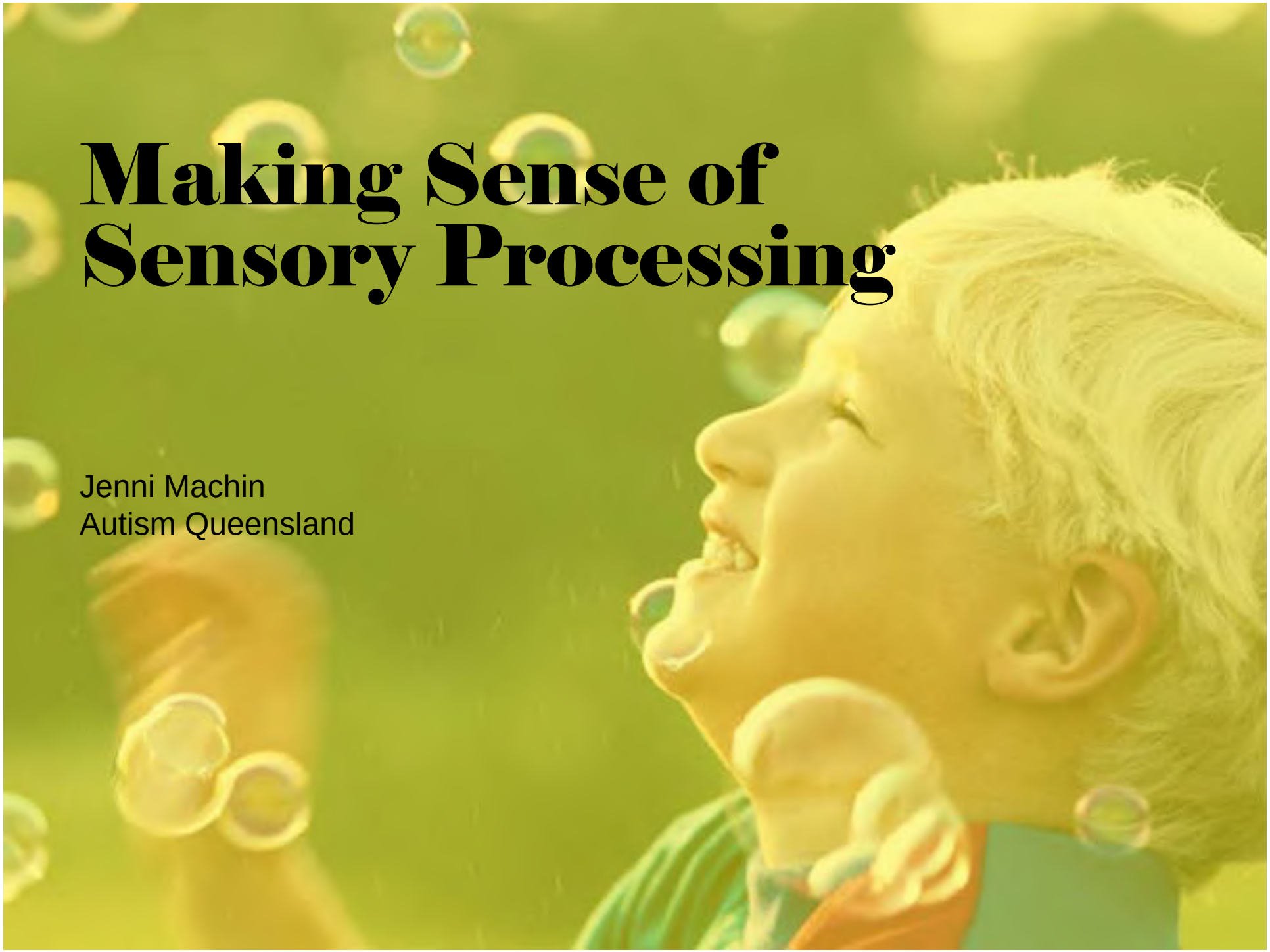

Making Sense of Sensory Processing

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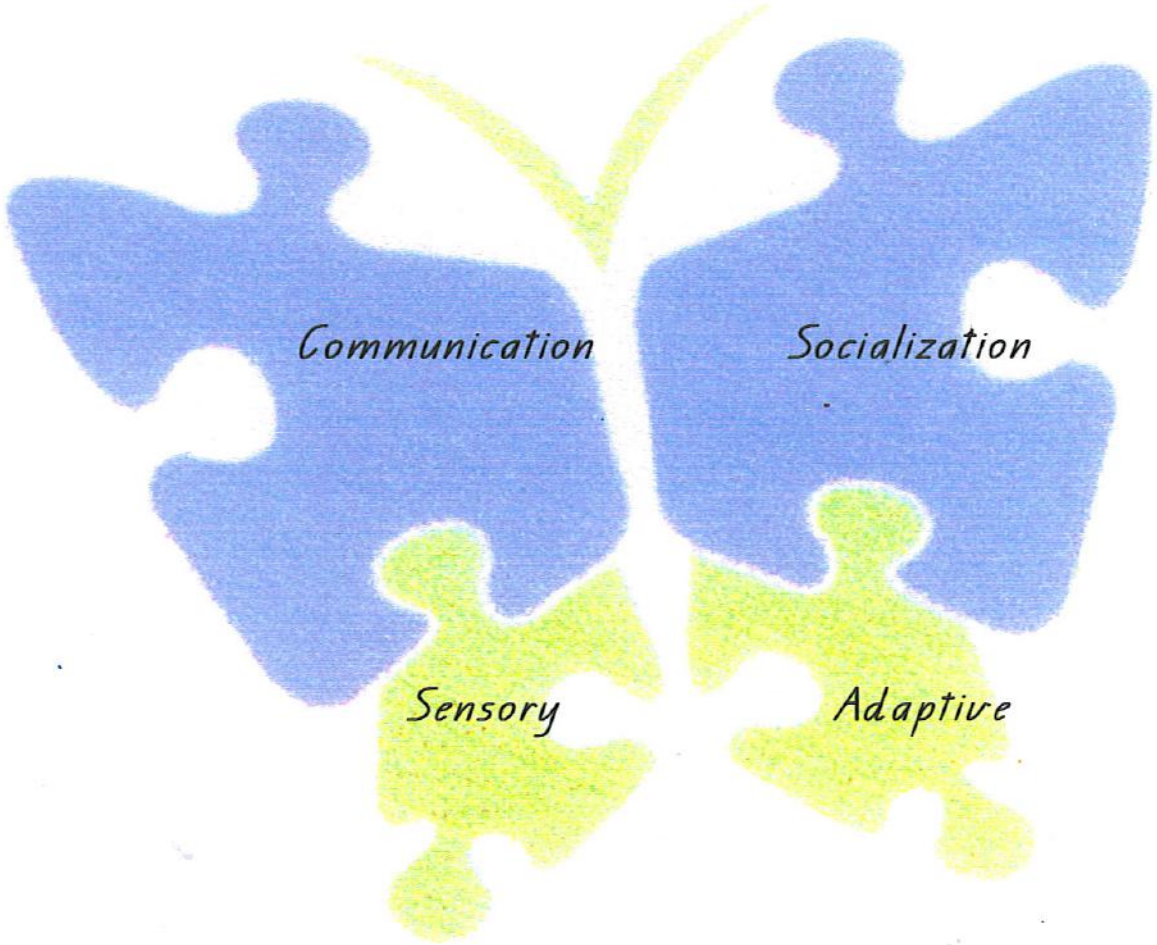
Autism Queensland

The impact of sensory processing issues has been noted by clinicians such as Delacto and Ayres, for more than thirty years. Many authors point to the stress and anxiety produced by sensory dysfunction as important causal factors in obsessive and compulsive behaviours in individuals with ASD.

The Four Core Deficits of ASD



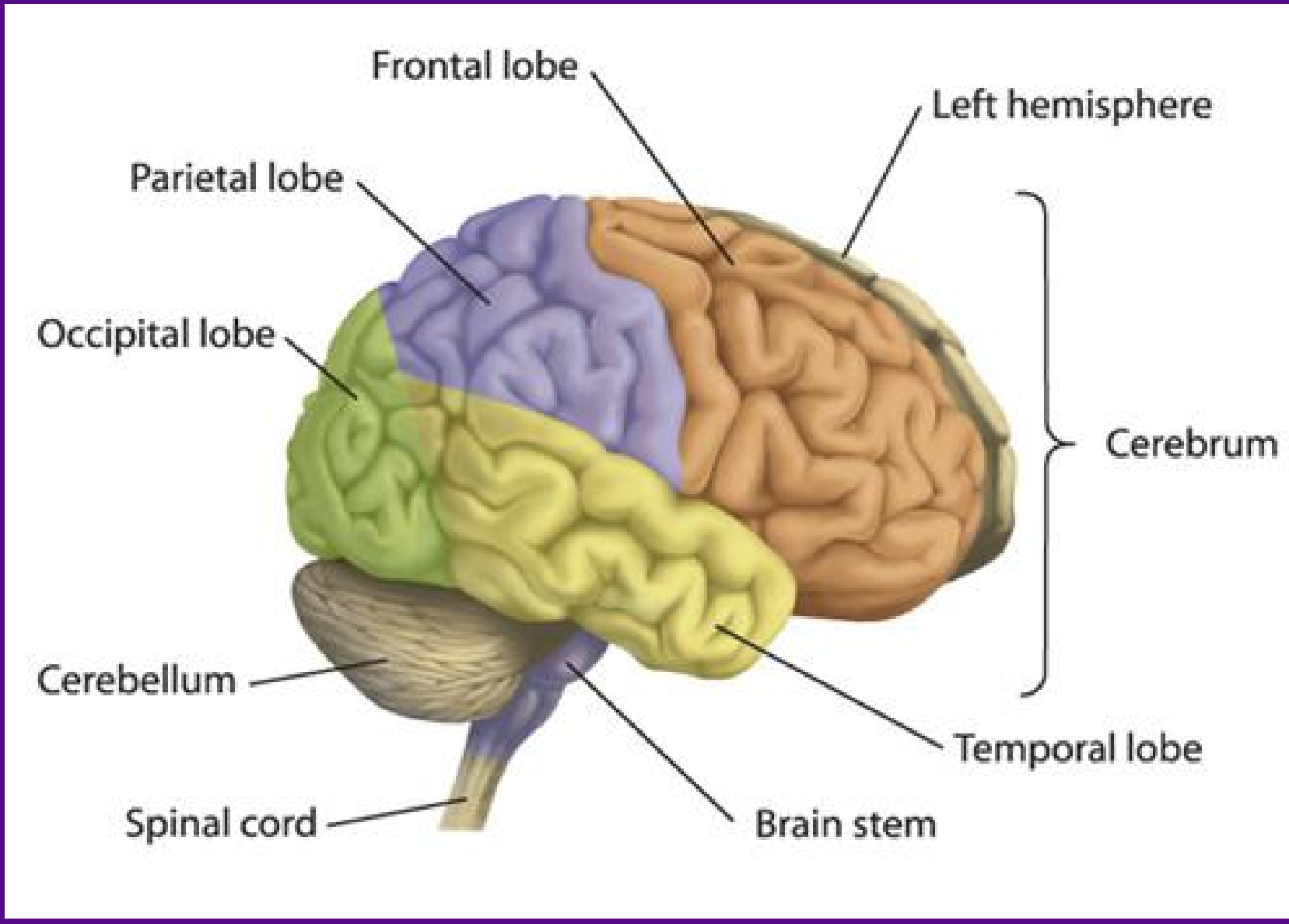
Individuals use sensory information, motor responses and cognition to learn about, move around in and manipulate their environment.

Beginning in the womb and continuing throughout life, sensory stimulation plays a major role in development.

How the Brain interprets sensory information

Sensory processing is controlled by the Central Nervous System (CNS) which:-

- Registers information
- Organises the information
- Filters out irrelevant information
- Integrates the information
- Creates an appropriate response


Frontal lobe
Left hemisphere
Parietal lobe
Occipital lobe
Cerebrum
Cerebellum
Temporal lobe
Spinal cord
Brain stem

Functions within the Brain

Cerebellum – regulates balance, posture, movement and muscle co-ordination

Corpus Callosum- nerve fibres which connect the two sides of the brain

Medulla Oblongata- controls automatic functions including heartbeat, breathing etc

Pituitary Gland- secretes hormones

Pons- joins the hemispheres of the cerebellum and connects the cerebrum with the cerebellum

Spinal Cord- transports messages to and from the brain to the body

Functions of the lobes of the Brain

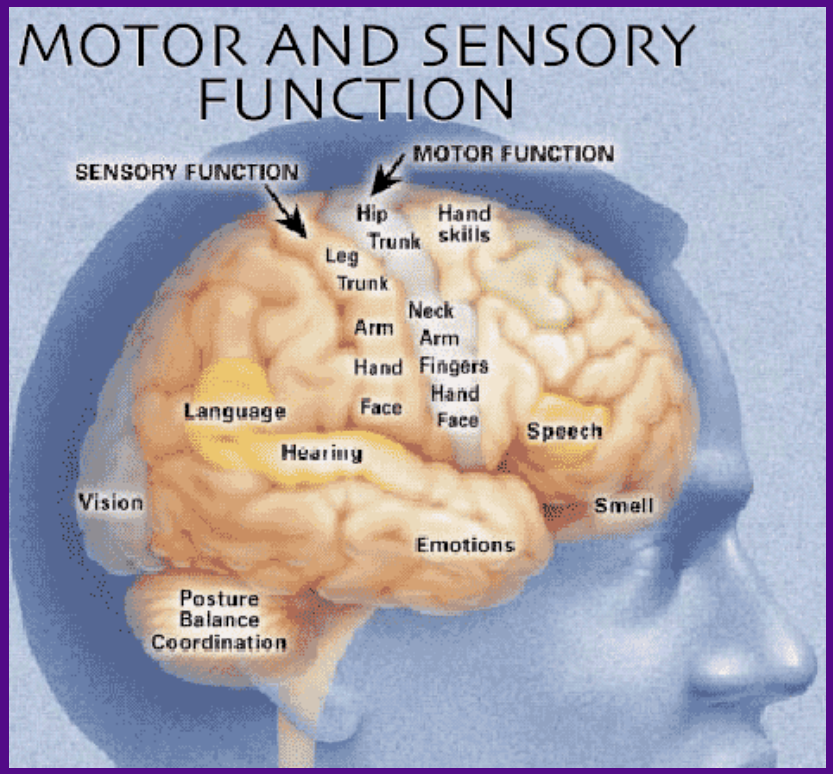
Frontal Lobe- reasoning,emotions, judgement and voluntary movement

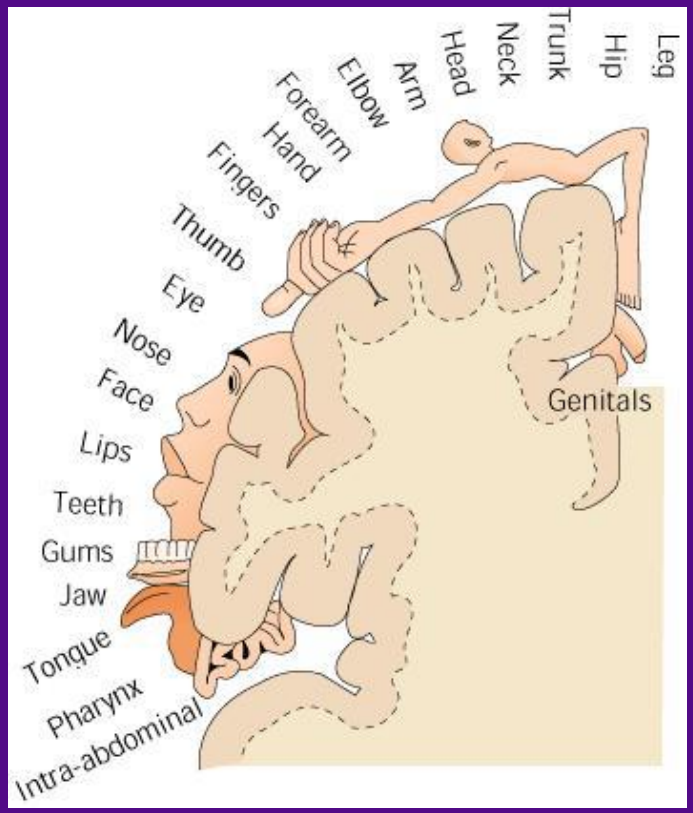
Temporal Lobe- contains centres for hearing and memory

Occipital Lobe- contains centres for vision and reading ability

Parietal Lobe- contains important sensory centres

Sensory areas of the Brain





Brain structures involved in Sensory Processing that have been linked to ASD

- Limbic system- Amygdala
  - Hippocampus
- Cerebellum
- Brainstem
- Parietal lobes
- Frontal lobe

Why is this important for people with Autistic Spectrum Disorder?

- Widely reported that people with ASD have ‘unusual’ sensory processing experiences
- Variation occurs in volume, understanding of meaning and predictability of stimulus
- Inconsistency in processing sensory information leads to high levels of stress and anxiety

“ Learning how each individual autistic person’s senses function is one crucial key to understanding that person” (O’Neill 1999)

What do we mean by 'Integrating' the Sensory System

Sensory integration is the ability to take in information through the sense, to put it together with prior information, memories and knowledge stored in the brain, and to make a meaningful response.

From input to execution

Stimulus

↓

Sensation

↓

Interpretation (percept)

↓

Comprehension (concept)

↓

Action (executed motor plan)

The Seven Senses

- Touch
- Vision
- Hearing
- Smell
- Taste
- Proprioception
- Vestibular

Tactile

- The sense of touch
- Receptors on the skin and inside the mouth
- Receives information on light touch, pain, temperature and pressure
- Information to the system is constant either actively or passively
- Two types of tactile systems – exploration and defense

Features of difficulties interpreting tactile input

1. Over registration (tactile defensiveness)

- resists being touched. May avoid people.
- Non threatening touch is interpreted as threatening - avoids getting messy
- Resistance in self help tasks common
- Overreacts to heat/cold/pain
- Discomfort with clothing / shoes
- Eating issues due to sensitivity in mouth

Features of difficulties interpreting tactile input

2. Underregistration

- Either a decreased awareness of tactile input OR an increased need for tactile input.
- May have a high pain tolerance
- Likes pressure eg tight clothes, squeezing into tight places
- Seeks rough and tumble
- Prone to self injury- low reaction to temperature and pain
- May mouth hands or objects
- May constantly touch objects or other people

Vision

- Minimal background stimulus is calming
- The ability to make sense of what is seen
- Excessive stimulus is arousing.

Some issues are common for all people with visual processing issues:

- Self stimulatory behaviour eg flapping, waving etc to ‘cut out’ perceived excessive visual input
- Staring for long periods of time – may seem to look through people

Features of difficulties with the visual processing

Over registration

- ‘Super vision’ due to inability to block out or filter unnecessary stimuli.
- Dislike of dark and bright lights- covers or closes eyes
- Frightened by sharp flashes of light eg lightening
- May look down a lot to try to block out excessive stimulus

Features of difficulties with the visual processing

Underregistration

- Attracted to light - stares
- Stares intensely at objects and people
- Fascinated by reflections etc
- May run hands around edges of objects
- Tends to be on the fringe of activities

Hearing (Auditory)

- Allows accurate interpretation of speech and environmental sounds
- Closely linked to the vestibular system
- Soft voices are calming
- Loud noises are alerting
- Normal acuity does not guarantee speech – auditory and vestibular must be integrated along with motor planning in the mouth, tongue and larynx

Features of difficulties with the auditory processing

Overregistration

- ‘Superhearing’ - unable to filter out noises
- Hears some noises as ‘intense’ - may cover ears
- Avoids sounds and noises - dislikes crowds, storms etc
- Self care tasks difficult eg washing ears, using an electrical device, toilet flushing
- May use own voice to ‘drown out’ environmental noise eg hum or croon

Features of difficulties with the auditory processing

Underregistration

- Seeks noisy environments - kitchen, crowds etc
- Likes to make noise - bangs objects, doors
- Makes loud rhythmic noises

Smell (Olfactory)

- Smell and taste closely related
- Soft and mild odours are calming
- However ALL odours have the potential to be alerting

Features of difficulties with the olfactory processing

Overregistration

- May find any environment overpowering
- May show extreme aversive reactions to odours and substances eg perfumes
- Will not use toilets etc due to odour

Difficulties with Olfactory Processing

Underregistration

- Doesn’t process strong smells eg own odour in toilet- may smear faeces
- May smell things obsessively in order to become oriented
- Seeks strong odours

Taste (Gustatory)

- Processed by receptors on tongue
- Different areas on tongue register different tastes
- Difficulties in this area associated not only with smell but very closely with food texture
- Eating issues are also linked to proprioceptive and motor planning issues

Difficulties with Taste

Overrregistration

- Poor eater
- Uses tip of tongue for eating
- Gags/vomits easily
- Craves certain foods

Difficulties with Taste

Underregistration

- Eats everything (pica)
- Mouths and licks objects
- Eats mixed foods (ie several tastes in combination)
- Regurgitates

Proprioception

“ our internal eyes”

- Provides unconscious information from muscles and joints
- Gives information about movement and changes of position in space
- Provides body awareness which allows for accurate motor planning
- overall, proprioceptive input is calming

Features of difficulties with the proprioceptive system

Overregistration

- Places body in strange positions
- Difficulty manipulating small objects such as buttons
- Turns whole body when looking

Features of difficulties with the proprioceptive system

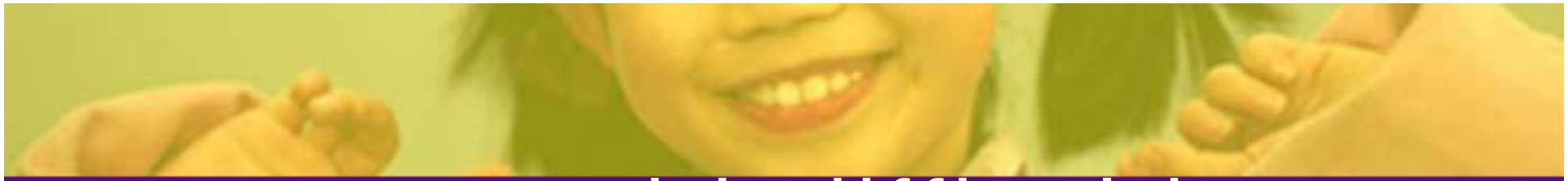
Underregistration

- Low muscle tone - including a weak grasp, appears “ floppy’, leans
- Lack of awareness of body in space
- Tendency to fall
- Unaware of own body sensations including hunger and feelings prior to bowel motions
- Bumps into people and objects
- Rocks back and forth

Vestibular

“ the unifying system”

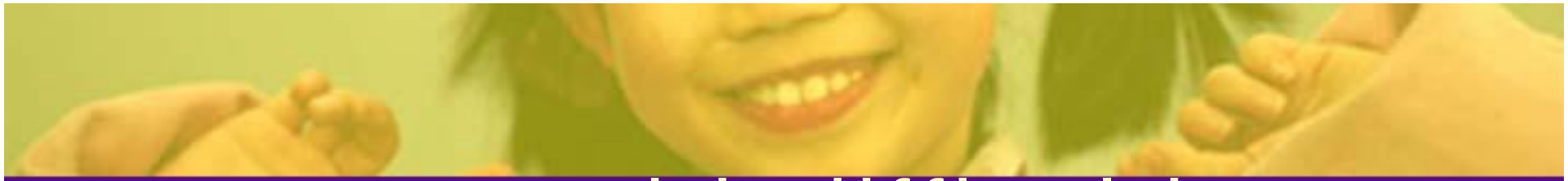
- Provides unconscious information from the inner ear about equilibrium and head and body movements away from, and to, the centre of gravity
- Provides sense of security and ties us to the ground
- Sends information to all parts of the body
- Receives input from body movement and movement in the environment
- Slow, linear movement is calming; fast is stimulating and arousing



Features with difficulties with the vestibular system

Overregistration

- Fearful reactions to ordinary movement activities
- Difficulties walking or crawling over uneven or unstable surfaces
- Dislikes being upside down
- Becomes anxious or distressed when feet leave the ground



Features with difficulties with the vestibular system

Underregistration

- Enjoys swings, merry-go-rounds - may be excessive
- Spins, runs round and round
- Rocks back and forth

Perceptual Styles in ASD

- Monoprocessing
- Peripheral perception
- Systems shutdowns
- Compensating for unreliable senses by other senses
- Resonance
- Daydreaming

Sensory processing issues and Behaviour

- Increased levels of stress and anxiety lead to reduced levels of frustration tolerance
- *" fright, flight, fight"* response
- Intervention techniques can be a major factor in effective behaviour management and self regulation

The Impact of Sensory Processing on Attention in ASD

Decreased selective attention

↓

Increased distraction

↓

Diminished cognitive functioning because of responses to irrelevant stimuli interfering with the processing of targeted information

Impacts on memory

Many people with ASD do not remember verbally but sensorially (Willey 1999)

- Main characteristics of ‘autistic memory’ are gestalt and literalness.
- Memories of sensory experiences may evoke physiological responses
- Sensorial memory is not an efficient carrier of all information particularly that which requires interpretation
- Main memory difficulty is failure to develop a personal memory for episodes (Jordan and Powell 1995)

Do sensory issues impact on learning?

- Sensory processing impacts on the manner in which the individual reacts to the world, and on how they take in, process and learn from information within their environment
- Difficulties with attention and memory are major factors in efficient learning both at an academic and social level.

Assessments & Interventions

ASSESSMENTS

- Observation
- Dunn Sensory Profile
- Sensory Profile Checklist Revised (SPCR)
- Sensorimotor History Questionnaires (Balzer-Martin)

TREATMENTS

- Sensory Integration – *'sensory diet'*
- Auditory Integration Training
- Irlen Method
- Behavioural Optometry
- Holding Therapy
- 'Hug Machine'
- Aromatherapy

People with autism lack the ability to adjust to ‘sensory assaults’ that others accept as normal. By accommodating their sensory needs, and helping them to interpret this information in a more reliable and predictable way, we can decrease their stress, increase their environmental understanding and facilitate their learning.

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