Sensory Distortions in Autism

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(Much of the material for this article is discussed in greater depth in her forthcoming book, ‘The Anger Box’, to be published later this year by Pavilion Publishers. As such it is copyrighted)

There is no one autistic brain: each person with autism has their own individual sensory profile of inputs to which they are hyper (over) or hypo (under) sensitive. But in general, people on the spectrum find it difficult to process too much incoming sensory information. Their sense organs (the eyes/ears etc…) may be working perfectly well but the brain has a limited processing capacity. ‘If you feed my brain with too much data it will crash’

When children or adults are upset it is almost always that their brain is sensorily overloaded: we need to recognise the underlying triggers to their distress. In many case we can ease the problems caused by their sensitivities, partly by reducing the incidence of the triggers that are causing the processing bottleneck and partly by increasing the input of signals that their brain can process easily without overloading the system. We are looking to provide an autism friendly environment that tells each individual what they are doing and what is going on around them.

‘Weird Girl Cyndi’s’ You-tube film, shows us that when she is overloaded, her visual experience zooms and pixillates, so that what she sees resembles a kaleidoscope where the pattern never settles. These visual distortions are known as Irlen Syndrome or Scotopic Sensitivity (present in the neurotypical population as well as in the spectrum). What we know about this stems from work on Dyslexia and has been applied to autism. Basically it can be triggered by certain colours, aggressive patterns or intense light or, the visual processing can be clogged up as the consequence of too much general environmental input such as too many people around.

For example, if a child screws up their eyes in bright light or rejects certain colours or patterns, they are probably trying to accommodate to incoming stimulus that may be painful. Treatment requires a Colorometric test. Even if they need them, not all children will wear coloured lenses, in some cases the correct coloured light bulbs can help.

Correct treatment can make a dramatic difference. When a schoolboy who screws up his eyes in bright light is given the correct lenses, he is immediately moved from the slow lane to the talented stream at his special school and subsequently has to be moved to a school for gifted children as his teachers cannot meet his needs. Although he still has severe autism, his cognitive ability has been wrongly assessed until his Irlen syndrome is addressed.

Irlen syndrome can have behavioural consequences. A man at a day centre tries to strip off his key-workers T-shirt. Enquiry reveals that the offending shirt is black with white stripes – and that he does not do this when she wears a plain T-shirt. What his ‘unacceptable’ behaviour is

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1 ‘Weird Girl Cyndi’ [http://www.youtube.com/watch?v=BPDTEuotHe0](http://www.youtube.com/watch?v=BPDTEuotHe0)
2 Irlen Centre, or enquire at Local Dyslexia Society which opticians in the district provide this service.

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telling us is that he cannot cope with the painful sensory distortions triggered by the pattern on her clothes. Wearing plain block colours reduces the chances of sensory overload.

Many children on the spectrum also experience auditory overload. Sounds boom, or cut out altogether or where there is hyperacusis, can be acutely painful. Grandin\(^3\) tells us that even now as an adult, sharp unexpected sounds arouse her sympathetic nervous system and cause panic attacks. Her heart pounds.

As applied to auditory sensitivity, the term ‘hypersensitivity’ is misleading, confusing cause with effect since as Donna Williams says, ‘the underlying causes of hypersensitive reactions may have nothing to do with the perception of pitch or volume but rather are the result of information processing problems’ \(^4\).

Exactly which sounds underlie sensory overload is specific to the individual: sounds can be loud or soft. Distortions can be set off by too much noise - as in overlapping speech - or by hypersensitivity to certain frequencies. The problem of too much sound can be alleviated by the use of Active Noise Cancelling Headphones (‘active’ not ‘passive’ - as in ear defenders or muffs - since passive headphones reduce all sound and there is some evidence that this adversely affects audition). Whereas Active Headphones (which are designed for pilots so they can talk to each other over the engine noise) only reduce certain frequencies and background noise. A child can still hear conversation. My own experience of using BOSE Quiet Comfort 15 with individuals with autism has had very positive outcomes.

When the fire alarm goes off, a young man sitting crouched in a crowded hall with his hood up, sticks his fingers in his ears. He is obviously in pain. I lend him the headphones. He stands up, pushes his hood back, walks away down the passage and comes back with a broad grin. ‘Now I can go to college. I could not stand the noise and the people before.’ He is now at the end of his first year of further education which he could not have accessed without the headphones.

A number of schoolchildren who are unable to engage in class are now doing so successfully wearing the BOSE headphones.

BOSE are expensive and there are a number of cheaper alternatives marketed by Sennheiser and Peltor. What is currently needed as a matter of urgency is a comparative study of the options, which will have to take in robust design as well as quality of noise reduction. It is likely that different children require different sets, depending on whether the problem is hyperacusis or located in the processing system.

Investigations that suggested use of headphones can have a negative affect on hearing used passive headphones (ear muffs). These reduce all sound, rather than selective active headphones, so this objection may be difficult to sustain.

The alternative to reduction of sensorily overloading sounds is Auditory Training, which aims to gradually increases tolerance of particular sounds. Recent research is ambiguous about its

\(^3\) Grandin T (2013) ‘The autistic Brain’

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effectiveness and suggests that while ‘there is some evidence that it can help in cases of hyperacusis, it does not appear to reduce the general symptoms of autism’.\(^5\) Even if auditory training is effective, it takes time, time during which the child is missing out on education, so it may be expedient to use noise reduction headphones, especially as most children seem to opt for using them in situations where they need them.

Recent neurobiological research suggests a possible site for the processing bottleneck in some individuals with autism. Incoming auditory and visual information is transmitted from the sense organs to the brain via cells called Climbing Fibres, which pass the messages on to Purkinje cells and thence to the Cerebellum (the centre of coordination of sensory data and consequent responses). In half of a post mortem study of brains belonging to people on the spectrum\(^6\), there was a deficit in the number of Purkinje cells, the effect being that, whereas in the undamaged state, one climbing fibre would be passing on a ‘visual input’ or a ‘sound input’ to one Purkinje cell, where there is a shortage of these to receive messages, signals of different modes are getting mixed up. More stimuli are being fed into the system than it can handle.

Where auditory inputs are leading to processing difficulties, current evidence suggests that the most direct intervention and probably the most expedient is to use active noise reduction headphones which allow the child to tolerate social and educational situations while reducing sensory distress.

People with autism may be oversensitive to light touch (‘it feels like spiders trying to crawl out of your skin’) but undersensitive to pressure – proprioceptive input) causing difficulties with knowing boundaries and what they are doing. (You know you are sitting down because of pressure on your backside.) People with this problem desperately try to compensate by physical activities. For example, children will climb, bang themselves on the wall or run round. Damian Milton who has Aspergers syndrome, tells us that he often walks on tiptoes in order to gain feedback of where he is in his environment.\(^7\) Some are helped by a Biohug Vest which delivers different programmes of pressure applied on the spine. While these are still in an experimental stage, one youth who wore one says it stopped his body feeling as though it was aggressively blowing itself apart – and he could walk straight without veering from side to side.

Proprioceptive problems may be compounded by vestibular (balance) problems. People with these distortions find it alleviated by giving themselves regular jerks as in rocking, swings, jumping and even toys such as a Pogo stick.\(^8\) When they do these, in a sensory world that is constantly on the move, they are giving themselves signals that have meaning, so they know what they are doing.

\(^5\)Research Autism ‘Auditory Integration Training and Autism’


\(^7\)Milton D Nature’s answer to over-conformity: deconstructing Pathological Demand Avoidance. Unpublished essay

Sensory overload can also be triggered by other external stimuli such as smell and taste but also by less obvious secondary triggers. These may be due to the sensory lability of the sympathetic nervous system to all forms of emotional warmth. For some a smile may be experienced as an overwhelming attack triggering the bodies self defence system. But even a broken object may set off emotional overload, experienced as an emotional tsunami.

It is difficult for those of us who are not autistic to understand the struggle for coherence that is the battle ground experienced daily by those with autism. Fortunately, there are now some extremely articulate reports by autistic authors. Understanding the world of autism means listening to what they have to say and to set this beside the striking current advances in neurobiological studies. One thing is certain, we cannot assess cognitive ability without first addressing sensory distortions.

Suggested further reading:

Caldwell P. ‘The Anger Box’ (In process of publication) Pavilion Publishers

Films:
Caldwell P. ‘Learning the Language’ Pavilion Publishers
Caldwell P. ‘Autism and Intensive Interaction’ Jessica Kingsley Publishers

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