Sensory processing differences in the classroom

School resources

The world is multisensory, meaning that we are constantly bombarded with external information in the form of sound, vision, touch, taste, and smell. We also receive vestibular (bodily motion) and proprioceptive (bodily awareness) information from within our own bodies. These seven senses are used to detect and process information to make sense of the world around us, and to generate an appropriate (usually automatic) response. For example, if we see a cyclist heading towards us at speed, we use this visual information to step out of the way, the smell of stale milk gives us the cue that it is not safe to drink, and the sensation of a full bladder signals us to go and find a bathroom!

Sensory processing plays an important role in development, with many higher-order processes such as language skills, spatial perception, and cognition relying on the development of the sensory system. As with all aspects of development, there are individual differences in the way these systems develop, and in the way that people interpret sensory information. Research categorises these differences in relation to both sensitivity and self-regulation[1].

Sensory sensitivity describes the differences in our threshold for noticing and responding to sensory stimuli. Someone with a low sensory threshold or hypersensitivity might notice the feeling of a label in their clothing against their skin. This is because their body and brain need very little stimulation to activate a neural response. By comparison, someone with a high neurological threshold or hyposensitivity may not notice that someone is talking to them, because they need increased stimulation, such as hearing their name, for this sensory activation to occur.

People also have different self-regulation strategies which lead them to behave differently in response to sensory stimuli. Someone with an active strategy may take action to adjust based on their sensory needs, such as putting their hands over their ears in response to a loud noise, whereas someone with a passive strategy may react with frustration due to an inability to self-regulate. Everyone experiences and interprets the sensory world differently. However, for some people, the way their body and brain process sensory information can make the world a difficult place to navigate, particularly if the environment they are in does not meet their needs or presents challenges for them. Read more about sensory processing differences in young children here.

Potential causes of sensory processing differences

Very little is known about why sensory processing differences exist. As with any psychological or behavioural difference, there are likely to be multiple factors at play rather than one identifiable cause. One explanation might be that differences in the brain lead to differences in sensory processing. For example, neuroimaging studies have shown that people with increased sensory processing difficulties have differences in the parts of the brain associated with controlling the speed at which information is transferred[2]. Some research has also suggested that sensory processing differences may be genetic, meaning that it could run in families.

Sensory processing differences and neurodiversity

'Sensory processing disorder' refers to difficulties with receiving, interpreting, and responding to information from the senses. Although this is no longer recognised as a distinct medical condition,

research has found that neurodivergent people, such as autistic people or those with a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) or Developmental Co-ordination Disorder (DCD), are more likely to experience differences in the way sensory information is experienced and processed. This is known more widely as **sensory processing differences.** Most research investigating sensory processing differences has been conducted with autistic young people and adults, so this will be described below as an example of what sensory processing differences might look like for neurodivergent people.

Sensory processing and autism

Sensory processing differences are part of the diagnostic criteria for autism, alongside other characteristics such as social communication differences and repetitive interests (see our overview of autism for more information). Not only do autistic children differ from non-autistic children in relation to sensory processing, but there is also **huge variability from one autistic child to another**. Most commonly, children are described as being either 'sensory seeking' or 'sensory avoiding'. Someone who is sensory seeking might seek out or make loud noises, or might be quite tactile and enjoy running their hands across different types of surfaces. This indicates hyposensitivity. Someone who is sensory avoiding is likely to be hypersensitive to certain stimuli, and may find noise or bright lights uncomfortable. Their reaction to these stimuli will vary depending on their self-regulation strategy, but could range from attempting to leave the environment, covering their ears or eyes, or more extreme reactions due to frustration or distress.

Autistic children (like other neurodivergent children) may also be **hypersensitive to some types of stimuli, but hyposensitive to others**. As described above, their sensitivity may also vary depending on their level of stimulation and how well they are able to self-regulate. This has also been linked to uncertainty[3] – autistic children may be able to manage sensory overload in a familiar environment, but in an unfamiliar environment this could lead to an extreme reaction like a meltdown. Knowing a child's triggers and managing their anxiety around uncertainty may help to identify how to support them.

Cognition, behaviour, and anxiety

Sensory processing has also been found to be related to the way people think and behave. Attention is often implicated, given that those who are differentially sensitive to sensory stimuli can become highly distracted. For example, some studies have shown that complex visual displays on classroom walls can negatively impact learning outcomes for autistic students[4]. Sensory processing is also related to executive functions such as inhibition, planning, and working memory. For example, children with increased sensory processing difficulties score more poorly on measures of inhibitory control[5]. This might mean that children with sensory processing differences also have difficulties inhibiting their actions and emotions, or may behave impulsively, which in extreme circumstances could appear in the form of aggression.

Given that regulation of emotions may be difficult for those experiencing sensory sensitivity, it is unsurprising that anxiety is also implicated. Sensory overload often leads to distress in the moment, but research has also found that overall anxiety levels are higher in children with these sensory sensitivities[6]. One explanation could be an intolerance of uncertainty, where sensory input that is unexpected or unfamiliar causes distress. Anticipation of this may also lead to heightened anxiety, causing a negative cycle that is difficult to break. For example, someone sensitive to sound might feel unable to enter public bathrooms due to anxiety around noisy hand dryers, as not knowing if or when the noise might happen can be highly distressing.

Sensory processing at school

Sensory demands are high in schools and research has shown that differences in sensory processing are related to achievement[7]. Negative sensory experiences at school can lead to distress, causing distraction and disengagement from learning[8], which may result in longer term high anxiety levels due to the unpredictability of the school sensory environment. School is a multi-sensory environment, which means that there are many scenarios in which children with sensory processing differences may experience barriers to learning. The visual environment is one example. Research has shown that classroom displays are related to learning, in that either too much or too little visual complexity in the classroom can lead to poorer academic outcomes[9]. Finding a middle ground is important, and might include thinking about where to position displays, the type of content to display, and the design elements (such as colour, vibrancy, and complexity).

Supporting children with sensory processing differences

Although every school is likely to have several students with sensory processing differences, there is still little research-based evidence for how best to support them[10]. That said, there is much to be gained from educational practice and, as a consequence, this section is mostly practice-informed.

The support that a student with sensory differences might need is very much dependent on their pattern of sensory processing (sensory seeking, sensory avoiding), as well as the sensory domains (such as vision or touch) to which they are sensitive. For example, a student might be hypersensitive to touch but hyposensitive to sound. This might present as being uncomfortable when sitting too close to their classmates, but comfortable in a noisy classroom environment. The context may also play a role in determining how they respond to sensory sensitivity: for example, they may be able to self-regulate during lessons they enjoy, but not when they are engaging in learning that they find challenging. It is vital to **involve the student and their family in discussion around triggers and potential solutions**, which can provide them with a sense of control and help teachers to understand their needs and identify potential strategies of support.

Many children with sensory processing differences may also struggle to recognise the physical and emotional signs that they are over- or under-stimulated. This is related to difficulties with proprioception (bodily awareness) and alexithymia (emotional awareness), which are also common for children with sensory processing differences[11]. A student who is sensitive to noise, for example, may not make the connection that their body becomes tense and they feel stressed when the class next door are having a music lesson. Supporting the student to identify these signs will give them agency and support their ability to self-regulate.

Environmental adaptations can also be made, such as dimming the lights for a student sensitive to light, or thinking about where the student is seated in the classroom based on how they respond to different aspects of the environment. A variety of seating options such as wobble cushions, carpet seating, or bean bags allows for choice in different contexts. Ear defenders or noise-cancelling headphones may support students who struggle with auditory filtering, allowing them to focus in situations where noise is uncomfortable or distracting. Some students may benefit from being given opportunities to engage in sensory seeking behaviour such as using fidget toys or stimming. Freedom to move around the classroom, or even between classrooms, can also help children to self-regulate. This could be as simple as asking the student to collect some printing, or giving a message to the teacher in the classroom next door. It is important to remember to **consult students before offering any of these environmental adaptations**, as they may feel uncomfortable at being singled out. Consider also whether some

adaptations, such as the use of headphones, may be offered more to all students rather than just to those with sensory processing differences.

If the young person's response to sensory processing is related to anxiety and intolerance of uncertainty, as described above, reducing uncertainty in certain contexts may help. This might include giving forewarning of certain activities to allow the student time to process and prepare for changes in sensory stimulation. Critically, some strategies may work for some children and not others, or in certain contexts but not others. Regular communication with students and their families, and an ongoing process of consultation and collaboration, can support this process of discovery in a way that helps minimise the student's anxiety.

Endnotes

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