- **Functional, organised behaviour and occupation**
- Developmentally appropriate, organised behaviour and motor actions relative to time and space are what Ayres has termed ‘end products’ of SI. This includes the ability to concentrate, ability to organise, good self-esteem, self-control and self-confidence, academic learning abilities, capacity for abstract thought and reasoning as well as specialisation of each side of the body and the brain.
- This implies that when a child is able to participate meaningfully and developmentally appropriately in daily activities and occupations, SI processes in the brain are supporting function. This is represented in the top section of the model in Figure

Sensory integration difficulties and dysfunctions in child psychiatric conditions

- If functional difficulties of children with child psychiatric conditions are considered, through reasoning, it becomes clear that the processing and integration of sensory information contribute to the clinical picture that is seen.
- Schaaf and Smith-Roley (2006) specifically mention the areas of academic achievement, personal identity, behaviour, social participation and activities of daily living, as all of these areas are dependent on adequate processing of sensory information and motor abilities dependent on the different sensory systems.

- For a child to perform optimally, he/she needs to process a lot of sensory information during a day and modulate all the different sensory information to attend and concentrate on all the activities throughout the day. To participate in activities, he/she needs motor function and skills and, when challenged with new motor actions or sequences, needs to be able to ideate, plan and execute.

Behaviour/functional difficulties	Possible contributing to SI problem
Poor sleep–wake cycles that interfere with day routines and activities	May experience difficulties to self-regulate; cannot implement self calming strategies and remains acutely aware of all the sensory information in his/her own body and in the environment
Poor attention abilities, always on the move	Modulation difficulties; use movement extensively in an attempt to modulate self, has a high threshold for vestibular input
Difficulty in sustaining postures and poor physical endurance	Poor vestibular–proprioceptive processing that does not support muscle tone and postural mechanisms
Poor use of tools such as eating with a knife and fork	Poor development of the coordinated use of the upper extremities due to BIS dysfunction caused by insufficient integration of proprioceptive and vestibular functions
Engage with play materials in a restricted and repetitive way, does not engage in novel or new play situations	Praxis dysfunction; contributes to poor ability to recognise affordances of play materials (ideation difficulties) as well as problems with planning and execution of motor actions during play

Intellectual disability

- Intellectual disability involves the impairments of general mental abilities having an impact on the functioning in three domains, which determine how the individual copes with activities of daily life. This includes:
  - ❑the conceptual domain (language, reading, writing, math, reasoning, knowledge, memory)
  - ❑the social domain (empathy, social judgement, interpersonal communication skills, making and sustaining friendships and similar capacities)
  - ❑the practical domain (self-management in the personal and school/work context, job responsibilities, money management and recreation)

- Children with intellectual disability experience a wide variation of SI difficulties and dysfunction, which include sensory modulation difficulties/ dysfunction, discriminatory difficulties/dysfunction, difficulties and problems with motor skills as well as praxis dysfunction. The degrees of the SI difficulties/dysfunction vary from child to child. The functional outcomes of poor SI are prevalent in these children's performance in activities, and they are very dependent on their environment and human support for optimal functioning.

- Because of the limited cognitive abilities, these children do not necessarily explore their environment optimally on a sensory level. The importance of the contribution of sensory experiences to development cannot be emphasised enough. A sensory-rich environment and the exploration and use thereof are crucial elements in the intervention plan for these children.
- Optimal motor function and skills are important outcomes for these children as they cannot rely on their intellectual abilities for later employment, but they can rely on their motor abilities to participate in occupations that can be fulfilling and in some cases also provide a form of income. Sensory modulation and motor difficulties/dysfunction based on poor SI can thus be addressed through SI therapy.

Autism spectrum disorders

- The latest prevalence of ASD on the website Autism Speaks indicates that 1 in 88 children in the USA is diagnosed with an ASD, with boys affected four to five times more than girls.
- In recent research, it is reported that the prevalence of SI dysfunctions among children with ASD can be as high as 88%.
- Functional difficulties of children with ASD are often related to SI difficulties/dysfunctions.
- They often experience difficulties with regulating responses in relation to sensations (often very specific stimuli), and they may use self-stimulation to compensate for limited input or to avoid overstimulation.

- Self-stimulatory behaviours that occur include repetitive movements that serve no perceptible purpose in the environment; have social, personal and educational implications; and often limit the child's ability to engage or participate in daily activities. Sensory processing in children with an ASD is often confusing, as it is often a source of distress but also a source of fascination and interest for these children.

- Ayres had already in the 1980s written on the SI difficulties that children with autism experienced . She described the sensory dysfunction they experienced both in terms of their SS and sensory-avoiding behaviour. She stated that they would often engage themselves in rocking or rhythmic motions (considered to be calming or organising) or twirling and swinging motions (considered to be alerting and activating). Her objectives of SI therapy for the autistic child were then described as improving sensory processing to enhance registration and modulation of sensations, so that the child would be able to form simple adaptive responses as a means of helping the child to learn to organise his/her behaviour.

- Recent research has indicated that individuals with ASD show more than one type of SI disorder as well as prominent sensory modulation symptoms across the ages and the spectrum of severity.
- These disorders involve challenges in modulation, integration, organisation and discrimination of sensory input to such an extent that the person does not respond appropriately to the input and experiences disruptions in daily activities and emotional/behavioural patterns.

- Schaaf and Smith-Roley view the key considerations when using an SI approach with children with ASD as follows:

✓Their inability to cope with unexpected or intense sensory input

✓Their difficulty to register and attend to salient sensory information

✓Their heightened sensory sensitivities

✓Their variability in reactions to sensory input

✓Their gravitational insecurity

- ✓Their seeking and avoidant behaviours in relation to movement, auditory input, touch, smell and taste
- ✓Their self-stimulatory behaviours
- ✓Their difficulties with processing tactile input
- ✓Their praxis difficulties
- ✓Their strengths in visual memory and ability to visually manipulate objects

- The known fact that children with ASD often have difficulty making eye contact can have its origin in more than one cause, including neurological and behavioural issues (Schaaf & Smith-Roley 2006). Schaaf and Smith Roley advise that difficulty with processing multi-sensory information should always be considered, as adults living with ASD have described their difficulty with maintaining eye contact whilst having to deal with visual and auditory input at the same time.
- The challenge of putting meaning to more than one sensory system's input at a time is a reality for children with ASD.

- The main objectives when using an SI approach with children with ASD are to improve their ability to engage purposefully and successfully in daily activities, including the forming of meaningful social interactions and relationships. The aims of occupational therapy will include:

❑To help them in organising sensory information so that it has meaning for them and to help them to experience enhanced sensory feedback about their bodies

- To support their sensory discrimination abilities so that the perceptions they form have better meaning
- To broaden their motor skills that are supported by vestibular, proprioceptive and tactile functions
- To enhance their praxis abilities by providing enhanced opportunities for forming ideas, planning motor actions and executing them
- Ensuring that their daily sensory needs are addressed will be crucial. This will also include human and environmental adaptations in those environments where they function on a daily basis.

Attention deficit hyperactive disorders

- Sadock and Sadock describe attention deficit disorder (with hyperactivity) as a disorder that 'is characterised by a pattern of diminished sustained attention and higher levels of impulsivity in a child or adolescent than expected for someone of that age and developmental level'. These children experience perceptual motor impairments, distractibility and difficulties in completing tasks, organisational skills, motor and cognitive learning and controlling emotions. When using an SI approach with these children, it will be important to assess which of the mentioned difficulties are caused by, or amplified by SI difficulties.

- Schaaf and Miller (2005) reported that in studies of children diagnosed with attention deficit disorders, a range of responses of processing of sensory information were demonstrated in about 66% of children that participated. SI dysfunction that was mentioned in their report included different sympathetic markers of sensory reactivity and decreased responses of inhibition in the presence of typical sensory habituation, both indicative of sensory modulation difficulties.

- Budding (2012) discussed the poor timing of behaviour that children with attention disorders experience. It is difficult for these children to know when to act and when not to. This could be attributed to difficulties with regulation of intensity of stimuli and timing in a specific context. It also appears that they have limited ability to learn from experience.
- The question that needs to be answered is to what extent are these difficulties the result of sensory and motor systems that do not develop optimally.

- Lane (2012) reported that high co-morbidity (50%) exists between children with attention Deficit hyperactive disorder who also struggle with praxis dysfunction. Poor working memory is a common secondary underlying concern in children with attention deficit hyperactive disorder.
- One of the questions that is currently being asked is whether visuospatial working memory deficits underlie the poor behavioural inhibition of these children.
- It is clear from current work being done on children with attention disorders that they do experience problems related to sensory modulation, sensory discrimination as well as praxis difficulties.

Developmental coordination disorder

- DCD is a serious impairment in the development of motor coordination that is not exclusively explainable in terms of general mental retardation or any specific congenital or acquired neurological disorder. Neurodevelopmental immaturity may be present, although no diagnosable neurological disorder is present, as well as definite signs of gross and fine motor problems (Sadock & Sadock 2003).
- A criterion for diagnosis is that scores on a standardised test of fine or gross motor coordination must be at least two standard deviations below the level expected for the child's chronological age. These problems must also interfere significantly with the child's academic performance. Poor performances in visuospatial cognitive tasks are also associated with DCD.

- According to Mauro (no date), children with DCD experience difficulties performing daily activities. They are clumsy, have a higher risk for language and learning disorders and are often ostracised by peers for poor performance in sports activities. This leads to difficulties with peer relationships. There is a large overlap among dyspraxia and DCD from an SI perspective. Delay of motor milestones, lack of motor abilities in sports and problems with handwriting are commonly seen in both children with SI disorder with dyspraxia and DCD.