

Supporting children with sensory processing differences in early childhood



ECE resources

Sensory processing is a **neurological process** in which the brain registers sensory information, and then selects, interprets, organises, and associates information in order to develop appropriate responses to situations and tasks. It requires both the accurate **discrimination of sensory information and the ability to give meaning to sensory stimuli** (for example, to identify letters, or the sounds heard, or the location of one's body in space), as well as the ability to **adjust responses to stimuli** in ways that are not over- or under-reactive (this is called modulation)¹. Almost every human activity depends on a complex process of receiving and organising sensory information received from the body and environment. Sensory information is obtained from seven senses: sight, smell, hearing, taste, touch, vestibular (sense of balance) and proprioception (body awareness through messages from muscles, joints and receptors throughout the body).

Human brains need a sufficient amount of sensory input to activate the nervous system, and the neurological thresholds of individuals are on a continuum from low to high². In other words, there is a great deal of variation in the way that different people perceive and respond to sensory information. Some people have a **low threshold** or heightened sensitivity to sensory information through particular senses, which means they pick up and respond to tiny sensory details, while other people may have a **high threshold** for particular kinds of sensory information, and are less likely to notice or react to information through that sense.

Children with **sensory processing differences** [SPD] may register and process sensory information from their bodies and the environment in unusual ways³. These differences may occur with any one or a combination of senses, with consequences for children's behaviours, emotions or patterns of attention⁴. Children with a high threshold for sensory information require very strong stimuli to activate their nervous system, and may miss certain stimuli, or deliberately seek out stronger sensations. Children with low thresholds will notice and respond to very subtle stimuli more readily. They may perceive everyday sensations to be annoying, unpleasant, or painful. They may struggle to use the brain's mechanism for suppressing and filtering out irrelevant or repeated stimuli (sensory gating)⁵ to regulate the intensity of sensory signals they receive. This means they may not be able to ignore the humming sound of fluorescent lights once it has been detected. Thresholds can be different for different senses (in other words, a child may have a low threshold for aural input and a high threshold for touch)⁶, and children can also have difficulty with combining sensory information from different senses (known as multisensory integration)⁷.

SPD occur as a result of specific neurological structures⁸. Processes such as sensory gating and multisensory integration have a developmental course which begins early in infancy⁹. These processes mature differently for children with SPD. These differences are reflected in infants' early behaviours, and are likely to persist until at least eight years of age¹⁰. SPD are not due to poor parenting or behavioural disorders¹¹, although children born prematurely are more likely to have SPD¹². SPD can exist independently¹³ or be part of another diagnosis, such as autism or attention deficit disorders¹⁴. There are different types of SPD, and difficulties can be at varying degrees. For example, children can have difficulties with sensory modulation (the ability to adjust responses to stimuli) or sensory discrimination

(the ability to accurately identify and interpret sensory information). They may also experience sensory-based difficulties with motor skills (including dyspraxia or Developmental Co-ordination Disorder)¹⁵.

What might we notice about children with SPD?

Because sensory processing is a management system that enables sensations to be experienced and processed in a calm and organised way, when the flow of sensations is disorganised, children can feel very chaotic. This may involve a variety of symptoms and behaviours. Behaviours that children engage in as a result of differences in sensory processing should be seen as the child's attempts to cope with sensory stimulation in order to prevent discomfort. Sensory processing difficulties can also cause disruption to sleep patterns¹⁶, as well as issues such as abdominal colic¹⁷. The challenges of sensory processing may fluctuate across the day and from day to day, and in different contexts.

Children with sensory over-responsivity can be sensitive to even the lightest of touches, loud sounds, strong smells, tactile sensations (such as those involved in paint or messy play, or from particular clothing), self-care activities such as face and hair washing, and brushing teeth, or certain textures in food¹⁸. They may be overwhelmed by and avoid group activities, busy environments, bright light, or eye-contact¹⁹, and be fearful, irritable, anxious, and hyper-vigilant, or alternatively stubborn, wilful, and inflexible²⁰. Negative emotional reactions to sensory stimuli are common and children may be more emotionally reactive, for example, with rapid, prolonged, and intense emotional responses²¹. They might react with panic if someone bumps into them, or over-react to pain. They may be challenged by wearing particular kinds or textures of clothing. They might avoid particular movement activities, such as climbing and balance activities, or move stiffly due to sensitivity to changing body position. They often have poor self-regulation skills and may display regular 'fight' (tantrums, crying, or aggression) or 'flight' (hiding or running away) behaviours.

Children with sensory under-responsivity, on the other hand, will exhibit fewer or delayed responses to stimuli, including pain or hearing their name called²². They are often unresponsive and unaware - for example, they might not be aware that they have a messy face or have dropped something. They might be clumsy, uncoordinated, and accident-prone too, perhaps bumping into things or falling out of chairs, or using too much force without realising it. They often get too close to others, having a decreased sense of personal space. Children can also be disinterested, socially withdrawn, lethargic, and sleepy. They may not have any motivation to be active.

Children with sensory-seeking behaviours will be extreme in seeking out sensations, such as seeking or making excessive noise, preferring strong smells and tastes, touching everything (including by being barefoot), crowding and touching other people, knocking peers over, or rubbing and pinching the skin of their caregiver²³. They might take extreme risks, and seek intense movement experiences, such as spinning, running, climbing, or deliberately bumping or crashing into things using excessive force, or seek pressure through wrestling, pushing, pulling, and being squashed. They can appear aggressive. They are likely to be constantly moving, perhaps constantly chewing their shirt, mouthing objects, or fiddling with something. They may engage in continuous humming, singing, or other vocalisations. They may struggle to calm down for quiet time and sleep.

What impact do SPD have on children's learning and development?

Children need to be able to process information from the world in order to develop academic and motor skills and to manage everyday activities. Sensory processing supports individuals to pay attention, concentrate, and perform and achieve tasks, and so is strongly related to children's academic achievements in early childhood and transition to school²⁴. Children with SPD may have difficulty paying

attention and adopting an appropriate level of alertness for a situation (whether this is playing in an early childhood setting or settling down for sleep at night). Sensory changes can cause children heightened levels of anxiety and stress²⁵. In addition, SPD may cause children to have significant challenges in translating sensory information into planning and executing motor actions²⁶, which has a negative impact on their enjoyment of activities, self-esteem, and confidence²⁷. All of these factors disrupt children's abilities to explore their social and physical environment, with negative effects on cognitive, physical, social, and emotional development.

SPD can impair children's ability to self-regulate²⁸. Although essentially SPD are physical differences in neurology, they can create emotional problems, depending on children's emotional competencies. If children can develop the skills to notice when they are becoming overwhelmed by a sensory feature in the environment, and seek an appropriate response (such as moving to a quiet corner and spending some time alone), then they will be able to cope more successfully. Without an awareness of their triggers, children may quickly become overwhelmed and express their feelings through aggression or withdrawal²⁹. As children try to regulate the negative emotions caused by SPD with maladaptive strategies, this can lead to regular and intense periods of dysregulated negative emotion, and may later develop into anxiety disorders³⁰. SPD have been shown to cause chronic stress, depression, and low self-esteem in school-aged children³¹, and SPD have also been observed in individuals with a range of psychiatric problems³². This makes it important to support children to improve their emotion regulation skills and to find ways to cope with aversive sensory stimuli.

There are many potential social impacts for children with SPD too, as social defensiveness or withdrawal, caused by a heightened response to sensory experiences (noise, proximity, touch) with other children, can lead to limited social experiences and decreased social interactions. Sensory-seeking children may act impulsively and recklessly without reasoning about the impact of their behaviours on peers. Children with SPD may therefore have impaired social skills³³.

Research has also shown the negative impact children's SPD can have on parents and siblings' mental health and wellbeing. For example, mothers of children with food sensitivities have higher rates of anxiety, depression, and low self-efficacy³⁴. Parents describe the stress and strain of their child's sensory sensitivities as being overwhelming, impacting on the whole household and often restricting family activities³⁵.

Caregiver stress and strain may impact the ability of primary caregivers to be responsive and sensitive to the child, impeding positive attachment relationships³⁶. This is important as early relationships are crucial for the early development of self, self-regulation, and the brain. Caregivers' difficulty in accurately interpreting a child's needs may lead to mismatched responses, which are experienced as caregiver insensitivity. It is possible, too, that sensory processing difficulties may impede children's ability to accept and internalise their caregivers' attempts to provide responsive care. For example, a child with sensory processing differences might pull away from a caregiver's touch, and caregivers might respond in a way that further overwhelms the child's sensory processing system.

Finally, children's SPD can cause challenges for the wider group. When children's needs for sensorimotor input are particularly great, their behaviours can cause disruption and distract others. Children and adults often engage (unconsciously) in sensorimotor strategies to maintain attention, including twirling hair, chewing gum, or crossing their legs back and forth. Children often need greater input to maintain attention, as their nervous system is still developing, and children with SPD (particularly sensory seekers) may need even more sensory input to self-regulate their attention³⁷. They may move excessively. They may be unable to sit still, feel an urge to disturb others, or be distracted by other stimuli, impacting on their own and other children's ability to participate in activities.

How can teachers support children with SPD?

Children with SPD need a lot of support in order to feel comfortable and be able to learn in an early childhood setting. Teachers can help increase a child's quality of experiences. Children with SPD should be provided with a balance of active and quiet activities and opportunities to engage in their favourite sensory experiences to support them to settle and be ready to participate, interact, and learn. Movement can help calm and regulate children's sensory systems, especially activities which provide pressure through the muscles and joints (jumping, pushing, pulling, and lifting)³⁸. Swinging and spinning can calm some children and arouse others. These supports should be readily available and implemented when a child's arousal is too high or too low.

Some environments may need to be avoided or altered for children with SPD, particularly environments that are bright, noisy, congested, smelly or, in contrast, underwhelming³⁹. Social and behavioural expectations might be reduced to better suit children's capabilities - for example, rather than expecting children to sit still and listen, instead encourage movement breaks and opportunities for sensory input. Incorporating movement breaks might be as simple as challenging all children to engage in animal walks (walking in the mode of a specific type of animal) or a yoga move. Visual sensory input might be reviewed by examining lighting, colours, and the amount of artwork, colours, and images displayed on the walls, as well as the sound levels of the setting, including the volume of teachers' voices. A very quiet voice is more effective than a loud one in helping children to regulate⁴⁰.

Children who are very sensitive to sensory input will require a more soothing and regulating environment, with slower transitions and patient and understanding caregivers. Busy and noisy environments will overload these children and leave them anxious, which may lead to nightmares, aggression, or withdrawal⁴¹. They may need a quiet corner in which to engage in a calming activity with one other child. With the right kind of soothing and regulating environment, children can learn to manage sensations and these can be gradually increased. Calming activities and environments include deep pressure massage, sitting on bean bags or body pillows, bear hugs, slow rocking, soft lighting and quiet music, chewing or fidget toys, stretching, rhythmic movement patterns, and relaxation exercises.

Children who are under-responsive to sensory input are likely to be self-absorbed, and may play by themselves. They may require highly energised interactions and encouragement to engage⁴². They might become more alert through actions like tipping the head upside down, perhaps through a game of *Heads, shoulders, knees, and toes*. Other possible activities and adjustments include firm massage, tickling, chewing gum or crunchy foods, cold water play, and pushing, pulling, and lifting. Also useful are jumping, running, skipping, swinging or trampolining, bright lighting, strong odours and tastes, loud music, dancing, and general exercise⁴³.

Children that crave sensory input are likely to benefit from soothing and regulating environments that are well-structured. Many of the activities for energising under responsive children are likely to be suitable for providing the sensory input these children need to regulate. Getting children to give themselves a hug provides lots of sensory input through the muscles and joints and can help with self-regulation⁴⁴. Children who crave sensory input need strong relationships with adults, who know them well and can support them to translate their actions into more appropriate strategies and language.

Teachers need to be highly responsive to children's needs which may fluctuate depending on whether any triggers have been present. This means looking carefully at what children are doing and what their actions suggest about their sensory needs. Children can be taught ways in which to cope with their personal challenges with sensory processing and begin to implement the strategies themselves. It is also supportive if teachers and families share the same understanding of the child's needs and the strategies being used to support them.

Sensory diets

Sensory diets are a set of sensory input activities that are tailored to meet the individual sensory needs of children with SPD, so that children receive the particular quality or quantity of sensory experience they require to be settled, focused and skilful in everyday activities. The aim is to support the child's nervous system to function at its most optimal level, and enable the child to better participate in daily activities. It is also thought that through carefully planned, purposeful, and playful activities, children can learn to make more appropriate responses to environmental and situational sensory demands. For example, some research has reported significant improvements in children's aversion to touch and orientation to sound as a result of participation in sensory activities⁴⁵.

While teachers and parents often perceive children as needing and benefitting from sensory-based supports, research on the effectiveness of sensory diets is limited and results are mixed. For example, while one study noted a reduction in children's aggressive behaviours, another study did not⁴⁶. Weighted vests have been found to increase purposeful play in some studies, while showing no effect in others⁴⁷. This may be due to different definitions and measurements of different outcomes across studies. Although there is limited research focused on pre-school children, alternative seats, such as therapy balls and air cushions, have been found to improve attention for school-aged children⁴⁸. There is no supporting evidence for sensory supports such as body brushing, deep pressure, joint compressions, and therapeutic listening⁴⁹.

Research into sensory-based interventions using a single sensory strategy, such as a weighted vest or a therapy ball, have found few positive effects⁵⁰. This might be because the strategies were not well-matched to the individual learners. Studies using a variety of sensory input activities have had better effects. A study using a rocking horse, weighted vest, clay, tactile wedge, and ball chairs reported significant improvements in children's measured activity levels (reducing behaviours such as foot swinging) and engagement, as well as anecdotal evaluations by teachers that reported better emotional behaviour and attention⁵¹. Another study that planned individualised activities for children noted positive responses for each child that extended beyond the duration of the course of activities, suggesting that children learned coping behaviours⁵². A follow-up study confirmed positive changes in targeted behaviours including improved engagement and a reduction in maladaptive behaviours (such as talking inappropriately) for children who received regular input through sensory activities⁵³.

Research in clinical settings shows that the use of sensory-rich, child-directed activities to challenge children's sensory processing skills and increase their ability to process and integrate sensory information has positive effects, and reduces negative behaviours linked to SPD⁵⁴. Some research shows that sensory processing supports used in inclusive early childhood settings are more effective than those used in twice-weekly clinic treatments⁵⁵.

It is important to be careful about using these supports for which there is no supporting evidence, which leaves less time for more evidence-based practices. There is no one-size-fits-all, and many of the supports that an individual child with SPD will need will be very specific to that child. Sensory diets need to be planned with the support and advice of an occupational therapist with experience in the area of SPD. Teachers can observe and document children's reactions to different environments and sensory activities, and share these with professionals to help identify children's patterns and triggers. It is also helpful to be really clear about specific goals for children related to the use of particular strategies to support their sensory needs, and to collect data about children's progress towards these goals, so that you can gauge the effectiveness of a particular strategy over time and modify it as necessary.

Endnotes

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