

Parallel Worlds

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At present there are no medical tests to indicate autism, and the diagnosis is based on the presence of the specific behaviours – impairments of social interaction, communication, and imagination, - known collectively as the Triad of Impairments (Wing 1992).

Figure 1: The Triad of Impairments

The Triad is very good at recognising and diagnosing autism, but it does not tell us *why* autistic people exhibit these behaviours and how they experience world. These behaviours are just a tip of the iceberg', caused by some fundamental impairments (differences?) hidden under the water.

Figure 2: The Iceberg Theory

Autistic people do not respond in a way we expect them to because they have different systems of perception and communication. Bob Morris, (a high functioning person with autism) calls it a different set of SPATS:

Figure 3: SPATS

Senses
Perceptions
Abilities
Thinking
Systems

The sensory differences in ASD are often overlooked. As people with ASD literally live in a parallel (differently reconstructed) world and are misunderstood (= mistreated), they are likely to display behavioural problems, such as self-stimulation, self-injury, aggression, avoidance, rigidity, high anxiety, panic attacks, etc.

Likewise we never find it strange or bizarre if the blind person touches things to recognise them, we should not demand from people whose sensory-perceptual problems are not straightforwardly visible to 'behave themselves' and 'stop mouthing and smelling objects' (when they try to recognise things). We accept that we cannot cure blindness and we do not waste time and effort to teach visually impaired children to recognise colours. We see our task to help these persons function using compensatory strategies, and adjusting the environment to make it easier for them to orient in space. We accept and respect their disability that, if appropriately addressed, does not interfere with the quality of life.

Let us do the same for people with ASD and try to imagine what it is like to see through their eyes, to hear through their ears, etc. As the systems work differently their responses to sensory stimuli are 'normal' (from autistic point of view), though different and unconventional.

Sensory perceptual problems in autism are recognised now. But they are often oversimplified to hypersensitivities. If it were as simple as that, does it mean that if we identify hypersensitivities of each individual and adjust the environment, we would solve all the problems? A short answer is 'NO'.

We will discuss possible sensory-perceptual experiences of people with ASD. If we can understand the causes of certain behaviours we can accept these behaviours. If we know what to look for, it will be easier for us to understand the person's problems and abilities and to find appropriate methods to reduce their difficulties while building on their strengths.

Before considering sensory-perceptual problems in ASD we have to discuss briefly the general concepts and issues, such as sensory systems and perception in general.

Everything we know about the world and ourselves has come through our senses. All our knowledge therefore is the product of what we have seen, heard, smelt, etc.

Traditionally we distinguish 7 sensory systems:

- Vision
- Hearing
- Tactility
- Olfaction (the sense of smell)
- Gustation (the sense of taste)
- Proprioception
- Vestibular system

Perception is the process by which an organism collects, interprets and comprehends information from the outside world by means of senses. The process of perception has several stages. It starts with sensation when we perceive (see, hear, feel, etc.), the object, then the incoming information passes through special areas in the brain and the sensations are interpreted (percept, or mental image is created), and then joined with appropriate cognitive associations (concept, or general notion is formed). We sense (see/hear/feel, etc.), interpret and then get the idea of what we see/hear/feel, etc. and make a decision about what we can do about it. For example, the perception of a pen is joined with the concept of writing.

Figure 4: Stages of perception

Stimulus → Sensation → Interpretation (Percept) → Comprehension (Concept)

A pen (an object) → a long thin cylindrical plastic thing → a pen → I can write with it.

We are not born with ready-made strategies to perceive the world around us. Vision or hearing, for example, means the ability to receive sights and sounds, but this ability does not mean to comprehend visual and auditory images. We have to learn how to see and hear with meaning.

We learn to form concepts. And concepts bring order. They help to put 'bits and pieces of information into a coherent picture. For example, the black spots could be transformed into a meaningful unit when given a name (Figure 5).

Figure 5: Black spots or a Dalmatian dog?

The outside world becomes conceptualised and cognitive processes become more efficient and rapid as we 'jump' from a very few perceptual details to get an idea of what we see. A few details are enough to 'recognise' objects or people.

How much do we see? In fact, we *see* very little, just a few things our attention happens to focus on. Every time we look at something we just pick up a few features (ignoring irrelevant ones) and 'recognise' the whole picture from our past experiences and memories. When we enter a familiar room, for example, we do not have to examine every object there to recognise it. We just know what and where everything is located. A quick glance is enough. So do we actually *see* the environment or do we just *know* 'what is there'? In fact, our perceptual reconstruction (or 'what we think we see') comes from two opposite directions—from outside (environmental stimuli) and inside (mental images we have stored in the brain). The more familiar the environment or situation, the less we actually perceive it!

[Figure 6: Are you sure you've recognised the person?]

The brain does not need to process *all* the stimuli; it just 'fills in' the gaps' and 'predicts' the final picture. We 'move' through the process Stimulus → Sensation → Interpretation → Comprehension very quickly. We 'jump' (using 'short-cut') to the conclusion (Figure 7)

Figure 7: 'Short-cut'

It is the 'labels' that are of ultimate importance, as they give us the idea of 'what is there' without any need to be aware of all the details (a few are enough to identify the object). We are blinded by our 'mental paradigms' or 'mindsets' (Snyder 1996).

Another example of 'seeing from inside' - 'seeing something that does not exist' is illustrated by a well-known illusion of the Kanizsa triangle (Figure 8).

Figure 8: The Kanizsa triangle

Non-autistic individuals report they *see* a triangle. But the triangle does not exist! It is our mind that makes that blank space meaningful. We cannot look at things without interpretation. We impose our concepts on them.

Our interpretation of the world depends on our memories and experiences. We often see what we expect to see or what is closer to our mental representations. What a person perceives often reflects that person's past experiences, present beliefs and state of mind. In a way, we are limited in our perception.

- The real world and our mental image of the world differ
- Information from the senses is influenced by the 'inside information'
- With age we 'distort' what we perceive even more
- Our interpretation of the world is based on our memory and experience

All the information we receive from our senses is constructed (pieced together) in our brain. Our brain cannot process all the stimuli simultaneously, therefore it selects the key aspects of the scene while the rest of the world falls into the background. That is, the process of perception is an active process, guided by the brain. Moreover, it is a two-way process: information from the senses ('raw material') is influenced by the 'inside information' (the information we have stored and adjusted to earlier experiences).

What is more with age we often tend to ‘distort’ what we perceive even more because we often add to our perception by ‘seeing’, ‘hearing’, etc. what we expect to see, hear, etc. in certain situations. These expectations are based on our experience and knowledge. And though every brain constructs the world in a slightly different way from any other because every brain is different, the ways it operates are similar for non-autistic people. Even with perceptual differences, we see sufficient similarity to agree that a book is a book, a cat is a cat, etc.

Though people with ASD live in the same physical world and deal with the same ‘raw material’, their perceptual world turns out to be strikingly different from that of people without ASD.

We will start with the assumption that there are at least TWO WAYS TO EXPERIENCE THE WORLD:

- The non-autistic way
- The autistic way

The personal accounts of high-functioning individuals with ASD reveal that one of the main problems they experience is their abnormal (different?) perception and many authors with ASD consider autism as largely a condition relating to sensory processing.

It is not that their senses work or do not work, it is that they work differently. What complicates the issue even more, is that these differences (and difficulties) are ‘invisible’ to outsiders (‘they are not blind, are they?’) and are very difficult to imagine by those who assume there is only one possible way to perceive the world (‘you either see or you don’t, there is nothing in-between’).

It is widely reported that people with ASD have unusual (from our point of view) sensory-perceptual experiences. These experiences may involve hyper- or hyposensitivity, fluctuation between different ‘volumes’ of perception, difficulty interpreting a sense, etc. All these experiences are based on real experiences, like those of people without ASD, but these experiences may look/sound/feel, etc. different, or they may be interpreted differently. We think about the world in a way we experience it and perceive it to be. Different experience brings different knowledge about the world. So can we be sure that we are moving in the same perceptual/social, etc. world if our reconstructions of it are so different? How can we know that only our ‘perceptual version’ of the world is correct and theirs is wrong? Whatever the answers to these questions are, it is worth remembering that people with ASD cannot help seeing and hearing the ‘wrong thing’, and they do not even know that they see or hear the wrong thing. ‘Normal’ connections between things and events do not make sense for them, but may be overwhelming, confusing and scary.

What makes the matter even more complicated, is that no two people with ASD appear to have the exactly same patterns of sensory-perceptual experiences.

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

“What I do realise is that I do not see the world as others do. Most people take the routines of life and day-to-day connections for granted. The fact they can see, hear, smell touch and relate to others is ‘normal’. For me, these things are often painfully overwhelming, non-existent or just confusing” (*Wendy Lawson*)

Autistic perception is more accurate
and...
dysfunctional (?)

In order to see why they take a ‘different path’ in the direction of concept formation, we have to return to the stage of sensation and consider possible differences in experiencing it. Let us consider possible scenarios and outcomes of each stage of perception if something goes wrong. We can distinguish some features of ‘autistic perception’ of the world, based on the testimonies of high-functioning individuals with autism and close observation of children/adults with ASD we live or work with.

Qualitative differences in experiencing sensations/receiving information:

- ‘Literal perception’

‘Literal perception’ means perception without interpretation (the first stage of perception) - they see, hear, feel, smell, etc without attaching the label to the experience—they just sense it.

Figures 9-10 gives the example of ‘literal perception’: Can you ‘read’ (name) the colours (not the words)?

Figure 9: It is difficult to perceive the world ‘literally’ when the meaning interferes!

Figure 10: When the meaning does not interfere, ‘literal perception’ is easier!

Many children with ASD stop at the first stage of perception – ‘literal perception’ - much longer than babies without autism. So-called low-functioning people with ASD may remain on this stage well into adulthood and store experiences on the level of sensation. For example, they may *see* things without interpretation and understanding (literal vision). For those who are at the stage of literal perception, verbal words have no meanings. They are meaningless sound patterns and may serve as ‘auditory toys’ to play with.

With development and maturation many individuals with ASD learn how to ‘proceed to the next stage of processing information’ – interpretation, while so-called low-functioning persons with autism may be stuck at the stage of sensation much longer.

- Gestalt perception (the inability to distinguish between foreground and background information):

“It was like having a brain with no sieve...” (*Donna Williams*)

There is much evidence that one of the problems many people with ASD experience is their inability to distinguish between foreground and background stimuli (inability to filter foreground and background information). They often are unable to discriminate relevant and irrelevant stimuli. What is background to others may be equally foreground to them; they perceive everything without filtration or selection. This results in a paradoxical phenomenon: sensory information is received in infinite detail and holistically at the same time. It can be described as 'gestalt perception', i.e. perception of the whole scene as a single entity with all the details perceived (not processed!) simultaneously. They may be aware of the information others miss, but the processing of 'holistic situations' can be overwhelming. As there is too much information coming in, it is hard to know which stimuli to attend. It is often difficult for the person with autism to 'break' the whole picture into meaningful entities, to 'group together' and to 'draw the boundaries' around plenty of tiny sensory pieces to make them meaningful units.

In contrast to our guessing 'what is there' from our experience and memory instead of actually *seeing* it, children with ASD seem to be unable to filter the incoming information and tend to perceive all the stimuli around them. Instead of 'inventing' the world as we do, they actually *perceive* it. Such 'acute-perception' brings overwhelming information the brain cannot cope with.

The phenomenon of autistic savants can contribute a lot to the explanation of 'autistic Gestalt perception'. Stephen Wiltshire, a well-known autistic artist, for example, draws pictures of architectural buildings with minute detail. Another interesting feature of his drawings is that he could start the picture from any (often insignificant) detail and complete it with ease. Could it be that for him all these details are one entity? If you want to draw a circle, you can start at any point and complete it. For people like Stephen, who perceive the gestalt, the starting point does not matter, as for us it does not matter from what point we start to draw a circle. (Figure 11)

[Figure 11]

Gestalt perception can account for both strengths and weaknesses of perception of people with ASD. On the one hand, they seem to perceive more accurate information and a greater amount of it. On the other hand, this amount of unselected information cannot be processed simultaneously and may lead to information overload.

Individuals with ASD may experience gestalt perception in any sensory modality. A person with auditory gestalt perception has a great difficulty to concentrate on one auditory stimulus, for example, someone's voice, as it goes as a package with all the environmental noises: fans working, doors opening, somebody coughing, cars passing, etc. Their ears seem to pick up all sounds with equal intensity. If they try to screen out the background noise, they also screen out the voice they are trying to attend to. The same problem occurs when several people are talking at once: it is difficult for them to listen to one voice and screen out the others. Children with ASD are bombarded with sensory stimuli. They often feel 'drowned' in the 'sea of background noise'. In crowded places their brain seems to try to process all the stimuli around them - what each person is saying, and what other noises and sounds coming from all directions mean.

Individuals with visual gestalt perception experience all visual stimuli (details) around them simultaneously. They can see (not process) changes that happen in milliseconds where those

without ASD are 'blind' to them. For example, many individuals with ASD visually experience (see) flickering of fluorescent lights, that makes the environment around them visually unstable.

It is common knowledge that people with ASD do not like changes and like routines. If the slightest detail is changed (for instance, a picture on the wall is not straight, or a piece of furniture has been moved a few inches to the side), the whole scene (gestalt) is different, i.e. unfamiliar. For them to recognize things, things must be exactly the same they have already experienced. Only then they will know what to do with them. The same is true about routines: if something goes differently, they do not know what to do. Gestalt of the situation is different. All this results in fear, stress and frustration.

Figure 12: Any difference?

Paradoxically, people with ASD have much more trouble with slight changes than with big ones. For example, they can cope with going somewhere unfamiliar much better than with changes in the arrangement of the furniture in their room. The explanation of this phenomenon lies in the gestalt perception. Their encounter with new information is a new gestalt, which will be stored, while any changes in the 'familiar gestalt' bring confusion: on the one hand, it becomes a completely 'new picture', on the other hand, in the familiar situation they are confronted with an unfamiliar environment.

For individuals with gestalt perception, each and every situation is unique. They can learn what to do in one situation but be lost if the slightest detail is different:

"Moments with their own uniqueness challenged me so much that I began to fear all those unknown paths, clothes, shoes, chairs and strange human voices. Each one challenged me by putting in front of me a new situation for me to face and understand" (Tito).

They might be baffled when things change or go differently. Even the slightest changes may confuse and upset them. For instance, if the door to the kitchen is usually shut between the meal times, and they happen to find it open after lunch, they do not know what to do in this situation.

On the conceptual level, gestalt perception leads to rigidity of thinking and lack of generalisation. They can perform in the exactly same situation with the exactly same prompts but fail to apply the skill if anything in the environment, routine, prompt, etc. has been even slightly changed. They need sameness and predictability to feel safe in their environment. If something is not the same, it changes the whole gestalt of the situation and they do not know what they are expected to do. It brings confusion, frustration and anxiety:

"I would learn how to tackle a given situation in one context but be lost when confronted by the same situation in another context. Things just didn't translate. If I learned something while I was standing with a woman in a kitchen and it was summer and it was daytime, the lesson wouldn't be triggered in a similar situation if I was standing with a man in another room and it was winter and it was night-time. Things were stored but the compulsive overcategorization of them was so refined that events had to be close to identical to be considered comparable" (Williams)

- Any change destroys Gestalt and brings confusion and fear
- They make their own connections and create new Gestalts
- Gestalt behaviours—rituals and routines

Another confusing (and frightening) thing for individuals with autism may be when something emerges in the situation that does not belong to it. For example, once Tito was playing on the grass in their garden, when he heard the voice of their neighbour. The matter was, the voice used to come from over the fence. It should not be in the garden, but that day it was there! The boy was frightened because he did not recognise the situation and did not know what to do. The only solution available to him, was to scream. And he did!

They make their own connections (causes and effects) and create new Gestalts. Thus, Tito connected his screaming with the place he was in when it happened (on the grass in the garden) and refused to walk on the grass for years.

To feel safe they create Gestalt behaviours – rituals and routines. These ritualistic behaviours bring reassurance and order in daily life which is otherwise unpredictable and threatening. These rituals may be long and complicated. For instance, in ‘a bed-time ritual’, a child may start with going round her father’s chair twice, then touches the wall behind it, taps three times at the dressing table and only after that goes upstairs to her bedroom to ‘launch’ the next phase of ‘undressing ritual’ and going to bed. For outsiders these behaviours seem bizarre and complicated. However, for the child it is *one* act of meaningful experience, and if any part of it is missing (for example, the child is prevented from tapping at the dressing table) the whole experience becomes incomplete, unfamiliar, and frightening.

For individuals with autism, these Gestalt behaviours are ‘safety belts’ in a roller coaster they have no control of.

What we can do to help them ‘sort out’ sensory information:

- *We should find out which modality does not filter information and make the environment ‘visually/auditorily, etc. simple’. The next step would be to teach the person to ‘break visual/auditory, etc. picture’ into meaningful units ,i.e., teach them to recognise relevant features of objects and situations while ignoring irrelevant ones.*
- *Structure and routine make understanding of everyday activities easier and provide feeling of safety and trust.*
- *It is important to always communicate to the person beforehand in a way he can understand (e.g., using verbal, visual or tactile means) what will be changed and why. Changes should be gradual, with his active participation.*
- *Let them have a ‘safety object’ (a toy, a piece of string, etc.) when they go to unfamiliar places or face an unfamiliar situation.*

Thus, we do not need to interpret *all* the stimuli around us. We pick up only the stimuli relevant to the situation, while ignoring the rest. Individuals with ASD, on the other hand, find it very difficult to filter irrelevant information and struggle to interpret what they perceive with equal intensity. They cannot cope with the rate and amount of incoming information. Without filtering they are flooded with sensory stimuli. The overflow of sensory information may result in different sensory experiences and (voluntary and/or involuntary) compensatory strategies the person acquires in order to cope with sensory information overload. Most commonly reported sensory experiences in autism are:

- Fragmented perception
- Delayed perception
- Hypersensitivity and/or hyposensitivity
- Inconsistency of perception (fluctuation)
- Sensory overload
- Fragmented perception:

Because of gestalt perception, when too much information needs to be processed simultaneously, very often people with ASD are not able to ‘break’ the whole picture into meaningful units and to interpret objects, people, and surroundings as constituents of a whole situation. Instead, they process ‘bits’ that happen to get their attention. As fragmented perception can affect all the senses, these ‘bits and pieces’ may be visual, auditory, olfactory, etc. For example, they may hear ‘bits’ of sentences that cannot be combined into a meaningful message.

“I had always known that the world was fragmented. My mother was a smell and a texture, my father was a tone, and my older brother was something which was moving about” (Williams)

The perception ‘in bits’ can be illustrated by drawings by some autistic children. Figures 13-14 are drawings by a 13-year-old verbal autistic boy.

Figure 13: ‘A plane’ by D., 13 years old.

Figure 14: ‘A train’ by D.

In the state of fragmented processing, the person has a great difficulty to deal with people as not only they seem to consist of many unconnected pieces but also the movements of these bits of people’ are unpredictable. The strategy to cope with the problem is to avoid people and never look at them. It does not mean that they cannot *see* an entire person (at perceptual level). They seem to be unable to *process* the meaning of an entire person but process them bit by bit instead. As a result, the mental image of a ‘collection of bits’ is meaningless and often frightening. They often select for attention minor aspects of objects in the environment instead of the whole scene or person. They may look at the person and see his eye, then they shift their attention and see his ear, then his nose, his hand. The person seems to be bits of a jigsaw that do not make sense.

Let us have a look at the children’s drawings again. Two autistic boys drew ‘portraits’ of their mothers (Figures 15 & 16). It is no wonder that these children find social interaction difficult if not impossible. We often describe them as ‘aliens’, but don’t we look aliens to them?

Figure 15: ‘Mother’s portrait’ by D.

Figure 16: ‘Mother’s portrait’ by A.

Fragmentation may be felt in all sensory modalities.

E.g., Fragmented proprioception:

“Sometimes the body feels fragmented,.. So it appears to be suspended or floating in pieces. This can be eerie but neat sensation. A lot of self-stimulations, including

rocking the body, swaying, flapping the hands, rubbing the skin, and countless others, are pleasurable, soothing connections with senses” (O’Neill, 1999)

Perception ‘in bits’ results in that individuals with autism define people, places and things by these bits. As they process what they perceive piece by piece and not as a whole, they recognise things and people by the ‘sensory pieces’ they have stored as their definitions. For example, they may ‘recognise’ their mother by the colour of her dress and may not recognize her if she wears a dress of different colour, or they may know people and objects by smell, sound they produce, tone of their voice, the way they move, etc.

One should know the person very well in order to identify the ‘sensory concepts’ this person uses to function in the environment. It is no wonder, people with ASD exhibit maintenance of sameness and resistance to change as they try to make sense of the ever-changing world around them.

As some individuals with ASD perceive everything in pieces they need time to adjust to different surroundings. As a consequence of this fragmented perception individuals with ASD exhibit maintenance of sameness, resistance to change, anxiety in unfamiliar places.

What we can do to help them to identify the ‘right pieces of the jigsaw’ and put them into the right places to get a clear picture of the environment

- *Structure and routines make the environment predictable and easier to control*
- *Routines and rituals help to facilitate understanding of what is going to happen*
- *Introduce any change very slowly and always explain beforehand what is going to happen differently and why*
- Distorted perception:

Persons with ASD may experience not only fragmentation but also all sorts of distortions in their perception. Distortions are reported to become worse in the state of nervous overarousal and information overload.

In the field of vision the most common distortions reported by the individuals with ASD are: poor/distorted depth and space perception, seeing a two-dimensional world, ‘double vision’, distortions of shape, size, movement, etc. Because of these distortions, their perception of space may be different; space may seem to be expanded, or, on the contrary, look smaller:

“Occasionally I lost all sense of perspective. Something would seem monstrously large if coming towards me at speed, or if I am unprepared. Someone suddenly leaning over me could frighten me enormously. I felt something was falling onto me and that I’d be crashed underneath it” (Gerland)

- Delayed perception: Do we live in the same ‘time zone’?

As a consequence of fragmented perception people with ASD may experience delayed processing:

“As a child,.. it appeared as though I didn’t feel pain or discomfort, didn’t want help, didn’t know what I was saying, didn’t listen or didn’t watch. By the time some of these sensations, responses or comprehensions were decoded and were decoded and

processed for meaning and personal significance, and I'd accessed the means of responding, I was fifteen minutes, one day, a week, a month, even a year away from the context in which the experiences happened" (Williams, 1996, p.90)

The experience of 'delayed hearing' happens when the question has been sensed and recorded without interpretation until the second (internalised) hearing (i.e. processing of the received message). They may be able to repeat back what has been said without comprehension that will come later. In less extreme cases, to process something takes seconds or minutes. Sometimes it takes days, weeks, months. In the most extreme cases, it can take years to process what has been said. The words, phrases, sentences, sometimes the whole situations are stored and they can be triggered at anytime.

Due to delayed processing individuals with ASD may need some time to process the question and their response. (Immediate responses are often given 'automatically', triggered by memories). Before proper response people with ASD must go through a number of separate stages in perception, and if this long decision-chain is interrupted by the outside world, the person with autism must start all over again because overselectivity has changed the scene completely. In other words, an interruption effectively wipes away any intermediate result, confronting the person literally "for the first time" with the same object/event/situation" (VanDalen)

"Some people think I am not paying attention when I am asked a question, because of the pause I often need to process the question and my response, and the blank look I often have when concentrating on such processing. When people try to get my attention, they actually just distract me, slow me down, and annoy me horribly with their impatience" (Jared Blackburn)

A person can be delayed on every sensory channel.

What we can do to help:

- Give them time to take in your question/instruction and to work out their response. Be aware that autistic individuals often require more time than others to shift their attention between stimuli of different modalities and they find it extremely difficult to follow rapidly changing social interactions

Other common problems people with ASD experience are their hyper- or hyposensitivities to sensory stimuli. Their senses seem to be too acute (in the case of hypersensitivity) or not working at all (in the case of hyposensitivity).

- **Hypersensitivity**

"I appear to have very sensitive ears, eyes and skin. Certain noises very definitely 'hurt' my ears and certain lights 'hurt' my eyes. Strip lighting is one of the worst, and lights that flash. If the strip lights have a grid covering them then I cope with them better" (Lawson, 2001).

“My hearing is like having a sound amplifier set on a maximum loudness. My ears are like a microphone that picks up and amplifies sound” (Temple Grandin)

Hypervision means that their vision is too acute. For example, they notice the tiniest pieces of fluff on the carpet, or dislike bright lights.

Individuals with *hyperhearing* are generally very light sleepers, are frightened by sudden unpredictable sounds (telephone ringing, baby crying), dislike thunderstorm, crowds, are terrified by haircut, etc. They often cover their ears when the noise is painful for them, though others in the same room may be unaware of any disturbing sounds at all. Sometimes hyperauditory people make repetitive noises to block out other disturbing sounds.

Some individuals with *olfactory hypersensitivities* cannot tolerate how people or objects smell, though their carers can be unaware of any smell at all. They run from smells, move away from people and insist on wearing the same clothes all the time. For some, the smell or taste of any food is too strong, and they reject it no matter how hungry they are. They are usually poor eaters, gag/vomit easily, eat only certain foods.

Some individuals with ASD are *hypertactile*, they pull away when people try to hug them, because they fear being touched. Because of their hypertactility resulting in overwhelming sensations, even the slightest touch can send them to a panic attack. Small scratches that most people ignore can feel very painful to them. Parents often report that washing their child's hair or cutting nails turns into an ordeal demanding several people to complete it. Many individuals refuse to wear certain clothes, as they cannot tolerate the texture on their skin. Some people with hypertactility overreact to heat/cold, avoid wearing shoes, avoid getting 'messy', dislike food of certain texture.

- **Hyposensitivity**

“My senses would sometimes become dull to the point that I could not clearly see or hear, and the world around me would seem seemingly cease to exist... Oftentimes, I would be aware that my body hurt somewhere, but I would be unable to pinpoint what was hurting, even to the point of being unable to distinguish between whether the distress is kinaesthetic or aural in nature” (Hawthorne)

“I had no concept of my body... and I never experienced it... My body was a mere reflection in front of the mirror. When I stood in front of mirror, I remembered that it was me. For it looked like my photograph which I saw often because I pointed at the faces of the family album when mother asked me...” (Tito)

Sometimes their senses are in 'hypo' and they do not really see, hear or feel anything. To Other common problems people with ASD experience are their hyper- or hyposensitivities to sensory stimuli. Their senses seem to be too acute (in the case of hypersensitivity) or not working at all (in the case of hyposensitivity).

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- **Hyposensitivity**

“My senses would sometimes become dull to the point that I could not clearly see or hear, and the world around me would seem seemingly cease to exist... Oftentimes, I would be aware that my body hurt somewhere, but I would be unable to pinpoint what was hurting, even to the point of being unable to distinguish between whether the distress is kinaesthetic or aural in nature” (Hawthorne)

“I had no concept of my body... and I never experienced it... My body was a mere reflection in front of the mirror. When I stood in front of mirror, I remembered that it was me. For it looked like my photograph which I saw often because I pointed at the faces of the family album when mother asked me...” (Tito)

Sometimes their senses are in ‘hypo’ and they do not really see, hear or feel anything. To stimulate their senses they might wave their hands around or rock forth and back or make strange noises.

People with *hypovision* may experience trouble figuring out where objects are, as they see just outlines, then they may walk around objects running their hand around the edges so they can recognise what it is. These individuals are attracted to lights, they may stare at the sun or

a bright light bulb. They are fascinated with reflections and bright coloured objects. Having entered an unfamiliar room they have to walk around it touching everything before they settle down. Often they sit for hours moving fingers or objects in front of the eyes.

People with *hypohearing* may ‘seek sounds’ (leaning their ear against electric equipment or enjoying crowds, sirens, etc.). They like kitchens and bathrooms - the ‘noisiest’ places in the house. They often create sounds themselves to stimulate their hearing - banging doors, tapping things, tearing or crumpling paper in the hand, making loud rhythmic sounds.

Individuals with *hypotaste/hyposmell* chew and smell everything they can get - grass, play dough, etc. They mouth and licks objects, play with faeces, eat mixed food (for instance, sweet and sour), regurgitate.

Those with *hypotactility* seem not to feel pain or temperature. They may not notice a wound caused by a sharp object or they seem unaware of a broken bone. They are prone to self-injuries and may bite their hand or bang their head against the wall, just to feel they are alive. They like pressure, tight clothes, often crawl under heavy objects. They hug tightly and enjoy rough and tumble play.

People with *vestibular hyposensitivity* enjoy and seek all sorts of movement and can spin or swing for a long time without being dizzy or nauseated. People with vestibular hyposensitivity often rock forth and back or move in circles while rocking their body.

Those with *proprioceptive hyposensitivity* have difficulty knowing where their bodies are in space and are often unaware of their own body sensations, for example, they do not feel hunger. Children with hypoproprioceptive system appear floppy, often lean against people, furniture, and walls. They bump into objects and people, stumble frequently, have tendency to fall. They have a weak grasp, drop things.

We can get a lot of information from watching repetitive behaviours—self-stimulatory behaviours (‘sensorisms’). [Figure 17]

Individuals with ASD often describe their stims as defensive mechanisms from hyper- or hyposensitivity. Sometimes they engage in these behaviours

- to suppress the pain or calm themselves down (in the case of hypersensitivity),
- sometimes to arouse the nervous system and get sensory stimulation from the outside (in the case of hyposensitivity), and
- sometimes to provide themselves with internal pleasure.

Very often, therefore, these self-stimulatory behaviours (‘sensorisms’), which are defined by people without ASD as ‘bizarre behaviours’ (such as rocking, spinning, flapping their hands, tapping fingers, watching things spin, etc.), can be viewed as involuntary strategies the child has acquired to cope with ‘unwelcome stimulation’ (hypersensitivity) or lack of it (hyposensitivity). That’s why, no matter how irritating and meaningless these behaviours may seem to us, it is unwise to stop them without learning the function they serve and introducing experiences with the same function.

The stereotypies caused by sensory hyper- or hyposensitivity can involve one or all senses. If we interpret these behaviours, we will be able to imagine (if not fully comprehend) how the person perceives the world and help the person develop strategies to cope with these (often painful) sensitivities.

However, one of the difficulties in interpreting the person’s behaviour caused by sensory

processing differences is our own 'non-autistic' sensory function. We have to train ourselves to perceive and understand the world from the individual's perspective. Only then will we join the person 'on his/her territory', in his/her perceptual world and will not have to live in two parallel ones.

As each individual is unique, very often we can find individuals with hyper- or hyposensitivities in one and the same classroom/work-place. The knowledge about each person's sensitivities can help the teacher/coach to plan the activities and address each person's particular needs. It is often very difficult to adjust the environment to satisfy needs of several individuals as the same stimuli may cause pain in some people and bring pleasurable experiences in others.

What we can do to help:

Hypersensitivities:

- *Identify which stimuli the person finds disturbing and either eliminate them (e.g., use natural lighting instead of fluorescent lights) or, if impossible, provide the person with 'sensory aids' (tinted glasses, earplugs, etc.)*
- *Desensitise the person to tolerate the stimuli via sensory diet*
- *Monitor a number of simultaneous stimuli; reduce irrelevant stimuli*
- *If possible, warn the person about fire alarms, bells, etc.*

Hyposensitivities:

- *Provide extra stimulation through the channels that work in 'hypo'*

Hypersensitivity can also lead to two different experiences – disturbance by certain sensory stimuli and its opposite – fascination with certain stimuli. These experiences are very individual. The kinds of stimuli that are disturbing or fascinating vary from person to person. A sight, sound, etc. that cause one person pain may be pleasurable to another.

“The buzzer on the microwave oven, children's voices, car horns, the bus bell people activate to tell the driver they want to get off, a kettle whistling... these are just some of the sounds I find unbearable” (Wendy Lawson)

“Sudden loud noises hurt my ears—like a dentist's drill hitting the nerve” (Grandin)

Disturbance by

- Certain stimuli
- Too many stimuli
- Any sudden unpredictable stimuli

Challenging behaviours may be caused by 'present but invisible' or 'probable future' antecedents

All senses can be affected. Some people might find many noises and bright lights nearly impossible to bear; for others certain noises and the pitch of some sounds might cause a lot of discomfort.

Besides, not only certain sounds but also any sudden unpredictable sounds can be painful. The fear of a stimulus that 'hurts' is often the cause of many challenging behaviours. The antecedents cannot be easily identified. Sometimes we cannot see/hear/feel them as our

senses are too 'normal'. Sometimes these are 'possible future antecedents'. Some children with ASD try to break things (telephone or alarm clock, for example) that can produce painful stimuli. They do it as a protective reaction. E.g, Alex, a boy with ASD, could not tolerate babies crying. Even when a baby was asleep he would 'attack' (hit, kicked) it. It was easier for him to tolerate the cry, when he 'was prepared' for it and could see the source of it. It explains his "challenging" behaviour – to 'initiate' (and be in control of) the painful sounds, make them predictable, instead of 'jumping out of his skin' when the baby starts crying and he does not expect it.

The most often reported visual sensitivities are: sensitivity to bright light, fluorescent light, colours and certain patterns (especially, stripes).

What we can do to help:

- *Remember, what we think is enjoyable (e.g., fireworks) may be fearful or overwhelming to an autistic individual*
- *Be aware of the colours and patterns of the clothes you are wearing and of your perfume*
- *Always warn the person about the possibility of the stimulus he is fearful of and show the source of it*
- *Strategies to cope with light sensitivity are turning off any unnecessary lighting (esp. fluorescent lighting), using lamps rather than overhead lights, low wattage bulbs and tinted lenses [Figures 18-19]*

As each individual is unique in their sensory profile, it is very difficult to adapt the environment for each individual's sensitivities. Often it is not the stimulus itself that can trigger what we call difficult behaviours, but rather the inability to control or predict it. The understanding of each individual's sensitivities is vital, or any intervention becomes a nightmare for both the person and those who work with him.

Fascination with certain stimuli is an opposite of disturbance by certain stimuli, caused also by hypersensitivity. These two features are like two sides of one and the same coin. The only difference is, while disturbance causes pain, fascination gives pleasant experiences and brings calm and peace to people with autism (although, sometimes, at the cost of their withdrawal).

People with ASD can be fascinated with different sensory stimuli.

The sources of fascinations are very individual. One and the same stimulus can cause disturbance and fascination to different children.

What we can do to help:

- *Make a list of pleasant stimuli for each individual. If you think the activities (behaviours) or material the person uses for 'self-treatment' are inappropriate, identify their function and replace them with more appropriate ones*
- *Use 'objects of fascination' in the 'case of emergency' - to calm the person down after a painful/stressful experience*

- Inconsistency of perception (Fluctuation)

Although we could address hyper- and hyposensitivities by desensitizing a person and/or providing the aids to help him/her cope (in the case of hypersensitivity), and by providing more stimulation to 'open' the affected channel (in the case of hyposensitivity), it does not often lead to the solution of the problem. The matter is, the volume of their perception is not stable, it fluctuates between hyper- and hypo-, or between hyper-/hypo- and normal. The fluctuation depends on many factors, such as developmental level, physical state, severity of autism, degree of familiarity with the environment and situations, etc., and will vary with age and circumstances of each person:

“Skin sensation was so unbearable one minute and yet completely unfelt next”
(Blackman)

“It is well documented that there are certain textures and patterns that are painful or displeasing to the touch of the person with autism. This is true from my own experience, but I am not able to tell you what they are because they are always changing. Day to day, hour to hour, sometimes even minute to minute. This can be very frustrating.” (McKean 1999)

- Vulnerability to sensory overload

The information overload can be caused by:

- The inability to filter out irrelevant, or excessive information (Gestalt perception)
- Hypersensitivity
- Distorted or fragmented perception
- Delayed processing

This is how a high functioning person with autism describes his experience of sensory overload. This experience is very individual, but it gives some idea what it is like to be overloaded with sensory information:

“My lack of interest... in the outside world did not protect my mind from the flood of unwanted information that continually assaulted my senses. The unmodulated sensory input often overwhelmed me, causing me mental torture... My head would feel fogged so that I could not think. My vision would blur, and the speech of those around me would become gibberish. My whole body buzzed... My hands would feel detached from my body, as if they were foreign objects.

I would be paralyzed, unable to comprehend my own movements unless I could see them. I could not tell where my hand started and the table ended, or what shape the table was, or even if it was rough or smooth... I felt lifeless, dazed and had difficulty refocusing on anything” (Hawthorne)

The threshold for processing sensory stimuli varies among persons with ASD, at different ages and in different environments. For example:

“When I was a small child, my threshold for processing blah-blah was only a few

seconds. When I was about ten or so, my threshold... was about five to ten minutes. When I was a teenager and up to my twenties, this threshold was about fifteen minutes to half an hour. Now it is about twenty to forty-five minutes. In a more accommodating environment... these thresholds could have been much higher than they were” (Williams, 1996, p.204).

Many people with ASD are very vulnerable to sensory overload. They may become overloaded in situations that would not bother other people. The overload comes when they have taken in more than they can keep up with.

What we can do to help:

- *It is important to recognise the first signs of sensory overload. It is better to prevent it than to ‘deal with the consequences’*
- *As soon as you notice the first signs of coming sensory overload (which are different for different individuals), stop the activity and provide time and space to recover*
- *Teach the individual to recognise the internal signs and ask for help or use different strategies (e.g., relaxation) to prevent the problem*
- *‘First Aid Kit’ should always be at hand (sunglasses, ear plugs, squeezey toys, favourite objects, ‘I need help’ card, etc.)*

The overload can lead to several different routes they can (are forced to) and may result in:

- If they continue to try to process all the information coming in, despite their inability to keep up with it, it may result in hypersensitivity and/or fragmentation, that eventually bring anxiety, confusion, frustration and stress., that, in turn, leads to tantrums and difficult behaviours
- **Sensory agnosia (difficulty interpreting a sense):**
‘Sensory agnosia’ (or difficulty interpreting a sense) is sort of ‘literal perception’, when interpretation of any sense can be lost. Though they can see/hear, etc. adequately, they may often have limited comprehension of what is being seen/heard, etc. It is a very frightening experience.

“I looked at the beige-colored blob in front of me. Meaning had shut down not only through my ears but now through my eyes, too. I could see it but I had absolutely no Idea what it was any more” (Williams)

- **Perceptual styles**

Individuals with ASD seem to develop a range of defensive strategies and voluntary and involuntary adaptations and compensations to survive in the world bombarding them with extraneous information. These adaptations and compensations become perceptual styles. Most commonly reported perceptual styles in autism are:

- Systems shutdowns
- Mono-processing
- Peripheral perception (avoidance of direct perception)
- Compensating for unreliable sense with other senses

- **Systems shutdowns**

When the person cannot cope with sensory information, he may shutdown some or even all sensory channels.

If it is used early in life it leads to self-imposed sensory deprivation. Many children with ASD are suspected to be deaf as they sometimes do not react to sounds. Their hearing, however, is often even more acute than average, but they learn to shut it down when they experience information overload. To shut down painful channel they may engage in stereotypic behaviours, or deliberately distract themselves through other channels (for instance, to touch objects when hearing is overwhelming) or to withdraw all together.

- **Mono-processing**

Most people use their senses simultaneously. When they are hearing something, they are still aware of what they see and feel emotionally and physically, because they are able to process information from several sensory channels simultaneously.

In ASD, to avoid overload of sensory information, only one modality may be processed consciously by the brain. The other channels are 'on hold'. Using only one channel at a time is called 'mono-processing' (Williams) or 'being single-channelled' (Lawson).

In mono-processing, concepts are often 'one-sensory', for example, if an apple was yellow when it was first seen, it cannot be identified as an apple if it is red.

Mono-processing means that a person focuses on one sense, for example, sight, and might see every minute detail of the object. However, while his vision is on, the person might lose the conscious awareness of any information coming through other senses. Thus, while the person sees something, he does not understand what he is being told, and does not feel touch, etc. When the visual stimulus fades out, the sound could be processed, but then the sound is the only information the person is dealing with (i.e. disconnected from sight).

“I have noticed that when I am using a particular channel to address a task, if I attempt to introduce another channel, then I lose my place in the completion of the task and need to begin again. This is very frustrating! For example,.. a child with ASD is using the channel of 'touch' to dress themselves, if an adult then says 'look at what you are doing' (introducing a second channel, vision) the child may stop the task altogether and react with aggression, self-injury or by giving up on the task completely.” (Lawson)

The individuals with ASD define this 'mono'-processing (monotropism) as one of their involuntary adaptations to avoid sensory overload or hypersensitivity. For example, when their vision is overwhelmed (has become hypersensitive, distorted and/or painful), they might touch something and 'send the information through a different sensory channel', thus 'getting a break' for their eyes. Switching between the channels give them an opportunity to be aware, though partially, of what is going on around them, through the sensory modality available to them at the moment.

What we can do to help:

- *A person who monoprocessees may have problems with multiple stimuli. Find out which channel 'is open' at the moment and reduce all 'irrelevant stimuli'.*
- *Always present information in the person's preferred modality. If you are not sure what it is or which channel 'is on' at the moment (in the case of fluctuation), use multi-sensory presentation and watch which modality 'works'. Remember, though, that they could switch channels.*

- **Peripheral perception:**

“Autistic people often glance out of the sides of their eyes at objects or other people. They have very acute peripheral vision and a memory for detail that others miss. Gazing directly at people or animals is many times too overwhelming for the autistic one... It can feel creepy to be searched with the eyes” (O'Neill)

One of the characteristics of ASD is avoidance of eye contact. It is an example of peripheral perception, as it turns out that avoidance of direct perception is not restricted only to vision but also includes other sensory systems. Direct perception in ASD is often hyper. It can cause sensory overload resulted in switching to 'mono'. Some individuals with ASD actually hear (= understand) you better when they are not looking at you!

Some people seem to be hypersensitive when they are approached directly by other people. For some, if they are looked at directly, they may feel it as 'a touch' - sort of 'distance touching' with actual tactile experience.

Individuals with peripheral perception often seem to look past things and appear to be completely 'absent' from the scene. However, it could be their attempt to avoid experiencing visual/auditory stimuli directly. This strategy gives them the ability to take in sensory information with meaning. Avoidance of direct perception for them is another involuntary adaptation that helps them to survive in a sensory distorted world by avoiding (or, at least, decreasing) information overload.

They can often understand things better by attending to them indirectly, for example, by looking or listening peripherally (such as out of the corner of one's eye or by looking at or listening to something else). In this case it is a kind of indirectly-confrontational approach in contrast to 'normal' directly-confrontational one (Williams 1998). The same is true for other senses if they are hypersensitive: indirect perception of smell or touch are often defensive mechanisms to avoid overload.

What we can do to help:

- *Never force eye contact.*
- *Do not approach the person directly in his hypersensitive modalities. When hypersensitivity of the affected sensory channel is addressed and lessened, the direct perception becomes easier.*

- Compensating for unreliable sense by other senses

Because of hypersensitivity, fragmented, distorted perception, delayed processing, sensory agnosia, one sense is never enough for people with ASD to make sense of their environment. For instance, in the case of visual problems, they use their ears, nose, tongue or hand to ‘see’, i.e. they compensate their temporary ‘blindness’ through other senses. Thus, a person can tap objects to produce the sound and recognize what it is, because visual recognition can be fragmented and meaningless. Some individuals smell people and objects to identify them. To many people with autism the senses of touch and smell are reported to be more reliable. Some people with autism touch and smell things, others constantly tap everything to figure out where the boundaries are in their environment.

What we can do to help:

- *It is important to let the individuals use the sensory modality they prefer to ‘check’ their perception.*
- *With appropriate treatment and environmental adjustments to decrease hypersensitivities they gradually learn to use their sense organs properly - eyes to see, ears - to listen, etc.*

However, the ‘compensating sense’ may become easily overloaded as it does 2-3 “jobs” simultaneously. For example, touch may compensate vision (if distorted) and hearing (if overloaded or hypersensitive and eventually shut down) and continue to serve as a tactile channel.

Sensory Perceptual Profile

No two autistic people appear to have the exactly the same patterns of sensory perceptual experience.

Differences in perception lead to a different perceptual world that inevitably is interpreted differently. We have to be aware of these differences and help people with ASD to cope with painful sensitivities and develop their strengths (‘perceptual superabilities’) that are often unnoticed or ignored by people without ASD.

Teachers and other professionals who work with individuals with ASD need to recognize sensory differences in ASD in order to select appropriate methods and plan intervention for these people.

As all the senses are integrated, the deficiency in one may lead to disturbances in the other(s). It is, therefore, necessary to find out which sense(s) and to which extent is deficient, and which senses can ‘be relied on’.

The sensory-perceptual profile of a person could be a starting point for selection of methods and, probably, working out new ones, in order to address the individual needs of each particular child.

Table 1 summarises possible sensory experiences in autism singled out for the Sensory Profile. Different colours are used for 7 senses. The extent to which is channel is affected is demonstrated in special graphs—‘rainbows’ (Figures 20-21).

Whatever educational approach is implemented (TEACCH, Applied Behaviour Analysis,

etc.) sensory interventions are vital in order for the person to benefit from it. To effectively teach and treat individuals with ASD it is necessary to understand how the qualitative differences of sensory perception associated with autism affect each particular person. Often it is not the treatment and the number of hours you work with the individual, but in 'what perceptual world' you both are, i.e., whether you are in one and the same perceptual world or in two different ones.

The unique characteristics of each person will require unique individual strategies, techniques and environmental adjustments to be implemented. As sensory profile of each individual is unique, what works for one individual may be not only painful but also harmful for the other.

We often do not understand the 'autistic perspective', the problems they experience. And sometimes our 'treatment' does more harm than good.

The sensory environment is very important for people with ASD. They lack the ability to adjust to sensory assaults other people accept as normal. If we accommodate it and try to 'keep it clean' in order to meet their very special needs, the world could become more comfortable for them. With sensory needs met, problem behaviour becomes less of an issue. If there were no danger to be attacked, you would not need defence.

Hopefully, this reconstruction of the sensory world of ASD will give some idea of the way people with ASD perceive the world and will make them assume that the way we see the environment is not necessarily the only way to see it.

"Learning how each individual autistic person's senses function is one crucial key to understanding that person" (O'Neill)

For more information:

Bogdashina O. (2003) *Sensory Perceptual Issues in Autism and Asperger Syndrome: Different sensory experiences—different perceptual worlds*. Jessica Kingsley Publishers.