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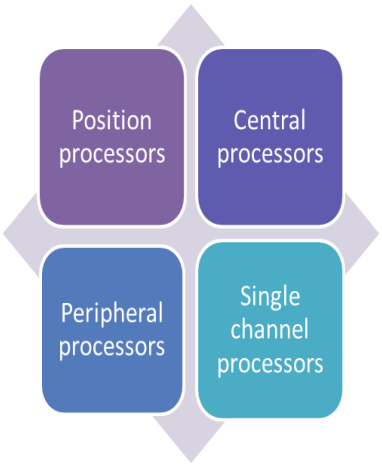
What's my ViBe? Visual Behaviours in autistic spectrum disorder

There has been a vast body of work published in the neuroscientific press which seeks to quantify ways in which visual processing differs in people with Autism or sensory processing disorder (ASD/SPD) compared with the general population. Study participants are typically young adults with higher functioning ASD/SPD and address a single visual behaviour. Many articles contradict one another in their results and conclusions and do not offer any indication as to how the visual behaviours might be addressed to improve functioning in the real world.

The aim of this article is to bring together real life encounters with children seen in special schools and the paediatric eye clinic to classify the behaviours and to offer a simple explanation for each visual behaviour. In this way we hope that carers and teachers are able to identify patterns of visual behaviour in a child, and offer some solutions as to how the child might be supported to use their vision more effectively.

We will discuss two models: one vision model and one sensory model.

Vision model



Broadly speaking there are four ways in which vision can be affected in autism or SPD. Most people have one or two of the four: some of them are contradictory, and some may occur in one situation more than another. Most people are able to inhibit or suppress various parts of their vision according to task. The underlying issue with autistic children who exhibit atypical visual behaviours is an imbalance between the various modalities or the inhibition of one part of vision occurs as a reaction or overstimulation.

1) Central Dominant Processors: people who are so tuned into their central sharp vision, they can only see a very small section of their visual world at a time

Your central or focal vision is equivalent to a HD TV – bright colours, high definition, fine detail. The brain receives an enormous amount of information from the central vision: for some children with autism/SPD this can be overwhelming, especially if they cannot balance or inhibit inputs in order to control sensory stimuli.

When the child has found an object of interest, they find it difficult to balance their focus of central attention with peripheral visual need such that the peripheral vision seems switched off entirely: when carrying the object they will trip over large objects which they would usually navigate round; or having seen an object of their desire across a room will move single mindedly towards it regardless of obstacles in their path.

Central processors find visual search difficult – they cannot find someone in a crowd or scan a room to look for an object: they find moving objects difficult to see and in the same way find it difficult to see when they themselves are moving.

These children may become visually fixated on specific colour or striking visual stimuli such as vertical blinds, radiator grills, or even another child's stripy t-shirt. They may find other stimuli distressing –visual aversion – and avoid or become distress by certain colours. THe central vision is sensitive to flicker such as that seen from a strip light or overhead projector.

Because of the overwhelming nature of central processors, they may be unable to use peripheral vision at all and appear clumsy. On occasion they may become so overstimulated that the vision simply shuts down and they feel temporarily unable to process any visual stimuli at all. They may deliberately look away from stimuli which are presented (visual avoidance). They may use rocking as a mechanism to shut off central vision – "rock to block" – and reduce sensory overload.

2) Peripheral dominant Processors: people who find it difficult to tune out of their peripheral vision in order to use their more complex central vision and are distracted by things in the periphery of their vision

If your central vision is like an HDTV, your peripheral vision is equivalent to a black and white analogue picture: fuzzy, grey, low in detail. This vision is less intense and easier to process. Many children with Autism/SPD use their peripheral vision in preference to central vision to reduce sensory load. They may well have good central vision fleetingly, but struggle to use it all the time. These children appear to be visually disinterested- they tend not to look directly at people or objects of reference.

Peripheral vision is used for movement detection: some children may only see moving objects rather that static ones. These children may enjoy swinging - "swing to see" – spinning or flicking objects in front of their face – as a way of suppressing central vision but stimulating peripheral vision alone. In other children they themselves are constantly on the move, perhaps in an effort to maintain peripheral visual dominance and suppress the central vision they find overstimulating.

They may have to pick up or touch each object in order to "see" it properly. They are likely to need larger size "PECS" or similar communication systems. They may turn their head to the side to use their peripheral vision when walking or talking to someone. This not only utilises their peripheral

vision, but also narrow the field of view, using their nose to "block" one eye and the temple to limit the visual field on the outer edge.

They may become distracted by objects in their periphery which are moving – other children, a shadow from a tree outside – and find it difficult to suppress peripheral vision in order to use their central vision effectively.

3) Posture deficient Processors: people who cannot relate their body position to the world around, do not have an awareness of how to make their body or face mirror another person's

This groups of children find it difficult to "map" where they are in the space they occupy. The tend to walk with their arms slightly to the side (like a capital A) or walk hesitantly. The well described behaviour of hand flapping or rocking may also help children orient their bodies. When faced with a new environment, they find the need to "tour" the space, touching each wall, chair, object in order to create a picture of where they are. Studies have shown that a moving face produces a measurable pain stimulus in children with posture processing difficulties, such that they look at the forehead or ear of someone who is speaking to them.

Copying facial gestures or physical movement is a challenge as the child cannot use vision as feedback to adjust the position of arms or legs. They will find it difficult to line up in a queue and frequently bump into or invade the space of other children. The difficulties can extend to fine motor tasks such as using cutlery, teeth brushing or writing when using a larger diameter handle or pen may help.

4) Single Channel Processor: people who find it difficult to tune into one sense at a time or modulate the sensory information which the brain receives from moment to moment

The brain has developed such that vision is usually the dominant sense : it overrides auditory stimuli and is processed ahead of other senses. The autistic brain finds it difficult to balance the visual inputs in the same way that some children with Autism/SPD find it difficult to process auditory stimuli and find it comforting to wear noise reducing headphones.

There are autistic children for whom visual input is overwhelming: the brain attempts the analyse all the visual input it receives without any filtering, like downloading an entire textbook onto a screen and trying to make sense of it in a snapshot. This can be countered by presenting only small amounts of information at a time and allowing sensory breaks – the child turning away, blinking: some children will intentionally rock – "rock to block" – as rocking inhibits central vision (as described above) and temporarily reduce sensory input.

For some children the visual input is almost constantly suppressed, giving the child the appearance of having no or minimal vision. For some children this is manifest as a squint or a drift in the eye, perhaps as a way of reducing visual input to one eye rather than a pair.

For some children it is difficult to attend sound and vision at the same time. These children may turn away when speaking, or look away from someone's face when they are being spoken to.

Whichever group or groups the patient belongs in, there are also four cross cutting themes which can interfere with visual processing in any child with Autism/SPD

a) visual fatigue is a common feature: using vision is much more tiring than for other people; using vision at its optimum can only take place at considerable cost, and short bursts of good vision followed by periods of poor vision are common. This may give the appearance of someone who cannot concentrate on a task or becomes frustrated and angry as they try and control the sensory input they receive.
b) Sensory urges – the child may need to suspend using their vision temporarily while they attend to other sensory urges: for some children the sensory urges are so overwhelming they seem to only fleetingly use their vision – these children tend to rock, spin, vocalise or chew
c) Visual memory – some children with Autism/SPD find it difficult to build up visual memory – a "photobank" in their mind of images they've seen before: they find it difficult to relate non-identical images – so if they have been taught the word "cup" using a red cup, they will think all cups have to be red. For children who learn to read, they may find it difficult to read handwriting or text in non-standard font
d) Saccades – saccades are the fast eye movements which allow the eye to move from one object quickly to another. Microsaccades are used when reading to move along a line of text a few words at a time. It has been long established that people with Autism/SPD have hypometric or underactive saccades – they cannot move fast or far enough and corrective movements need to be made. These are almost imperceptible to an observer but make using vision very tiring and frustrating.

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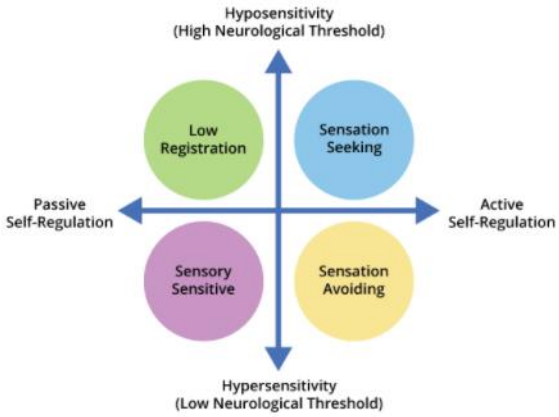
Sensory Model



This is based on the work of Dunn, an occupational therapist, and relates to all sensory processing.

She describes four sensory responses – they will overlap and fluctuate from situation to situation. Understanding each of these will help interpret visual behaviours.

Sensitivity axis – this is the threshold for visual detection, or perception – how much sensory stimulation do they need to 'trigger' visual attention

Self-regulation – the child's ability to use their sensory 'mixing-desk' – to tune into different senses with an appropriate level of attention to use the information effectively.

Sensation seeking – these are the children who have to 'touch everything' as they enter the clinic room. They are always on the move and seem to lack focus. They 'like to see' and seek out visual stimulus –eg spinning wheels. **Their vision is 'on all the time'** and may push out other senses making it harder to integrate (eg) speech and sight. They will get tired and burn out, seeming to hit a wall suddenly.

Avoiders – these children deliberately look away when you are showing them stimuli. They look away from people when spoken to, and may only briefly make eye contact at all. They may get stuck on a visual stimulus which is calming to them or has low definition (eg light, flowing screen saver). They may flap hands or chew on an object, or hum or growl using touch/vocalisation as an alternative sensory stimulus, . **Their vision is deliberately 'off'** most of the time.

Sensitive – these children become easily overwhelmed and seem to 'see everything all at once'. They 'can see too much' , seeing every detail and may be compelled to fully complete a vision task before moving onto the next thing. They may be easily distracted by other senses and be knocked off course by sound or talking. They may be sensitive to stimuli most of use tune out – clothing, the chair, the flicker of strip lights, the whirr of a computer fan. **Their vision is more on than off**

Bystander – These children seem passive, do not interact with their world unless things are pointed out to them. They lack interest in many stimuli, or show interest for a short period. They are easy going and seem to 'drift'. They need reminding that vision is available to them and **their vision seems more off than on.**

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Understanding HOW a child sees can help parents, carers and teacher develop strategies to make seeing easier; to reduce sensory stimulation, offering one at a time, reducing clutter and noise, allowing more time for vision to be attended to and responded to.