



Sensory Processing and Impact on Feeding

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Overview

- Introduction to Sensory Integration
- Explanation of Sensory Processing Disorders
- Prevalence
- Assessment of sensory needs
- Intervention - Application to feeding difficulties
- Research evidence

- Dr Jean Ayres, an Occupational Therapist and Educational Psychologist, developed SI theory in the 50's and 60's to better explain the relationship between behaviour and neural functioning, especially sensory processing or integration.
- Theory based on neurobehavioural literature
- Three interrelated elements: The theory itself, the evaluation methods, the intervention.



What is Sensory Integration?



‘The neurological process that organizes sensation from one’s own body and from the environment and makes it possible to use the body effectively within the environment’

Ayres (1972, p.11)

- 'Sensory Integration sorts, orders and eventually puts all the sensory inputs together into whole brain function.' (Ayres 2005).
- What emerges from this process is increasingly complex behavior, the adaptive response and engagement in daily tasks.
- Feeding is one of the major daily tasks that require a complex interaction with the environment eliciting an appropriate adaptive response, and it therefore appropriate to consider the role of sensory processing in feeding difficulties.

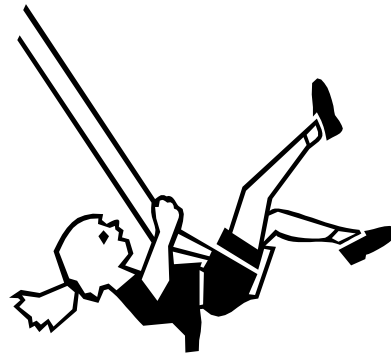


Major Sensory Systems:

Tactile

visual

Vestibular



Auditory

Proprioception

GUSTATORY

Olfactory

Terminology


- As the theory has evolved, so has the terminology to describe the behaviours and the diagnostic categories.
- Bundy et al (2002) proposed a model with two subtypes of sensory integration dysfunction: dyspraxia and poor modulation,
- Miller et al (2007) proposed that the SI dysfunction be renamed sensory processing disorders, with three subcategories
- Whilst researchers continue to refine categories, the current consensus is that the problem should be described, rather than the disorder named i.e. children and adolescents with difficulty processing and integrating sensory information.

Prevalence of Sensory Processing and Integration Difficulties

- 5 - 15 % of general population (Miller, 2006)
- Autistic Spectrum Disorder population - 70% have a Sensory Modulation Disorder (Adamson et al , 2006), or 69% exhibit sensory related behaviours (Baranek, et al , 2006).
- Attention Deficit Hyperactivity Disorder - 54% Sensory Over Responsive (Lane, 2010)

Prevalence of Sensory Processing and Feeding difficulties

- 67% of surveyed parents reported their ASD children as being picky eaters (Williams et al, 2000).
- Leekam et al (2007) found that 90% of their ASD sample (n=200) has sensory abnormalities and these were particularly in the areas of touch and smell/taste, with 46% of low functioning and 32% of high functioning ASD children having other oral problems.
- Klintwall et al (2011) found that in their ASD sample (n= 208) children with food selectivity had more affected sensory modalities than children with no such problems.
- 62% of children with autism in the Field et al (2003) study had selectivity of food by type, and it is suggested that this may be attributed to difference in their sensory systems

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- Field et al (2003) correlated medical conditions with type of feeding problems and found that food refusal, oral motor problems and dysphagia were more prevalent than selectivity by type or by texture,
 - Children with Gastro-oesophageal reflux had strong avoidant patterns of eating, (sensory over-responsive?)

Sensory Modulation Disorder

- Characterised by impairment in the ability to grade the degree, intensity, and nature of responses to sensory input.
- Reactions are frequently inconsistent with the demands of the situation
- Divided into three categories
 - Sensory Over-responsivity
 - Sensory Under-responsivity
 - Sensory Seeking

Behavioural Manifestations of Sensory Modulation Difficulties

- Sensory over-responsive:
 - Fight or flight response to non-noxious sensations
 - Responds quickly and intensely
 - Poor habituation
 - Emotional responses: anxiety, depression, anger, lability
 - Inattention, distractibility
- Sensory under-responsive:
 - Lethargic or slow completing tasks
 - Difficult to motivate
 - Can fall asleep quite easily
 - May become restless/fidgety after long periods of seated work
- Sensory seekers



Possible effects of sensory modulation on mealtime behaviour

Twachtman-Reilly et al (2008)

Over-responsive:

- **Auditory:** Overly sensitive to sounds in environment (might cover ears, cry, become withdrawn)
- **Visual:** Overly sensitive to light and movement (shields eyes, averts gaze, distracted)
- **Gustatory:** Overly sensitive to tastes (picky, food refusal)
- **Olfactory:** Overly sensitive to smells (picky, distressed, anxious)
- **Tactile:** Overly sensitive to touch (dislikes messiness around mouth, food refusal)
- **Vestibular:** Overly sensitive to movement or change in head position (fearful in unsupported seating)
- **Proprioception:** Poor awareness and grading of force (messiness, poor gradation of jaw and hand to mouth movements).



Under-responsive:

- **Auditory:** Unaware of sounds at mealtimes (daydreaming, spacey, lengthy meal times)
- **Visual:** Unaware of relevant changing visual input in environment (over focussed on irrelevant visual features of food on plate, inattentive to complete meal)
- **Gustatory:** poor taste discrimination (craves strong flavours, licks or tastes inedible objects).
- **Olfactory:** unaware of even strong environmental odours (disinterested in eating without the enhancement of smell).
- **Tactile:** Unaware of touch differences in food textures (unaware of messiness around mouth, over-stuffing or pocketing of food).
- **Vestibular:** Seeks high level of movement input (poor posture, high activity level, fidgety)
- **Proprioception:** Poor body awareness and grading of force (messiness, poor gradation of jaw and hand to mouth movements).

Sensory Based Motor Disorder

- Problem with stabilising, moving, or sequencing a series of movements in response to sensory demands
- Two main categories:
 - **Postural Disorder** – poor balance, inappropriate muscle tone, inadequate control of movement (e.g. oral-motor control), poor stability of trunk, and difficulty maintaining good standing or sitting position (which is needed for mealtimes)
 - **Dyspraxia** - An impairment in the ability to plan, sequence and execute novel or unfamiliar actions. Characterized by awkward and poorly coordinated motor performance; May be accident prone; Poor ball skills and other sports; Self-care skills often slow to develop; and self-organisation skills are poor. Getting food to mouth, co-ordinating lips, chewing, swallowing all demand motor planning.

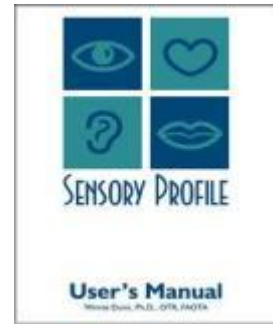
Assessment

- Standardised assessments of motor performance: Sensory Integration and Praxis Tests (Ayres, 1989)
(Two tests that may be particularly relevant to feeding, include the oral praxis section, as well as praxis on verbal command).
- Observations at mealtimes, as well as general observations of motor performance



Assessment: Questionnaires of sensory processing:

- Sensory Profile (Dunn, 1990) (includes oral, smell/taste sections)
- Sensory Processing Measure (Parham and Ecker, 2007 and Miller-Kuhaneck, et al (2007) (taste/smell, body awareness, planning and ideas, as well as a school cafeteria questionnaire)
- Diagnostic Interview for Social and Communication Disorder (DISCO) (Wing et al , 2002) for ASD assessment – 21 sensory items, including taste/smell, and other oral items



Assessment

- The assessment analyses the characteristics and quality of movement and performance skills
- Determines whether sensory processing is affecting the child's ability to adapt, organise, and integrate sensory information in different school and home environments
- The assessment data is interpreted to identify which aspects of sensory processing affects performance

INTERVENTION



Rationale for SI therapy for children with feeding problems:

- Keen (2008) suggests that successful intervention will need to integrate management approaches to dysfunctional sensory processing, attachment, cognitive inflexibility and learnt behaviour, as well as associated anxiety and phobia.
- Sensory processing difficulties may be the cause of both oral motor difficulties (due to dyspraxia) and food avoidance (due to sensory modulations issues).

Intervention Options: Models of Delivery

- **Direct 1:1 Intervention** by a therapist who has training in the relevant area. If using SIT, then this needs to adhere to the Fidelity tool (manualised SI therapy adhering to both structural and process elements so that SI is delivered appropriately) (Parham et al, 2007)
- **Consultation** – therapist offers support and advice to carer to carry out activities
- **Sensory Strategies** – this is not SIT but is based on SI theory, and included environmental adaptations to assist the child who may be finding their environment overwhelming and challenging

passive
observing

active
participating

level of involvement of the person

sensory
stimulation by
another

self stimulation

sensory diet
prescribed

the person
chooses own
Sensory Diet

sensory rich
experiences
purposefully
constructed by
a therapist -
the person
uses them

the person
engages in a
purposefully
constructed &
personalised
sensory rich
environment in
a playful
manner

Sensory input

Unrelated

sensory integration
based approach

sensory
integration
therapy

Adapted for adults by Kath Smith 2011 original by Gretchen Dahl Reeves, PhD, OT, FAOTA, Sensory Stimulation, Sensory Integration and the Adaptive Response, AOTA Sensory Integration Special Interest Section Quarterly, June 2001.

Essential Characteristics of Occupational Therapy using Ayres Sensory Integration Structural Elements – Parham 2011

Item	Components
1. Therapist Qualifications	
2. Components of OT Assessment Report	
3. Physical environment	
4. Communication with Parents and Teachers	

Essential Characteristics of Occupational Therapy using Ayres Sensory Integration (OT/SI)

Process Elements – Parham et al 2011

	Characteristic	Score	
1	Ensures Physical Safety		
2	Presents sensory opportunities (2 of 3 tactile/vestibular/proprioceptive)		
3	Facilitates the child's self-regulation of arousal levels, attention and emotion.		
4	Tailors activity to present just right challenge		
5	Challenges postural-ocular and bilateral motor control		
6	Challenges praxis and organization of behaviour		
7	Collaborates in activity choice		
8	Ensures the activities are successful		
9	Fosters a context of play		
10	Establishes a therapeutic alliance		

4= Certainly 3= Probably 2 =Doubtfully 1=No

Specific application to feeding for sensory modulation

- For the Over responsive child:
 - Deep pressure to lips and palate
 - Chewing: tube, neutral gum
 - Forewarn, and build choice into activities
 - Use bland tasting foods
 - Check whether individual's perfume distracts
 - Provide crushed ice or frozen juice ice-lollies prior to a meal if child/adult is oversensitive to food texture or taste
- For the Under responsive child:
 - Use scented markers if they help client to focus
 - Strong flavoured foods
 - Deep pressure to lips and palate
 - Chewing: tube, gum, sweets
 - Vibration (electric toothbrushes etc.)
 - Sucking, blowing, making noises, whistles
 - Crunchy snacks



Specific application to feeding for oral motor difficulties/dyspraxia

- General proprioceptive activities that improve general body awareness, posture and tone will help to develop better motor planning with the whole body, including motor planning for eating.
- Specific blowing, sucking (using a straw) activities done in the context of play will help to develop oral-motor control



Environmental Adaptations

- This is important for the child with dyspraxia as well as the child with sensory modulation problems
- The noises, smells, lighting, activity level, movement with the environment, can influence their ability to engage in successful eating (Twatchman- Reilly et al 2008).
- Consider turning off lights to calm, or putting them on to alert. Free the environment (and table surface) of visual distractions. Use a dark place mat to provide contrast. Provide headphones for a break from general noise. Be aware of therapist animation and loudness. Use music to calm or alert
- For stability, they need their feet firmly on the floor or foot-rest, with a child-sized chair and a table at the right height

Evidence for use of SI and improvement in feeding.

- Not many of the studies specify improved feeding in their outcome measures, but they have started to include Goal Attainment Scaling (GAS) which may include feeding, if this was a functional goal chosen by the carer/child.
- The criticism leveled at studies that have been done include small sample size, lack of controls, poor description of the therapy performed.
- Vargas, S and Camilli, G (1999) completed a meta-analytic study of 32 studies from 1972 to 1998, SI compared to no treatment (NT) and alternative treatment (ALT)
 - SI /NT : significant effect for SI in earlier studies but not in later studies
 - Larger effect size in psycho-educational and motor categories
 - SI as effective as ALT

- Miller, Coll and Schoen (2007)
 - A pilot RCT of the effectiveness of OT using an SI approach was conducted with children who had sensory modulation disorders. 24 children were randomly assigned to one of three Rx conditions: OT-SI, activity protocol, No-Rx. OT-SI group compared to the other 2 groups made significant gains on the Goal Attainment Scaling (functional goals) and on the Attention subtest and the Cognitive/Social composite of the Leiter International Performance Scale-R. The Short sensory profile, Child Behaviour checklist and electrodermal reactivity were in hypothesised direction fro the OT/SI group.

- Reeves (1998) used a single subject design for a 6yr old boy with delays in fine motor skills, poor eating behaviour, low self-esteem and sensory over-sensitivity. 9 months of Rx using SI. Improvement in all areas of concern.
- Candler et al (2003) documented significant improvement in performance or satisfaction on individualised family-developed functional goals after an SI-based summer programme for children with sensory modulation problems.
- Miller, Schoen, et al (2007) also found significant gains on functional, parent-developed goals after OT using an SI approach.
- Roberts, et al (2007) documented gains in individualised functional behaviour and attention goals in a children with sensory modulation problems.
- May-Benson and Koomer, (2010) concluded in their systematic review of the research evidence examining the effectiveness of S,I that the findings suggest that there is a trend for positive results from the SI approach, especially in contrast to no treatment. Consistency of findings is limited by a variety of methodological concerns.

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Useful Websites

- www.sensoryintegration.org.uk
- www.spdnetwork.org
- www.tmbeducational.com
- www.siglobalnetwork.org
- www.ateachabout.com