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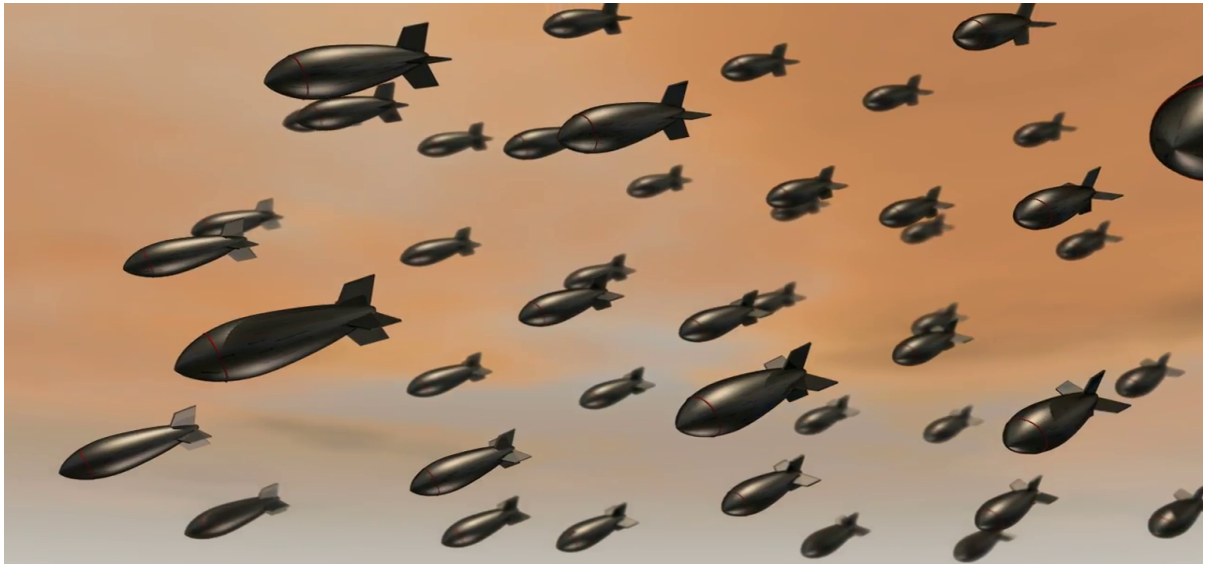
Sensory Processing and Brain Injury



We are constantly bombarded by sensory information every minute of every day.

When our brain receives this information it can choose to do one of three things:-

- Screen out or ignore it if its deemed unimportant or insignificant
- Habituate to it
- Notice it and assign the relevant importance to it.

The processing of sensory information begins even before we are born.

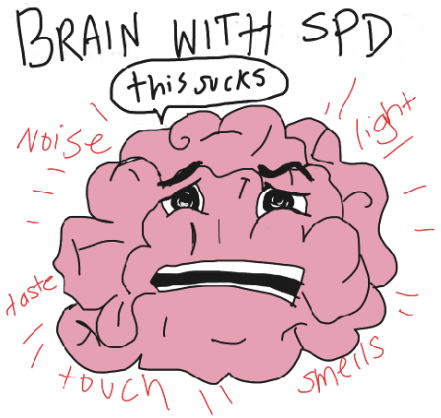
It continues throughout the whole of our lifetime.

It is estimated that 80% of our brain function is devoted to processing sensory information

It is estimated that between 5-15 % of the general population experiences difficulties processing and integrating sensory information.

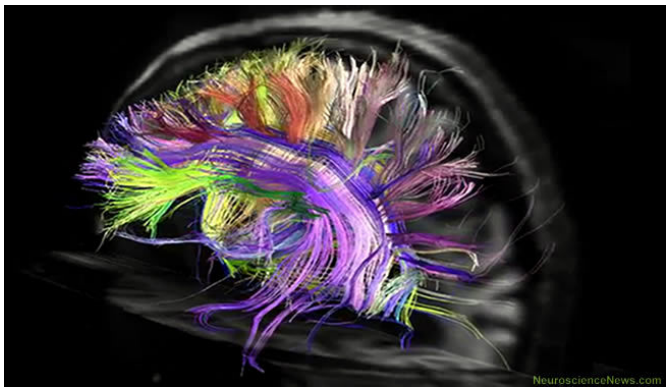
This figure increases dramatically in those with :-

- Learning Difficulties
- Who are born prematurely
- ADHD
- Autism



Sensory processing refers to the way our nervous system receives, organises and understands the input we get from each **individual** sensory system.

Sensory Integration is the process by which the brain brings all this information together.

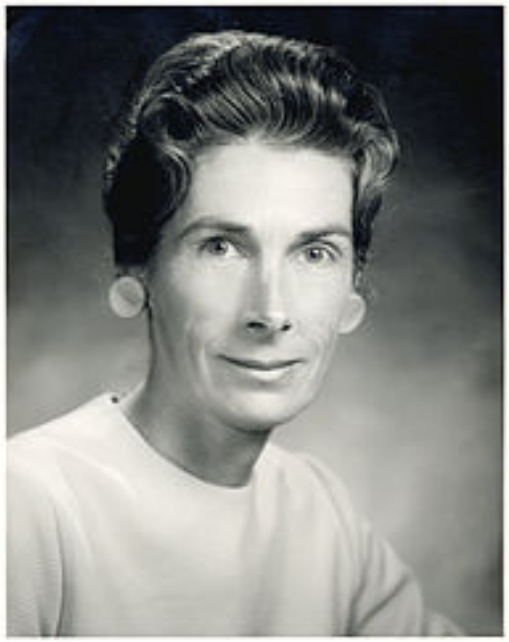


Most of us are brilliant at integrating the information we receive from our senses.

We take in information and filter out what we don't need and respond appropriately.

However, when this doesn't happen effectively it has a massive impact on how the individual interacts with the world around them.

The theory of Sensory Integration was first developed by Jean Ayres in the 1950s

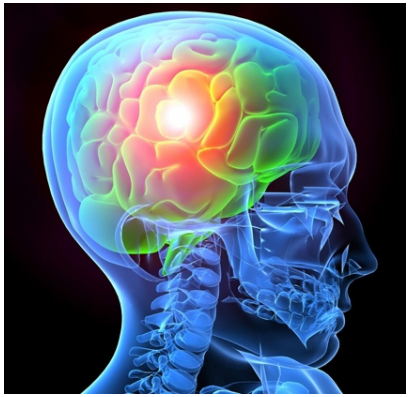


She described how the brain locates and organises sensory information in the same way a traffic policeman directs traffic.

When the brain processes and integrates the information correctly – it can then carry out the formation of appropriate behaviours, perception and learning.

Traffic flows freely.

When the traffic flow becomes jammed, disorganised or over flowing, the individual can experience stress rather like that of being in a constant rush hour.



- Information from all of our sensory systems moves along neural pathways from our bodies into our brain e.g. touch from receptors in our skin, vision through our eyes.

- It is registered at the level of the brain stem then moved upwards via the mid brain, where the information is processed.

- It then travels to the cortex where decisions are made about how to react or not and form the basis of our behaviour via a complex integrative system with all of our senses and cognition.

The term neuroplasticity refers to the brain's ability to regenerate and form new connections, even after an injury.

The brain has the ability to recover to a certain degree, given the right stimulus.

Sensory Integration theory believes that certain types of sensory input can be used to help regulate our responses to sensory input.

Helping us to remain in a calm alert state for more of the time.

When we are in a calm alert state we are able to process sensory information more accurately.

- Most of the research into sensory processing and sensory integration has been carried out on the Autistic population

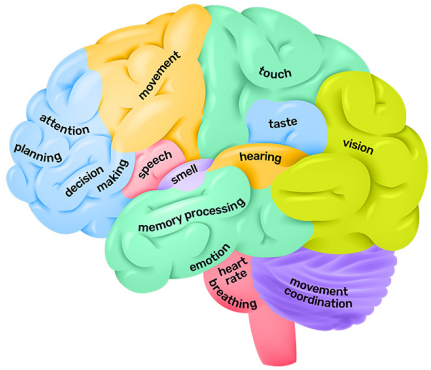
- Although there is lots of anecdotal information, very little research has been carried out into the incidence and effects of sensory processing and sensory integration on the brain injured population.

- What little research there is, says there should be more!

- From our experience of working with clients with sensory processing difficulties without a brain injury, there are parallels with behaviours seen after a brain injury.

If we think of the parts of the brain that are primarily involved in the processing of sensory information these areas are commonly affected by brain injuries.

Lobes of the Brain and function



- The Frontal lobe, is responsible for conscious thought
- The Parietal lobe, is responsible for visuospatial processing and the integrating of sensory information
- The Occipital lobe, is responsible for the sense of sight,
- The Temporal lobe, is responsible for the senses of smell and sound.

Functional impact

- In very simple terms, a disruption to any part of the pathway and processes involved with sensory processing will have functional impacts on the individual.

- When body and sensation work together as a whole learning new skills and adapting to different challenges appears relatively easy.

- However, when they don’t, difficulties will affect how an individual responds and interacts with the world around them.

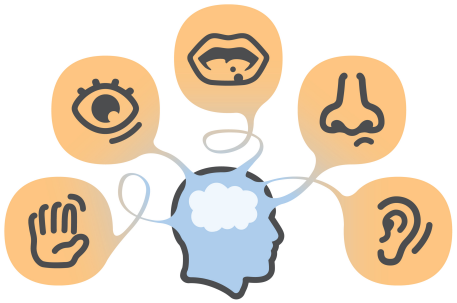
- Individuals post brain injury often struggle to modulate their responses to sensory information.

- They will frequently over or under respond to information their brains could previously respond to in an appropriate way.

- They will also struggle to filter out unimportant information resulting in poor attention and concentration and making focusing on tasks difficult.

- Despite this it is an area often over looked or not assessed in detail.

- Though we are not suggesting that that the effects on the sensory system will be exactly the same, we feel that we can draw on the research carried out by Ayres to help us evaluate the effects of trauma on the brain and use some of the strategies we know work, to help brain injured individuals.



- Sensory Integration theory believes that input can be used to help regulate our responses to sensory input.

- Helping us to remain in a “calm alert state” for more of the time.

- We can use sensory strategies throughout the day to prepare for functional activities in order to get the best treatment outcomes.

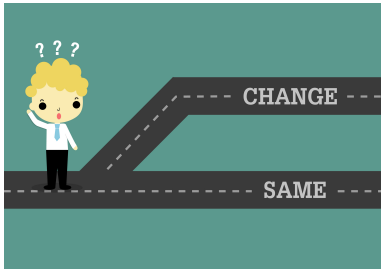
- Proprioceptive, vestibular and deep tactile sensory input can have a very calming and organising effect on the central nervous system of those struggling to process sensory information

- The reason for this is that they can cause the release of the “Happy Hormones” Serotonin, Dopamine and Endorphins.

- If we can increase the amount that an individual gets, it can have a positive effect on arousal levels and helping get into that calm alert state, ready for rehab.

- Ben is 14 years old.
- He sustained a Traumatic Brain Injury when he was 9 years and 8 months old.
- As a result, Ben has physical and cognitive difficulties that impact significantly on his day to day functioning.
- Ben also has epilepsy.

Changes in Ben's behaviour post injury included :-



- Poor attention and difficulty focusing on tasks including work in class and therapy sessions
- Quick to anger
- Becoming distressed and angry at loud unexpected noises
- Frequently arriving in school in a state of high arousal
- Running out of classroom and trying to leave the school premises
- Constantly on the move even when seated
- Sitting too close to others and seeking out hugs from strangers at times and being over responsive to touch at others
- Poor sleep hygiene

Assessment

- Our assessment comprised of the following :-
- Observations of Ben at home and in school
- The Sensory Processing Measure Home Form was completed with Ben's mum
- The Sensory Processing Measure Main Classroom Form was completed with Ben's Classroom Support Assistant.
- This information was then pulled together along with clinical reasoning to establish if Ben was processing sensory information atypically.

The assessment concluded that …

Ben was struggling to modulate the information he received from all of his sensory systems and as a result was fluctuating between being over and under responsive.

He was unable to stay in a calm alert state.

This in turn was impacting on Ben's arousal levels and he was quickly alternating between being over and under aroused.

Ben had developed some self-regulatory strategies. For example, when he is over whelmed he will run away, cover his ears and rock or lash out. However, these strategies were not appropriate and often put Ben and those caring for him at risk.

Following our assessment the following was completed

- Training session for parents, support workers and school staff.
- Ben was assisted to write a sensory “passport”.
- A sensory diet was devised that gave Ben regularly bouts of calming proprioceptive, vestibular and tactile sensory input during the day. This was directed at times that Ben had identified were difficult for him e.g. entering the noisy school dining room; as part of his bed time routine; prior to therapy sessions.
- This helped to bring Ben’s arousal levels down so that he has a reduced number of behavioral out bursts and was more able to cope with the sensory challenges he faced on a day to day basis.
- The “Alert Programme” was completed. This is an evidence based four week program aimed at helping children to develop self-regulation, organisation, attention and focus.

- Particularly effective for Ben was the introduction of “Jett Proof Clothing”. This is clothing that provides a deep even pressure which can be very calming and regulating for the central nervous system. Ben stated that it felt like he was “having a hug”.
- Ben also used a wet-suit for Hydro-therapy sessions. The physiotherapist noticed an immediate improvement in Ben’s ability to focus during the sessions.
- Ben’s sleep hygiene improved. Sensory activities were incorporated into his night time routine and he was able to fall asleep much quicker. His also used a stretchy sensory sheet that provided increased proprioceptive input.
- Aggressive outbursts were significantly reduced at both home and school.
- Ben began to be able to use language that explained how he was feeling when he was in a high state of arousal and began to request sensory activities that he knew helped him.

- Searches bring up little research in this area and suggest more is needed.
- Drawing on clinical experience from treating individual's with brain injuries, it is clear that sensory processing is frequently affected.
- Strategies that work with other populations experiencing sensory processing difficulties also work in this client group.
- This is not a 'magic wand' it takes time and skilled thorough observation.
- It requires care givers to understand and be on board.
- When this happens, positive effects to clients and their families/care givers lives are seen.
- These strategies can also help to improve clinical outcomes.

Any Questions ?