SPD and ADHD: Recognizing the Difference

Dr. Jamie Chaves, OTD, OTR/L, SWC

Sensory processing disorder (SPD) and attention-deficit hyperactivity disorder (ADHD) can be tricky to tease apart. Both are diagnosed based on symptomology (i.e. what behaviors/responses we see) and a series of performance-based tests. And to be honest, sometimes SPD can look a lot like ADHD. Children who are sensory-seeking may be constantly moving around to receive the input their body and brain craves. Children with sensory-based postural challenges may shift positions frequently when sitting because they cannot adequately sustain the position. Children who avoid or are sensitive to sensory inputs may be hypervigilant of their environment so they appear inattentive to the task. Children with coordination challenges or dyspraxia may bounce from activity to activity, or completely disengage from an activity, because they cannot effectively manipulate the object or their body.

We do know that there are many similarities between SPD and ADHD. Boys are more susceptible to both diagnoses compared to girls. Research indicates that both SPD and ADHD have neurobiological underpinnings. Studies indicate a 40-60% co-diagnosis of SPD in children with ADHD. However, they are not one in the same, as explored in this article. It is therefore important for parents and professionals to adequately differentiate these two diagnoses because the treatment looks different for both (see below). It is not uncommon for children to be diagnosed with SPD before the age of 2-3 years, while children with ADHD typically receive a diagnosis after the age of 5-7 years. The chart below, taken in part from *Sensational Kids* by Lucy-Jane Miller, PhD, OTR, highlights some of the differences between children with SPD and children with ADHD:

SPD	ADHD
• Stop impulsive behaviors with sensory input	• Continue impulsive behaviors despite sensory input
• Crave specific sensory inputs	• Crave novelty associated with sensory input
• Increase organization with sensory input	• Remain disorganized after sensory input
• Poor self-control around seeking tactile input and proprioceptive input	• Poor self-control around seeking auditory input
• Frequency, intensity, and duration of sensory-based activities improves regulation	• Cognitively challenging/motivating activities improve regulation
• Difficulty planning and coordinating movements	• Age-appropriate motor planning and coordination
• Sitting upright in a chair is difficult because of poor postural stability or fatiguing	• Sitting upright in a chair is difficult because of motor overflow
• Executive functioning generally intact	• Executive dysfunction common

Typically children with ADHD who also present with SPD tend to demonstrate more sensitivities or avoidance behaviors, rather than low awareness or seeking behaviors. I frequently tell parents who have children with co-diagnoses of SPD and ADHD, "Your kid will still be bouncing off the walls and humming to himself because of the ADHD diagnosis. But now he can participate in putting on his clothes without freaking out about the texture." Children with ADHD might also have a motor-based sensory disorder, such as dyspraxia (difficulty planning/coordinating movements) or dysgraphia (difficulty planning/coordinating writing). Early diagnosis of SPD is critical because the neurological system is more plastic, or able to be changed, meaning that progress occurs more quickly and bad habits and

compensations can be averted. Let's switch gears from symptomology and take a look at the current neurobiological research related to SPD and ADHD.

Recent studies from the University of California in San Francisco highlight the neurological differences between children with SPD and children with autism spectrum disorder, as well as neurotypical children and children with SPD. In specific, boys with SPD had decreased white matter in the posterior cerebral tracts—the part of the brain that is critical in processing and integrating sensory information, in particular information about the position of the body (Owen et al., 2013). White matter contains nerve fibers that help pass along information so different areas of the brain can communicate. The authors note that this is an important distinction from ADHD, whereby the white matter deficits typically occur in the anterior cerebral tracts. A more recent study of both boys *and* girls found similar white matter deficits in the posterior cerebral tracts (including projections to the thalamus, which relays sensory information, and the corpus callosum, which connects the right and left side of the brain), as well as in the right internal capsule, where sensorimotor fibers run to and from the cortex (Chang et al., 2016). This means that children with SPD have impaired neurological ability to process, relay, and interpret the sensory information that bombards them on a daily basis—this study shows this is particularly true for tactile and auditory input. Other research shows children with SPD habituate more slowly and have increased arousal reactivity to sensory stimulation than children with ADHD (McIntosh, Miller, Shyu, Hagerman, 1999b; Miller, Nielsen, & Schoen, 2012). Children with SPD have also been found to have higher sympathetic response ("fight-or-flight" mechanism) and lower parasympathetic response (calming mechanism) to sensory input (Schoen, Miller, Brett-Green, & Nielsen, 2009; Schaaf et al., 2003). This means that these children respond more quickly/intensely and take longer to regulate/calm down when encountering various types of sensations.

As for ADHD, MRI studies indicate white matter abnormalities in several areas of the brain including the prefrontal cortex, basal ganglia, and cerebellum (Mohammad & Haile, 2013). These brain regions are associated with executive functioning; working memory, impulse-control, voluntary motor control; and motor coordination, respectively—all of which are seen as challenges in children with ADHD. In addition, decreased gray matter volume has been identified in adolescents in the anterior cingulate cortex, occipital cortex, cerebellum, hippocampus, and amygdale (Bonath et al, 2016). These brain regions are respectively associated with decision-making, attention, formation of new memories, and impulse/emotional-control. Gray matter plays in important role in processing and directing information passed along by white matter. Pharmacological research of ADHD suggests dysfunction of the neurotransmitters dopamine and glutamate (Miller et al., 2013), which is why medication is commonly prescribed for children with ADHD.

Based on these studies you can see that different brain structures are implicated in SPD versus ADHD, indicating they are two distinct disorders. However, there is a lot we still do not know about SPD and ADHD, and what makes them similar and different. As aforementioned, accurate diagnosis is necessary in order to proceed with the most appropriate treatment plan. Listed in the chart below are ways in which different professionals might intervene with SPD versus ADHD.

Professional	SPD	ADHD
• Psychiatrist	• No specified role	• Evaluate • Prescribe medication • Conduct behavioral therapy
• Psychologist	• Address secondary symptoms	• Evaluate

	of anxiety, depression, and social isolation	• Provide attention training • Provide mindfulness training • Find functional strategies to manage symptoms
• Occupational Therapist	• Evaluate • Provide sensory integration therapy • Develop a sensory diet for the home and school • Find adaptive tools to help facilitate success	• Provide executive functioning training • Provide sensory-based strategies to increase regulation and decrease motor overflow
• Educational Therapist	• Teach strategies for more effective/efficient learning • Integrate sensory-based activities into sessions for improved outcomes	• Teach strategies for more effective/efficient learning • Provide executive functioning training

As with any diagnosis, it is important to continually ask questions and seek answers. Research for SPD and ADHD continues to do this on a daily basis because there is still so much to learn. In the meantime professionals and parents can use the knowledge we have right now in order to best serve our children. If you suspect your child may have ADHD or a co-diagnosis of ADHD with SPD, seek a full neuropsychological or psychoeducational evaluation from a psychologist. If you suspect your child may have a SPD or a co-diagnosis of SPD with ADHD, seek a comprehensive evaluation from an occupational therapist who specializes in sensory integration.