What Is Sensory Processing?

The development of sensory processing begins in the womb and continues throughout our lives. Every moment of every day, we are constantly experiencing sensory information from our environment whether we are aware of it or not. From the texture of the fabric in our clothing, to the sound of the cars driving past a window, to the brightness of the lights overhead, or a fan whirring in the background, our bodies are constantly taking in information from the world around us. Our brains take that sensory information and process it, allowing us to create thoughts and actions that influence how we live our daily lives. Sensory processing, also called sensory integration is the basis for learning and refers to the nervous system’s job of taking in all the information around us through our senses (touch, smell, taste, vision, and hearing) and organizing that information so that we can attach meaning to it and act on it accordingly. This is called an adaptive response. In addition to the 5 senses people are most familiar with, there is another sensory system within our body that tells our brain about sensory information that we receive from our internal organs. These sensory systems inside our bodies provide us with information about the sense of touch, movement, and our body position and it is these sensory systems that provide the foundation for organizing sensory information before it is relayed to the brain. The three internal sensory systems that provide sensory information about our body and how it is working are the tactile, vestibular, and proprioceptive sensory systems. It is through these sensory systems that incoming sensory input is processed, organized and sent to the higher levels of the brain. By organizing this information, we are then allowed to tune-out irrelevant sensory information in order to focus our attention on the things we need to do every day. When sensory processing disorders (SPD) are present, we may be unaware of our bodies or how they are moving and we may have difficulty completing tasks efficiently, with appropriate attention, and to the best of our abilities.

The Tactile Sensory System:

Tactile information relates to the sense of touch and is received through input to the skin. It tells us about the things in our environments and about ourselves. There are 2 basic components of tactile information: protective touch and discriminative touch. The protective sense of touch gives us the ability to correctly respond to dangerous situations, such as a hot stove or sharp piece of glass. Discriminative touch enables us to tell the difference between two objects if our vision is occluded.

The Vestibular Sensory System:

Vestibular information is processed in the inner ear and tells us about our relationship with gravity and how we are moving through space. There are small organs within our inner ear that determine if our head or body is moving in a certain direction or at a certain speed. The vestibular system tells us the orientation of our body in relation to our environment and is also important in that it integrates all other sensory information our body receives before it is sent off to the brain to be processed. It is essential to the integration of input.

The Proprioceptive Sensory System:

Proprioceptive input is the input we receive from our joints and muscles. This input tells us where our body is in space and gives us an awareness of how we move our body. Proprioceptive information allows us to make purposeful and precise movements through space. With this sensory system, we are able to identify our body or limb position in space without having to look.

Development of Sensory Integration

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Prenatal Period | 1-3 Months | 4-6 months | 6-12 Months | 2nd Year | 3-7 Years |
| Tactile: At 5 ½ weeks gestation an embryo responds to tactile information with an avoidance response | Infants receive a variety of touch sensations (wet diaper, Mom, feeding); hands begin to stay open for longer periods of time for grasping | Develops an awareness of where hands are in space; brings hands together at center of chest (midline); grasping skills are maturing; enjoys play with a variety of textures | Tactile skills are more refined and more mature hand skills begin to develop, tolerates creeping and crawling on hands and knees | Touch sensations guide the development of fine motor and gross motor development; motor planning depends upon the accuracy of the child’s touch system | Children engage in tool use, establish hand dominance, and further develop postural control |
| Proprioception: At 9 weeks gestation embryos can bring head to chest (an approach reaction) and receive proprioceptive input | Thrusts limbs while on back and tummy; use of muscles in back and arms to lift chest off floor while on tummy | Movements become more intentional, beginning motor planning with mouth and facial movements then eye and hand movements | Beginning bilateral (activities involving use of both arms/hands together) motor control, crawling, creeping, pulling to stand | Body awareness develops and contributes to body image; learns about gravity, movement of different body parts, interaction of body parts, abilities and limitations, what feels good and what hurts | Children are able to gauge their own strength and size for participation in daily activities |
| Vestibular: Last 6-8 weeks fetus can tolerate an inverted position | Vestibular: Startle reflex; begins to lift head; calming effect of rocking; begin to stabilize eyes and head; tolerating tummy time, laying on back, sitting up | Able to move in and out of different positions, when on tummy, gravity urges child to lift head, upper back, arms, and legs off the floor at the same time; enjoys stronger gravity and movement sensations (rocking, held up high, swung in the air, moved about) | Able to move through space; develops postural control for movements against gravity | Improving balance and postural control while holding still and moving | Child has good balance and is coordinated during simple active sports such soccer and bike riding |
| Visual and Auditory: 28 weeks and later: Able to see light; can hear and remember sounds and voices | Can recognize familiar sounds from in-utero; likes to look at high contrast images and faces | Infant is mostly receptive to visual and auditory info | Moving through space helps the child understand what he sees, begins to judge distance and size, speech begins to develop | Language is forming; visual space perception develops | Child has complex auditory discrimination and can understand complex language; relies less on vision for postural control |

**What Are the Signs of Sensory Integration Dysfunction?**

*Hyper-responsiveness:*

* Responds negatively to unexpected or loud noises
* Cannot work with background noise
* Is distracted by sounds not normally noticed by other people
* Prefers to be in the dark
* Hesitates going up and down stairs
* Avoids eye contact
* Avoids certain tastes/smells
* Is a picky eater with a very limited food repertoire
* Frequent gagging with different foods/tastes
* Walks on toes
* Becomes anxious or distressed when feet leave the ground
* Avoids climbing/jumping on playground equipment
* Avoids getting messy
* Is sensitive to certain fabrics
* Avoids going barefoot
* Has difficulty paying attention
* Appears anxious
* Dislikes bath time, toothbrushing, combing hair, haircuts, having nails trimmed
* Dislikes being touched or cuddled
* Doesn’t like to be in large crowds or to stand close to other people while in line
* Doesn’t like to use hands in play or will only play with specific toys
* Prefers sedentary activities
* Dislikes being upside down, sideways, or on back
* Fearful of walking on uneven surfaces

*Hypo-responsiveness:*

* Seems oblivious within an active environment
* Often doesn’t respond when name is called
* Makes noise for noise’s sake
* Stares intensely at people or objects
* Routinely smells nonfood objects
* Seeks out certain tastes or smells
* Continually seeks all kinds of movement activities
* Can’t sit still
* Hangs on people, furniture, objects
* Seems to have weak muscles, tires easily, poor endurance
* Takes excessive risks while playing
* Has no safety awareness
* Touches people and objects at an irritating level
* Has decreased awareness of pain or temperature
* Is accident prone
* Is unaware of being touched or of bumping into objects in environment
* Does not express emotions
* May engage in self-injury behaviors (head-banging, pinching, biting)
* Frequently mouths nonfood items
* Enjoys foods with lots of spice, flavor, and texture
* Excessive drooling past the teething stage

If you have questions about sensory processing development OR your child's skills, speak to your occupational therapist and/or speech-language pathologist today. Or call us today to schedule your child's FREE consultation or evaluation.

Kim Roseland, M.A., OTR/L