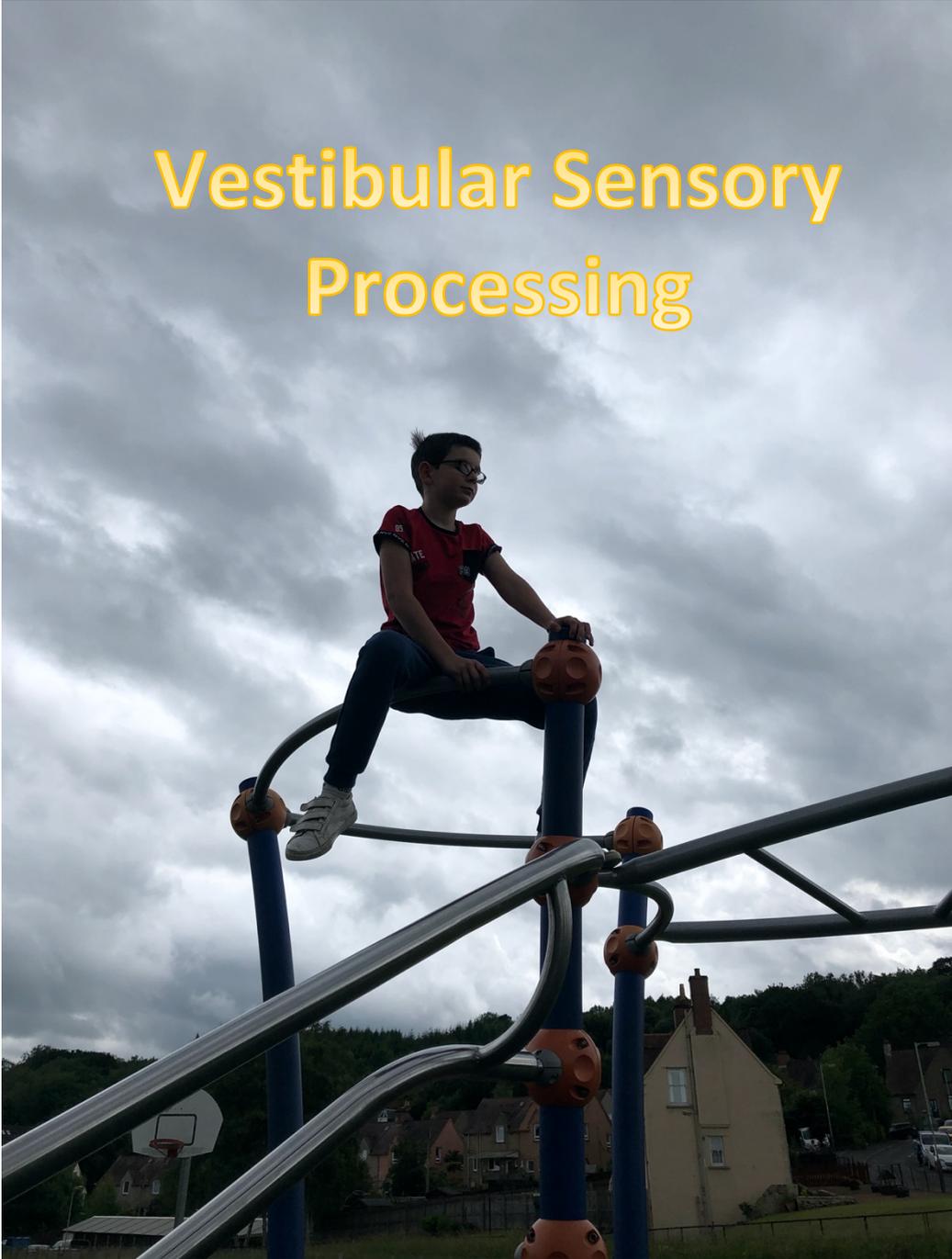




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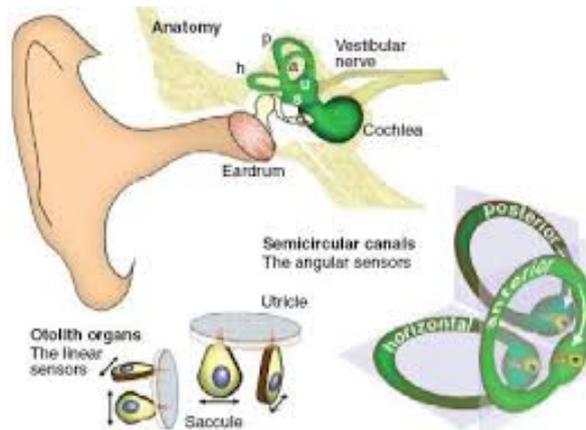
Vestibular Sensory Processing



What Is Vestibular Sensory Processing?

The vestibular system is one of the body's sensory systems. It detects both rotational movements and linear movements of the head in relation to gravity and in conjunction with other sensory systems. Have you ever had an inner ear infection? What did it feel like? I am sure it affected your balance.

The system is located in the part of our inner ear called the vestibule. The vestibule is attached to the cochlea, the part of the inner ear that helps with hearing. Inside the vestibule, there are two organs, the semi-circular canals, and the otoliths.



What does it help us with?

We live on planet earth and we have the pull of gravity to deal with! The vestibular system receives information when our head moves.

Head movements provides information which then prepares us makes the necessary (subconscious) adjustments to:

- Maintain posture/muscle tone
- Balance reactions (equilibrium)
- Visual control
- Spatial orientation
- Coordination skills.
- Alertness levels



It is essential that the vestibular sense works in conjunction with other sensory systems, particularly vision, proprioception, tactile.



Balance

We rely on the feedback from our inner ear to ensure we don't fall over when the surface changes or moves e.g. uneven or changing surfaces, steps, escalators, walking up/down hill. For this to happen we require the following:

Spatial orientation lets our brain know where our body is in space. It helps us to know whether we are lying down, standing, sitting, moving forwards, backwards, sideways, up or down and judge the speed of movement. Our **visual system** is closely linked to our spatial orientation.

Our vestibular system controls our **eye movements**. The brain processes the information from our head movements to adjust our eye movement. This means that we can look over at a person and then back to our activity, without getting dizzy or losing focus on the activity. When we move, our visual picture doesn't bounce up and down (or we would feel sick), it stays still.

Our body has to make constant small adjustments to ensure we don't over or under balance (**equilibrium reactions**) Our **postural control** allows our bodies to move in different directions whilst remaining stable. Our postural control is closely linked to **muscle tone**.

Muscle tone refers to the constant contraction/relaxation in sets of muscles throughout the body to hold us upright against gravity and in response to the movement we need to make. There is an increase or decrease in tension in the muscle as required and the vestibular system supports this tension.

What happens when we have Inefficient Vestibular Processing?

We take for granted how we move around the environment, can look down at our feet, pick up something from the floor, all without feeling dizzy or falling over. When the Vestibular system is not integrated in the way it should it can be seen in the way we respond to movement.

Over-responsivity

- Dislike activities requiring their feet to leave the ground such as swings, slides, riding a bike, jumping or climbing
- Innate fear of head tipped forward or back (gravitational Insecurity)
- moving slowly/cautiously, avoidance of movement. Prefer sedentary activities.
- Frequent motion sickness/dizziness (not just in the car)
- Seek out activities swings, slides, riding a bike, jumping, climbing, rocking, spinning, twirling, or frequent head tilting.

Under-responsivity

- Appearing to never become dizzy with excessive spinning
- Seemingly unaware of danger/risks or impulsively jumping, running, and climbing



- Difficulty sitting still or unable to concentrate when not moving, the child may appear weak or 'floppy'.

Discrimination (detail)

- Clumsiness, tripping up or frequent falling
- Difficulty with coordinating both sides of body e.g. completing star jumps, skipping

Alert levels

- Difficulty maintaining visual attention while moving
- Difficulty focusing on a task or listening in class
- Significant anxiety/fear of moving causing fight/flight response and or demand avoidance behaviours.

Strategies

Vestibular difficulties can be more difficult to deal with than proprioception over-stimulation of this sense can lead to over-whelm and or high anxiety. Understanding that your child/adults behaviour may be triggered by an inefficient vestibular system however is the first and most important strategy.

It can be hard for us to put ourselves in somebody's shoes who has inefficient vestibular processing. From descriptions from clients who have experienced in particular another responsivity to vestibular input it appears to cause huge levels of fear and anxiety which can lead to significant controlling of the environment around them. Imagine walking on the floor where the floor appears to move all the time. Imagine bending over to tie your shoelaces and you feel that you're falling to the ground. Imagine needing to spin and rock and move all day, how would we get any other work done.

We need to look at the types of input that are causing a significant behavioural response, which affects day-to-day function. This may mean the responses of the young person/adult when they are getting in and out of bed, being changed, getting dressed, being hoisted, being moved in a wheelchair, not enjoying every day movement activities that other children/adults enjoy, very passive lifestyle/avoidance of movement, or indeed a constant seeking of movement.

Type, Timing and intensity

This is where your observation skills (adult) are key. WHAT input are they seeking or avoiding? WHAT activities make them dreamy or more fidgety?

A young child is NOT able to put strategies in for themselves and they are not in control of the class/home environment, the adult is.



If the sensory response is significant (survival/stress mode) an older child will also not be able to put strategies in for themselves. It is the responsibility of the adult to adapt the surroundings and the sensory input, not the child.

Although their behaviour can appear wilful and intended, if there is a sensory basis it is not a 'chosen' behaviour but an end product of the sensory inefficiency.

These are only useful if the activity is providing the child with input for the **correct sensory system**, the correct **intensity** needed, and the **frequency, duration** and **timing** is right.

- if a child is dreamy during an activity then the timing of sensory input would be **during** the activity for a short brain break using fast movement which provides intense input to 'wakeup' the system.
- If a person is fidgety/movement seeking during an activity the best time to provide sensory input is **prior to the task** so that the brain can concentrate on the task and is not continually seeking movement. They may need a further break during the activity to provide them with slow deep pressure input to allow them to sit still to carry-out the task (as above)
- If a child is **avoiding** a sensation or distressed with an input e.g. noise, taste, smell, touch, movement ask yourself **what you could have done prior to this to prevent the stimulation** and what can you do now to help the child screen out the stimulus. What was the TYPE of input that caused the response. Does it always happen at a certain time? Is it only at a certain intensity?

Type

TIMING
IS EVERYTHING



Intensity



Sensory general menu

(vestibular activities in orange, proprioception in green)

General Calming Activities (required when you are over responsive to day to day sensory stimuli). These activities should be used when possible at the very first sign of dys-regulation. These can be used prior to sleep.

Typical Behaviours: frightened, withdrawn, Angry, emotional, fight or flight type responses

Significant Over-responsiveness to sensory stimuli requires Occupational Therapy intervention to reduce the over-responsiveness by changing the Neural pathways*

The best strategy is to understand the triggers in order to change the environment/activity to avoid the trigger next time. Ref. The Out of Sync child.

If a person is over-responsive to vestibular you would use these strategies advice from Occupational Therapist is recommended. These can be used in conjunction with proprioception strategies.

- slow, steady, rhythmic, repeated, predictable input
- slow and rhythmic music slow linear movements forward-and-back or head-to-toe
- Rhythmic (slow) bouncing on a therapy ball
- Steady, **slow** forward/back movement on swing or rocking chair
- Rocking chair
- Listening to classical music, steady drums, or nature sounds (water, birds, waves)
- slow-moving, dim, deep-colours for visuals
- neutral warmth in the room
- Look at fish tank, snow globes, lava lamp, campfire, or other slow-moving visual
- Use of a small environmental area which helps to cut out sensory stimuli e.g. indoor tent, canopy in corner of a room

Use a heavy/weighted blanket; read or work lying on floor with pillows stacked on top

ensure weighted blanket guidelines are followed for safety

Wrap or roll-up in blanket or rug (arms out). Please ensure safety.

- firm, steady, pressure touch or squeezing (**think massage or a big hug**) *** this can only be done if the child agrees to this***
- Using muscles for "heavy work" Pushing or pulling heavy furniture; putting chairs on desks & taking down
- Carrying a stack of books, laundry, groceries, or something else approx. 5% of body weight
- Carry backpack with some weight to it (not more than 5% of body weight)
- Push on wall as if to move wall. Lean on desk for "desk push-up"
- Hold self above chair seat, weight-bearing through arms, hands to side of seat for "chair push-up"
- Isometrics: push hands together, hook hands and pull apart, push knee against hand, etc. Push with feet against something (push'o'war with a pillow between 2 peoples' feet, no shoes)
- Chew on Chewy Tubes or Chewelry.
- Reduce talking/asking questions.



Sensory Seeking (under-responsive)

Required when a person is not gaining enough information from general everyday movement and the brain sends signals to seek more input. Proprioception can be used alongside tactile and vestibular.

Typical Behaviours: fidgeting, squirming, jumping on furniture, thrill seeking movements, constant touching

Understand what type of sensory input your child is seeking by carefully observing and recording the seeking behaviours.

- Wear Lycra clothing regularly, like bike shorts or long underwear (can wear either under regular clothes firm, steady, pressure touch or squeezing (think massage or a big hug). A child with particularly low tone may benefit from a clinically measured Lycra product. **vestibular**
- Regular Motor breaks during school day - stand and stretch, run an errand for teacher, walk to bathroom, carry a heavy backpack etc. (also use strategies below).
- Sensory pathway <https://youtu.be/3xaMz6Eko5I> **vestibular**
- Regular change of position. E.g. lying over therapy ball, or on tummy, standing frame. This can be very difficult to implement if a change of position means hoisting however it is essential in order to be provided with an adequate amount of proprioception input/**vestibular input**.
- Use a heavy/weighted blanket; read or work lying on floor with pillows stacked on top.

NB: They should not be left unsupervised. Not recommended for sleep.

- using muscles for “heavy work” pushing/pulling, lifting, climbing, monkey bars, tug of war.
- Squeeze stress ball or other resistive “fidget toy” (putty, beeswax, art erasers), Put hands into container of beans or rice (ensure safety if child still mouths items)
- Inflatable seat cushion (Move’n’sit, or sit on therapy ball for listening times) **vestibular**
- Eat chewy type foods (send fruit roll-ups, bagels, dried fruit, cheese, gummy candy with lunch). **Use your judgement related to food allergies and Safety of swallow.**
- Push on wall as if to move wall
- Lean on desk for “desk push-up”
- Jumping in place (trampoline, jumping jacks, jumping rope, etc.) **vestibular**
- **Stop/start should be encouraged in order that the brain ‘registers’ the input**

This should be used with caution as they can over-stimulate due to the vestibular element of these movements. Stop/start is essential



General alerting activities (to increase alertness levels)

Behaviours: when child is under-aroused, dreamy sleepy or poor registration of sensory input.

Please note this is very different from when a person may be in 'shutdown' due to a prolonged and intense sympathetic nervous system Stress response. When a person is in shutdown, they require time and a safe space to move into a regulated stated.

- **Heavy work/ lifting.** Without straining, teens and adults can shovel snow, garden or lift free weights (take advice on this).
- **Music:** heavy irregular
- **Wheelchair dancing/dancing**
- **Push, pull, and carry.** Rake leaves, push heavy objects like firewood in a wheelbarrow, do push-ups against the wall, wear a heavy knapsack (not too heavy!) or pull a luggage cart-style backpack, or mow the lawn with a push mower.
- **Circuit type activities.** Irregular rhythm. **Vestibular**
- **Skipping, jumping, running, cycling Vestibular**
- **Foods:** Chewy, crunchy stronger tasting

Sensory Shutdown

Behaviours: this can look similar to someone who is under-responsive (dreamy, less aware), small blank stares (seizures need to be ruled out), sleeping after a stressful dysregulated fight/flight event, dissociated (not aware of surroundings/or what happened), unable to communicate (when usually able to verbalise).

We are always trying to PREVENT sensory shutdown. If a person is in sensory shutdown then it is the sensory input, they have experienced and responded to subconsciously that needs to be looked at and changed the next time.

When a person is in shutdown, they are in survival mode and will not be able to answer questions about WHY they behaved in the way they did, they likely will not be able to communicate with you at all.

If they are having short shutdowns during a time of instruction they will NOT be able to take on board the instructions and miss crucial information which will affect their performance. This inability to 'hear' the instructions is not a choice.

It is important that the person is provided with a quiet, safe space to allow their sensory system to rest and restore to a regulated state.

Dr. Bruce Perry uses three R's for this process. It begins with techniques for regulation (as above), then it moves to relationship, **and only then can the intervention move to attempting to reason.**

Regulate, relate and reason is the best way to help a person to come to a place of calm and clarity

<https://www.childtrauma.org/>



Useful Links

1. https://smile.amazon.co.uk/Brain-Gym-Orange-Paul-Dennison/dp/0942143051/ref=sr_1_1?ie=UTF8&qid=1550577461&sr=8-1&keywords=brain+gym+book
2. https://smile.amazon.co.uk/Yoga-Pretzels-Activities-Grownups-Cards/dp/1905236042/ref=sr_1_1?s=books&ie=UTF8&qid=1550569349&sr=1-1&keywords=yoga+pretzels+cards
3. https://smile.amazon.co.uk/100-Ideas-Primary-Teachers-Mindfulness/dp/147294495X/ref=sr_1_3?ie=UTF8&qid=1550569760&sr=8-3&keywords=mindfulness+for+schools
4. https://smile.amazon.co.uk/Sync-Child-Carol-Stock-Kranowitz/dp/0399531653/ref=sr_1_1?ie=UTF8&qid=1550578181&sr=8-1&keywords=the+out+of+sync+child+book
5. https://smile.amazon.co.uk/Too-Loud-Bright-Fast-Tight/dp/0060932929/ref=sr_1_1?ie=UTF8&qid=1550578213&sr=8-1&keywords=too+loud+too+bright+too+fast+too+tigh

Sensory Equipment

Weighted Blanket:

1. [https://www.sensorydirect.com/weighted-](https://www.sensorydirect.com/weighted-blankets.html?gclid=CjwKCAiA767jBRBqEiwAGdAOrxwvneiHp7QEBPqvGVDdN_zHww5HKq-apgE7frNF4r_-9ho4Aj06PRoC8nAQAvD_BwE)

[blankets.html?gclid=CjwKCAiA767jBRBqEiwAGdAOrxwvneiHp7QEBPqvGVDdN_zHww5HKq-apgE7frNF4r_-9ho4Aj06PRoC8nAQAvD_BwE](https://www.sensorydirect.com/weighted-blankets.html?gclid=CjwKCAiA767jBRBqEiwAGdAOrxwvneiHp7QEBPqvGVDdN_zHww5HKq-apgE7frNF4r_-9ho4Aj06PRoC8nAQAvD_BwE)

weighted lap pad

2. <https://www.sensorydirect.com/weighted-lap-pad.html>

3. Sensory clothing

<https://www.sensorydirect.com/deep-pressure/hug-shirts-115.html> <https://jettproof.co.uk/>

4. Dynamic cushion

<https://www.backinaction.co.uk/sitfit?gclid=CjwKCAiA767jBRBqEiwAGdAOr3JXsjq85cZZeUZoK>

[jRHDHqY-hgllpkAik3OtnuQ85LQ6G60-clHTRoCFk8QAvD_BwE](https://www.backinaction.co.uk/sitfit?gclid=CjwKCAiA767jBRBqEiwAGdAOr3JXsjq85cZZeUZoK)



Thanks to James for
Helping.

