom. Participants recruited included all general and special education teachers teaching in an elementary classroom and occupational therapy practitioners (OTP) practicing in elementary schools in the district.

15 general education, preschool through 5th grade, teachers and 4 special education teachers participated in the survey. Teachers reported the following concerning behavior in their classroom; aggression toward others (7), outbursts or tantrums (5), property destruction (5), making disruptive noises including screaming (3), self-injury (2), difficulty sitting on the floor appropriately (1), head shaking (1), difficulty walking in line appropriately (1), inability to focus (1), non-compliance (1), sleeping in class (1), and elopement (1). Teachers reported using the following sensory supports; opportunities for movement (16), snacks (15), music (13), teaching of emotional regulation skills (13) manipulatives (13), fidgets (10), flexible/alternative seating (9), Zones of Regulation curriculum (4), visual supports (2), mini trampoline (1), noise reducing headphones (1) and weighted blanket (1).

Other behavior management strategies reported included token economy (10), calm down corner (4), clip chart (3), classroom pledge (2), increasing student proximity to teacher (2), team building activities (2), parent contact (2), Premack's principle (1), Conscious Discipline (1), class jobs (1), self-reflection (1), removal of student from classroom (1), brain breaks (1), Positive Behavioral Interventions and Supports (1), daily commitments (1), loss of privileges (1), confidence building activities (1), and verbal praise (1).

84.42% of teachers indicated the need for sensory strategies to use with individual children. 84.42% of teachers desired training on how to recognize signs of sensory processing disorder that warrant a referral to occupational therapy. 78.9% indicated the need for age appropriate emotional regulation resources. 73.7% indicated the need for strategies to help "wake children up" in preparation for learning. 68.4% indicated the need for strategies to help calm children down in preparation for learning. 57.9% indicated the need for sensory strategies to use

with the whole classroom. 57.9% indicated the need for age appropriate movement break resources.

Six occupational therapy practitioners (OTP) working in the district participated in the survey. OTPs reported the following barriers when implementing sensory intervention in the school setting; loss of material by students/staff (5), not enough time to implement (5), lack of equipment or materials to provide (5), lack of staff understanding (4), not enough staff to implement (3). In response to the question, "What do you wish teachers better understood about sensory processing?", the following themes emerged. Challenging behavior can be a result of dysregulation. Environmental changes, brain breaks, and flexible seating can be beneficial. Consistency is important when implementing a new intervention. Not all behavior is a result of sensory processing difficulty. Addressing sensory needs helps students learn and achieve at their full potential. In response to the question, "What do you wish families better understood about sensory processing?", the following themes emerged. When implementing a new intervention, follow up and consistency at home is beneficial. Not all behavior is a result of sensory processing difficulty. Addressing their child's sensory needs can improve their self-regulation, social, and cognitive skills. OTPs reported that they would find the following resources beneficial to give to teachers or families; strategies to use with the whole classroom to promote emotional regulation skills (6), education on how sensory processing affects learning and behavior (5), strategies to use with the whole classroom to calm or alert students in preparation for learning (5), activities to do at home to promote sensory development (5), education on milestones that are grade specific (3).

The survey results and informal discussion with occupational therapy practitioners, teachers, and staff informed the creation of four resources. The first resource created was a

handbook for general education teachers that included education on sensory processing and how it affects learning and behavior, free and simple strategies to use with the whole class, and education on signs of sensory processing disorder that warrant a referral to occupational therapy. The second resource was a sensory pathway created on a bulletin board at one of the elementary schools to serve as a space for teachers and staff to take children to regulate. The sensory pathway included proprioceptive, vestibular, and tactile components, deep breathing exercises, and a Zones of Regulation activity. The third resource was a newsletter for families which included education about the senses, an activity to support sensory development, and signs of sensory processing disorder that warrant a referral to occupational therapy. The last resource was a list of sensory equipment and tools for the district to purchase to support the creation of a sensory library at the alternative school. Toward the end of the capstone experience, this idea was proposed by the site mentor and supported by the principal. In the future, this will allow for a centralized place for teachers to check out equipment for students based on their needs.

A 15 minute in person training was provided to all faculty at two of the elementary schoolsl on how to utilize the teacher's handbook. The handbooks were then disseminated by email to all teachers at three elementary schools along with a post survey to complete. Because of scheduling conflicts, training was not able to be conducted with the OTPs. However, the teacher's handbook and family newsletters were sent to them by email along with a post survey to provide feedback.

Implementation also included modeling sensory strategies with students on caseload in occupational therapy sessions through both the pull out and push in models. There were many barriers to modeling these strategies for teachers. The first is that when students are pulled out from their class to attend occupational therapy, teachers don't get to see what is done with the

student. Occupational therapists often have to verbally describe what worked for the child which is more difficult to understand than true modeling. When the occupational therapist and capstone student pushed in to model these strategies, it had to be at an appropriate time. However, when the occupational therapist and capstone student pushed into the classroom to model, they noticed that teachers were more likely to try the strategies on their own.

Evaluation

Evaluation by qualitative survey methodology was attempted. To ask teachers and OTPs to read a resource and then fill out a survey after was proved to be a challenging task as staff working in the district are limited on time. Not enough participants were recruited for the post surveys to provide a strong evaluation of the resources with this data alone. However, the data is included in this report as it's still insightful. An email was also sent for recruitment to teachers, but the email was written and sent by the school principals.

Three OTPs participated in the post survey. All three OTPs reported finding the teacher's handbook helpful. One OTP reported finding the newsletters helpful. Specifically, the OTPs reported the sensory processing education, sensory strategies, and developmental milestones as beneficial. One OTP wished there was a shorter version with just the sensory strategies as not every teacher has time to read the background information.

Two teachers participated in the post survey. Strategies from the resource that they were interested in using were the meditation and calm down strategies, Alphabet Yoga, and the BodyBrainTech website. After reading the resource, one teacher reported feeling confident in identifying students who may need OT for sensory processing concerns and the other reported feeling somewhat confident, but they wanted more training.

To strengthen the evaluation of the capstone experience, The DEAL Model for Critical Reflection developed by Dr. Patti Clayton of North Carolina State University was used. DEAL stands for describe, examine, and articulate learning which are the three steps outlined in the model. As defined by Ash & Clay (2009), critical reflection is an "evidence based examination of the sources and gaps in knowledge and practice with the intent to improve." Critical reflection is helpful for use in experiential courses to enhance depth of learning and critical thinking (Molee et al., 2011).

The faculty mentor completed a thematic analysis of the written reflection to identify areas of the experience that were significant and prompted learning and growth. The experience's overall themes included sensory processing and behavioral challenges, a need for resources and support, implementation of intervention, educational and training initiatives, and feedback and impact assessment. These themes pulled from the capstone student's critical reflection highlighted the "why" and "how" of the project. The project was developed and implemented with the stakeholders continuously in mind. While there were many stakeholders, teachers especially expressed a strong need for these resources and education. When developing the project, it was important the resources and education were accessible to them. This is why the education was provided in a handbook format, so that they could use the table of contents to quickly reference what they were interested in. This is also why training sessions were integrated into the regular faculty meetings to not impose additional time burden. The capstone student was able to informally observe and discuss with teachers the impacts of the project. The capstone student continuously assessed the project to make refinements that fit the teachers' needs.

As emphasized previously, there were many barriers to intervention in the school setting that required the capstone student's flexibility. Themes pulled from the capstone student's critical

reflection that indicated challenges and adaptations included time constraints and school schedules, material costs and accessibility, and understanding and perception of sensory processing. Adaptations the capstone student made included simple interventions that fit into the school routine, creation of no-cost resources, and providing education to stakeholders to dispel misunderstandings. If implementing another program in the school setting in the future, the capstone student would plan ahead and obtain the classroom schedules ahead of time as well as look into grants for funding.

Themes that displayed insight and reflection included personal and professional growth, systemic observations and future directions, and collaboration and community involvement. In regards to the capstone student's personal and professional growth, the capstone student learned to enjoy school-based occupational therapy. The school setting can be a challenging place to be an occupational therapist. However, the capstone student learned that if you build a good relationship with teachers who will carry over interventions, you can see a lot of progress with students. It was very rewarding to work with a student in their natural environment and belong to a team of passionate teachers and therapists. Another significant takeaway is that although sensory regulation strategies can be beneficial, they are just one piece of the puzzle. Challenging behavior is a major concern of teachers right now. From their observation in the schools, the capstone student believes there are many reasons this is happening including increased academic demand and decreased opportunities for movement and play. Systemic change is needed to address the root causes of maladaptive behavior.

Discussion & Impact

In efforts to support the school district wide initiative to decrease the suspension rate, the capstone student decided to look at student's maladaptive behavior from a sensory and emotional regulation perspective. Only behavioral strategies were being used in the initiative, and occupational therapists were not consulted as part of the initiative. Because of this, the project provided a new, more holistic lens to understand and address behavior.

Throughout the capstone experience, the capstone student was able to create and promote health and participation through the educational resources and training on sensory processing's role in learning and behavior. Although the sample size was small, all participants in the post survey indicated some part of the resources that they found beneficial. Because the strategies provided to teachers were antecedent strategies, the use of these strategies will ideally prevent barriers to participation and improve safety when addressing maladaptive behavior.

The literature review revealed that those who have experienced trauma are more likely to have sensory processing differences (Whiting, 2018). Therefore, the education and training included how trauma and sensory processing are linked. This connection made the project more relevant to the teachers the capstone student was presenting to due to the high incidence of students who have experienced trauma. Additionally, because the literature review supported movement and its positive influence on academic learning (Mavilidi et al., 2019), a majority of the strategies provided included movement.

All goals and objectives of the capstone experience were met. The capstone student created materials for teachers on the impact of sensory processing on learning behavior and strategies to use in the classroom. The capstone student created materials for families on sensory processing. The capstone student conducted training for teachers on sensory processing. By the

end of implementation, teachers and occupational therapists were able to identify at least one sensory strategy or resource to use as evidenced by the post survey data. Limitations of the capstone project included a small sample size of post survey participants, schedule constraints which impacted further data collection, and no funding.

The feedback provided from the site mentors included that the resources are accessible and consider all variables that make intervention in the school setting challenging such as time, cost, and health literacy. The site mentors acknowledged that they will continue to use the resources. They will be stored on the district's occupational therapy google drive, so they can continue to access them as needed. One site mentor has plans to provide further training to teachers during future faculty meetings with a focus on modeling the strategies.

Conclusion

The purpose of this project was to provide teachers and families with sensory processing education and resources, as well as a new lens to understand and prevent behavior and dysregulation. A review of the literature, discussion with stakeholders, and formal surveying of stakeholders informed the creation of several resources. All occupational therapists and teachers who participated in the post survey were able to identify a strategy or resource they would use. Additionally, the capstone student experienced significant growth in their professional development as they learned the importance of flexibility when working in a system like the schools and collaboration with stakeholders.

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