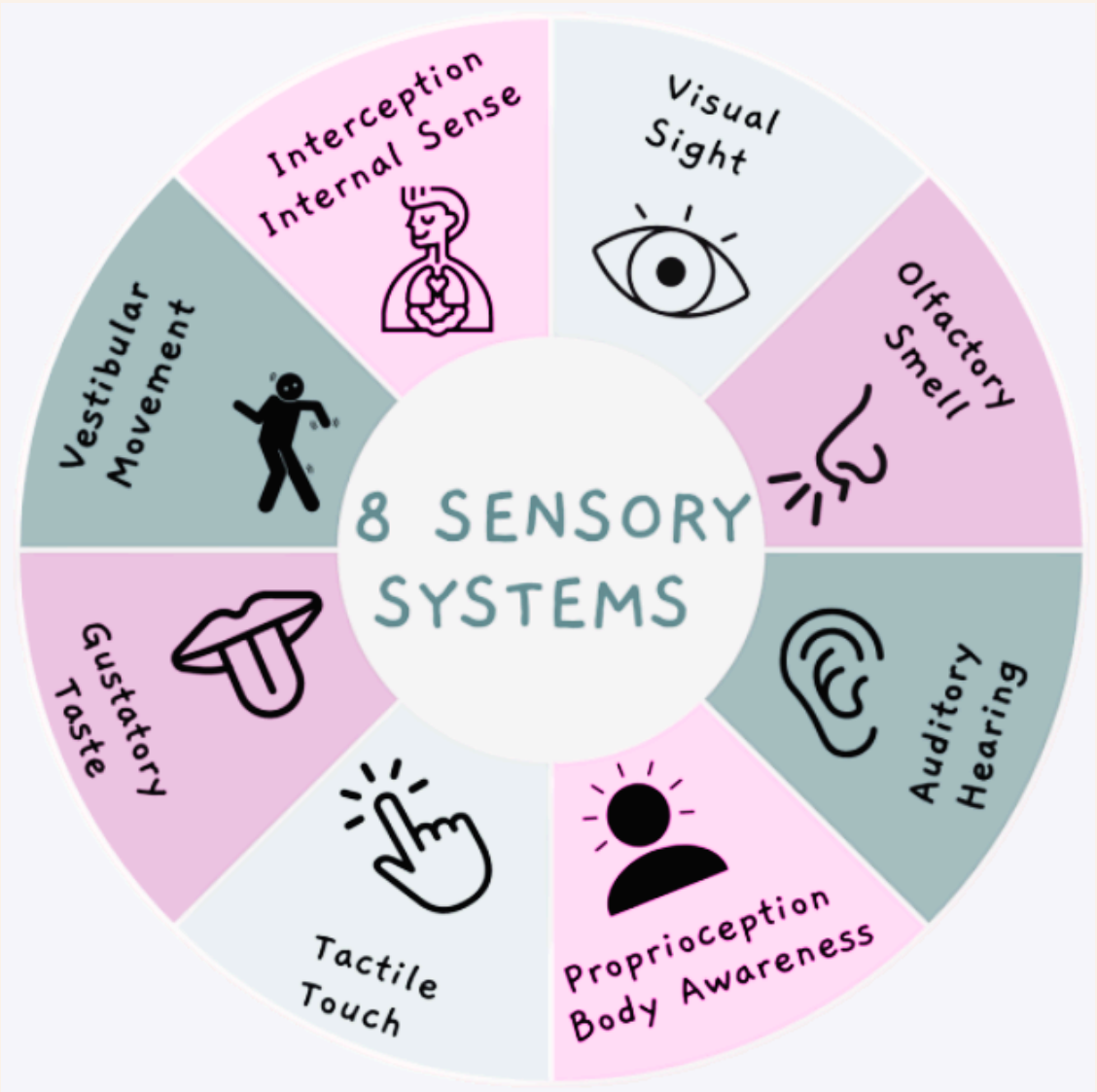
SENSORY PROCESSING

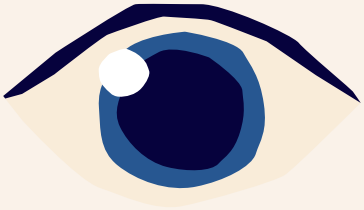
KATE BAKEWELL
SENIOR MENTAL HEALTH PRACTITIONER
MHST

CONTENTS

THE EIGHT SENSORY SYSTEMS

1. VISUAL
2. AUDITORY
3. OLFACTORY
4. GUSTATORY
5. TACTILE
6. VESTIBULAR
7. PROPRIOCEPTIVE
8. INTEROCEPTIVE


8 SENSORY SYSTEMS
Interception Internal Sense
Visual Sight
Olfactory Smell
Auditory Hearing
Proprioception Body Awareness
Tactile Touch
Gustatory Taste
Vestibular Movement



VISUAL

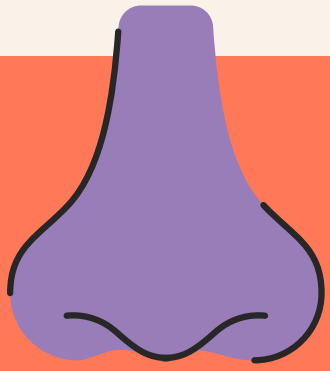
01.

The Visual System gives us information about what we see and how things look. The receptors are our eyes eyes. Visual input includes light and dark, colours, size, finding things in a cluttered space, noticing similarities and differences.

AUDITORY

02.

The Auditory System gives us information about what we hear including sounds and noises around us. The receptors are located in the inner ear. Auditory input includes music, talking, humming and background noise.



OLFACTORY

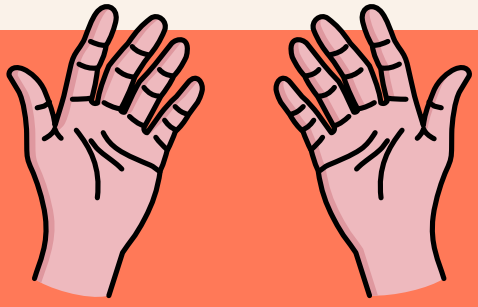
03.

The olfactory system processes smell, including identifying and filtering odours in the environment. This system has a direct connection to the emotion centres of the brain, therefore making it a powerful tool for triggering memories and feelings.

GUSTATORY

04.

The Gustatory system helps us process taste, food textures, and temperatures. Receptors are located on our tongue and mouth. Gustatory input includes: spicy, sweet, sour, savoury, crunchy, soft, hot, cold foods. Our mouth also has proprioception receptors that give us information from oral motor input (chewing, sucking, or swallowing).



05.

TACTILE

The tactile system detects sensations felt on the skin, including both light touch (a fly landing on our arm) and deep touch (a massage or hug). It's so sensitive and complex that we are able to use our fingertips to identify the shape and texture of an object without looking with our eyes.

06.

VESTIBULAR

The Vestibular System gives us information about our head and body position in space. The vestibular system is housed within the inner ear. There are fluid-filled canals that give information about the position of our head against gravity. Posture, balance, and movement rely on the vestibular system's function.

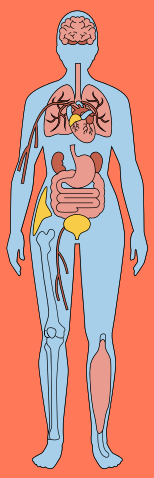
PROPRIOCEPTIVE 07.

Proprioception is our awareness of our body and where it is in space. The receptors are located in the muscles and joints and are activated during “heavy work” activities such as pushing, pulling or lifting.

eg. pressing pedals on a car with different pressures to change speed

INTEROCEPTIVE 08.

Interoception describes the internal sensations that give us clues to what we are feeling, such as body temperature, pain, hunger levels, bladder/bowel control, sickness, emotions.



eg. our stomach rumbling when we are hungry

SENSORY SENSITIVITY

HYPERSENSITIVITY (ALSO CALLED SENSORY OVER-RESPONSIVENESS) - AN "EXAGGERATED" OR **HEIGHTENED RESPONSE** TO SENSORY STIMULI

HYPOSENSITIVITY (ALSO CALLED SENSORY UNDER-RESPONSIVENESS) IS DEFINED AS A **REDUCED** OR DULLED **RESPONSE** TO SENSORY STIMULI.

SENSORY PROCESSING

also called "sensory integration," this refers to how our brain receives messages from the sensory receptors in each of the 8 systems.

SENSORY SEEKING

Sensory seekers are likely to **crave intense input** like loud music, tight hugs, deep pressure and constant movement. They may **struggle to sit still** as they are driven towards physical engagement with their environment, and sitting still can feel uncomfortable or even painful.

Sensory seekers still need a combination of alerting and calming activities to feel regulated.

Calming input for sensory seekers could include heavy or weighted blankets, wearing a rucksack filled with books or deep massage.

Things you may see with sensory seekers:

- preferring to take the lead in situations or play
- always “on the go”
- can be noisy and find it difficult to notice their volume increasing during play
- often interrupting or speaking over others and finds taking turns difficult
- stopping or changing activity can lead to anger or frustration
- finds it difficult to calm down or regulate
- can be read by others as disruptive or naughty

SENSORY AVOIDING

For sensory avoiders, input like sounds, smells, textures and bright lights can be **overwhelming** and even painful, so they will often **have an aversion to high-input environments**. Taste sensitivity can look like picky eating, but is much more complex than that. When sensory overload becomes too much, avoiders may experience shut downs, become tearful or go into meltdowns.

Predictable environments and routines are helpful, as this gives the brain less unexpected information to process on top of the sensory information we're taking in.

Things you may see in sensory avoiders:

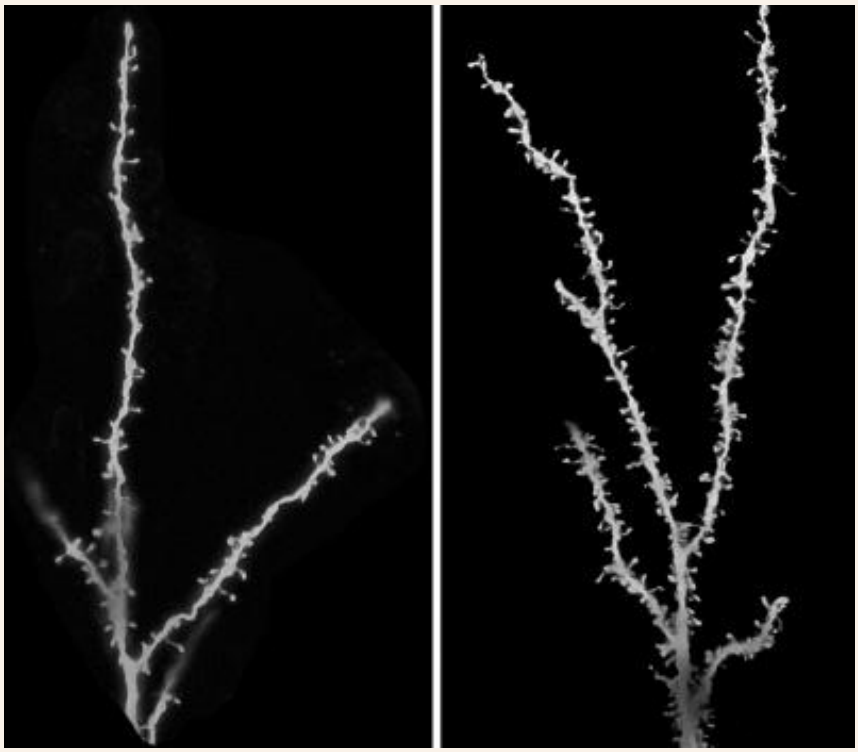
- more quiet personalities or passive styles.
- Can be perceived as withdrawn.
- Can find it difficult to engage in conversation or other social interactions
- Spend lots of time daydreaming
- Being easily exhausted
- Slower than peers to respond to directions or complete assignments
- Preferring safe and familiar activities as opposed to exploring the world

UNDERSTANDING THE DIFFERENCES

being hypersensitive doesn't always equal sensory avoiding, and being hyposensitive doesn't always equal sensory seeking.

Sensory Pattern	Definition	Behaviour or Response	Example
Sensory Avoiding	Actively trying to avoid or escape sensory stimuli due to overwhelm.	Withdrawal, resistance, seeking refuge from sensory input.	Covering ears during loud noises, avoiding bright lights.
Hyper-sensitivity	Strong or exaggerated responses to sensory stimuli.	Overreaction to normal sensory stimuli (e.g., covering ears, crying, agitation).	Becoming distressed by a vacuum cleaner or itchy clothing.
Sensory Seeking	Actively seeking more sensory input to satisfy sensory needs.	Seeking out activities that provide additional stimulation (e.g., rough play).	Constantly moving, jumping, or spinning.
Hypo-sensitivity	Reduced or dulled response to sensory stimuli, requiring more input to notice.	Under-response to sensory input, may seek more intense experiences.	Not reacting to pain, needing loud noises or intense play.

SENSORY PROCESSING AND AUTISM



neurotypical neurons autistic neurons

Synapses are the points in the brain where neurons (cells which send and receive messages) **connect and communicate with each other.**

Neuroscientists at Columbia University Medical Centre found that **Autistic people have a larger number of synapses in their brain** than neurotypical peers, linking this to a slow down of the brain “pruning” process during early development.

This pruning typically happens between the ages of 2 and 10 years old and is influenced by our life experiences, with some pathways being strengthened, some weakened and others lost.

The research estimates that **neurotypical children’s brains had about 50% of their synapses pruned, while Autistic children had around 16%**

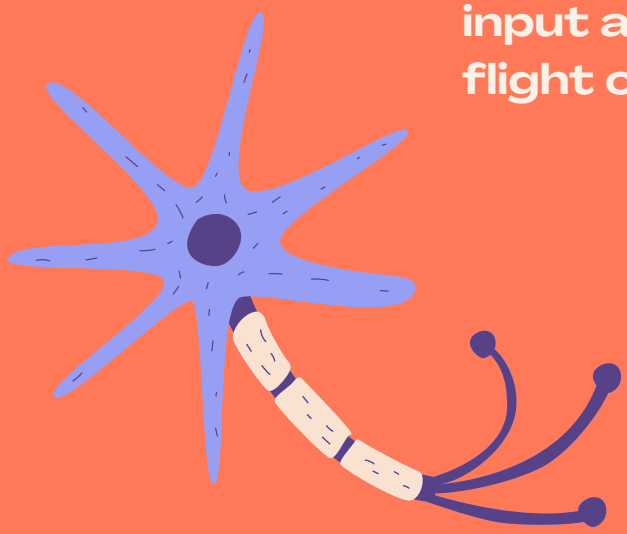
Ref: Loss of mTOR-Dependent Macroautophagy Causes Autistic-like Synaptic Pruning Deficits. Tang, Guomei et al.

SENSORY PROCESSING AND AUTISM

WHAT DOES THIS MEAN PRACTICALLY?

For autistic and other neurodivergent people, this research - **supported by a large proportion of the lived experience community too** - their **sensory systems are taking in about 50% times more information from the world around them** (compared to neurotypical people).

This means feeling overloaded is far more likely, and their nervous system is activated more frequently. When autistic people are described as struggling to cope with change, emotional regulation or social communication, it can be helpful to be aware that their **baseline experience is already one of excessive sensory input and more time spent in fight, flight or freeze as a result.**



MANAGING OVER-STIMULATION

Over-stimulation happens when the brain is overwhelmed by sensory input.

Signs of over-stimulation

- increase in irritability or anxiety
- withdrawing from sensory input eg. wanting to leave the environment, covering eyes or ears
- heading towards or experiencing meltdowns without a clear trigger
- restlessness/finding it difficult to relax and unwind
- feeling overexcited or hyperactive
- heightened sensitivity to textures eg. clothing, foods

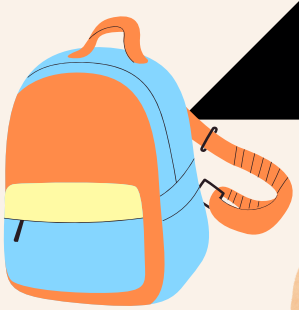
ANTICIPATING & MANAGING OVER-STIMULATION

(**This includes things that can help in the moment, or to plan for in advance**)

- noise cancelling headphones, ear defenders or calming ear plugs
- wearing comfortable clothing (for some people this is loose, others it is compressing eg. leggings
- opening a window for some cool, fresh air
- giving plenty of personal space and limiting touch.
- firm touch is often preferred to light touch, but asking and giving warning of necessary touch can help.
- a tissue with a favourite essential oil or perfume smell to reach for if there's a disliked smell around
- regular relaxation and deep breathing - practicing this when we're feeling calm helps us use it when we're overwhelmed
- spending time in nature
- giving advance notice of plans and changes
- arts and crafts, writing - sitting down activities

Calming sensory input can help sensory seekers to re-regulate (feel calmer) after periods of activation/overwhelm.
Some examples of calming input are:

- having a warm drink
- dimming or turning off the lights
- wearing a weighted backpack or weighted blanket
- slow stretching - this could be yoga, or just whatever stretching feels good
- calming videos/audios eg. rain, waterfalls or a crackling fire
- squeezing theraputty or holding smooth stones/crystals



- rolling up tightly in a duvet or blanket (like a burrito!) - bonus points for deep pressure squeezes along the way
- bear hugs
- “steamrollering” - this involves lying on your stomach while someone rolls an exercise ball slowly along your back
- massaging hands or feet

Remember: everyone’s sensory experience is different: we can be understimulated in one sensory system and overstimulated in another. Learning more about our own patterns of stimulation is the best way to develop tools to regulate ourselves in different situations.

MANAGING UNDER-STIMULATION

Under-stimulation happens when the brain doesn't receive **enough** sensory input to meet its needs.

Signs of under-stimulation

- low energy
- lack of focus
- fidgeting
- disinterest in activities
- lack of motivation
- difficulty staying on task
- increase in disruptive behaviours due to frustration

ANTICIPATING & MANAGING UNDER-STIMULATION

Movement

- Encouraging rocking, swaying, and moving the body when seated.
- Hands-on tasks like moving or carrying things
- "Shake it out" to wake up vestibular and proprioceptive systems
- Encourage play activities like swings, climbing, running, dancing, stomping

Finding the types of movement that are most enjoyable and trying to include them each day helps maintain sensory regulation.

Adjust the environment - reduce distractions and consider adding elements to engage the different senses eg. preferred colours, sensory lights. Rhythmic background music, using sound cues like maracas or claps for transitions. Having easy access to fidget toys, play dough/blu-tac or chewellery.

Drawing, scribbling or doodling while engaging in less physical activity like watching TV or listening to instructions.

Listening to podcasts, audiobooks or music while doing less engaging tasks (or things that are boring but neccessary!) provides an extra layer of sensory engagement.

Weighted blankets, lap pads or vests provide input while still being calming. Home made versions of a weighted lap pad could include a backpack with books in, a big bag of rice or a friendly, calm and willing cat.

ALERTING ACTIVITIES

Alerting activities can be helpful if we feel lethargic, unmotivated, stuck, or in a “freeze” state. They are designed to wake up our sensory system, and help us feel alert and able to focus. They can be especially useful to aid transition times eg. moving from relaxing on the sofa to helping out with household tasks or leaving for school..

EXAMPLES OF ALERTING ACTIVITIES:

- Jumping on a trampoline
- Rough and tumble play
- Running
- Bouncing on a therapy/exercise ball
- Star jumps
- Rolling on a therapy/exercise ball (facing the ground with tummy on the ball)
- Skipping
- Dancing or moving to music
- Obstacle courses
- Stamping feet
- Star jumps
- Drinking cold water
- Chewy or crunchy snacks
- Running a hands-on errand eg. taking something to the school office or getting something from upstairs

One way of supporting transitions <u>into</u> alerting activities and <u>build some momentum</u> is to slowly start to move fingers and toes, then hands and feet. Next, start to make some bigger movements with arms and legs until our whole body has started moving.

STIMMING & HARM REDUCTION

Stimming is way of self regulating, and helps with sensory processing, emotional regulation and focus. Stimming is totally natural and should be allowed and encouraged whenever possible, as long as it's not causing harm.

Harm reduction strategies are generally only needed when there is risk of harm to themselves or others. This might include hitting, slapping, biting themselves or others, head banging, scratching or picking at skin.

Support young people's autonomy by working together with them to find alternatives that meet a similar sensory need. Gently guiding or redirecting to a safer option is helpful in the moment.

Try to focus on understanding the function of the stimming, rather than trying to stop the behaviour itself.
Is there a certain sensation or sensory system that is being engaged?
Look for alternative activities that involve input in similar ways or to these sensory systems.

Hitting myself is providing **deep pressure**.

Other deep pressure activities I could try: deep tissue massage, weighted blanket, asking Mum for a bear hug

Educating peers, family members and school staff about the importance of accepting stimming helps develop non-jugemental and understanding environments. One way of doing this is simply **modelling acceptance and understanding of stimming** to others around you - this immediately helps children and young people feel safe and supported.

SENSORY PROCESSING AND EMOTIONAL REGULATION

Sensory processing will often influence a child's ability to regulate their emotions and behaviours. Sensory overload or understimulation can contribute to emotional distress, and behaviours which may be distressing or challenging.

CALMING SENSORY STRATEGIES

Techniques such as deep pressure (e.g., weighted blankets), sensory rooms with calming stimuli (e.g., soft lighting, quiet space), or relaxation exercises that involve sensory input (e.g., slow, rhythmic rocking)

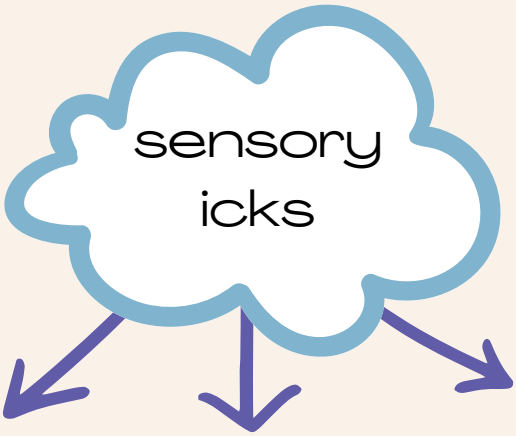
ALERTING SENSORY STRATEGIES

For children who need stimulation to stay regulated, use activities that stimulate the proprioceptive or vestibular senses, such as jumping on a trampoline or swinging.

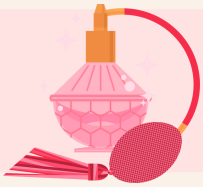
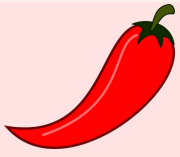
CO-REGULATION

Use sensory strategies alongside supportive adult-child interactions (e.g., calming music or tactile activities during a difficult conversation) to help children regulate their emotions.

SUPPORT WITH SENSORY PROCESSING



Listing or mapping out likes and dislikes in each of the 5 main sensory systems can be a great way to help children and young people start developing more self understanding of sensory triggers, as well as helping to work out personalised sensory tools for managing anxiety or overwhelm

SENSE	LIKES	DISLIKES
smell		
sight		
touch		
taste		
sound		

SENSORY PROCESSING AT SCHOOL

Sensory processing difficulties at school and in the classroom can often be seen as disruptive behaviour, particularly for sensory seekers. For young people who are sensitive to sensory input, it can be really challenging to focus if something is causing sensory distress or overwhelm.

SIGNS OF SENSORY DYSREGULATION

- getting up and walking around in lessons
- distrupting lessons by shouting out, or distracting peers
- rocking on chair, fidgeting, destroying paper/stationary
- inability to focus on the lesson
- getting distracted easily by sounds outside, or visibly trying to block out sounds.
- having unexpected emotional responses to rising noise levels in the classroom, or a fire alarm going off
- an aversion to going to school, but not being sure (or struggling to explain) why
- finding break times, transitions between classes and less structured or noisier lessons extra difficult.

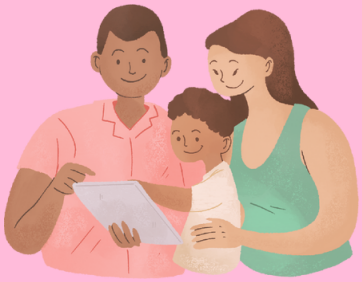
SENSORY PROCESSING IN LEARNING

NHS OCCUPATIONAL THERAPY GUIDE THAT GOES INTO MORE DEPTH ABOUT SIGNS, CAUSES & STRATEGIES

STRATEGIES THAT CAN HELP

- being given a task or job to do by the teacher
- reducing visual distraction in the classroom
- sitting somewhere with less visual distraction eg. not facing a window where people walk past frequently
- use of ear defenders/calming ear plugs
- permission to move between lessons earlier/later to avoid busiest times
- standing at the end of a queue rather than the middle to avoid feeling trapped/getting bumped into
- time out passes for when sensory overwhelm hits or is approaching
- a pre-designed 5 point system to communicate overwhelm when less able to use words
- access to a calm quiet space - this can help “in the moment” when feeling overwhelmed, but can also provide support in avoiding overwhelm by helping reduce overall sensory input across the day

CONSISTENCY & COLLABORATION



Consistent sensory support is important to allow young people to develop their own skills in managing sensory input.

Work with families and other professionals to ensure everyone is using appropriate sensory strategies for that specific young person - **what works for one young person doesn't neccessarily work for another**, and co-created plans are more likely to be meaningful for young people and therefore better support them in difficult moments.

Sharing Sensory Plans: share sensory maps and plans like the ones earlier in this booklet with parents and school.

- **Sensory Breaks**: Integrate regular sensory breaks into daily routines (e.g., time to move or engage in calming activities).
- **Routine Sensory Tools**: Provide access to sensory tools like fidget toys or noise-cancelling headphones to help children manage sensory needs throughout the day.
- **Predictable Environments**: Minimise sensory overload in environments by controlling light, sound, and movement, especially for children who are more sensitive.

Pre-emptive Sensory Strategies to prevent overwhelm can be used at home and in school.

TRAUMA INFORMED SENSORY CARE

CHILDREN WHO HAVE EXPERIENCED TRAUMA MAY HAVE HEIGHTENED SENSORY SENSITIVITIES, OR SEEK SENSORY INPUT TO SUPPORT WITH THEIR SELF-REGULATION.

Developmental, complex or long standing trauma can lead to nervous systems that are "hard wired" to perceive danger. Top Down approaches which ask us to adjust our thinking (without first recognising and responding to the very automatic nature of our nervous system responses) can be ineffective or lead to further dysregulation. Bottom Up approaches are usually a good first step.

"TOP DOWN" AND "BOTTOM UP" PROCESSING

It's thought that the top section of our brains are where thinking, speaking and in-the-moment emotional awareness are processed. Working through experiences in a "top down" way involves things like noticing thoughts, communicating, decision making and problem solving.

The bottom part of the brain is considered responsible for memories, impulses and survival responses. Working through experiences in a "bottom up" way involves understanding sensations, our nervous systems, grounding & mindfulness approaches and becoming more aware of our bodies.

Creating sensory safe spaces

Offer predictable, calming spaces that children can use to self-soothe when feeling activated or distressed

Resilience Building

Use sensory strategies to help children regain a sense of control, like rhythmic movement or calming touch eg. squeezing a soft toy or thera-putty. This can help them connect with body sensations and recognise that they can get through difficult feelings.

FURTHER INFORMATION AND SUPPORT

Birmingham Community Healthcare Trust's Pediatric Occupational Therapy team offer an Occupational Therapy advice line.

This is a universal offer, and can provide practical Occupational Therapy advice, strategies and support to schools, parents / carers and other professionals in relation to a child's/young person's functional and independence skills.

If you wish to speak directly to an Occupational Therapist, please call 0121 683 2325. This phone line is open Monday-Friday 9-4pm.

How sensory processing can affect Autistic children in school

Sensory Processing - a Guide for Parents

Sensory activities and information on creating inclusive home and classroom environments

Alerting activities - these can help focus in class (or anywhere else) for both hyper and hyposensitive students

created by Kate Bakewell
Senior Mental Health Practitioner
and Registered Mental Health Nurse
Birmingham Mental Health Support Team, Forward Thinking Birmingham

GLOSSARY OF TERMS

Some terms you may hear, or are used in this booklet:

NEUROTYPICAL

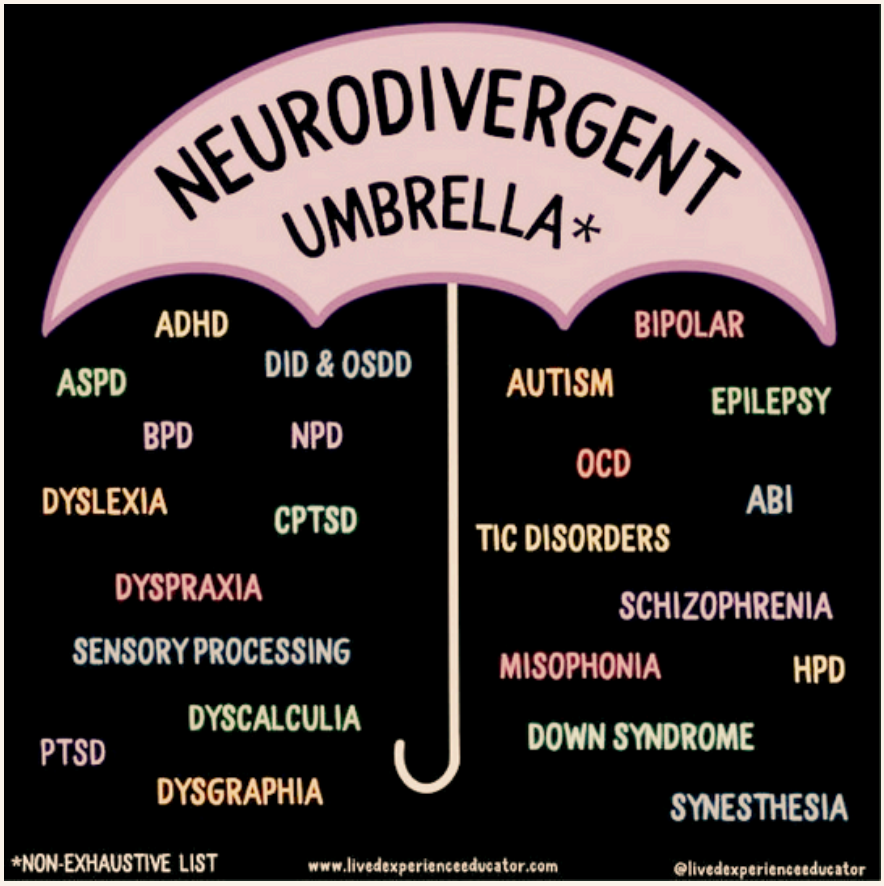
refers to an individual whose functioning falls **within** dominant or “typical” norms.

NEUROTYPICAL

refers to an individual whose functioning falls **within** dominant or “typical” norms.

NEURODIVERSITY

refers to the natural diversity of **all human minds**. think along the lines of biodiversity - it’s made up of all the different types of plants, flowers, creatures etc.



NEURODIVERGENT

refers to people whose **functioning is outside dominant norms**, often labelled as "disordered" or "abnormal" in medical models. It is an umbrella term that includes both innate or genetic conditions as well as acquired or developed conditions.

Most commonly used to describe Autism, ADHD, Dyslexia, Dsygraphia, Dyscalculia and Tic Disorders, but in the most inclusive corners of the neurodiversity movement, covers far more, as the image above shows.

Allowing people to share which terms they connect with most is usually the best approach.

image and definitions: Sonny Jane Wise @livedexperienceeducator


MENTAL
HEALTH
SUPPORT
TEAM