



Understanding Sensory Processing Issues

Sensory integration is an important consideration when working with children with Sensory Processing Disorder or sensory processing problems. Research shows that the majority of children on the autistic spectrum also have sensory problems, especially with hearing, touch, and vision. It's estimated that there is one child with sensory issues in every regular classroom, and somewhere between 50 and 80 percent of children have some degree of sensory problems in a classroom of children with Autism Spectrum Disorders.

Sensory processing is the ability of the brain to correctly integrate information brought in by the senses. The information we take in through the senses of touch, movement, smell, taste, vision, and hearing are combined with prior information, memories, and knowledge already stored in the brain to make sense of our world. In people without Sensory Processing Disorders, all the sensory input from the environment and all the input from our bodies work together seamlessly so we know what's going on and what to do. Without conscious effort, we are filtering out sensations that are not important.

Sensory processing occurs first by registration, when the child becomes aware of the sensation. The second stage is orientation, which enables the child to pay attention to the sensation. Next comes interpretation; the child has to somehow understand the information coming in. Finally comes organization, when the child uses the information to elicit a response. This can be an emotional behavior, a physical action, or a cognitive response.

Sensory Processing Disorder

When sensory input is not integrated or organized appropriately in the brain, children experience the world differently. They're not always getting an accurate, reliable picture of their bodies and the environment, and this misperception produces varying degrees of problems in development, information processing, and behavior. Because they are not always able to process information received through the senses, they cannot easily adapt to a situation. The neurobiology of the sensory systems is dysfunctional and therefore distorts the individual's ability to perceive the world correctly. People must be able to perceive, interpret, and process information so that they can learn about the world around them. If they are unable to do so, they can feel uncomfortable, which may show itself in such behaviors as tuning out or hand flapping.

Children with Sensory Processing Disorder may have difficulty "reading cues," either verbal or nonverbal, from the environment. Dysfunction in this area makes it difficult for people to adapt to their environment and function as others do. They may be hypersensitive to sound or touch, or unable to screen out distracting noises or clothing textures. Their response to these stimuli might be impulsive motor acts, making noises, or running away.

This hypersensitivity is also known as overresponsivity or sensory defensiveness. Children with this response may complain about how clothing feels, the annoyance of a tag, or how their socks have to be on just so. They could be picky eaters and get stuck on one certain food, making it

impossible to get them to eat anything else. They might walk on their toes to avoid sensory input from the bottoms of their feet. They may not be able to tolerate normal lighting in a room. They may be so oversensitive to smells that, for example, a trip past the meat department at a supermarket is unbearable. Some children are oversensitive to sounds and will frequently cover their ears, even when listening to what is generally perceived as a pleasant sound. They usually feel uncomfortable with the noise in a group setting and often tune out. Children who are hypersensitive are on alert to protect themselves from real or imagined dangers in an unpredictable world. Their behavior might seem anxious, self-absorbed, or stubborn because the imagined danger is very real to them.

Children with sensory processing problems might also have the opposite response and be underresponsive. This hyposensitivity is characterized by an unusually high tolerance for environmental stimuli. Rather than avoiding smells, they seek to increase them by sniffing people, objects, and food. Rather than avoiding touch or touching, they will constantly be crashing into things or stamping their feet, seeking extra stimulation. Rather than avoiding motion and fatiguing easily, they may excessively crave intense movement and love to spin, swing, and jump, and can be in constant motion. They may get dizzy easily—or never at all. They may appear restless and be overactive because they are hyporesponsive and are trying to increase their alertness by seeking out sensory stimulation. When children are hyporesponsive to sensations, they are not defensive enough and are more likely to do things that put them in harm's way, such as running into the street or jumping from high places. They often have a high pain threshold and can become injured and not realize it.

In addition, some children may fluctuate between these extremes. Their arousal level is erratic and not necessarily relevant to the stimuli itself. This means that it would be very hard to predict how they might react.

As Carol Kranowitz points out in her book, *The Out-of-Sync Child* (2005, p. 78), “The child may be both over-responsive and under-responsive in one sensory system, or may be over-responsive to one kind of sensation and under-responsive to another, or may respond differently to the same

stimulus depending on the time and context, fluctuating back and forth. Yesterday, after a long recess, he may have coped well with a fire alarm; today, when recess is cancelled, he may have a meltdown when a door clicks shut. Context makes a huge difference.”

Types of Sensory Processing Disorders

Stanley I. Greenspan, MD and Lucy J. Miller, PhD, OTR further delineate sensory integration issues into categories. Sensory Processing Disorder is being used as a global umbrella term that includes all forms of this disorder, including three primary diagnostic groups.

TYPE I. SENSORY MODULATION DISORDER (SMD)

Sensory modulation refers to the process by which messages from the sensory system convey information about the intensity, frequency, duration, complexity, and novelty of sensory stimuli. Usually we respond with an appropriately graded reaction, neither underreacting nor overreacting.

Miller, in her book *Sensational Kids*, describes Sensory Modulation Disorder (SMD) as one that makes it hard for kids to match the intensity of their response to the intensity of the sensation. It takes the form of sensory overresponsivity which causes children to be more alert than most people. “Even when asleep, [their] ‘engine’ is running too fast, the way a car’s engine does when the idle is set too high. This causes sounds and other sensations to seem more intense . . . than they would to a typically developing child. Even something as innocent as . . . [a door] slamming can jolt [a child] into instant and complete alertness the way a big BOOM coming from the furnace room of the house would alarm you or me” (p. 98).

TYPE II. SENSORY-BASED MOTOR DISORDER (SBMD)

This dysfunction occurs when the sensory input of the proprioceptive and vestibular system is misinterpreted or incorrectly processed. The proprioceptive system lets us know what our body parts are doing, even in the dark when we can't see them, and how much strength we need to do specific tasks. The vestibular tells us if we are tilting or if our bodies are balanced. (Because the input from these systems is so crucial, they are a major factor in the design of the games in this book and are discussed in more detail below.)

When the child's central nervous system has difficulty making use of the sensory information from these systems, he can exhibit a subtype of SBMD called dyspraxia, which is the inability to carry out a sequence of actions that are necessary to do something the child wants to do, such as imitate actions, play sports, get on a bike, or climb a ladder. Children with SBMD are often clumsy, unintentionally breaking toys, or tripping over things. This may also show itself as a child who prefers sedentary fantasy play over playing sports.

Postural Disorder is another subtype whereby the child seems weak, tires easily, or doesn't consistently use a dominant hand or cross midline.

TYPE III. SENSORY DISCRIMINATION DISORDER (SDD)

This is the inability to distinguish between similar sensations. Sensory discrimination is the process whereby we take the information our senses deliver and we integrate, interpret, analyze, and associate it with all the data we have already stored, and make good use of the information. This enables us to know what is in our hands without looking, to find things by touch alone, to organize writing on a page, to differentiate between textures or smells, or to hear what is being said if there is background noise. This disorder can show itself as inattentiveness, disorganization, and poor school performance.

Sensory issues can be on a spectrum and as unique as fingerprints. Being annoyed by the scratchiness of a sweater is considered to be a typical sensory response for anyone. However, when a child is so strongly affected by

tactile sensations or other sensory input that he totally withdraws, becomes hyperactive, or lashes out, the child's sensory issues are severe enough to warrant intervention.

The Three Major Sensory Systems

Dr. Jean Ayres, an occupational therapist, was the pioneer who formulated a theory of sensory integration that led to identification of Sensory Processing Disorders and to their therapeutic intervention.

In therapy, Ayres focuses primarily on three basic senses—tactile, vestibular, and proprioceptive. Although these three sensory systems are less familiar than vision and audition, they are critical, because they help us to experience, interpret, and respond to different stimuli in our environment. Their interconnections start forming before birth and continue to develop as the person matures and interacts with her environment. These three senses are not only interconnected but are also connected with other systems in the brain and will be discussed in detail below. Many of the motor activities used in the games in this book are designed to integrate, challenge, and stimulate these systems.

THE VESTIBULAR SYSTEM

The vestibular system is found in the inner ear (the semicircular canals) and detects movement and changes in the position of the head. It is how we relate in space. It is a foundation for muscle tone, balance, and bilateral coordination. All other types of sensation are processed according to vestibular information, so it is a unifying system in our brains.

Children who are hypersensitive to vestibular stimulation may have a “fight or flight” response that would cause them to be very frightened or want to run away or strike out at others. They may have a fearful reaction to ordinary movement activities and seem anxious in space and appear clumsy. They will shun playground equipment and riding in elevators or

escalators, and sometimes even in cars. They may refuse to be picked up or to ever let their feet leave the ground.

Children with a hyporeactive vestibular system may purposefully seek excessive body movements, such as whirling, jumping, spinning, hanging upside down, swinging for long periods, constantly moving, or just continually fidgeting. They may rock when upset; this is a kind of tranquilizing self-therapy. They are trying continuously to stimulate their vestibular systems in order to achieve a state of quiet alertness.

Temple Grandin, whose landmark book, *Seeing in Pictures*, made her famous as one of the first people to write about having autism, invented a “squeeze machine.” This machine put pressure on her trunk, similar to a firm hug, which brought her comfort and relief.

THE TACTILE SYSTEM

The tactile system is the largest sensory system in our body and is composed of receptors in the skin, which send information to the brain regarding such factors as light, touch, pain, temperature, and pressure. This input gives form to body and spatial awareness and plays an important role in perceiving the environment and in establishing protective reactions for survival. There are two components to the system: protective, which is defensive; and discriminative, which is discerning. These two must work together to enable us to function and perform everyday tasks.

Hypersensitivity in the tactile system, also called tactile defensiveness, may lead to a misperception of touch and can be seen in the affected child’s withdrawing when being touched, avoiding groups, refusing to eat certain foods, wearing certain types of clothing, avoiding getting his hands dirty, or using his fingertips rather than whole hands to manipulate objects. The child with tactile dysfunction will often curl her hands into loose fists to avoid touching; keeping her hands in that position can affect her fine motor skills. This dysfunction may also display itself in behavior where children try to isolate themselves or are generally irritable. This is where you might see the “fight or flight” response.

Hyposensitivity is seen in children who are undersensitive or unaware of pain, temperature, or how some objects feel. Sometimes they seek more

stimulation and may paw through toys, chew on objects, or bump into people or furniture. Painful tactile stimulation may not be felt, easily leaving the child defenseless or vulnerable to dangerous situations. Intervention needs to include intense touch stimulation to help them adequately process the information.

THE PROPRIOCEPTIVE SYSTEM

The proprioceptive system lies along muscle fibers and in the tendons and ligaments that provide a person with a subconscious awareness of body position and how it is moving. It allows us to automatically adjust in different situations, such as stepping off a curb, sitting in a chair, or staying upright on uneven surfaces. Even fine motor tasks, such as writing, using a soup spoon, or buttoning a shirt, depend on an efficient proprioceptive system. This system helps to develop adapted responses to our environment.

When the proprioceptive system is hypersensitive, there is difficulty receiving information from the muscles and joints. The affected person is unable to properly interpret the feedback about movement and will often have poor body awareness. Signs of dysfunction are clumsiness, a tendency to fall, odd body posturing, messy eating, and difficulty manipulating small objects, such as buttons and snaps. Children may put too much or too little pressure on objects and break toys without meaning to do so. They may resist new motor movement activities because they have been unsuccessful with imitating movements in the past.

Likewise there may be hyposensitivity, in which there is an underlying high pain threshold and the affected person needs more input to gain sensation. Behaviors seen may be excessive crashing or bumping into things, biting or teeth grinding, head banging, and so on.

Another dimension of proprioception is where we find the dyspraxia problems mentioned above. Praxis or motor planning is the ability to plan and execute different motor tasks, such as imitating another's movements, climbing a tree, or copying words from a blackboard. In order to do this, the system needs accurate information from the sensory system. The child with dyspraxia has difficulty using sensory information to plan and organize what needs to be done and may not learn easily.

VISUAL AND AUDITORY PROCESSING

In order to understand the children's reactions when we are playing games with them, we also need to understand something about problems with visual and auditory processing.

Visual processing deficits do not mean that those affected cannot see. Rather it means that their brains are not processing what they are seeing. It is a very complex system. If asked to go get an object, they might look right at it and then say they can't find it. They might also have a hard time finding the words for objects they are viewing. They may exhibit poor spatial awareness, lack coordination, and have overall learning problems as well. The vestibular system and vision work collaboratively in order to maintain posture and balance.

Similarly, auditory processing deficits are not about problems with hearing, but about processing the information heard. The child may hear what you say, but the brain may not integrate and assimilate your words. It's not that the child doesn't understand—it simply may take a moment or more before it clicks in.

Auditory processing has also been associated with the vestibular system. Some children may have auditory defensiveness and may become anxious or sensitive to certain sounds and frequencies. Likewise, they may be hyposensitive and find ways to seek out and repeat certain noises, or may fixate on them.

How Sensory Processing Disorders Affect Socialization

Sensory difficulties may show up in academic underachievement; problems with peer interaction, attention, gross and fine motor coordination, and activity level; developmental difficulties; poor self-esteem; and speech or language delays. Behaviors are almost always affected, and the child may be impulsive, aggressive, distractible, fearful, withdrawn, or “in his or her

own world”; may show a general lack of planning, and may have difficulty adjusting to new situations.

Sensory Processing Disorders can take many forms, but almost always show up in social activities. What other children find enjoyable can be extremely uncomfortable for kids with sensory processing issues. Other children might be having fun playing ball in the field, trading gossip, and joyfully squealing or shouting. But for children with sensory issues, the playground can be an unpredictable, scary, confusing, and dangerous place. The noise levels are too loud, the visual clutter of running children is disorganizing, and the possibility of being bumped, or of even just inadvertently touching something, can be frightening. If being touched is an issue, if the sensory systems that give one a sense of balance and body awareness are not aligned, if being in crowds produces anxiety, then it makes sense that social situations would be difficult.

The child’s social behavior may look “odd,” “geeky,” “babyish,” or “weird.” Children who are trying to protect themselves by stubbornly refusing to do things might be seen as “problem” kids with “an attitude.” For example, if the child is trying to calm himself by flapping his hand or twirling, others might see him as odd and avoid his company. Or the child might be ostracized because she doesn’t understand the rules of social space and, seeking sensory input, gets right into another’s face, touches too much, or bumps into others too often.

Having trouble with transitions—going from one activity to the next—makes school routines a problem and may cause these children to act out, thus making them different from the others. You may see such social behaviors as anxiety, withdrawal, anger, defiance, and defensiveness, which make it difficult for children with Sensory Processing Disorders to be accepted by other children.

When sensory information is unpredictable, it’s easy to see why some of these children prefer facts and information and putting objects in order. These things are completely stable and predictable and do not change according to one’s arousal state.