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Exploring Sensory Modulation Disorder in Children with Attention Deficit Hyperactivity
Disorder Through Use of the Brain and Body Center Sensory Scales

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Author's Note

This paper was prepared for OT492 Undergraduate Scholarship Practicum, advised by Nancy

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Abstract

Children with attention deficit hyperactivity disorder (ADHD) may have a co-diagnosis of sensory modulation disorder. The purpose of the present study was to consider this idea by exploring the sensory patterns found in children with ADHD and to examine the patterns that cause occupational performance problems. By utilizing the Brain-Body Center (BBC) Sensory Scales, it was found that children with ADHD experienced more auditory processing difficulties than that of the other sensory systems. This knowledge is valuable to occupational therapists in that it can aid in developing individually tailored intervention plans through utilizing a sensory processing frame of reference. Further research should be conducted to better understand the present sensory patterns.

Background on Sensory Processing Disorder

Context and environment provide a person with a great deal of knowledge, both about the world and about themselves. Every individual takes in information from their surrounding environment, whether it is via touch, smell, or sight. Without the sensory information we gather, we would be unable to understand and make sense of the world around us and fail to successfully interact with other people and objects (Reynolds, Lane, & Gennings, 2010). *Sensory processing* is the term used to describe this process, and the sensory input helps to provide meaning to the world, as well as activities of daily life (Pfeiffer, Daly, Nicholls, & Gullo, 2015). The broad, over-arching process involves the management, regulation, and organization of all incoming sensory information, specifically by the central and peripheral nervous systems (Yochman, Parush, & Ornoy, 2004). In some cases where sensory stimuli are present, these two systems experience difficulties in regards to their functioning in such a way that there is an interference with daily life (Miller, Nielsen, & Schoen, 2012). This condition, sensory processing disorder (SPD), is a frequent diagnosis in school and private practice settings and is a focus of occupational therapists. Because the sensory system plays a role in every context of a person's life, the consequences of the dysfunction can be incapacitating.

There are multiple ways in which sensory information is processed, including modulation, discrimination, and integration. These characteristics present themselves in different subtypes of the broad diagnosis. One category of sensory processing disorder, sensory modulation disorder (SMD) (Yochman et al., 2004), is defined as an inability to regulate typical sensory responses appropriately (Parush, Sohmer, Steinberg, & Kaitz, 2006). About 5% of the typically developing population experience symptoms that can be credited to this disorder, while at least 30% of individuals present similar symptoms as a comorbid condition with other

developmental disabilities (Reynolds et al., 2010). SMD is typically expressed as patterns of over-responsivity and under-responsivity. The former refers to interpreting sensory information as an intense stimulus (Reynolds & Lane, 2009); that is, the response is amplified compared to that of a typically functioning system. In the latter, the opposite occurs: the stimulus is not as prominent as it should be. These types of SMD differ in the way they present. Over-responsivity typically causes sensory-avoiding behaviors, such as in the case of a child becoming overly upset by a loud television, and under-responsivity perhaps causing a child to be oblivious to their parent calling their name (Reynolds et al., 2010). Another category—sensory seeking—is also seen within this population (Miller et al., 2012); these children may present with behaviors such as constantly spinning on a chair or frequently running around the home. Sensory stimuli from any system can be wanted or rejected, and the behaviors associated with either type vary on a case-by-case basis and should be assessed with this variability in mind.

Theories Involving Sensory Processing Disorder

Occupational therapists consider dysfunctions of the sensory system through the use of two theoretical frameworks that help inform their interventions and practice: Sensory Integration theory and the Model for Sensory Processing. Originally created by A. Jean Ayres, Sensory Integration theory shows that engaging in sensory-rich activities will aid the nervous system in organization, processing, and integrating (Lane & Schaaf, 2010), while Winnie Dunn's Model for Sensory Processing involves understanding strategies for intervention and self-regulation in respect to how each person perceives sensory stimuli (Dunn, 2001). Assessment tools based on these theories are frequently used to assess the functioning and performance of individuals with apparent sensory impairments. Among the most common are the Sensory Processing Measure (SPM) and the Sensory Profile 2 (SP2). The SPM was created with the intention to determine

the functional limitations of children across various environments in respect to sensory processing, praxis, and social participation. As an in-depth assessment, the SPM addresses all of the sensory functions and a wide variety of school and home environments in order to fully understand the source of the problem for each child assessed (Asher, 2014). A frequently used tool to assess sensory processing is the SP2. Originally created by Winnie Dunn in 1999, the SP2 also explores the sensory areas in which a child is experiencing difficulties, and it assists in determining how these difficulties affect function (Asher, 2014).

Another helpful assessment tool, the Sensory Integration and Praxis Test (SIPT), was created by A. Jean Ayres, and is one of the keystone assessments for Sensory Integrative theory. It involves a series of subtests that aid in determining if a child does in fact have sensory integration limitations, as well as testing the areas of sensory processing to determine the extent of the deficit. This assessment is different than those previously stated; it requires formal training in both theory and the testing process itself (Asher, 2014). These stipulations make the test difficult to use in some respects, however, it provides the therapist with a battery of information in regards to both sensory processing and integration functions of their client. Having an understanding of both the Model of Sensory Processing and Sensory Integrative theory is necessary to gain a broader scope of knowledge on SPD, and it allows for refinement in choosing assessment tools, as well as interventions.

Determining the appropriate assessment tool and frame of reference is often determined by the population in question. Sensory processing issues can coexist with a variety of different diagnoses. One of the most highly regarded coexisting diagnoses is autism spectrum disorder. Countless children on the spectrum are documented as having both sensory processing and sensory modulation disorders that affect their daily functioning (Lane, Reynolds & Dumenci,

2012). Other diagnoses have been shown to present with difficulties in respect to their sensory systems as well, including Fragile X and Developmental Coordination Disorder (DCD). Of the comorbid conditions, one that is beginning to be frequently explored in regards to its connection to sensory processing is attention deficit hyperactivity disorder (Koeing & Rudney, 2010), and this connection between the diagnoses is the main interest of the present study.

Attention Deficit Hyperactivity Disorder

Attention deficit hyperactivity disorder (ADHD) is a diagnostic population that is prevalent within school systems, with up to 6.4% of children experiencing symptoms (Shimizu, Bueno, & Miranda, 2014). Typically diagnosed in childhood, this life-long disability often presents as inattentive and impulsive behaviors, as well as hyperactivity (Dunn & Bennett, 2002). However, the diagnostic criteria for the disorder are vast, and they encompass other symptoms such as moodiness, inflexibility, and worrying (Reynolds & Lane, 2009). ADHD is typically diagnosed through physician recommendation that is based on criteria stated within the Diagnostic and Statistical Manual of Mental Disorders: Version 5 (Dunn & Bennett, 2002). The manual provides the criteria of inattention and hyperactivity, and each of these areas contains various sub-criteria that must be met in order to be properly diagnosed as having ADHD (American Psychiatric Association, 2013). Standardized testing as well as caregiver reports are used in tandem to specifically identify where the child is experiencing difficulties (Dunn & Bennett, 2002).

When considering ADHD, it becomes clear that the diagnosis can cause many problems in occupational performance (Yochman et al., 2004). The symptoms of the disorder commonly affect a child's performance both academically and socially (Dunn & Bennett, 2002). Along with affecting the social context, ADHD can also create problems within the home context

(Yochman et al., 2004), specifically in regards to daily functioning for these individuals (Mangeot et al., 2001). ADHD continues to be a difficult diagnosis to fully grasp and understand regardless of the research that has been completed (Dunn & Bennett, 2002). Not only is it confounding due to its diverse symptoms, it appears as a comorbid condition to many other disorders, one of which being sensory modulation disorder.

Connecting Sensory Processing and ADHD

The link between sensory processing and attention deficit hyperactivity disorder is often met with uncertainty and ignored by many healthcare professionals (Miller, Nielsen & Schoen, 2012). This is due largely to the diagnoses frequently presenting in similar ways. Both SMD and ADHD can cause inattention, impulsivity, and hyperactivity, which are keystone symptoms of the latter (Yochman, Alon-Beery, Sribman & Parush, 2013). Typically, SMD is forgotten and not considered in children with ADHD because their symptoms are seen more as a result of behavior, not from outside sensory stimuli; viewing their symptoms from a behavioral frame of reference as opposed to that of sensory processing is much more likely because it is what is familiar (Shimizu, Bueno, & Miranda, 2014). However, some professionals—including occupational therapists—have discussed the relationship between the two diagnoses.

Current research suggests that the two occur as comorbid conditions, hoping to stress the importance of considering both in treatment. Specifically, a few of the previously stated assessment tools based on the theories of Sensory Integration and the Model for Sensory Processing have been used with the ADHD diagnosis to help solidify the connection. Dunn and Bennett (2002) used the Sensory Profile to aid in bringing this relationship to light. The children with ADHD scored fairly low on the measure, and they displayed more sensory dysfunction than the children that were deemed typically developing (Dunn & Bennett, 2002). Similar studies

were completed with the same goal in mind while using the same outcome measure. Yochman, Parush, and Ornoy (2004) used the Sensory Profile years after the aforementioned researchers to explore the difference in responses of children with ADHD, and they acquired the same results. Other researchers such as Mangeot et al. (2001) also explain this connection. However, the results are not always consistent, suggesting that not every child with ADHD has problems with SPD. The children that do appear to show qualities of both diagnostic groups often fall into the overresponsive category (Mangeot et al., 2001). The child is unable to make sense of the incoming sensory information at a sufficient rate and the response itself is amplified (Reynolds & Lane, 2009), which is often the cause of the hyperactivity and impulsivity of ADHD.

Other occupational therapy outcome measures have been used to bring together the two diagnoses, one being the Sensory Processing Measure. Pfeiffer, Daly, Nicholls, and Gullo (2015) used this assessment similarly to how Mangeot et al. (2001) used the Sensory Profile in that they wanted to explore the sensory impairments typically seen in children with ADHD. It was discovered that there was a significant difference for the total score of the measure, as well as for all of the subtests of the measure (Pfeiffer et al, 2015). Studies similar to this continue to provide professionals with evidence that SPD, specifically its subcategory SMD, should be considered as a co-existing diagnosis. There are other conditions that seem to be comorbid with ADHD, which are referenced within the DSM-V (American Psychiatric Association, 2013). Anxiety is a major condition that is often linked with ADHD, but recent research shows that individuals that are expressing both ADHD and symptoms relating to a SMD are even more likely to display anxiety than those with just ADHD (Reynolds & Lane, 2009). Studies such as this lead the professional to consider the limitations that a sensory problem can cause, and that it should not be pushed to the wayside.

When considering children with ADHD, it is not only important to know where their dysfunction lies, but how their diagnoses are being treated as well. In most cases, pharmacological interventions are used to keep the disorder in check. However, for children who are also experiencing problems regarding sensory processing, this may not be the best option for them. Reynolds, Lane, and Gennings (2010) conducted research which points to there being significant differences in brain responses to sensory stimuli within the ADHD population. Physical evidence is allowing medical professionals to consider that another subcategory of ADHD—one that involves sensory responsivity—could be developed based on the growing knowledge base of client symptoms and responses (Reynolds et al., 2010). Other research has pointed out that SMD sometimes precedes a diagnosis of ADHD. Due to this, it is recommended that children be screened, not only for ADHD when they appear symptomatic, but SMD as well (Miller et al., 2012).

The relationship between ADHD and SPD becomes clear through the use of treatment. A study completed by authors Lin, Lee, Chang, and Hong (2014) used weighted vests in attempt to improve the attention and impulse control of children with ADHD. At the end of the study, they found that this mechanism was successful for both attention and on-task behavior, but not for impulsivity (Lin et al., 2014). Regardless, the significance of the results shows that a treatment that is heavily based on proprioceptive input—an aspect of the sensory system—can have positive effects on a child with ADHD. Based on research, the overlap between the two disorders is clearly evident. There is a wealth of information of the two diagnoses alone, but regarding their relationship, the research is limited. Occupational therapists are increasingly interested with this area, and therefore, the use of sensory-based assessment tools is beneficial; however, the expansion into other disciplines may give the concepts the spotlight they need.

The Brain-Body Center Sensory Scales

The Brain-Body Center (BBC) Sensory Scales were developed as a research tool to provide a more accurate picture of an individual's thoughts, feelings, and behaviors in regards to the sensory world, while using a neuroscience background. The purpose of this neurobiological understanding is to change the environment or activity in a way that will improve client functioning and performance, if necessary. The measure itself is similar to that of the Sensory Profile: it gives specific questions involving such domains as tactile, auditory, and visual. It can either be self-administered or given as a non-standardized, semi-structured interview format (Porges, 2011). Therefore, this tool can be used with individuals with ADHD as a research mechanism to provide supplemental information in regards to their current functional limitations and to determine if their behaviors stem from underlying sensory modulation problems.

Purpose

Research consistently shows that SMD and ADHD present with similar responses to various sensory stimuli within the environment. Multiple studies have been completed demonstrating the similarity between the two, the prevalence of the disorders to appear together, and treatments that are beneficial for both. Currently, there are no diagnostic criteria for sensory processing disorder—or any of its sub-parts—within the DSM-V, so many professionals overlook the possible cause of the sensory modulation problems within much of the ADHD diagnosis. Though occupational therapists are the major proponents of addressing this disorder as an individual diagnosis, some research and tools are being developed to give SPD a presence within a non-occupational therapy-based field.

The aim of the present study is to bring forward SPD through the use of a research tool that was not created by an occupational therapist, thus giving it broader applicability. In this

way, it may provide evidence that the disorder is not merely a symptom of a larger problem, but an issue that should be addressed and treated individually. Through the study and the administration of a new tool—the BBC Sensory Scales—for children with ADHD, the intention is to differentiate both disorders and to gain broader knowledge of the sensory patterns present in children with a diagnosis of ADHD. The primary research question is: what sensory patterns are present that potentially cause occupational performance problems within the ADHD population? The secondary research question is: how can occupational therapists better understand these sensory patterns to effectively frame their clinical reasoning when creating interventions for children with ADHD?

Methods

Subjects/Participants

Four parents were recruited using a combination of both snowball and convenience sampling. Each participant was the mother to a child with a diagnosis of attention deficit hyperactivity disorder. The sample consisted of three boys (ages 5, 12, and 12 years) and one girl (age 10 years), and all of the mothers recruited were the primary caregiver of the respective child. One of the children had a probable dual-diagnosis of a sensory processing impairment, but had not been assessed by a physician. Three of the children were functioning at grade level within the classroom, and one was participating in special education classes in another district. See Table 1 for more details on the demographic information.

Materials

The Brain-Body Center (BBC) Sensory Scales was the tool utilized in the present study. The scale is currently being developed by Stephen Porges, a neuroscientist out of University of North Carolina at Chapel Hill. The scale will ultimately be used as a research mechanism to

determine sensory patterns in both children and adults. The BBC Sensory Scales can be either self-administered or given via interview. The tool consists of four sections—auditory processing, visual processing, tactile processing, and eating behaviors—that ask specific questions about behaviors relating to each sensory system. The scale utilizes a one to five Likert-type format, with one meaning almost always exhibiting the behavior and five meaning almost never exhibiting the behavior. Each section of the scale allows for additional comments to be documented in regards to any behaviors not referenced explicitly.

Procedure

BBC Sensory Scales packets were created for distribution to the participants in the present study; the packets included an informed consent form, a demographic information sheet, and the scale itself. Two of the mothers were interviewed. Each interview lasted about 40 minutes and followed a semi-structured interview format. The other two mothers were mailed the BBC Sensory Scales packet due to time limitations. These two mothers self-administered the scale and sent the completed packet back to the researcher. Because the BBC Sensory Scales tool is currently in development, there was no manual from which to base administration. Therefore, the use of interviews and self-administration were within the scale guidelines. Institutional Review Board (IRB) approval was obtained through Elizabethtown College before initiation of the present study and the study was completed within its required parameters.

Upon collection of the data, Microsoft Excel was used as a means for data analysis. Each question response was placed within the spreadsheet, and mean scores were calculated based on the one to five Likert scale to determine which behaviors yielded the most meaningful results. Means were also calculated for the sensory processing categories as a whole (auditory; visual; tactile; eating), and this provided information on which sensory system appeared to have the

most impairment within the sample. Frequencies were also calculated to further examine how often the behaviors were displayed among the four participants.

The additional comments documented by the parents were compared with the numerical results to validate the findings displayed in Tables 1 and 2. The same process was completed with the demographic information provided by the participants. All of this qualitative information was considered in comparison to the quantitative data to determine any further trends in the results.

Results

Mean scores lower than 3 were deemed significant, as rating lower than this value represented displaying a behavior frequently. The mean score of the auditory processing category was 2.75. The visual processing category yielded a mean score of 3.37. The mean scores of the tactile processing and eating behavior categories were 3.22 and 3.25, respectively (Figure 1). The mean scores for the individual questions can be found in Table 2. Only the questions that have a calculated mean below 3 were included in this table.

The majority of the meaningful questions appeared to be from the auditory processing category, with eight questions yielding a mean score lower than 3. Three questions within the visual processing section had a mean score lower than 3. There were only three questions that showed differences in tactile processing and two in the eating behaviors category. These frequencies show that auditory processing dysfunction occurred more than the other three categories within the sample.

The comments from the parents correlated with the quantitative data. Comments including "...becomes extremely impulsive, overstimulated, and many times agitated in noisy environments," and "I am very concerned because he doesn't answer when talked to..." were

meaningful to the results, as they provided qualitative evidence of the dysfunction present. It appeared as though there were more parental comments for the categories of auditory and visual processing, further depicting frequency of behaviors.

Discussion

The purpose of the present study was to explore sensory modulation disorder in children with a diagnosis of attention deficit hyperactivity disorder. Through the study and the administration of the developing BBC Sensory Scales, the intention was to differentiate both disorders and to gain broader knowledge of the sensory patterns that impact a child's life. Additionally, the exploration of what sensory stimuli can commonly cause occupational performance problems in children with ADHD and how occupational therapists can understand these problems was also addressed.

It was found that the children displayed more concerning behaviors in regards to auditory processing than that of the other three categories. This trend was consistent for both the general categories and the specific questions, based on the calculated means. Among the most common behaviors were becoming distracted and overstimulated in noisy environments and unintentionally ignoring people speaking, even though their hearing was intact. The comments given by the parents correlated with these results, as well as showed their concern for these behaviors.

The two most common behaviors differ in their relation to SMD; becoming distracted is a keystone symptom of over-responsivity while ignoring others may occur due to under-responsive systems. The result showing that the children in the sample most often displayed the behavior of becoming overstimulated and unfocused further validates the research completed by Mangeot et al. (2001). Their study found that children with a possible dual-diagnosis of ADHD and SMD

often experience these over-responsive behaviors, and this was no different in the present study. However, where their study depicted that the children with ADHD having difficulty with sensory processing were sensory seekers, the present study showed both over-responsivity and under-responsivity in the results.

While these frequently observed behaviors do fall into the realm of ADHD, it is possible that the inability to process auditory stimuli may be exacerbating an already present problem. Dunn and Bennett (2002) discovered that children with ADHD scored much lower on the Sensory Profile than typically developing children, solidifying this idea. While the BBC Sensory Scales is not an occupational therapy-based tool, it utilizes similar principles and questions regarding how sensory information is processed. Because the children showed frequent behaviors in terms of auditory processing and scored lower on this section than that of the others, there is reason to believe there may be a deeper cause to the concerning behaviors.

As depicted by the concern of the parents and the tendency for the auditory processing behaviors to impact function, it is important to address the present issues. Because the frequent behaviors included becoming overstimulated and ignoring others, these auditory behaviors observed have implications for functioning in both the context of school and in public settings. Therefore, creating interventions and providing suggestions to address these aspects need to be considered.

The children had less difficulty with visual processing behaviors, and this was shown through the few significant questions on the scale. The only issues observed often include becoming distracted by moving objects, people and animals. Again, these behaviors are a symptom commonly seen as a result of ADHD, but a co-diagnosis of SMD may exacerbate the response to the stimuli; the deficit may be due to an inability to efficiently process the visual

stimuli, which occurs commonly in SMD. These results have implications for the classroom, as children may have difficulty focusing when other students are moving. In regards to tactile processing and eating behaviors, there was not much concern as the only finding was an avoidance of certain types of textures. However, behaviors such as avoiding wearing a jacket because it has long sleeves or only eating crunchy foods like cereal may manifest in both school and home environments and should be addressed in a therapy setting.

The similarity between the diagnoses of ADHD and SMD make it difficult to validate the assumption that the two are co-existing diagnoses. Much of the uncertainty stems from the tendency to dismiss SPD as an independent diagnosis (Miller, Nielsen & Schoen, 2012). Reynolds, Lane, and Gennings (2010) provided evidence that sensory issues can be present in children with ADHD and have the potential to cause problems in occupational performance. These researchers brought forth the idea that there is physical evidence for a possible subcategory of ADHD that involves sensory responsivity. While the present study did not utilize a means to expand on this physical evidence, it did yield both quantitative and qualitative results from the BBC Sensory Scales that provide more insight into this theory.

The results suggest that SMD and its array of symptoms may be frequently present in the diagnosis of ADHD. For children experiencing the effects of the dual-diagnosis, sensory-based interventions may be of benefit. Winnie Dunn (2013) is a supporter of utilizing a sensory processing frame of reference when addressing individuals with an obvious dysfunction in the way their nervous system understands incoming information. The results of the present study are consistent with her ideas and other studies completed that further depict the benefit of the theory.

Limitations

There were several limitations to the present study. The first limitation was that the sample size was small, utilizing an n of 4. It is difficult to achieve valid results and to generalize the conclusions to the broader population of children with ADHD with a sample of this size. Ideally, the sample size would be much larger in order to limit the chance of one child with severe symptoms of the diagnoses skewing the results one way or the other. Similar to this, no control group was utilized. Because there was no control group in the present study, comparisons were unable to be made between the children with ADHD and typically developing children in terms of how their caregiver answered each question.

Another limitation of the study relates to the acquisition of data. Two of the participants were interviewed and two self-administered the BBC Sensory Scales packet on their own, due to the element of time. The participants that self-administered the packets made significantly more additional comments than those who were interviewed. This difference may be due to the participants completing the packet on their own having more time to think about their child and complete the sections with accuracy. It is also possible that they were more comfortable writing about these behaviors, as opposed to the interviewees disclosing information via interview to the researcher, whom they just met.

Implications for Occupational Therapy

The results of the present study will help occupational therapists gain a broader understanding of the sensory behaviors found in their clients with ADHD. Knowing that auditory stimuli appear to be the most distracting to this population may assist therapists in tailoring their interventions to address these problems. For example, when addressing auditory processing behaviors, a therapist may provide noise cancelling headphones to limit distractibility in the school lunchroom. Similarly, realizing the effects of the inability to effectively process

other sensory stimuli (i.e. visual stimuli) will allow therapists to better determine occupational performance problems in their clients so they can more efficiently create these interventions. Knowing that a child becomes distracted when there is movement in a classroom allows a therapist to better see how their performance is affected and where they should intervene; in this example, seating the child near a wall or corner to limit movement all around them may prove beneficial.

Along with this, these results add to the growing number of studies showing that the use of a sensory processing frame of reference may be beneficial when treating children with ADHD. Typically, medical professionals treat these clients based on behavioral theory and this often leads to the utilization of pharmaceutical interventions. However, in a situation where there is a probable co-diagnosis of SMD, occupational therapy treatment based on limiting these behaviors from a sensory standpoint may prove to be more beneficial. This, along with the ability to create interventions specifically tailored to each client's sensory needs, puts occupational therapy in the position to more effectively treat ADHD in children.

There is much potential for further research on the coexistence of SMD and ADHD. Completing more studies similar to the present study may increase the validity of using sensory processing theory to base thinking in the clinical setting. Utilizing a non-occupational therapy-based research tool and other assessments may also allow for more medical professionals to view the diagnosis of SPD as a legitimate concern when working in populations of not only children, but adults as well.

In the future, it is recommended that researchers acquire a larger sample of participants. Comparing the sensory patterns in a wide variety of children would help to validate and generalize the results found within the present study. Including children of all different ages,

ethnicities, and functional levels is recommended for a follow-up study. Using only one form of data acquisition (i.e. self-administration or interviewing) may improve the validity of the results, as the lack of comments on the obtained scales of the participants interviewed was a limitation within the present study.

In conclusion, the present study furthers the understanding of the different presentations of two different diagnoses: SMD and ADHD. Within this research, sensory patterns in the children with ADHD were documented. This suggests the potential for dual diagnosis with sensory processing disorder (SPD) co-occurring with ADHD. With further research on how these patterns specifically affect the occupational performance of their clients, clinicians could make more informed decisions regarding appropriate and effective interventions.

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Table 1:

| Demographics | Number of Participants |
|---|-------------------------------|
| Gender | |
| Male | 3 |
| Female | 1 |
| Race | |
| Caucasian | 3 |
| Hispanic | 1 |
| Other | 0 |
| OT Services Received | |
| ADLs | 2 |
| Handwriting | 2 |
| Motor Skills | 1 |
| Sensory Integration | 1 |
| Family Intervention | 0 |
| Other | 3 |
| Grade in School | |
| K | 1 |
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 1 |
| 5 | 1 |
| 6 | 1 |
| Educational Level | |
| Grade Level | 3 |
| Grade Level with Special Education Services | 0 |
| Special Education Class at Home School | 0 |
| Special Education Class at Another District | 1 |
| Special Education School | 0 |
| Residential Program | 0 |
| Other | 0 |

Table 2:

| Negative Behaviors Based on the BBC Sensory Scale | Mean |
|--|------|
| Auditory Processing Behaviors | |
| How often does your child become distracted, or have difficulty following verbal instructions when there is a lot of noise around? | 1.75 |
| How often does your child appear not to hear what you say (for example, does not seem to pay attention to what you say, appears to ignore you)? | 1.75 |
| How often does your child not respond when his/her name is called, even though you know the child's hearing is not a problem? | 2.25 |
| How often do you have to speak loudly or get very close to your child's face to get your child's attention? | 2.5 |
| How often does your child seem overly aware, distracted, or disturbed by continuous noise in the environment | 2.25 |
| How often does your child take a long time to respond when spoken to, even to familiar voices? | 2.75 |
| How often is your child distracted by sounds not normally noticed by other people (for examples, air conditioning fans, trains or planes outside)? | 2.75 |
| How often do any of the above behaviors interfere with your child's daily functioning? | 2.25 |
| Visual Processing Behaviors | |
| How often does your child seem easily distracted by movement he/she can see? | 2.25 |
| How often does your child seem easily distracted by movements of other people or animals? | 2.25 |
| How often does your child seem easily distracted by movements of objects (i.e. mechanical toys or cars)? | 2 |
| Tactile Processing Behaviors | |
| How often does your child seem distressed by fingernail cutting? | 2.25 |
| How often does your child seem distressed by hair-brushing? | 2.75 |
| How often does your child refuse to wear certain fabrics or cry or fuss in response to wearing certain fabrics? | 2.75 |
| Eating Behaviors | |
| How often does your child become constipated? | 2.75 |
| How often does your child eat (or want to eat) significantly more than you think is appropriate for his/her size or age? | 2.75 |

*Note: The results are based on a 1 to 5 Likert Scale, with 1 being almost always displaying the behavior and 5 being almost never displaying the behavior.

Figure 1:

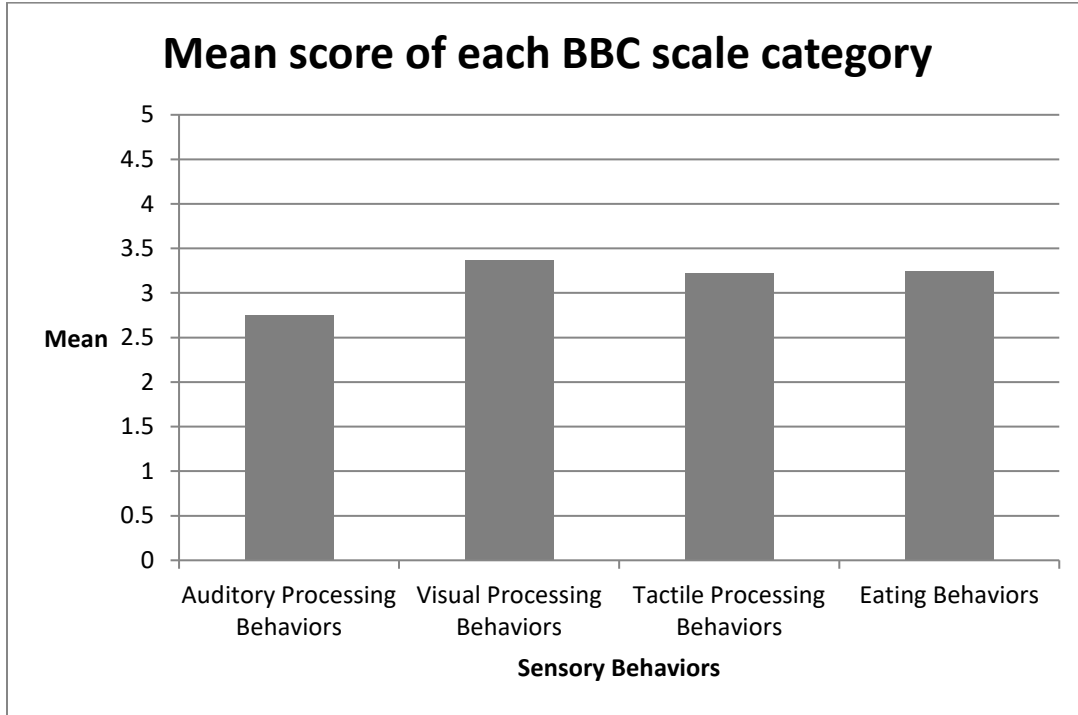


Figure 1 depicts the mean score of each BBC scale category, with negative auditory processing behaviors occurring more often than the other three categories.