Sensory Integration and Children with Autism Spectrum Disorders

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Children with autism spectrum disorders comprise one population treated by pediatric occupational therapists. Autism spectrum disorders (ASD) include Autistic Disorder (Kanner's Autism), Asperger's Disorder, Rhett Syndrome, Childhood Disintegrative Disorder (Heller's Syndrome), and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS). Shared characteristics of ASD are deficits in communication and socialization, presence of unusual patterns of interest, rigid adherence to unusual routines, and repetitive patterns of unusual body movements (Deisinger, 2001, pp. 181-182). However, as the term suggests, autism spectrum disorders present along a continuum, with each child exhibiting a unique set of characteristics with varying degrees.

Another major symptom in children with ASD is a disturbance of sensory modulation, resulting in overreactivity or underreactivity to sensory stimuli (Case-Smith & Miller, 1999). Baranek (2002) explains the basis of sensory integration as such: "through somatosensory and vestibular activities. . .the nervous system is thought to be able to better modulate, organize, and integrate information from the environment, which in turn provides a foundation for further adaptive responses" (p. 406). Since A. Jean Ayres presented the sensory integration theory in 1972, several single-subject design studies have attempted to demonstrate the efficacy of sensory integration-based interventions with children with autism spectrum disorders. Three studies are of particular interest.

Case-Smith and Bryan (1999) studied five preschool-age boys diagnosed with autism during ten weeks of occupational therapy intervention emphasizing sensory integration. To measure changes, the boys were videotaped each week for ten minutes

during free play time. The weekly 30-minute therapy sessions began and ended with tactile and proprioceptive input and included vestibular stimulation (i.e., linear swinging). The activities also targeted motor planning and self-regulation.

In comparing the baseline data with the data obtained during intervention, several changes became evident. Three boys demonstrated significant changes in mastery play: from nonpurposeful repetitive actions to functional and imaginative play (e.g., playing matching games, constructing objects, driving a toy car on a track). The authors suggested that these changes could relate to improved motor planning and reduced sensory defensiveness. In addition, nonengagement behaviors decreased significantly in four of the five boys. During baseline, typical nonengaged behaviors included wandering around the room, staring into space, and self-stimulating. During intervention, these behaviors decreased as much as 50% in one boy. The article states that this decrease in nonengaged behaviors, or increase in engaged behaviors, could reflect improved sensory modulation and motor planning.

The researchers also observed the subjects' social interactions with adults and peers during the ten weeks. Only one boy showed significant improvement in interactions with adults, and no subjects showed significant improvement in interactions with peers. The authors noted that measurement limitations could have affected the adult interaction outcomes and that the boys' peers, not only the boys themselves, could have affected the peer interaction outcomes. To clarify, typical children may discontinue efforts to communicate with an autistic child when they do not receive the responses they expect, thereby providing fewer opportunities for the autistic child to interact with them. The authors admitted that generalizations from these findings would be challenging but

asserted that the study supports the belief that behavioral changes can occur in children with autism when receiving occupational therapy using a sensory integration approach.

A similar study conducted by Linderman and Stewart (1999) explored the effects of sensory integration-based therapy on two three-year-old boys diagnosed with pervasive developmental disorders (PDD). The areas considered were social interaction, functional communication during mealtime, approach to new activities, response to holding, and response to movement. Participant 1 received one-hour therapy sessions weekly for eleven weeks, while Participant 2 received seven weeks of therapy. Therapy depended on the child's sensory needs and encouraged active decision-making. Data collection using the revised Functional Behavior Assessment for Children with Sensory Integrative Dysfunction (Cook, 1991) occurred both at the school and in the home. Baseline and treatment data were compared for both participants' results.

Participant 1 showed improvements in the areas of social interaction, approach to new activities, and response to hugging and holding. During the intervention stage, he began to initiate conversations and lead the interactions. However, the authors noted some confounding variables, such as introduction of speech services and vitamin regimens, which may have affected the results. Participant 1 also showed less hesitance and fear when approaching new activities. In fact, by the final observation, he was performing at expectations for a child his age without PDD. He also demonstrated increased tolerance of hugging and holding, which led to a more satisfying relationship with his parents.

Participant 2 also displayed some significant changes, as well. Quickly after treatment started, he began to imitate and mimic others' movements. In addition, he was

able to sit and attend to a video. He did not make gains in the area of functional communication during mealtime. Overall, the frequency of disruptive behaviors in both boys decreased while more functional behaviors increased.

Larrington's 1987 case study followed a fifteen-year-old boy with both autism and severe mental retardation through two years of sensory integration-based occupational therapy and revealed dramatic changes in the subject. The boy received weekly hour-long therapy sessions in addition to supplementary interventions by home and school staff. Weighted vests and lap robes, linear swings, various vibrators, and manipulatives were used to provide sensory input whenever the boy desired. Therapy also targeted weight-bearing, rotational and diagonal patterns, pelvic and hip movement, and postural adjustments. Throughout the two years, the boy's functional skills improved greatly while his inappropriate behavior decreased sharply. He abandoned his twisted sensory-seeking positions for a more erect posture in self-selected chair sitting. He also substituted a tailor or long sit for his former W-sitting position. At school, he was able to participate in functional activities, such as identifying colors or sorting eating utensils, and stay on task without becoming frustrated. He began to show more interest in his surroundings and in other people. He no longer needed to be restrained while riding in a vehicle and responded to the verbal command "good hands" if he attempted to reach for the steering wheel or gear shift. Decreased or eliminated behaviors include: plate and food throwing, hair pulling, head banging, twisting limbs, screeching, destructive acts, and bowel and bladder accidents in pants. An oral stimulation program was implemented during these two years, as well, and seemed to complement the sensory integration therapy: the boy showed more interest and motivation in an activity if a food component

was involved. The author expressed concern that regression would occur if sensory integration-based therapy was interrupted and emphasized the importance of providing these sensory experiences for the boy for his continued progress.

Since sensory processing can be neither seen nor measured, it is difficult to explain exactly why the subjects discussed have or have not demonstrated gains in functioning. Case-Smith and Bryan explained the rationale behind the sensory integration approach as attempting to raise or lower neural thresholds through graded tactile, proprioceptive, and vestibular input since children can "purposefully interact with the environment only when appropriate levels of arousal, orientation, and attention are attained" (p. 490). Though not addressing the scientific basis for the results, Linderman and Stewart described the assumed effects of the therapy sessions in their study: when the subjects became able to integrate sensory information effectively, they could form the appropriate behavioral and motor responses. Larrington discussed a crucial element of therapy which influenced her subject's success. She emphasized cooperating with the boy so that he could meet his sensory needs rather than feel forced to "conform to therapy demands" (114). Additionally, a 1980 study by Ayres and Tickle provided a possible correlation between hyper-responsivity and positive response to sensory integration treatment. They found that intervention was more effective in the subjects who exhibited hyper-responsivity to various sensory stimuli than those who were hypo-responsive.

Baranek (2002) explores some additional reasons for the results of these four studies in her research review paper. She argues that since sensory processing cannot be directly assessed, other factors may contribute the subjects' gains, such as maturation, other components of therapy sessions, caregiving effects, education, and other therapy

services. She also notes the small sample sizes, confounding variables, limited or no follow-up, measurement errors, and inability to generalize the findings. She stresses the need for replications and further research in this area of occupational therapy.

Still, researchers may never learn exactly why or how sensory integration works. The studies discussed here are significant because they demonstrate that some children with autism spectrum disorders do respond well to this approach. One could argue that it is a valuable tool to be used in conjunction with other therapeutic approaches, but occupational therapists who have observed progress in children with ASD through sensory integration may feel it is the most important "tool in their box." In a 1999 survey of pediatric occupational therapists, 100% of the respondents reported that they address sensory processing skills always or frequently when working with children with autism and cite sensory integration as the frame of reference they use (Watling et al., 1999). Reports like these show that pairing empirical evidence with clinical application can produce a more complete picture of the true efficacy of a therapeutic approach.

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