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The Development and Implementation of Sensory Corners in a School-Based Setting

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Abstract

This doctoral capstone project fills the current gap in educational programming for students to meet their individual sensory needs more quickly and effectively. This program creates sensory corners and strategies for five students (Students A-E) who demonstrate sensory processing, self-regulation, and coping difficulties to teach them how to overcome these difficulties constructively. To measure their improvement, the Sensory Profile-2 School Companion (SPSC) and the School Anxiety Scale-Teacher Report (SAS-TR) were used as pre- and post-tests to assess their sensory processing and anxiety/psychological stress. Students A-E all demonstrated improvement in at least one area of sensory processing on the SPSC. On the SAS-TR, Students D and E demonstrated improvement in their scores, however, Students A, and C showed worse scores and Student B showed no change. This project suggests the overall efficacy of sensory corners and strategies in reducing sensory dysfunction in students to improve engagement with their learning environment.

The Development and Implementation of Sensory Corners in a School-Based Setting

Brownsburg Community School Corporation (BCSC) is a hub for education and learning for children of all ages, backgrounds, and health concerns. This site houses students with learning disabilities and those receiving special education services under the Individuals with Disabilities Education Act (IDEA) (2020 [Students with disabilities]). S. Borem (personal communication February 26, 2021) expressed that the district utilizes occupational therapy (OT) services to assist some of their students as part of their Individualized Education Plan (IEP). Additionally, S. Borem (January 13, 2021) indicated multiple weaknesses of both Brown Elementary and the school district at large. She explained that many of these weaknesses are a result of the following: the residual effects of COVID-19, a lack of appropriate educational programming for students, and little to no time availability for the therapy staff to take on additional projects because of large caseloads. These weaknesses create threats to the BCSC's ability to promote academic success. The residual effects of COVID-19 have left vacancies in special education administration and negatively impacted staff and student attendance due to the need to quarantine for the health safety of others within the school community. When students have to quarantine at home, they miss out on receiving their therapy/special education services as mandated by their IEP, which may cause difficulty maintaining IEP compliance by those staff members who provide therapy/special education services. Additionally, the increased vacancies in staff positions lead to a disproportionate ratio of special education students to staff members. This disproportionate ratio leads to poor staff work-life balance due to the need to work increased hours to make up for the lack of staffing.

By completing this doctoral capstone project, I would fill a gap in educational programming for students that the OT staff cannot fill due to their lack of time resulting from

their large caseloads. This educational programming (i.e., sensory corners) will reduce the number of additional times students on the occupational therapists' caseloads need to be pulled out of class for sensory breaks. As a result, this will increase the time available for the OT staff to complete other necessary tasks such as finishing evaluation reports, conducting assessments, and attending more annual case reviews (ACR). Frequently, therapists have to stay late to complete various related paperwork or reports, and this project also has the potential to lead to increased staff work-life balance for OT staff. This project will provide a program to meet the sensory needs of students that may not be fully met by the occupational therapists' lack of time, which will also increase IEP compliance and the meeting of student therapeutic and educational goals more quickly and effectively.

Background

Pro-Sensory Integration Camp

According to the literature, there are two main camps regarding sensory integration therapy/sensory-based interventions and its effectiveness. One claims it is effective (i.e., pro-sensory integration therapy), while the other claims that there is little support from sound research (i.e., anti-sensory integration therapy). Within the pro-sensory integration camp, research shows its usage within different settings, including various pediatric settings (i.e., schools, early intervention, community-based) and adult settings. It is interesting, however, that a vast majority of the literature is limited to children, especially children with Autism Spectrum Disorder (ASD) and/or Attention Deficit Hyperactivity Disorder (ADHD), as these are two of the most commonly discussed groups when referring to sensory-based therapy within OT. Regarding schools, sensory integration therapy and sensory-based strategies are utilized by teachers and OTs working with preschool and school-aged children with disabilities and/or sensory

dysfunction. The literature indicates that often teachers and OTs working with this population

claim that sensory integration strategies are effective in reducing hyperactivity, unwanted

behavior/behavioral outbursts, and sensory dysfunction of children with disabilities or sensory

dysfunction, thereby dramatically improving classroom behavior as a result (Chien-Lin, et al.,

2012; Mills & Chapparo, 2018; Paul et al., 2003). This information presents an excellent

opportunity to use a unique form of sensory integrative techniques within classroom sensory

corners to reduce sensory dysfunction within students and their associated psychological stress,

anxiety, and adverse behavioral reactions.

Additionally, research expresses that sensory integration interventions appear to increase

the concentration, participation, academic performance, improved overall function of this

population (Mills & Chapparo, 2018; Mills et al., 2016; Paul et al., 2003; Piller & Pfeiffer, 2016;

Stonefelt & Stein, 1998). A classroom sensory corner with the proper sensory equipment poses a

way to facilitate positive outcomes in the students they would serve (i.e., students with sensory

dysfunction in a general education classroom) that would directly impact their educational

experience. Therapists also often utilize sensory integration in early intervention and community

settings. Research suggests that sensory-enriched early intervention programs reduce delays in

critical areas of development such as motor skills, language, and cognition (Blanche et al., 2016).

Sensory-based early intervention programs may also increase engagement in play and

participation in other occupations in children with sensory dysfunction as well as co-existing

diagnoses (Blanche et al., 2016). The usage of sensory-based strategies in the early intervention

setting embodies the concept that effective modulation of sensory input is critical for proper

development in all areas (cognitive, physiological, neurological, fine/gross motor,

social/emotional, etc.). If this is true, this supports the usage of sensory strategies within a

classroom with children who may have developed atypically (i.e., have sensory dysfunction) and require a sensory-driven approach to their school-based OT services; this will assist them in learning how to regulate their receptivity to sensory stimuli.

Literature has also commented on the usage of sensory integration to enhance the participation of adolescents with disabilities in activities within a community setting. Research suggests that changing an adolescents' environment can improve their participation in occupations/activities (Anaby et al., 2018). This is done by determining barriers to occupational participation and identifying strategies to remove those barriers; this directly impacts their personal motivation (Anaby et al., 2018). This idea of changing a person's environment is a simple yet effective way to broaden a person's range of ability to increase their occupational performance. This idea will be a common theme throughout the development of my project because this theoretically concludes that making modifications to a student's environment (i.e., installing a sensory corner) and supplying the student with the necessary tools they need (i.e., sensory equipment), they will be able to modulate their sensory input. By modulating their sensory input, the student will reach a typical threshold for sensory regulation to better function within their classroom environment without their psychological stress, anxiety, and negative behavior stemming from their nervous system over-responding or under-responding to their surroundings.

The most current research indicates that sensory-based interventions are successful treatment tactics when used with adult populations, specifically those with disabilities. Research has found a decrease in challenging behaviors in adults with disabilities in a community-based setting through environments constructed to include specific sensory stimuli (McGill & Breen, 2020). Based on this information with adult populations, creating environments may reduce

behavioral concerns by creating environments that are sensitive to an individual's sensory needs and letting them have some control over that environment. Giving an individual the ability to make choices when presented with options in a therapeutic environment often increases their receptivity to certain therapeutic tactics and often increases compliance with the therapeutic process. By giving a child multiple options of sensory equipment or strategies to choose from that still provide them with the necessary input they need to regulate their nervous system properly, they will be more inclined to participate with the sensory corners and learn different ways to independently cope with sensory input through usage of different equipment or strategies.

Lastly, literature supports the pro-sensory integration camp emphasizing environmental change to effectively use sensory-based interventions to facilitate positive results with individuals with disabilities, especially children. Researchers have found that a child's general sensory responses and their sensory responses to the environment impact their overall levels of participation (Pfeiffer et al., 2017; Unwin et al., 2021a). Additionally, implementations of sensory modifications to certain environments can reduce psychological distress in children, which leads to their overall improved participation and reduction in avoidant behavior (Bodison & Parham, 2018; Piller & Pfeiffer, 2016; Unwin et al., 2021b). Furthermore, it has been suggested that multi-sensory environments positively impact behavior, attention, and mood, as well as emotional support regulation (Unwin et al., 2021a; Hetherington et al., 2021). This information concludes that by increasing or decreasing the number of sensory modifications to an individual's environment, a therapist could increase or decrease their level of participation and avoidance of certain activities. This directly translates to grading the intensity of therapeutic interventions. My project will use this tactic to determine the correct amount of sensory

stimulation to give a child a "just right challenge" to learn good self-coping and self-regulation skills. Based on all the information presented, it can be concluded that these designated sensory areas will work to fulfill Brownsburg's need for a way to assist children of this nature with their sensory needs without disrupting their learning in the classroom.

Current literature, more specifically research published within the last 1-2 years, suggested positive outcomes when using sensory rooms or multisensory spaces with various populations. Dorn et al. (2020) indicated that the use of sensory rooms in adult mental health rehabilitation units produces positive patient arousal changes leading to increased occupational engagement. Dorn et al. (2020) also implemented a wide range of sensory equipment to obtain the previous results that addressed auditory, visual, tactile, proprioceptive, olfactory, and gustatory stimulation. In another article, Asojo et al. (2021) discuss a community engagement partnership program between the University of Minnesota Extension Children, Youth, and Family Consortium and Bruce Vento Elementary School to develop a calming room with various sensory equipment to increase self-regulation in elementary school students. The researchers then interviewed teachers and staff within Bruce Vento Elementary School about the calming room's impact on the students and the overall school environment (Asojo et al., 2021). These teachers and staff expressed that the calming room supported students in returning to class sooner; it improved the overall school environment, student self-regulation, and increased physical safety (Asojo et al., 2021). Cavanagh et al. (2021) installed a Sensory-Art Space in a university in NSW, Australia that acted as a multisensory space providing calming tactile, olfactory, visual, and auditory stimulation to adults in a non-clinical setting. It is suggested that this multisensory space leads to increased personal affect and decreased negative affect and perceived stress of the participants who utilized it (Cavanagh et al., 2021). Lastly, Mills et al.

(2020) evaluated the effectiveness of a sensory activity schedule used in a school setting with children with autism. The researchers concluded that the children implementing the sensory activity schedule demonstrated significant improvements in classroom task performance.

Anti-Sensory Integration Camp

Compared to the research supporting the pro-sensory integration camp, there is also significant research that supports the opposing side of this argument, otherwise considered to be the anti-sensory integration camp. One can appreciate that although the literature has praised the usage of sensory integrative interventions and strategies, they must consider this information with caution. Many studies and systematic reviews have determined that pro-sensory integration studies lack sound methodological components, which questions the validity of these studies in all aspects (Bodison & Parham, 2018; Case-Smith et al., 2015; Stonefelt & Stein, 1998; Van der Putten et al., 2011). Furthermore, pro-sensory integration studies often have to indicate their methodological flaws in their limitations section and advise readers to consider their results with scrutiny (Anaby et al., 2018; Chien-Lin et al., 2012; Grace, 2020; Mills & Chapparo, 2018; Mills et al., 2016; Paul et al., 2003; Pfeiffer et al., 2017; Piller & Pfeiffer, 2016; Stonefelt & Stein, 1998; Van der Putten et al., 2011). This lack of proper methodology requires me to understand the possibility that my project will not produce a positive outcome with the students my sensory corners will attempt to serve.

Issues with maintaining proper methodology within pro-sensory integration experimental studies are due to two main concerns with study design stemming from an overarching reality present in the literature. The overarching reality is that every client with sensory dysfunction presents with different sensory processing difficulties, and they often require vastly different interventions to meet their specific needs to properly modulate sensory information. This reality

leads to one issue in creating a standardized experimental protocol consisting of sensory

integration therapy and sensory-based interventions because of the wide range of needs for each

participant/client that may not respond to a single level sensory-integrative or sensory-based

experimental protocol (Case-Smith et al., 2015; Mills et al., 2016). It can be theorized that a

standardized approach to sensory-based therapy in any setting, such as school-based OT, is

potentially impossible to create as each client with sensory dysfunction requires an effective

approach of an individualized nature that is tailored to them rather than utilizing a "one-size fits

all" approach. It also leads to another issue: it is unethical and impossible to assign varying

levels of sensory dysfunction presentation to participants in an experimental study (Paul et al.,

2003). Because of both of these factors, one can appreciate that it is near impossible to create a

comprehensively appropriate, standardized protocol for a control group and clinically even

experimental group of participants with sensory dysfunction to determine the effectiveness of

sensory integration therapy or sensory-based interventions.

One could propose that these circumstances prevent the creation of any "gold standard"

method in support of the pro-sensory integration argument that can truly confirm the

effectiveness and benefits of sensory-based strategies when used in any therapeutic setting. Few

studies have come close to the gold standard of research that is a randomized control trial, which

demonstrates an inability to compare the results of pro-sensory integration studies as the study

designs are not sound (Davidson & Williams, 2000). Since there is no gold standard for sensory

integration implementation, I will be hand-selecting all sensory equipment for each student to

use based on their level of sensory dysfunction and what sensory equipment will best facilitate a

reduction in anxiety and psychological stress. All this information against sensory integration

encourages me to utilize an outcome measure before and after the project's implementation to

include a standardized, methodological component. Another way I could potentially create more of a "standardized approach" would be using the same sensory equipment for children who present similarly in terms of the level of dysfunction, need preferred/undesired type of stimuli, etc. However, this would take away the individual nature of this form of OT and could potentially reduce the benefit those students would experience. This information is critical and should be considered when developing my sensory corners. This will help me identify sensory integrative tactics that have the most support compared to those with little or no evidence to back the reasoning for their usage among OTs in practice.

Occupational Theory and Frame of Reference

To guide my doctoral capstone experience (DCE) and project is the Ecology of Human Performance (EHP) occupation-based model and the Sensory Integration (SI) frame of reference. I chose these theories because they can be effectively intertwined to facilitate increased sensory integration leading to more successful task performance (Cole & Tufano, 2008). Oftentimes students with disabilities have increased difficulty with sensory processing and integration with input from their school environment, which may often manifest into behavioral issues, heightened anxiety, and reduced academic performance. Students with an inability to effectively integrate and process sensory input may be exacerbated by an environmental context that is not supportive enough to assist them in resolving these issues. When these students' environmental context (i.e., their classrooms) are too constrictive, this results in a smaller performance range to complete their necessary tasks (i.e., their academic responsibilities) (Cole & Tufano, 2008). Additionally, their personal constructs consist of these reduced abilities and skills related to managing sensory input as well as their negative experiences related to the incoming sensory information (Cole & Tufano, 2008).

My visual diagram embodies aspects of both the EHP model and SI frame of reference in how I approached my project when working with students with sensory processing and integration difficulties (see Figure 1). The chaotic personal construct of these students resulting from their sensory dysfunction causes these students to feel as though they are in a mental web of confusion and frustration (Cole & Tufano, 2008; Watkins, 2020). They, in a sense, begin to feel overwhelmed with all the incoming sensory stimuli as they are not able to appropriately regulate their reception of this information. My project took on the EHP concept of adapting their environmental contexts (i.e., classrooms) by incorporating sensory corners where they could receive the necessary sensory input or break from the increased input. As a result, this broadens their performance capacity to complete their educational responsibilities, leading them to learn appropriate sensory processing/integration strategies and coping skills to relieve anxiety and frustration because of sensory stimuli. Some of the students in this project were either hyporesponsive or hyperresponsive to certain sensory input, and it was crucial to be aware of their individual needs to provide appropriate types of sensory equipment that they can use to assist them in regulating their response to certain stimuli. My DCE required me to be aware of other possible external factors that may constrict these students' environmental contexts as these may also impact their sensory processing and integration strategies. Lastly, I educated the teachers on how to be supportive of the sensory corners and how they will enhance these students' learning experiences and overall educational success.

Explanation of the DCE Project

The building of sensory corners within a classroom environment will achieve three things to address the needs that were previously discussed. First, it will help kindergarten-2nd grade general education students with sensory needs and IEPs meet their therapeutic and educational

goals, increase their academic participation and self-sufficiency, and learn proper coping and self-regulation skills. Second, it will educate staff/teachers about self-regulation and provide feasible sensory tools/strategies for them to utilize in their classrooms. Lastly, it will advocate for the OT profession and the overall acceptance of sensory-based interventions. The six students that will be using the sensory corners all present with sensory needs and are eligible for therapy/special education services either by diagnosis or eligibility criteria (see Appendix A). These sensory corners will contain and implement individualized sensory equipment/tools and strategies to facilitate increased self-regulation and coping skills within these students. My project is different from the literature in that many of the projects completed in support of sensory integration methodology utilized different sensory rooms that require complete removal of the individual. In contrast, I aim to build these sensory areas within the classrooms to minimize the amount of time a student spends out of class to fulfill sensory needs such as completing movement breaks, spending time using fidgets or a weighted vest, deep breathing, etc.

Project Design and Implementation

This DCE project is a true representation of my passion for school-based occupational therapy and working with children who have sensory integration/regulation difficulties. I noticed how much of a need there is to be filled with these kinds of children to set them up for success later in life. Within Brownsburg, there are many students that receive occupational therapy services to address their sensory needs and it appears that the therapy staff do the best they can for their students. As I mentioned previously, the therapy staff struggles with increased time and availability to donate to creating other effective projects involving extensive amounts of

research. This project was developed to bridge the gap between these needs and increase the students' abilities to monitor and fulfill their sensory needs independently.

To assess each student's needs to help me construct the sensory corners in their classrooms, I asked the students' classroom teachers to complete the Sensory Profile 2 - School Companion (SPSC) and School Anxiety Scale-Teacher Report (SAS-TR) assessment tools. The SPSC and SAS-TR have an internal consistency Cronbach alpha coefficient of 0.94 and 0.93, respectively (Brown et al., 2010b; Lyneham et al, 2008a). The SPSC has a moderate-to-good intra-class correlation range of .66 to .93, while the SAS-TR has an intra-class correlation of .78 (Brown et al., 2010a; Brown et al., 2010b; Dunn, 2014; Lyneham et al., 2008a). The literature indicates that the SAS-TR assessment has an internal consistency for the total anxiety score of 0.93 and satisfactory test-retest reliability (Lyneham et al., 2008a; Syriopoulou-Delli et al., 2018). The generalized anxiety and social anxiety subtest scores had an internal consistency score of 0.90 and 0.92, respectively (Lyneham et al., 2008a). The intraclass correlations for the total anxiety, generalized anxiety, and social anxiety scores were .78, .73, and .81, respectively (Lyneham et al., 2008a). The SAS-TR has also demonstrated evidence of convergent validity through strong correlations with other teacher report questionnaires (Lyneham et al., 2008a).

The SPSC is a standardized test that requires the respondent (i.e., teacher) to rate the frequency of behaviors resulting from the student's sensory processing difficulties (Brown et al., 2010b). This information provides great insight into whether a child may be sensory seeking or avoiding, sensitive to sensory input, and/or able to register sensory information from their environment (Dunn, 2014). The SPSC also provides school factor scores which "reflect the teacher's view of the student as a learner in the classroom" (Dunn, 2014). These factors are the student's need for external support, their awareness and attention, their tolerance, and their

availability all in relation to the learning environment (Dunn, 2014). This information helped me determine the most appropriate sensory tools to add into their sensory corner and/or activities to add into their movement breaks.

The SAS-TR aims to target "the behaviors and feelings distinctive to the experience of anxiety" (Lyneham et al., 2008a). This also addresses the teacher's perspective of how the child's level of generalized and social anxiety is impacted by various school-related tasks and activities, such as asking questions in class, being shy, volunteering answers/comments in class, etc. (Lyneham et al., 2008b; Lyneham et al., 2008c)

For my project, I used the information obtained from this questionnaire to assess the child's level of anxiety and psychological stress that is present at school. Although I knew that these students would not qualify on the SAS-TR as having clinical general or social anxiety, I wanted a general understanding of what school situations cause them increased stress as this may either be due to sensory processing difficulties and/or the student's lack of confidence. Furthermore, this information would help me determine how many calming components to include in the sensory corners and/or with a student's movement breaks for them to utilize.

For my project, I am working with five students who demonstrate sensory processing, self-regulation, and coping difficulties and teaching them how to overcome these difficulties constructively by using sensory corners and sensory strategies. At the beginning of the project's implementation period, I worked with each student during ideal times for breaks in their day schedule and during their school occupational therapy sessions to educate them on how to utilize the sensory corner and related strategies when needed. These sensory corners had individualized sensory equipment and strategies (e.g., movement breaks) as well as visuals related to the zones of regulation, exercise activity cards, deep breathing cards, "I need a break!" cards, and a visual

indicator related to the number of breaks that have yet to be taken (see Figures 1 and 2). Some of

the sensory equipment included, but are not limited to, wiggle cushions, fidgets, squishy balls,

weighted lap pads, and therapy bands (see Figures 3 and 4). These sensory corners were not to be

overly elaborate initially due to the limited space in classrooms and finances related to having to

obtain other items that were more expensive (see Figure 5).

Some challenges that I faced with initiating the project were the timing of when my

SPSC assessment forms came in the mail as they came in later than anticipated due to being on

backorder despite having been ordered prior to arriving at Brown Elementary for my DCE.

However, these came in early enough to still begin my implementation period in a timely

manner. Another challenge was that two of the students struggled with some of the bilateral

coordination exercises that I had planned for them to use during their movement breaks. This

required me to find other bilateral coordination activities that were appropriate and were easy for

them to understand. A third challenge was that my site mentor was unsure whether the students I

was working with for the sensory corners would fully grasp how to navigate them due to their

ages, so I had to work hard to modify my language with the students to facilitate understanding

at their age level. Lastly, the sensory corners that I envisioned installing in my head were not

how they appeared initially due the extensive time I had to wait for additional supplies to get in

from an Amazon order, which was another challenge.

I did also have a few major successes at the beginning of the implementation period. The

first was that one of the students executed a full sensory break by himself using my protocol the

first day it was introduced to him in his classroom without adult assistance. The teacher indicated

that he did extremely well and that it was very helpful for him. Another student had a major

meltdown in his classroom while I was setting up the sensory corner with his activities and the

teacher mentioned to me that I could try to use my protocol with him. I worked with him to execute his sensory break by completing his exercise activity cards and then sitting on a wiggle cushion with a fidget, therapy band, and a weighted lap pad. This student indicated to me that he was able to move from the "red zone" to the "green zone" by the time he had to go back to the classroom activity. Later, another student who was to utilize my sensory corner program recognized me while I was in the classroom and came to me to indicate that he needed a break. He mentioned that he felt as though he didn't need to do exercises, but instead needed to calm down. He also spent some time using his calming items such as the weighted lap pad and fidgets. This student also mentioned that he felt much better after taking his calming break before returning to his classroom activity.

Project Outcomes

For the assessment component of this capstone project, I utilized the Sensory Profile-2 School Companion (SPSC) and the School Anxiety Scale-Teacher Report (SAS-TR) as my standardized assessments. The SPSC was a great tool to use as it assesses how a child responds to various sensory experiences within their school environment throughout the day (Dunn, 2014). It was great for the students I worked with because the information was reported by their classroom teachers who spend the most time with them during the school day in a classroom setting and have the most merit to provide information of this nature. As mentioned previously, the SPSC is a standardized questionnaire and it is designed for teachers to rate a student on a Likert scale from 0-5 where 0=Does Not Apply, 1=Almost Never, 2=Occasionally, 3=Half the Time, 4=Frequently, and 5=Almost Always. The assessment has a total of 44 items with items divided up and added to obtain 13 sensory area scores related to sensory needs, behaviors, and school factors. These raw scores are compared to a bell curve with descriptive categories representing their relation to the mean range. More specifically, scores within the "Much Less

Than Others" range are -2 SD below the mean, scores within the "Less Than Others" range are -1 SD below the mean, scores within the "Just Like the Majority of Others" range indicates the mean range, scores within the "More Than Others" range are +1 SD above the mean, and scores within the "Much More Than Others" range are +2 SD above the mean.

My project results indicated that in comparison to the pre-test, all five of the students were reported to show improvements in at least one of their SPSC post-test scores in comparison to their pre-test SPSC scores (see Table 1). Student C demonstrated improvement in only one sensory area from his pre-test to post-test scores, however it was noted by this student's teacher that the sensory corner and sensory strategies were extremely helpful for him and was effective in addressing his sensory needs. Student B demonstrated improvement in two sensory areas, but it was observed during the project implementation period that this student had great difficulty with understanding and processing the sensory corner protocol and sensory strategies. This explains his limited improvement between his pre-test and post-test scores. Students A, D, and demonstrated notable improvement in multiple sensory areas between their pre-test and post-test scores. More specifically, Students A, D, and E showed improvement in a total of 11, 6, and 9 sensory areas, respectively, out of a total of 13 areas on the SPSC.

The SAS-TR was another great tool to use as it assesses the level of generalized and social anxiety (i.e. psychological stress) a student demonstrates within a school environment that is perceived by the classroom teacher (Syiopoulou-Delli et al., 2018). This assessment worked great with the Sensory Profile-2 to determine each student's level of psychological stress and its relation to their sensory needs. This standardized assessment is a questionnaire for teachers to rate a student on a Likert scale from 0-3 where 0=Never, 1=Sometimes, 2=Often, and 3=Always. The assessment has a total of 16 items with items 1, 2, 4, 6, 11, 13, and 14 combined to obtain a generalized anxiety score and items 3, 5, 7, 8, 9, 10, 12, 15, and 16 combined to obtain a

socialized anxiety score. Both the generalized and socialized anxiety scores are also combined to obtain a total anxiety score. A higher score indicates more anxiety and psychological stress.

From the beginning to the end of the project implementation period, Students D and E were reported by their classroom teacher to have reduced scores in the areas of generalized and social anxiety as well as the total anxiety categories (see Table 2). This indicated that these students demonstrated a decrease in anxiety and psychological stress. However, Students A and C were reported by their classroom teachers to have increased generalized, social, and total anxiety scores (see Table 2). Furthermore, this indicated that these students demonstrated increased anxiety and psychological stress. Student B was reported to have no change in their score in any of the three areas (see Table 2).

In addition to the standardized assessments, I also utilized Microsoft Forms as an informal assessment to gain data. The Microsoft Forms were a great way to gain weekly information from the classroom teachers about how things went each week with the protocol as I am not in each classroom all day every day. I quickly figured out what components worked/did not work for each student and worked to modify each protocol as a result. From the beginning of the project implementation period to the end, the average number of times the five students used the sensory corner was one time per school day. The classroom teachers reported that the sensory corners were 60% effective while it was 40% neither effective nor ineffective among the five students (see Figure 6). The predominant reason for use among the students throughout the implementation period was difficulty with attention to task at 25%, emotional distress at 37%, and extraneous movement/passive inattentiveness at 38% (see Figure 7). Note that two students were reported to have two predominant reasons for use. Lastly, the classroom teachers reported that by the end of the project implementation period 4/5 of the students demonstrated a good understanding of the sensory strategies and sensory corner protocol.

Conclusions

This doctoral capstone project explored the efficacy of sensory integrative interventions when incorporated into the classroom. The findings support the idea of increasing sensory integrative equipment and strategies within a student's learning environment to improve sensory regulation and increase their ability to effectively interact with their learning environment.

The Brownsburg Community School Corporation, more specifically Brown Elementary, ultimately gained multiple things as a result of this project. They gained a better understanding of the needs of some of their students as we found that some of the students that participated required more direction to effectively utilize certain sensory equipment and strategies while others could be more self-guided. A second thing they gained were new ideas on how to incorporate sensory integrative equipment and strategies into their classrooms in a way that allows for students to have their sensory needs met outside of their one OT session each week. Lastly, the occupational therapists within the school district at large gained a better understanding of new assessment tools to use as a part of their evaluation process of students and as well as new informal ways to collect data for the students on their caseload.

Oftentimes in school-based practice, occupational therapists are only seeing a student on their regular caseload for 20-30 minutes per week due to their high caseload numbers. This reduces their ability to donate additional time to find effective solutions for students within the classroom to help them meet their sensory needs. The findings of this project suggest that sensory corners and sensory strategies may provide a more well-rounded approach to school-based OT and further advocates for the OT profession by emphasizing the benefits of using OT interventions within the classroom in this format.

Summary

This doctoral capstone project aimed to address the notable lack in appropriate programs for students that address sensory dysfunction within a school environment. Literature related to sensory integration and intervention techniques as a whole struggle with generalizability, standardization, and sound methodology. Furthermore, it is difficult to create a "gold standard" when utilizing sensory integration as it prevents OT intervention from fully meeting the unique needs of each child. More specifically, their personal level of dysfunction and need for more or less of preferred/non-preferred stimuli to facilitate regulation. As a result, this project provided five students with individualized sensory equipment and strategies to make up their sensory corner protocol. The findings of this project suggest efficacy of sensory corners and sensory strategies when incorporated into a classroom environment to reduce sensory dysfunction. Additionally, these findings coincide with pro-sensory integration literature and with occupational theory in that they suggest this protocol leads to improvement of a student's ability to engage further with their learning environment, which leads to overall greater academic success and progress in meeting the student's therapeutic goals (i.e., improved occupational performance). This project also emphasizes the importance and benefit of OT through advocation for its furthered usage in a new format within the classroom as a way to meet the needs of Brown Elementary, Brownsburg school-based therapy staff, the BCSC, and the educational system at large, which are better ways to overall promote and support student success.

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Table 1

Number of scores in SPSC descriptive categories

Student	Just Like the Majority of Others (Mean)				More Than Others (+1 SD)				Much More Than Others (+2 SD)			
	Before	After$_I$	After$_W$	S	Before	After$_I$	After$_W$	S	Before	AfterI	After$_W$	S
A	-	-	-	-	2	**1**	1	0	11	**10**	1	0
B	-	-	-	-	1	0	1	0	12	**2**	6	4
C	1	0	1	0	6	0	6	0	6	**1**	6	0
D	1	0	1	0	6	0	6	0	6	**6**	0	0
E	4	**1**	2	1	0	0	0	0	9	**8**	1	0

Note. The numbers reflect the 13 areas scored on the SPSC. None of the students received scores that fell within the "Much Less Than Others" and "Less Than Others" descriptive categories. Students A and B did not receive scores in the "Just Like the Majority of Others" descriptive category. Bolded scores indicate improved sensory area scores from pre-test to post-test. A_I=after improved score, A_W=after worse score, S=score stayed the same

Table 2

Before and after project implementation scores on SAS-TR

Student	Generalized Anxiety		Socialized Anxiety		Total	
	Before	After	Before	After	Before	After
A	3	7	1	7	4	14
B	0	0	0	0	0	0
C	4	9	2	4	6	13
D	5	**0**	4	**3**	9	**3**
E	0	**0**	6	**5**	6	**5**

Note. Higher score indicates more anxiety while a lower score indicates less anxiety.

Figure 1

Deep breathing activity cards

Figure 2
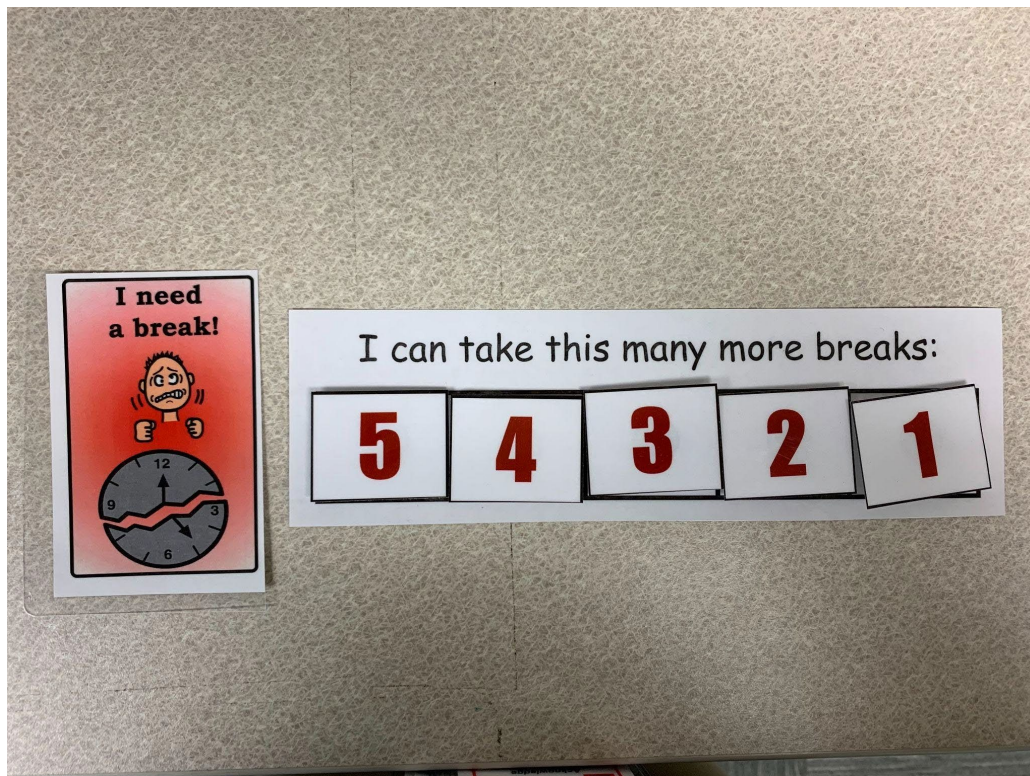
"I need a break!" card and break frequency visual

Figure 3

Second-grade sensory corner items

Figure 4

Second grade sensory corner

Figure 5

First grade sensory corner

Figure 6

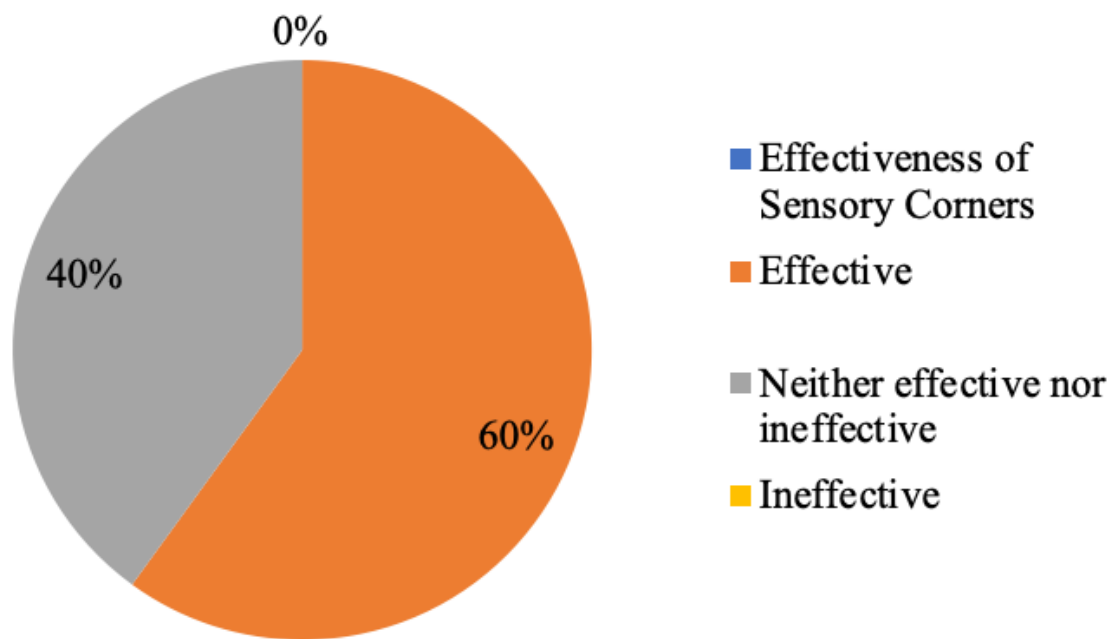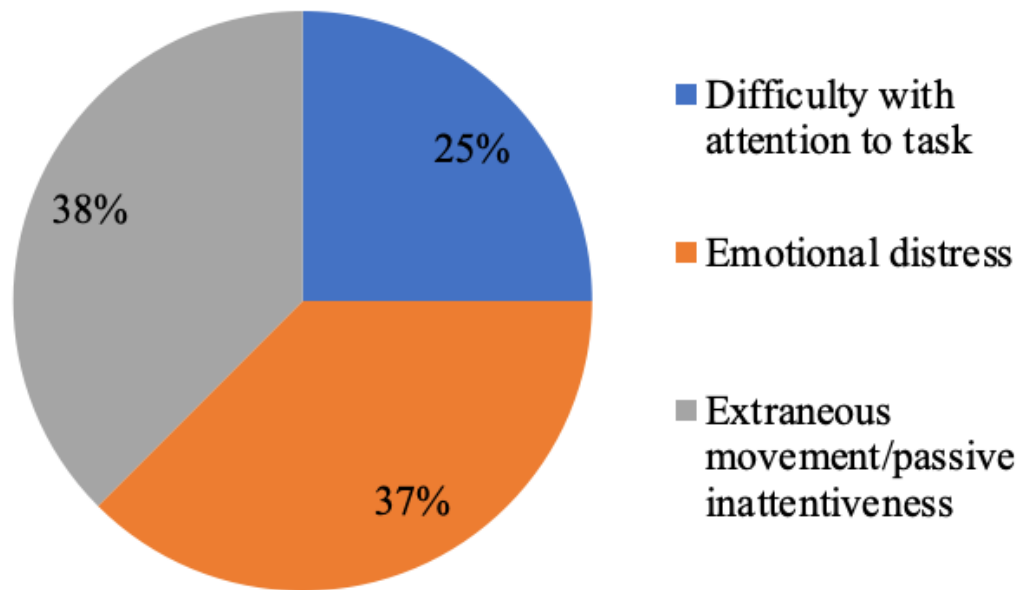*Effectiveness of Sensory Corners and Strategies*

Figure 7

Predominant Reason for Sensory Corner and Sensory Strategy Use

Appendix A

Participating students and eligibility criteria

Student	Eligibility Criteria
Student A	Developmental Delay Language Impairment
Student B	Developmental Delay Deaf or Hard of Hearing Learning Impairment Speech Impairment
Student C	Developmental Delay Learning Impairment Speech Impairment
Student D	Developmental Delay Learning Impairment Speech Impairment
Student E	Developmental Delay