sensory processing, part 5

See, hear

How sight and hearing work, their effects on children's development, and spotting problems. By Anne O'Connor and Dr Kath Dickinson

PERCEPTION Both the eyes and the ears pick up

ight and hearing are the two senses that often come to mind first when we think about sensory experience, but there is a lot more going on than just 'looking' and 'listening' when it comes to these two senses.

Although our eyes will be open a few minutes after birth, our hearing will have introduced us to the outside world from within the womb, well before we were born. The ability to respond to sound very early on is part of a newborn's survival kit, helping them acclimatise to their surroundings and recognise the familiar, while their other senses are still very much in early development (McConnell and McCarthy 2014). Our instinct to connect with the 'bump' through talking, singing and listening to soothing music actually makes a lot of sense.

DEFENSIVE AND DISCRIMINATIVE

Just like the other senses, sight and hearing have both a defensive and a discriminative function and the defensive component comes into play first. This is why babies are easily startled by loud noises or bright lights, letting us know very clearly that they don't like them. Gradually, with increased

interaction with our environment and the positive experiences that come with warm, attuned relationships helping us to regulate our reactions, our brain learns what sights and sounds are okay and won't harm us.

auditory messages. This is quite complex, because there are several aspects to both visual and auditory perception that depend not just on the mechanics of the eyes and ears working well (acuity), but also the strong neural connections that are made in the brain, often through links with other senses.

information from our environment

all the time, but the brain needs to

learn what to do with this

involves the brain learning

information. Perception

interpret and analyse all

to recognise, sort,

these visual and

SEEING

As well as the ability to focus clearly and control eye movement, the eyes also have to be able to work together as a team (binocular vision) to allow us to see in 3D (depth perception) and to keep the eyes still enough to focus on an object (fixation).

Sight also involves the development of:

- visual attention to filter out unimportant background information and focus on what vou need to see
- visual discrimination to determine differences and similarities (for example, size, colour and shape)
- visual memory/sequential memory – to recall visual aspects/sequence of visual information in order
- something in a busy background visual closure – to recognise an image when part of it is missing.

Hearing and sight involve more than just listening and seeing

Visual and

auditory

develops

gradually

through

human

connection

and playful

experience

fluent reader's skillset as it allows them not to have to look at every letter visual form constancy - to know something is the same even if it is smaller, in a different

- position, etc visual directionality and spatial vision – to understand how an object is positioned in space **visual motor integration** – to
- enable the eyes and body to work together (for example, hand-eye co-ordination).

HEARING

Similarly, hearing involves the development of various skills:

- **auditory discrimination** to determine the differences in sounds (vital for sound-letter correspondence, music, languages, etc)
- **auditory figure ground** to tune in and tune out to sounds depending on their relevance
- auditory tracking to distinguish where a sound is coming from (auditory location); to anticipate, predict and react to sound (auditory context); to interpret a sequence of sounds as in speech, music etc (auditory sequencing).

HEALTHY DEVELOPMENT

Visual and auditory perception develops gradually and developmentally through human connection and playful experience, as children's bodies mature and their ability to engage with the world around them increases. Vision is particularly linked with early movement development because, as toddlers, we need to look at our limbs when we use them, until our developing proprioceptive sense allows us to perform movement tasks automatically and skilfully. When we consider how



For later academic learning to be successful, we have to take into account that sensory perception is developmental and unique to the individual. This means that both the body and the brain need to be ready before such things as sound-letter correspondence (for example) can be acquired.



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We also come to recognise those that we can enjoy and make the most of, as we learn more about the world around us. If all goes well, our other senses interact with our sight and hearing to enable our visual and auditory abilities to

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- perception

- visual figure ground to spot
- This is an important part of a

about this series

Our five external senses (touch, sight, hearing, smell and taste) and three internal senses (interoceptive, vestibular and proprioceptive) are constantly sending messages to our brains - a process that we often barely register. Yet this sensory information is vital in helping us understand and make sense of the world.

Typical sensory development occurs naturally in childhood. However, for some children this doesn't happen, causing sensory processing difficulties that impair development and are manifested in children's behaviour.

Advice and support Part one of this series provides an introduction to typical and atypical sensory processing and integration. The rest of the series looks at the senses individually, explaining the causes, symptoms and effects of sensory problems and giving advice on how to adapt provision and practice to address a child's sensory difficulties.

Series authors

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PROCESSING PROBLEMS

A range of problems can occur with visual and auditory processing, some of which are linked to other conditions or learning disorders such as autism, but not exclusively. These include:

- defensive behaviours (reacting and avoiding certain kinds of light or sounds) or sensoryseeking behaviour - where the child is excessively drawn to certain sights and sounds. These children like the volume up and making lots of noise themselves, or are fascinated (and easily distracted by) bright lights and colour and 'busy' visual stimulation (for example, TV)
- poor visual or auditory discrimination - where the child appears not to understand or interpret what they see or hear. As well as struggling to distinguish images and sounds, register details and identify differences and similarities, they may also misread important cues in social interaction as they don't 'read' facial expression or tone of voice
- distractibility as the child finds it hard to filter out visual or auditory distractions refusing or avoiding activities >>

WHERE TO **BUY PRODUCTS**

Suppliers that offer a range of tactile resources include:

- SpaceKraft https://bit. ly/2WCzuOS SensoryPlus https://bit.
- ly/2UsyMpY • Early Years Resources https://bit. ly/2JZeKiL
- Learning Resources https://amzn. to/2Iaxb1B
- Sensory Education https://bit. ly/2YMXW1S
- Rhino Sensory UK https://bit. ly/20IMTCd Explore Your
- Senses https:// bit.ly/2YL9AKQ

sensory processing, part 5



that cause them discomfort or anxiety – or often going 'off task'.

Poor auditory processing A child with poor auditory discrimination might:

- be unable to locate or track where a sound is coming from
 have trouble recognising some
- sounds
 struggle to recall and repeat
- struggle to recall and repeat words, phrases, instructions, lyrics, etc
- not hear the difference between high and low sounds, pleasant or angry voices, etc
- have a poor sense of rhythm and timing when clapping or singing.

It might also affect their receptive language ability so that they:

- struggle to discriminate similar-sounding words, especially consonants at the end of words (for example, bad/bag)
- look to others to respond first to questions
- ask for things to be repeatednot register when they need
- more information
- struggle to recognise rhyming words
- find it hard to learn languages.

If their expressive language is affected they might:

- struggle to get their thoughts out in speech or writing
- not stay on topic when talkinghave poor vocabulary and use
- immature sentence structurestruggle with spelling and reading out loud

need more time to respond when listening and talking.

Poor visual processing When there is a problem with

- complain of headaches and sore eyes, blurred or double vision or
- that the words move on the page move their head when reading
- find it hard to shift gaze from one thing to another, so find copying from a board difficult
- struggle to focus on stationary objects but also find it hard to follow moving objects
- often lose their place on a page and use their finger as a marker.

A child with poor visual discrimination might: struggle with depth perception

- stragge with depth perception (seeing things in 3D)
 become overwhelmed easily
- where there is lots of movement as they struggle to discriminate what is moving and what is still
- have trouble with spatial relationships, judging distances, and understanding concepts of position such as up/down
- struggle to find their way in new places and find it hard to follow patterns, maps, etc
- find team sports a challenge when position and movement matter
- have difficulty distinguishing objects
- get confused by beginnings and endings of words (for example, tree/three)
 find it hard to line up letters,

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Some children are over- or undersensitive to light and sounds

→ REFERENCES AND FURTHER READING

- The Out of Sync
- Child by Carol Stock Kranowitz Raising a Sensory Smart Child by
- Lindsey Biel and Nancy Peske Sensory Integration and
- the Child by A Jean Ayres • A Moving Child is
- a Learning Child by Gill Connell and Cheryl McCarthy
- Understanding Physical Development:

Linking bodies and brains by Anne O'Connor and Anna Daly keep them the same size (form constancy) reverse letters and words

- struggle to differentiate objects in the foreground/background (visual foreground), so struggle to find a face in a crowd or a
- specific word on a page
 not know how something feels just by looking at them (for example, kittens are soft and furry) so has to touch.

Where poor visual skills are linked with poor motor skills (visualmotor skills), the child might: display poor hand-eye and

- foot-eye co-ordination, so may have difficulty using tools, getting dressed, etc
- struggle to write within the lines
 find fine motor tasks such as cutting/sticking and playing with small-world toys a challenge
- have poor balance and body co-ordination, so have difficulty with sports, movement and rhythmic activities

(adapted from Stock Kranowitz 2005).

These issues can also lead to tiredness, particularly after a long day, as well as a lack of confidence and a subsequent lack of motivation and poor self-esteem.

NB: Clinical assessments of sensory processing issues must be carried out by an appropriately qualified occupational therapist. Always seek advice and guidance if you are concerned about a child.

SUPPORTING VISUAL AND AUDITORY PERCEPTION DEVELOPMENT

At SEND to Learn Nursery we have had a number of children with visual and hearing issues, often linked with medical conditions such as autism, Angleman syndrome or Down's syndrome.

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Visual sensitivity

One child was over-sensitive to light and constantly turned lights off. One solution was to replace our light switches with dimmer switches, so that he could still control the amount of light and we could help him accommodate other children who required more light. This was important for his home life, as his brother was under-sensitive to light and needed the lights on, so home life was proving difficult for mum. She also introduced dimmer switches, which helped alleviate the problem.

At nursery, we always had dark spaces for him to use. So, you might have found him sitting in a box with the lid closed, in a tub with a blanket over his head, or in our 'egg chair' with the cover down while listening to a story or in a group activity. This allowed him to focus without the distraction of too much light when his tolerance levels were low.

This child also had a diagnosis of autism, so when he was finding life too much, we would provide a den, box or tent that blocked out the light when he climbed inside and this would help to calm him. Our sensory room has blackout blinds and we also have 'blackout goggles' which he could access. We slowly introduced him to sensory lighting and the control of the dimmer switch control, which helped reduce emotional reactions and helped him focus.

Another of our children was under-sensitive to light and wanted to shine bright lights into her face, which could have caused eye problems. So, we allowed her to play with torches but put covers on them to reduce the intensity of the light. We also used coloured light bulbs in some rooms to reduce the light intensity, and allowed her to access all of the light sensory equipment and toys that we have in nursery. She still likes bright light but now she will shine a torch onto her hand or arm instead of into her eyes.

Visual acuity

One of our little girls has problems with her visual acuity, meaning that she finds it difficult to distinguish between objects of similar colours. To address this, we use bold colours, plain backgrounds, uncluttered pictures and colour-differentiated resources (for example, an inset puzzle that has pieces differentiated by bold colours). When assessments are carried out involving other professionals, we will remind them to use clearly differentiated resources as it may be the resources that are the issue, not her ability to complete the task.

Depth perception

We have had children with depth perception problems, which means they find it hard to know where their body stops and the furniture, ground or other objects begins. This leads to difficulty in walking, climbing, going up steps, sitting down, etc. To support a child with this problem, we place clearly defined markers on the edges of things (such as tape on steps); plan adult-supported activities, such as step climbing; and use resources with clearly defined backgrounds and foregrounds, clear labels and, if required, we add textured surfaces.



Auditory sensitivity

Sometimes it is difficult to understand how a child with over-sensitivity to noise can be so noisy themselves and you may be faced with the comment, 'He is not sensitive to noise, as he is always making loud noises!'

There is a difference between the child having control over their own noise and hearing other sounds – and sometimes it is pitch and tone rather than level that causes the problem. Children who are over-sensitive to noise may hear sounds that others cannot, like the humming of lights.

We currently have a little boy who is sensitive just to the voice of one particular child. He finds the pitch of this child's sounds overpowering, particularly at lunch time. The solution is that the child wears ear defenders during lunch.

Other children who have been over-sensitive to noise have worn ear defenders during their normal day at nursery or just for specific activities, like singing or outdoor play. These children would also wear ear defenders when we were on visits. Some can replace their ear defenders with MP3 players with their favourite music on it, which distracts them from the noises that they were sensitive to.

We sometimes use a process of desensitisation, where children are introduced to challenging sounds for short periods of time alongside distraction/coping techniques. Sometimes a child who is noise-sensitive may trigger another child to make the noise they do not like, as this gives them some control over the timing of the noise, instead of being on 'edge' all of the time waiting for it to happen. Staff need to be aware of this and work to support the child. Quiet spaces are also available in nursery and all of our windows are double-glazed, which cuts down environmental noise.

We currently have a child who is under-sensitive to noise and likes to make loud noises and play with all of the very noisy toys. We are teaching him that we can have different sorts of voices (for example, loud and quiet) and we can make different levels of noise, so we play the instruments loudly and quietly, we move around making stamping noises or tip-toeing, we have noisy and quiet stories. This child can access the outdoor spaces where it is easier and more acceptable for him to make louder noises and we are fortunate that our sensory room used to be used as a recording studio, so it is triple-glazed and this provides a place for him to make noise without upsetting others.

Some people need background noise (how many of us

work with the radio/ music on to help with concentration?) and we have accommodated this in nursery by providing those children who need it with background music at different times of the day or in certain rooms, such as the sensory room, or with MP3 players to aid concentration

