

Sensory Integration

Sensory integration is a term that is unique to occupational therapists. This term refers to the brain's ability to take in information from the outside world as well as from the inside world of the child's body and use this information to create purposeful activity. Without adequate sensory integration it is difficult for the child to respond to the demands that the world places on him/her as well as to plan movements to allow successful interaction within the world.

Problems with sensory integration can result in difficulties with gross and fine motor skills, balance, co-ordination and in-hand manipulation. Furthermore these problems can present as distractibility, tactile defensiveness and language and visual spatial difficulties. The functional outputs that parents and teachers will evaluate as being problematic include poor handwriting, reading, maths and organisational difficulties.

Two very important sensory systems are involved in the process of sensory integration, in addition to the 5 commonly known senses of touch, sight, vision, hearing, smell and taste. These 2 systems are:




- **Proprioception** (Body Sense)
 - Information is received from the muscles, tendons and joints, and provides us with an awareness of our body position in relation to our environment, gravity and space
- **Vestibular** (Movement Sense)
 - Information is received from the inner ear, and relates to movement, gravity and balance.

Sensory Modulation:

Sensory Modulation is the first component of sensory integration. Sensory modulation acts like the brain's filter to all incoming sensory inputs. If the sensory input is too intense the brain filters it out and if it is not intense enough the brain focuses in on it (if it is deemed to be important). In addition some sensory inputs that are consistently present throughout the day are habituated to and therefore no longer recognised (for example the clothes that you are wearing you are not always conscious of the sensation on your skin).

Problems with sensory modulation occur when the child has either too high or too low sensory thresholds. If the threshold is too high the sensory input is seldom sufficient to be registered by the brain and therefore these children either seek out sensory input and can display hyperactive type behaviours in an attempt to reach their thresholds or they simply live in a little bubble and seldom respond to the world around them, including appearing to ignore you when you speak to them.

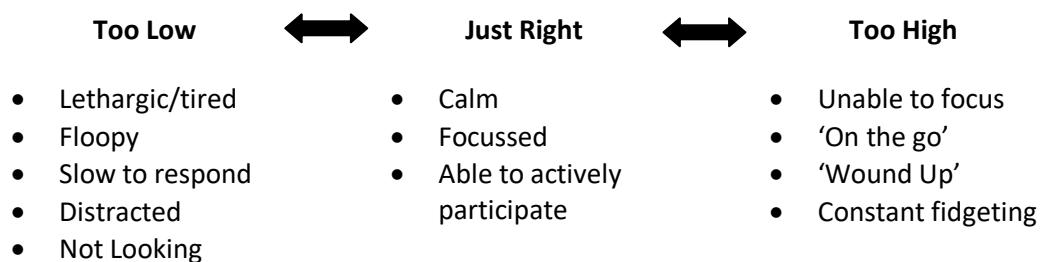
The opposite is true for those children with low sensory thresholds. These children respond to all sensory inputs, even those of a very low intensity that will not typically be registered by the brain, and as a result are often in sensory overload. They often find it difficult to habituate to and screen out irrelevant sensory input. These children respond in one of 2 ways. Either they react negatively to sensory input in the form of tears or acting out alternatively they avoid sensory input. Typically children that are sensory sensitive initially react negatively but through a learnt response begin to avoid situations in which unexpected or threatening inputs may be experienced. As a result the child may become anxious, fearful, excessively attached to his/her parents, manipulative of the situation and behaviours can be quite ritualistic in an attempt to control their sensory environment.

	Acting in accordance with Threshold	Acting to Counteract Threshold
High Threshold	<p>Poor Registration Uninterested Dull Affect Withdrawn 'Overly Tired' Self-Absorbed</p> 	<p>Sensory Seeking Active Continuously Engaging Fidgety Excitable</p> 
Low Threshold	<p>Distractible Hyperactive Sensory Sensitivity</p> 	<p>Manipulative Wants own way Resistant to Change Reliant on ridged rituals Avoids challenges or new situations Sensory Avoiding</p>

Regardless of the child's sensory threshold sensory input in the form of vestibular and proprioceptive information is vital to functioning in life and the development of sensory processing and motor skills. As a result children often try to obtain sensory stimulation in ways that are inappropriate or unsuccessful. Therapy is important in this regard to provide the child with useful sensory stimulation and to help them to learn to cope with their sensory thresholds.

Fussy feeding, preference for strange clothing (long sleeves in summer or short sleeves in winter), dislike of grooming or bathing, tantrums, biting, difficulty concentrating or sitting still, making strange noises or covering ears to protect from unexpected/loud sounds, difficulty falling or staying asleep and excessive need for hugs can be indicators of sensory modulation difficulties.

The 'Just Right' Level of Arousal/Alertness



Treatment of Sensory Modulation Difficulties:

Treatment starts with identifying the modulation difficulties that the child is experiencing and this is determined through an in-depth occupational therapy assessment. Treatment takes place through individual therapy sessions, typically once a week but if the modulation difficulties are severe this can be increased to twice a week, and strategies (sensory diets) for home and school are given to help the child cope between therapy sessions.

- High Sensory Thresholds
 - Provide the child with sufficient vestibular and proprioceptive sensory information to help them to reach their high sensory thresholds. This is done through the use of gross motor activities such as fast swinging and bash and crash games.
- Low Sensory Thresholds
 - Provide calming sensory inputs through slow linear vestibular (swinging) and deep proprioceptive input to allow their arousal levels to return to a normal state for concentration and social interaction. Therapeutic brushing as well as gross motor activities are used within the therapy sessions.

Sensory Processing:

Sensory processing is the ability of the brain to make sense of the incoming sensory input and use this information to participate in purposeful interaction with the environment.

Sensory processing includes processes such as developing eye movements and visual form perception, postural tone and stability, tactile processing and in-hand manipulation. Body scheme and visual spatial perception are also important aspects of sensory processing.

The major results of poor sensory processing, particularly the processing of vestibular, proprioceptive and tactile inputs, are low muscle tone and difficulty with motor planning.

Low muscle tone:

Low muscle tone leads to a floppy body that has difficulty maintaining postures against gravity. As a result children with low tone often lean on external support when standing, rest their heads on their hands when sitting at a table or lie down at the table while working. Low toned children also tend to fatigue easily due to their muscle weakness and the additional effort required to perform motor skills. As a result these children often do not take part in or struggle with gross motor activities and this leads to poorer development of other skills such as bilateral integration and midline crossing.

Motor planning:

Motor planning is the process of conceiving, planning, sequencing and executing motor actions. In order to successfully plan movements we need to have a correct knowledge of where our body is in space (proprioception) the direction of movement of our body through space in relation to gravity (vestibular) as well as the ability to perceive tactile feedback from our bodies regarding how movements feel and what we are touching before, throughout and after movement.

Motor planning difficulties can be very frustrating and confusing as often the child knows what he/she wants to do or understands the demand but is unable to access the motor plans that are necessary in order to be successful as executing the task. Children with poor motor planning often display inconsistent motor performance and can often easily perform complex actions (e.g. somersaults) while simple actions such as imitating movements in games like 'Simon says' are difficult. Practice, concentration and fatigue significantly affect their ability to plan and carry out motor sequences. Motor planning also affects the child's ability to sequence, time and grade motor activities as their poor body awareness does not provide them with the necessary or correct information to allow the anticipation of motor demands and the alteration of motor sequences once action has been imitated.



As a result of motor planning difficulties children may present with slow or inefficient performance of basic self care tasks such as dressing, they may have difficulty with articulation and sentence construction and they often have organisational difficulties that manifest in their school work. Due to the functional implications of poor motor planning these children are often manipulative in an attempt to direct their own actions as well as the actions of others, or they avoid motor activities and seek out sedentary play activities in an attempt to compensate.

In addition to low muscle tone and motor planning difficulties poor sensory processing can negatively impact on a child's cognitive and social skills. These are observable behaviours that include learning, planning, concepts, memory, visual perception, visual motor integration, gross and fine motor skills, and interpersonal skills.

Treatment of Sensory Processing Difficulties:

Intervention for children with poor sensory processing is dependent on the severity of the child's difficulty, which sensory system is most affected, the functional outcomes that result and whether or not the child presents with sensory modulation difficulties as well as the sensory processing difficulties.

In the case of the child who does not have significant modulation difficulties intervention is generally given through providing enhanced vestibular and proprioceptive sensory information to help the child to learn to process this information and integrate it into their skill performance.

If significant sensory modulation difficulties are diagnosed intervention would typically begin with addressing the sensory modulation aspect to allow the child to appropriately respond to the incoming sensory input so that they can then begin to organise this information into adequate adaptive motor responses

Tips to help your child at home:

- Get your child involved in gross motor activities (swimming, karate, gymnastics) and playing outside on climbing frames rather than playing computer games or watching TV (Wii included!!!)
- Activities that require heavy work/effort such as jumping on a trampoline, wheelbarrow walking, tug of war, playing twister, helping mom carry the shopping bags or knead dough etc are good for developing proprioceptive processing

- Playing games where your child should carry out a motor task blind folded (eg walking to bedroom from bathroom)
- Playing games like 'Simon Says' where your child copies your movements. Start with simple movements that only involve one side of the body or symmetrical movements with both sides. As your child's planning improves the complexity can be increased to incorporate crossing the midline (eg right hand to left knee) and the speed of the game can be increased. It is also fun to give your child a chance to be 'Simon' as this allows them to plan their own movements as well as judge your response according to their own body scheme.

Recommended Reading:

1. Building Bridges Through Sensory Integration: Therapy for Children with Autism and Other Pervasive Developmental Disorders (Hardcover) by [Ellen Yack](#) (ISBN: 1931615128)
2. Baby Sense: Understanding Your Baby's Secret World (Paperback) by Megan Faure and Anne Richardson (ISBN: 0806527250)
3. Toddler Sense: Understanding Your Toddler's Sensory World - the Key to a Happy, Well-Balanced Child by Ann Richardson (ISBN: 1919992170)
4. The Out-Of-Sync Child (Paperback) by Carol Stock Kranowitz (ISBN: 0399531653)
5. The Out-of-Sync Child Has Fun: Activities for Kids with Sensory Integration Dysfunction (Paperback) by Carol Stock Kranowitz (ISBN: 0399528431)