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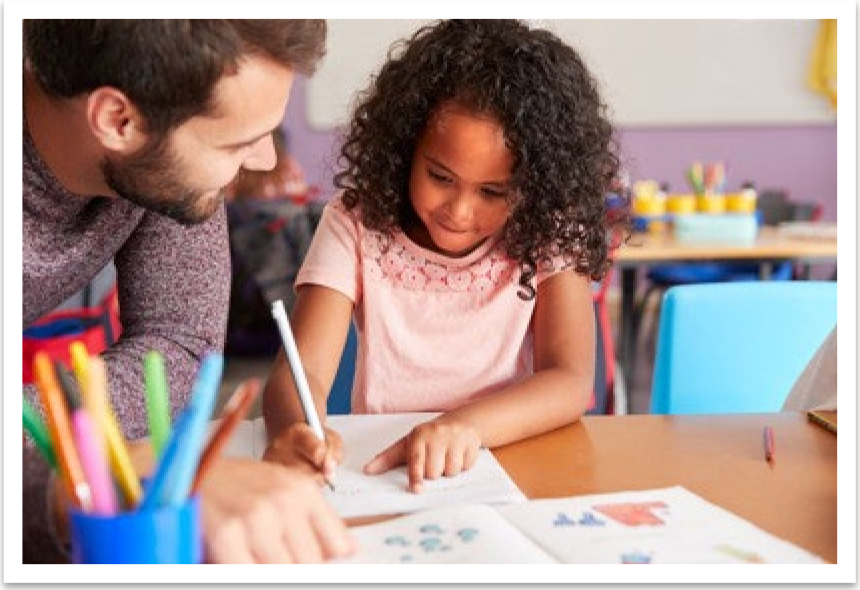
The Science of Learning for Neurodiverse Children

The Science of Learning for Neurodiverse Children



Event Materials

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Readiness. Knowledge. Network.

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Today's Presenter

Celest Austin, M.D., Ph.D.

Founder/CEO of GoManda and Physician Scientist
Professor, University of Texas in Austin

Today’s Objectives

1. Describe the neurological findings in neurodiverse individuals
2. Compare neurotypical and neurodivergent learning styles
3. Construct individualized support based on the neuroscience of different learning styles

Poll

Please indicate on the poll if you attended or viewed Dr. Austin’s previous webinar, “How A Neurodiversity Mindset Helps Children Thrive?”

A. I watched it live.
B. I watched it on-demand.
C. I’ve not yet watched it.

Brainy Topics

- What is Neurodiversity?
- What is Autism
- The Neurodivergent Brain
- Neuroscience of Learning for Neurodivergent Children
- How to Support
- Q&A

What is Neurodiversity?

Neurodiversity Model

Neurodiversity is the idea that different neurological wirings exist.

Neurodiversity Paradigm

Neurodiversity is the idea that different neurological wirings exist and are normal, natural variants in society. Disorders are differences.

Neurodiversity Movement

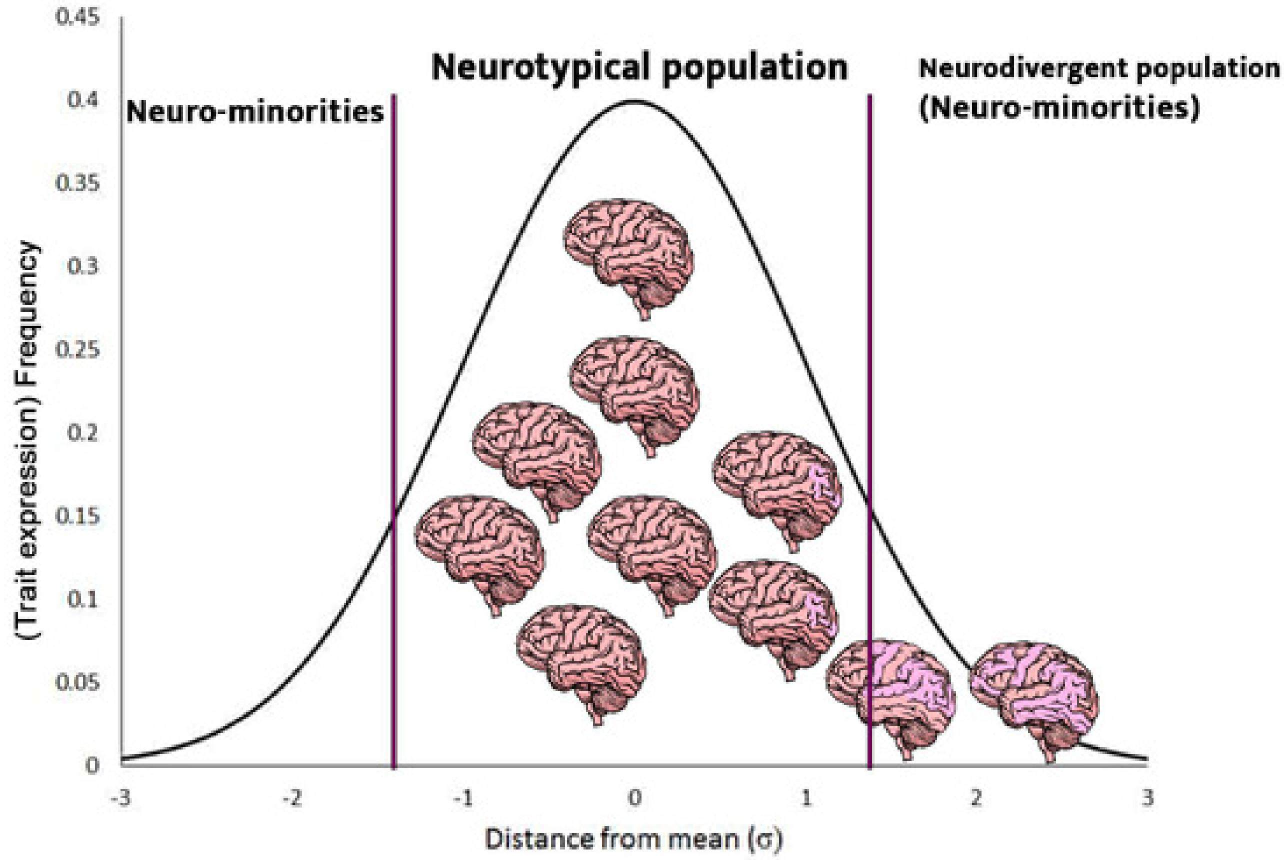
A movement that seeks civil rights, equality, respect, and full societal inclusion for neurodivergent individuals.

Who Termed it Neurodiversity?

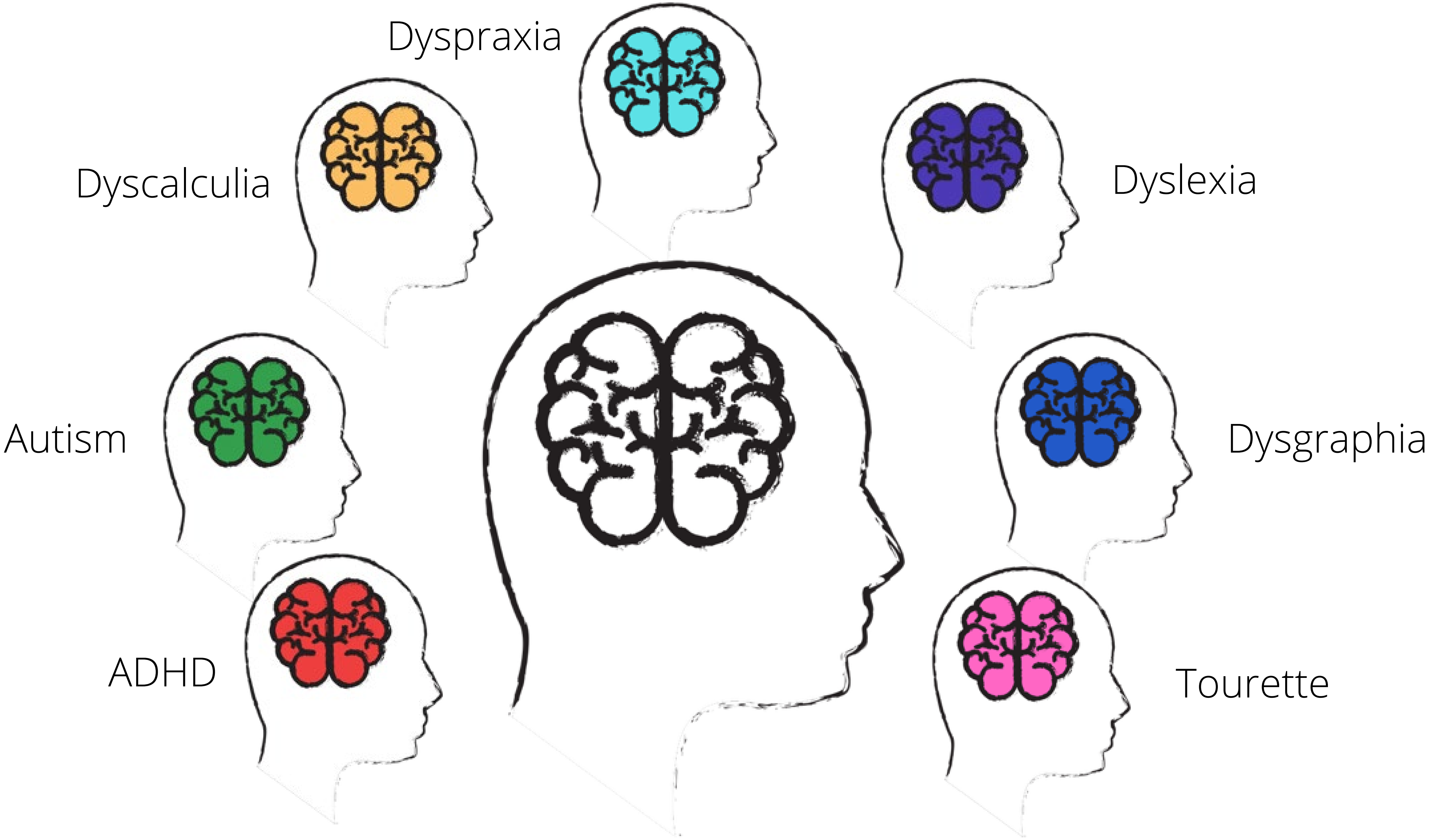
- Coined by autistic web forums in 1990s

  (originally said to be by Judy Singer)
- Strongly associated with the autism acceptance

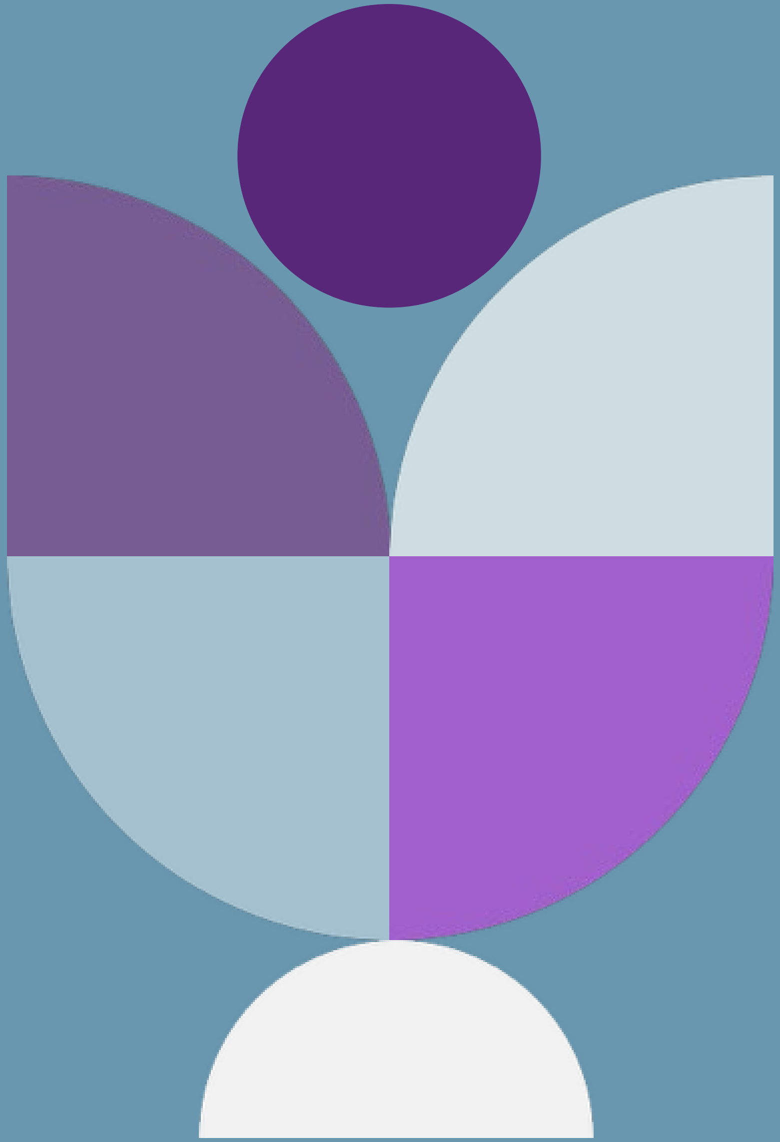
Neuronal/Behavioral Trait Expression Across Population



(Goldberg, 2023)


Dyspraxia
Dyscalculia
Dyslexia
Autism
Dysgraphia
ADHD
Tourette

What is Autism?



DSM-5 Autism Diagnosis Criteria

A

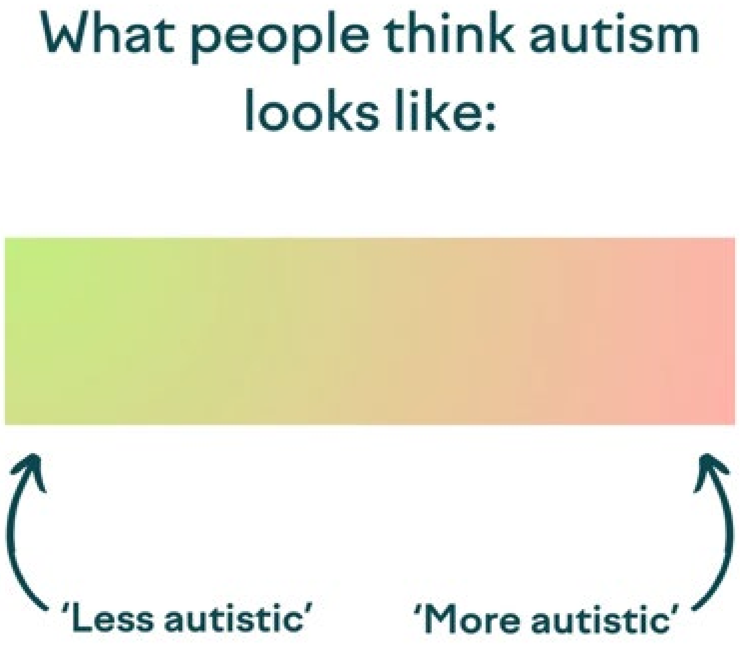
Social Communication and Interaction Differences

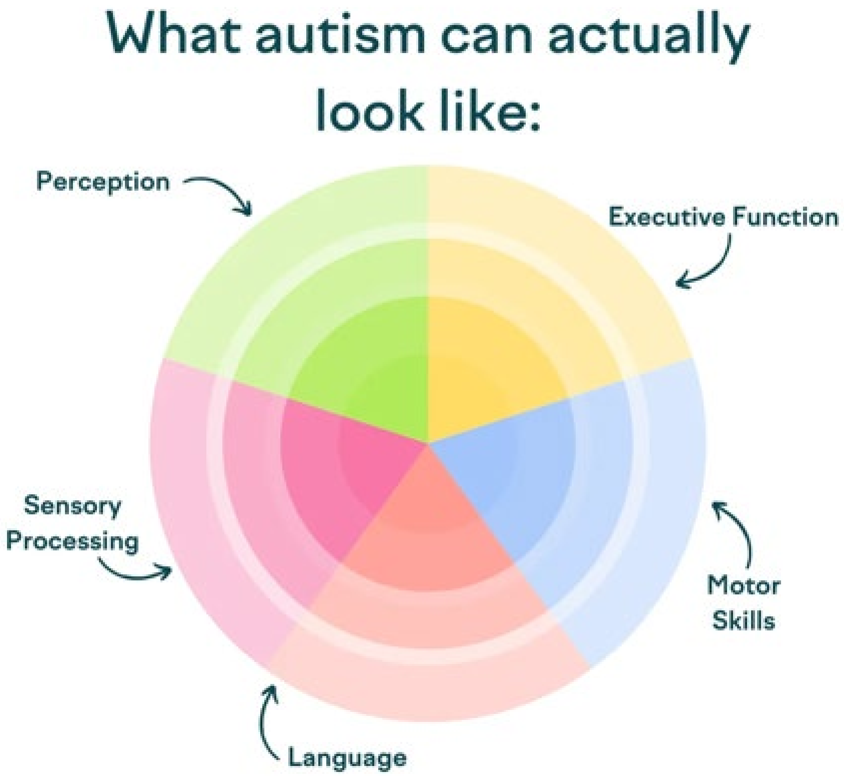
B

Restricted Repetitive Patterns of Behavior

(CDC, n.d.)

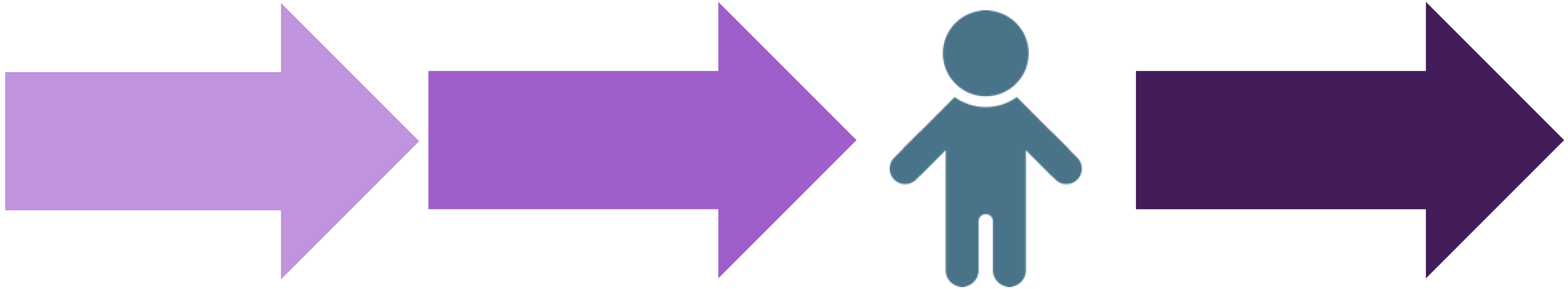
	DSM-I	DSM-II	DSM-III	DSM-IV	DSM-V
	Schizophrenic reaction, childhood type	**Schizophrenia, childhood type**	**Infantile Autism/ Autistic Disorder**	**Autistic Disorder**	**Autism Spectrum Disorder**
Attentional Differences					
Perceptual Differences					
Sensory Differences					
Repetitive Behavior					
Restricted Interests					
Language Development					
Socialization Differences					
Psychosis					





(Image Credit: daisychainproject.co.uk/about-autism-neurodiversity/)

Lightening the Load



Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

Lightening the Load Continues

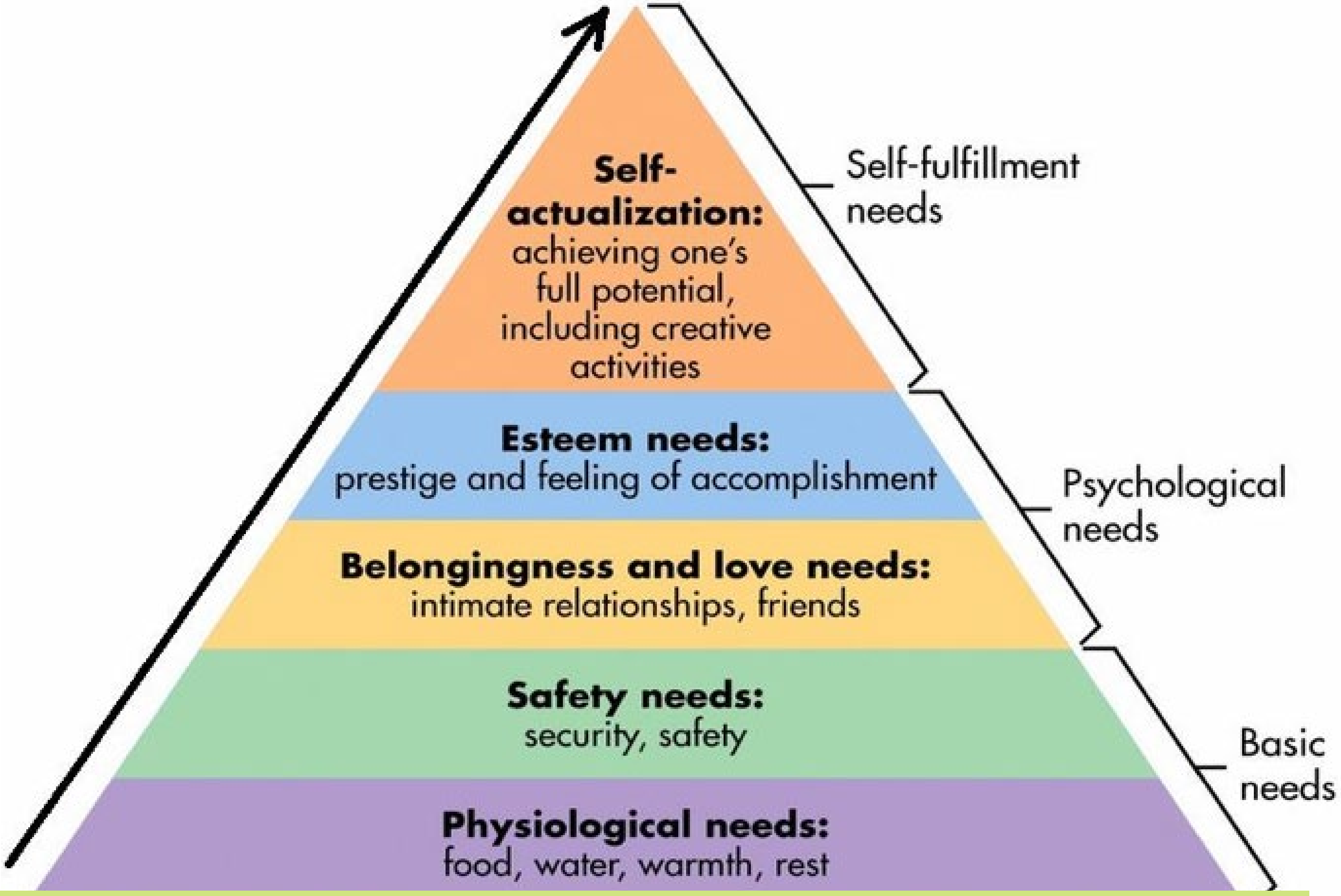
Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

Physical Environment
- Sensory Needs

Embracing Learning Style
- Interests-led programs
- Science of learning for neurodiversity
- Strengths-based Approach

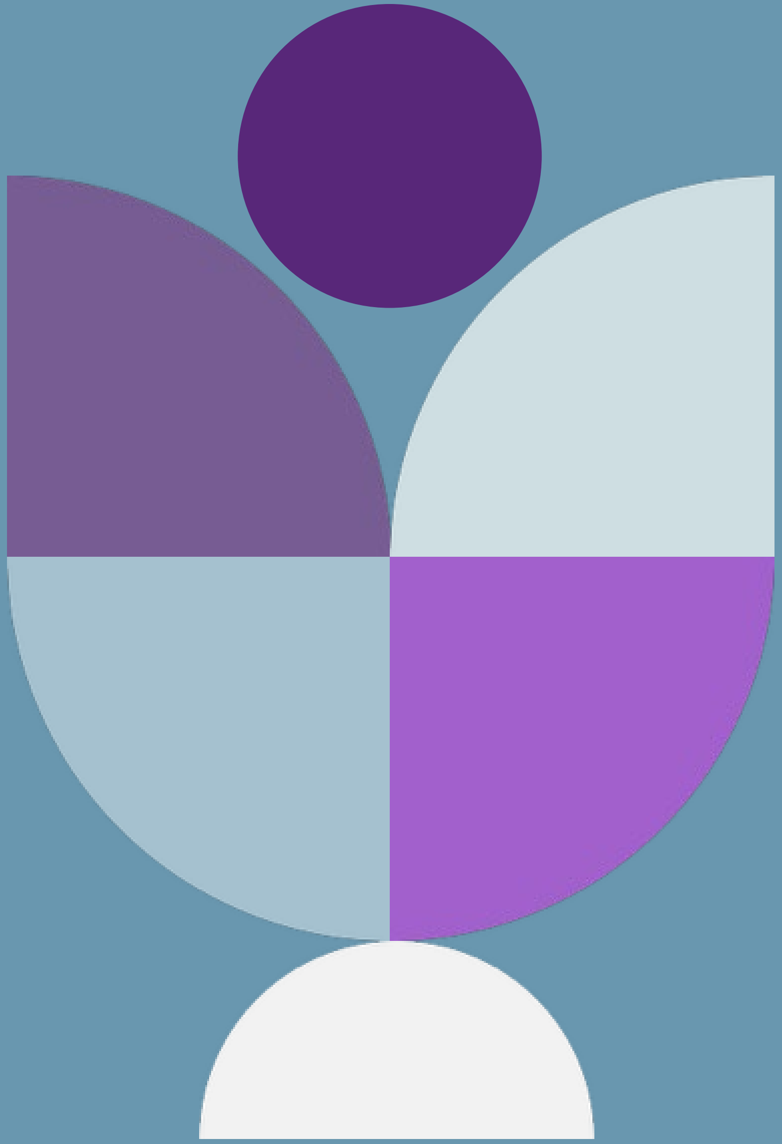
Maslow's Hierarchy of Needs



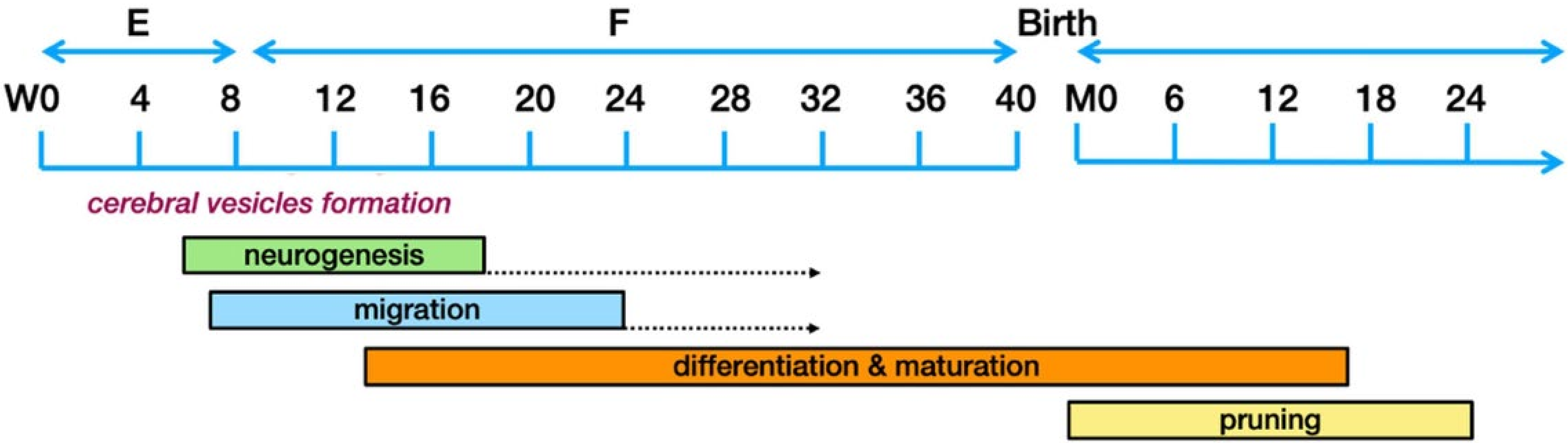
Mindset of the child's ecosystem

(Image Credit: Medium.com)

The Neurodivergent Brain

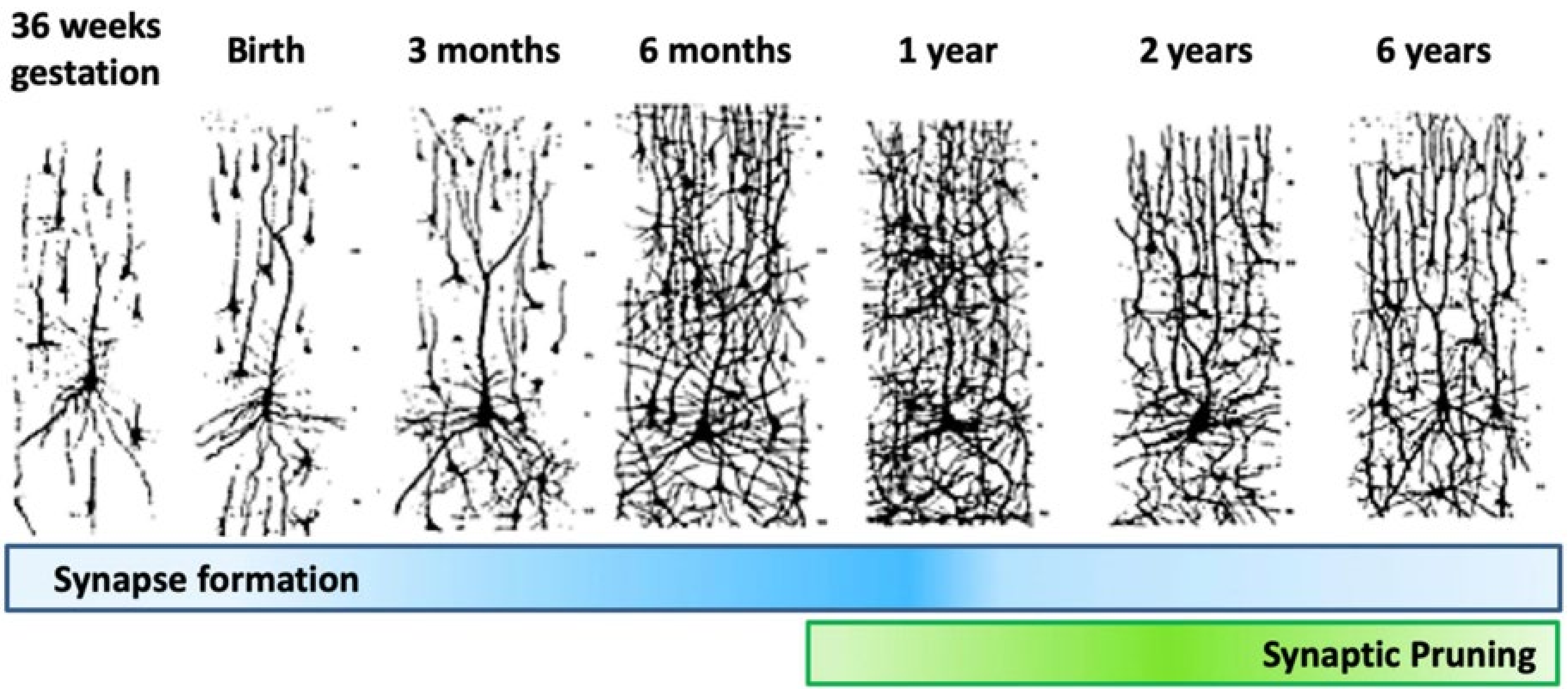


Human Brain Development Timeline



(Image Credit: Frontiers in Neuroscience; Beopoulos et al., 2022)

Neurotypical Synapse Formation and Pruning



(Image Credit: Frontiers in Neuroscience; Beopoulos et al., 2022)

For Autistic People

- Sensory Processing Differences
- Attentional Differences
- Detail Focused Perceptual Preference

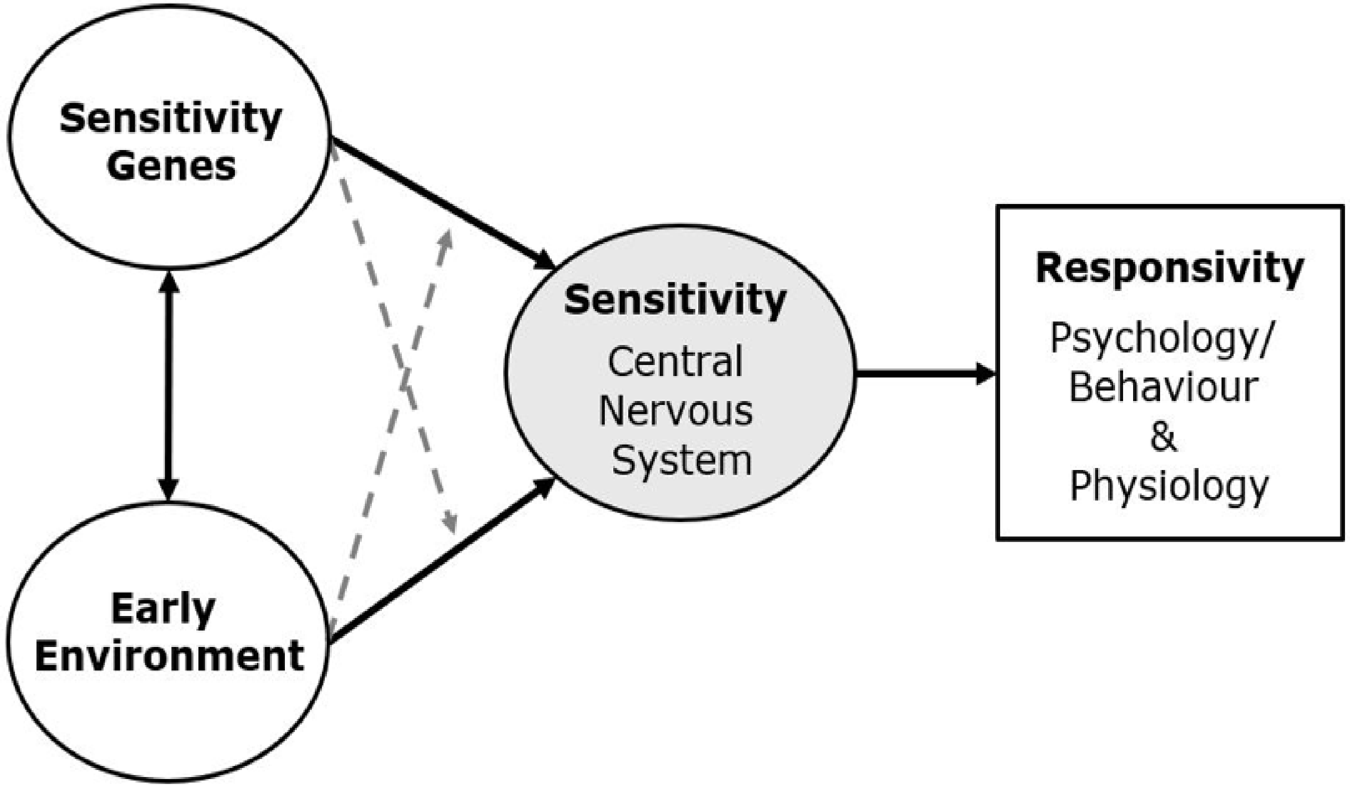
(Mallory et al., 2021)

Sensory Differences

Up to **95%** autistic children have sensory differences.

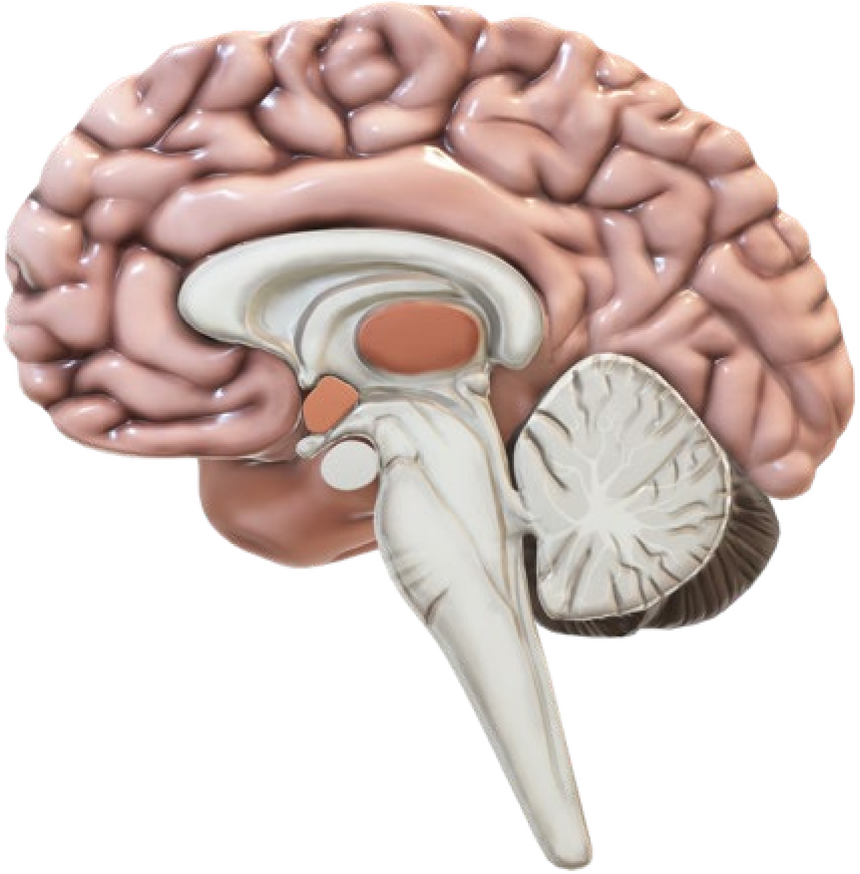
(Mallory et al., 2021)

Neurosensitivity Hypothesis

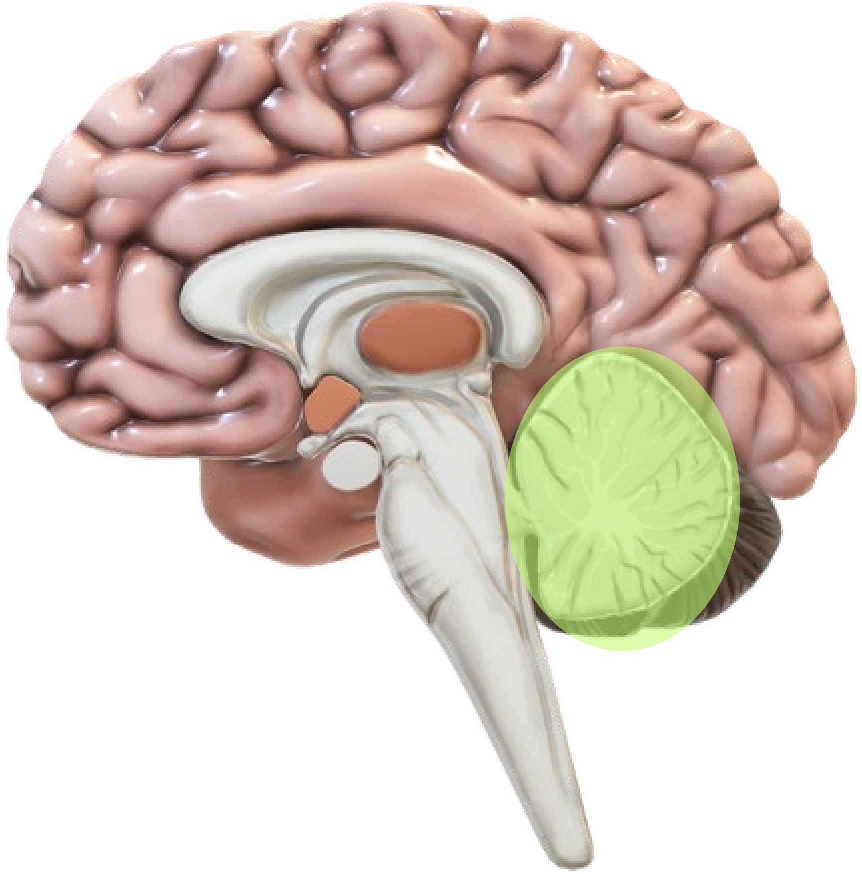


(Pluess, 2015)

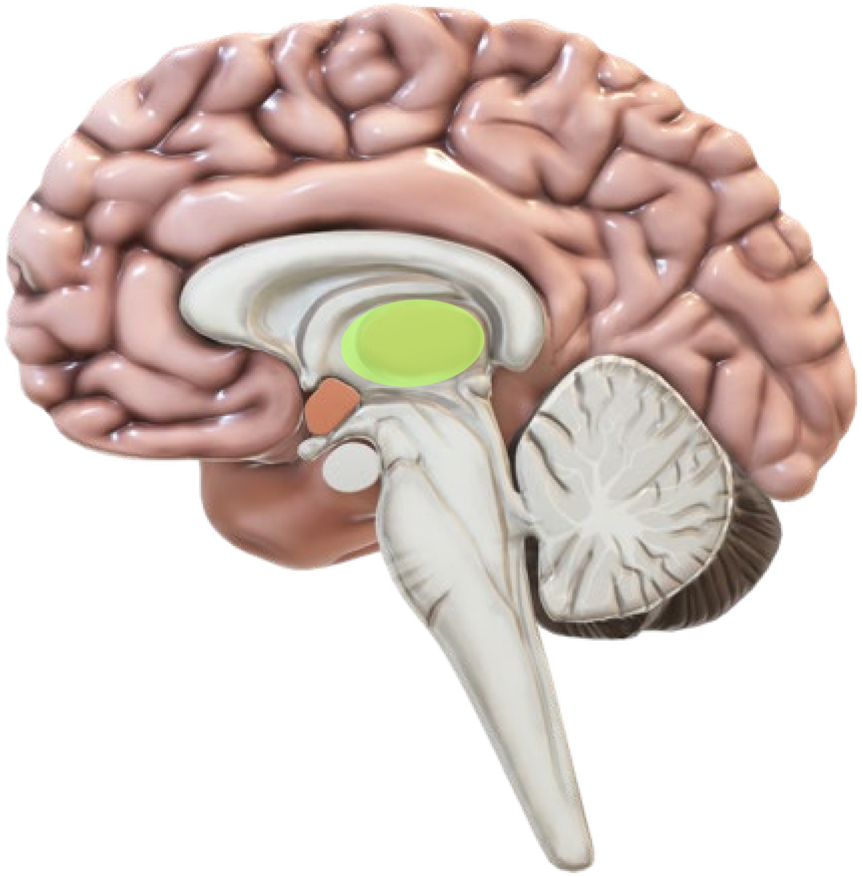
Anatomy of the Brain



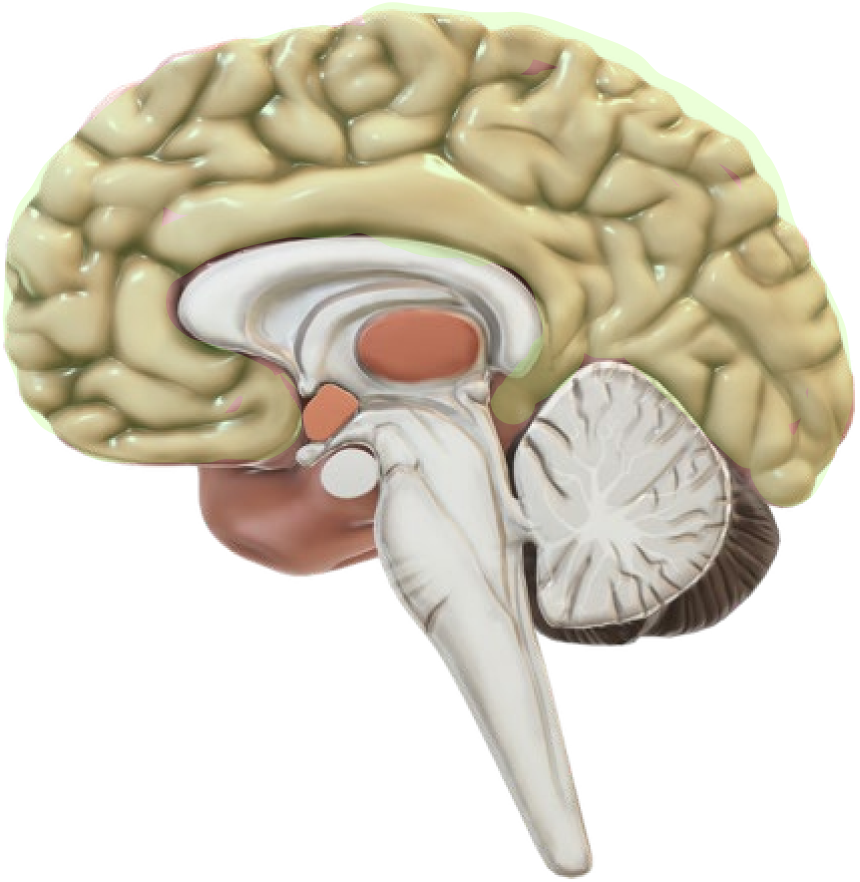
The Cerebellum: “The Filter”

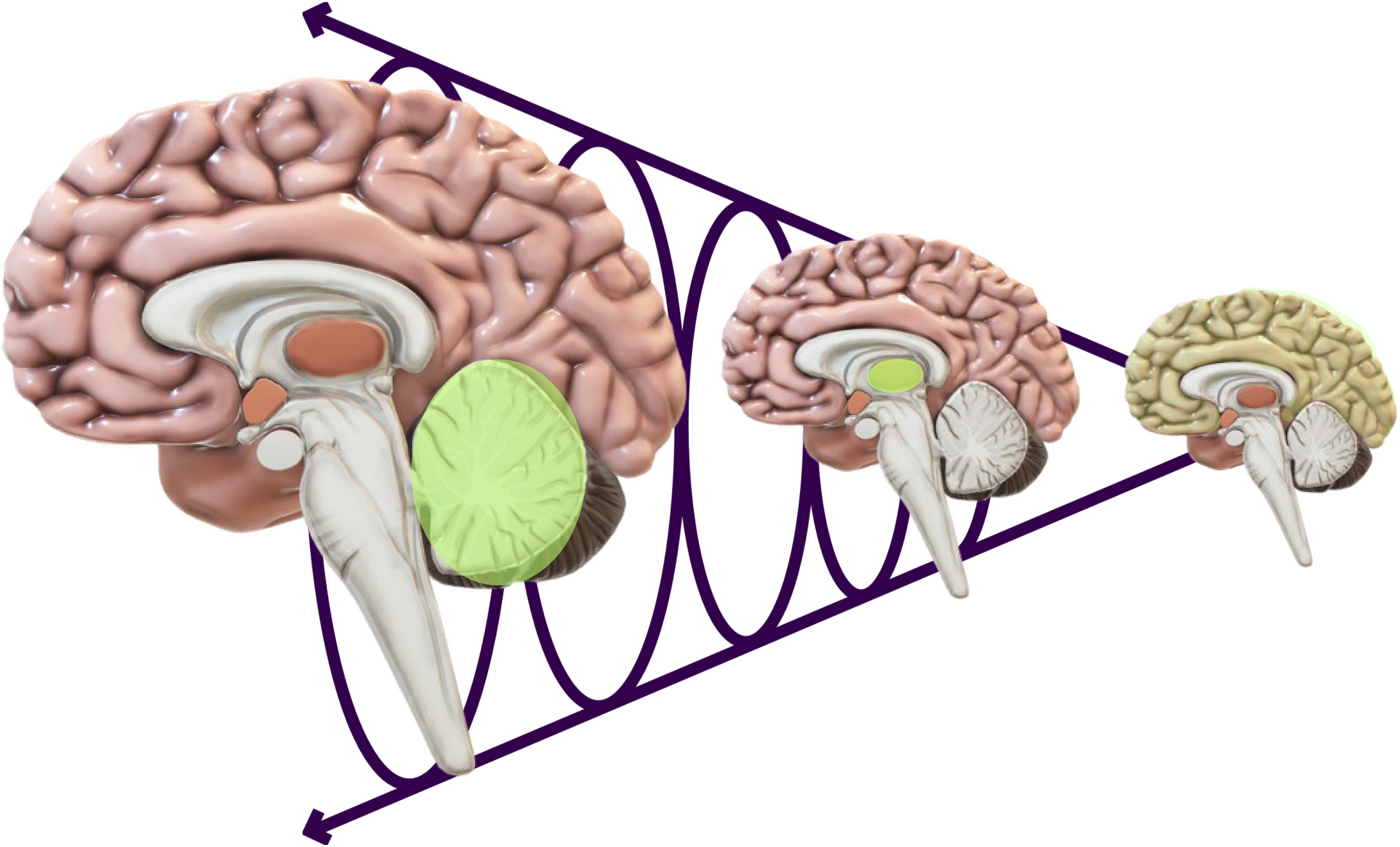


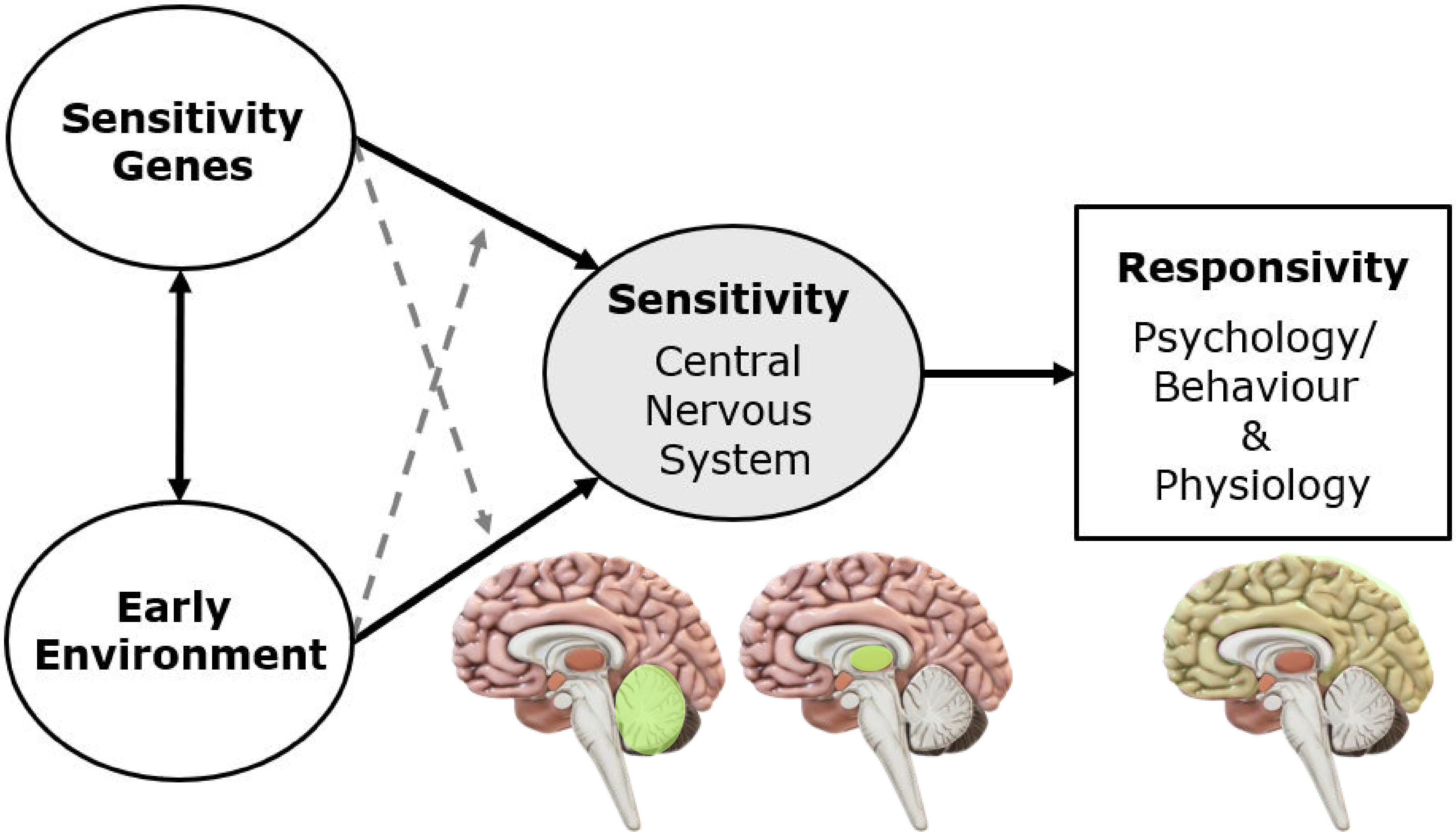
The Thalamus: "The Sensory Processor"



The Cerebral Cortex: “The Implementor”



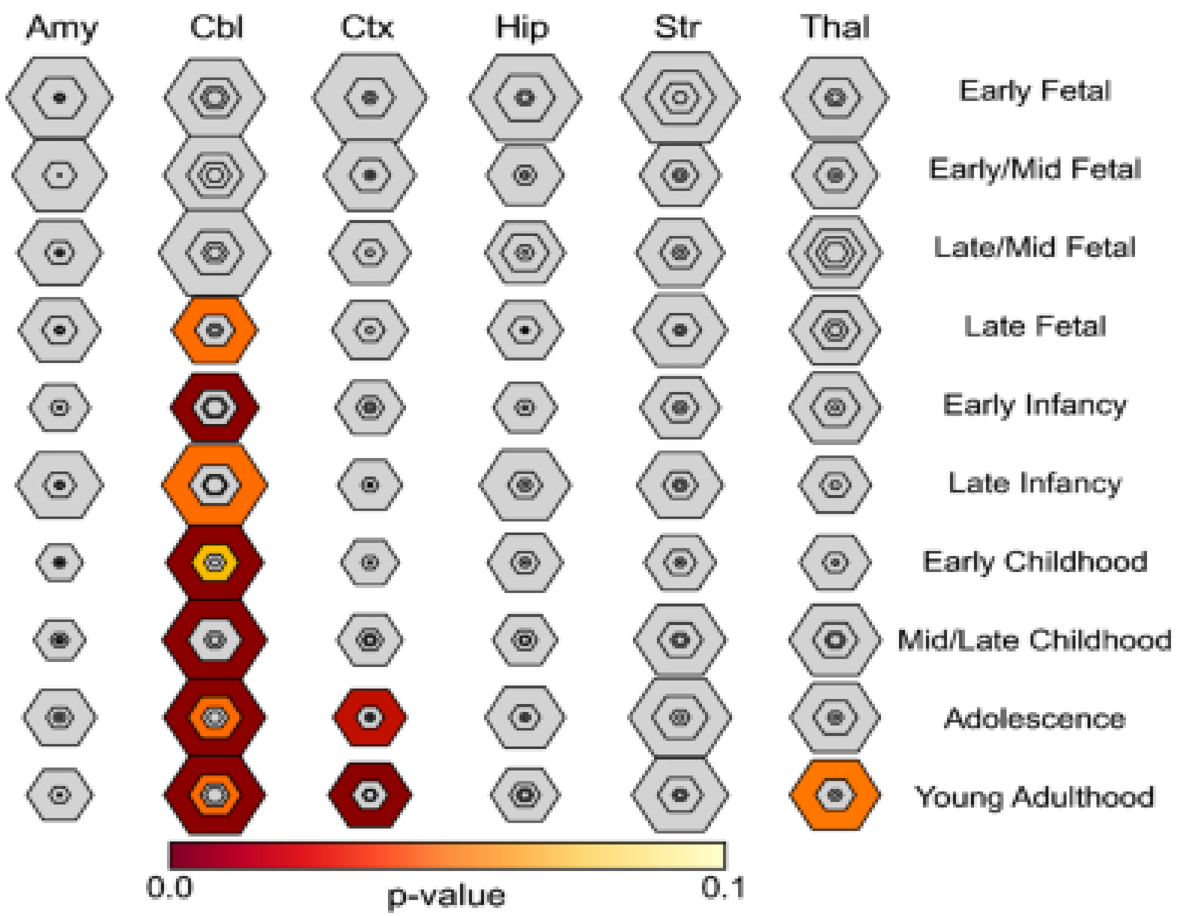



Sensitivity Genes
Early Environment
Sensitivity
Central Nervous System
Responsivity
Psychology/ Behaviour & Physiology

(Pluess, 2015)

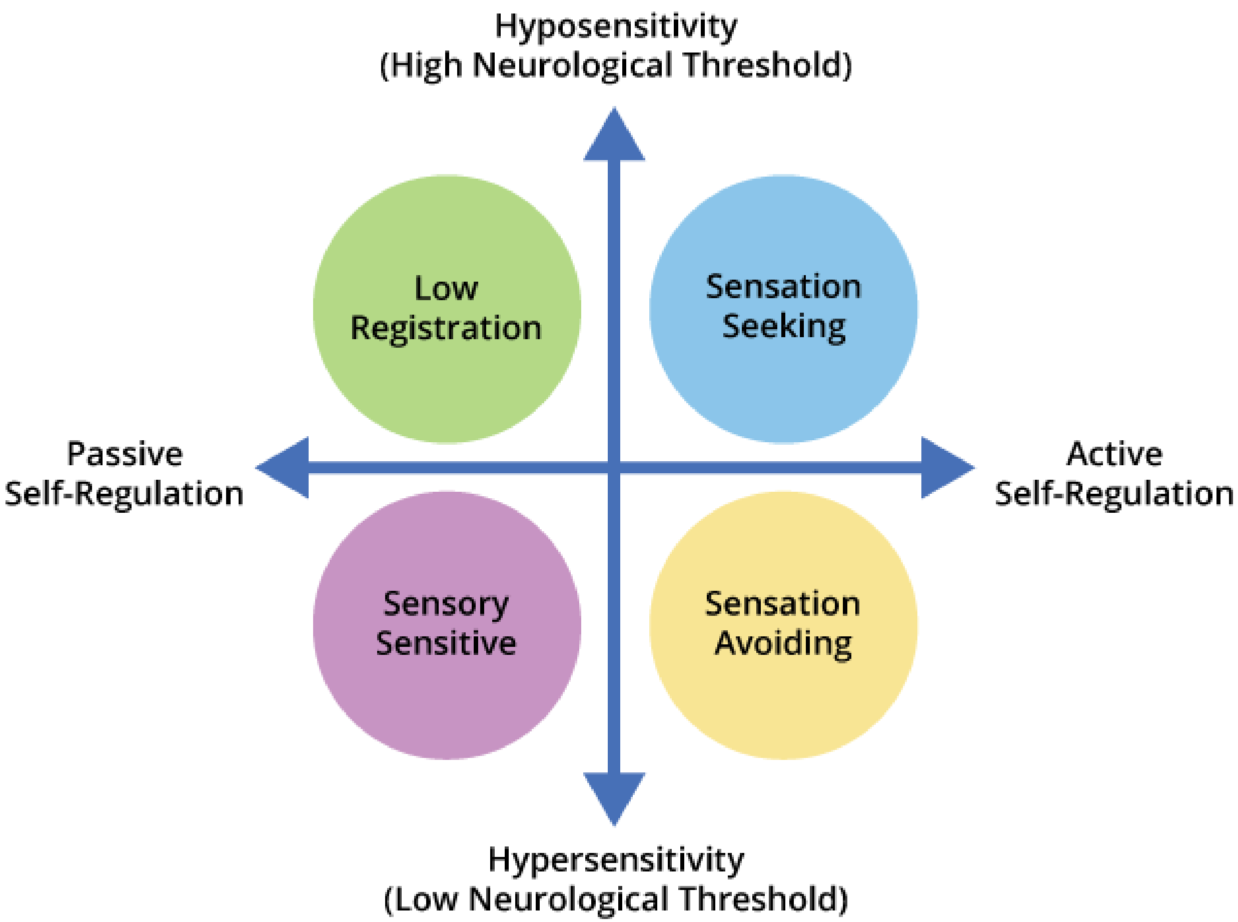
Neurodevelopmental Implications of Enriched Gene Sets

Autistic individuals have increased neuronal connectivity in the cerebellum and thalamus



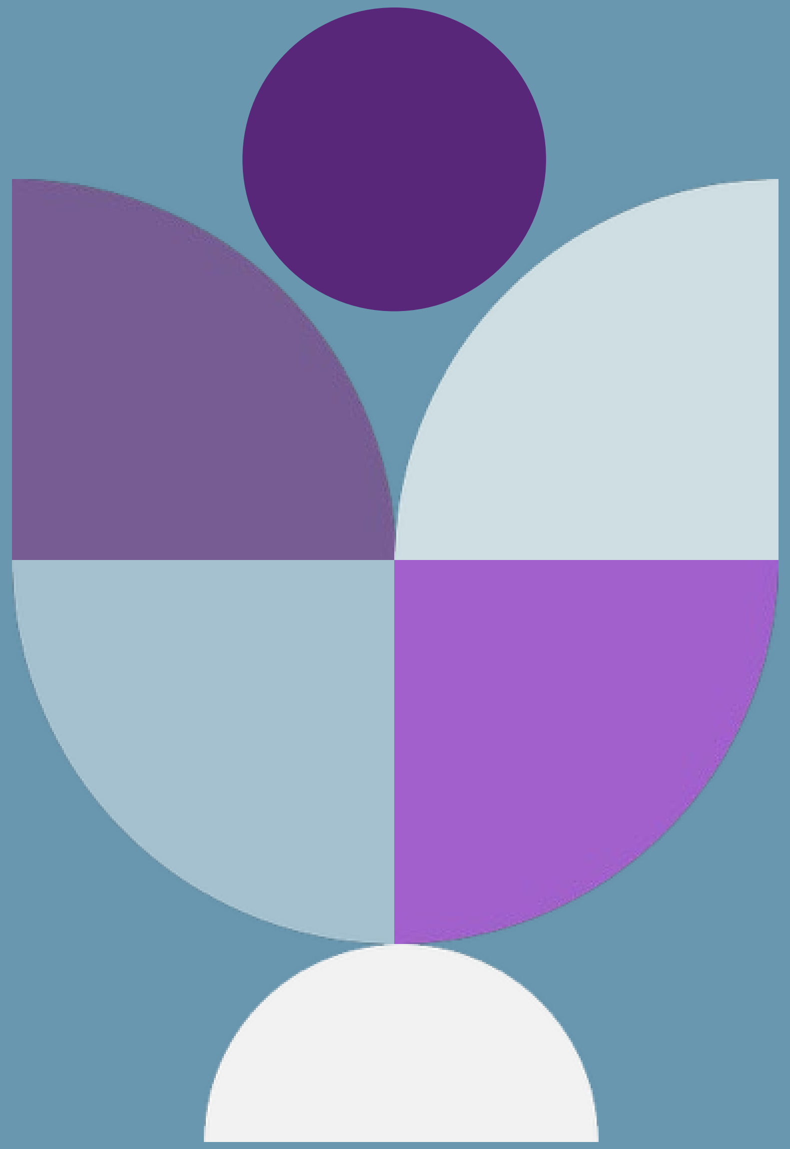
(Image Credit: Medrxiv.org; Benkarim et al., 2021)

Dunn’s Model of Sensory Processing



(Image Credit: Connectability.ca; Dunn, 2007)

The Neuroscience of Learning for Neurodivergent Children



Ability vs. Performance

Significant discrepancies between intellectual ability and broad academic performance - **60% of autistic students performed below** their predicted achievement level based on overall intellectual ability in at least one subject domain.

Affects attention because of increased distraction in the environment.

(Image from Storyblocks.com, CC0)

Sensory & Attentional Demands

(Mallory et al., 2021)

Sensory & Attentional Demands Continued

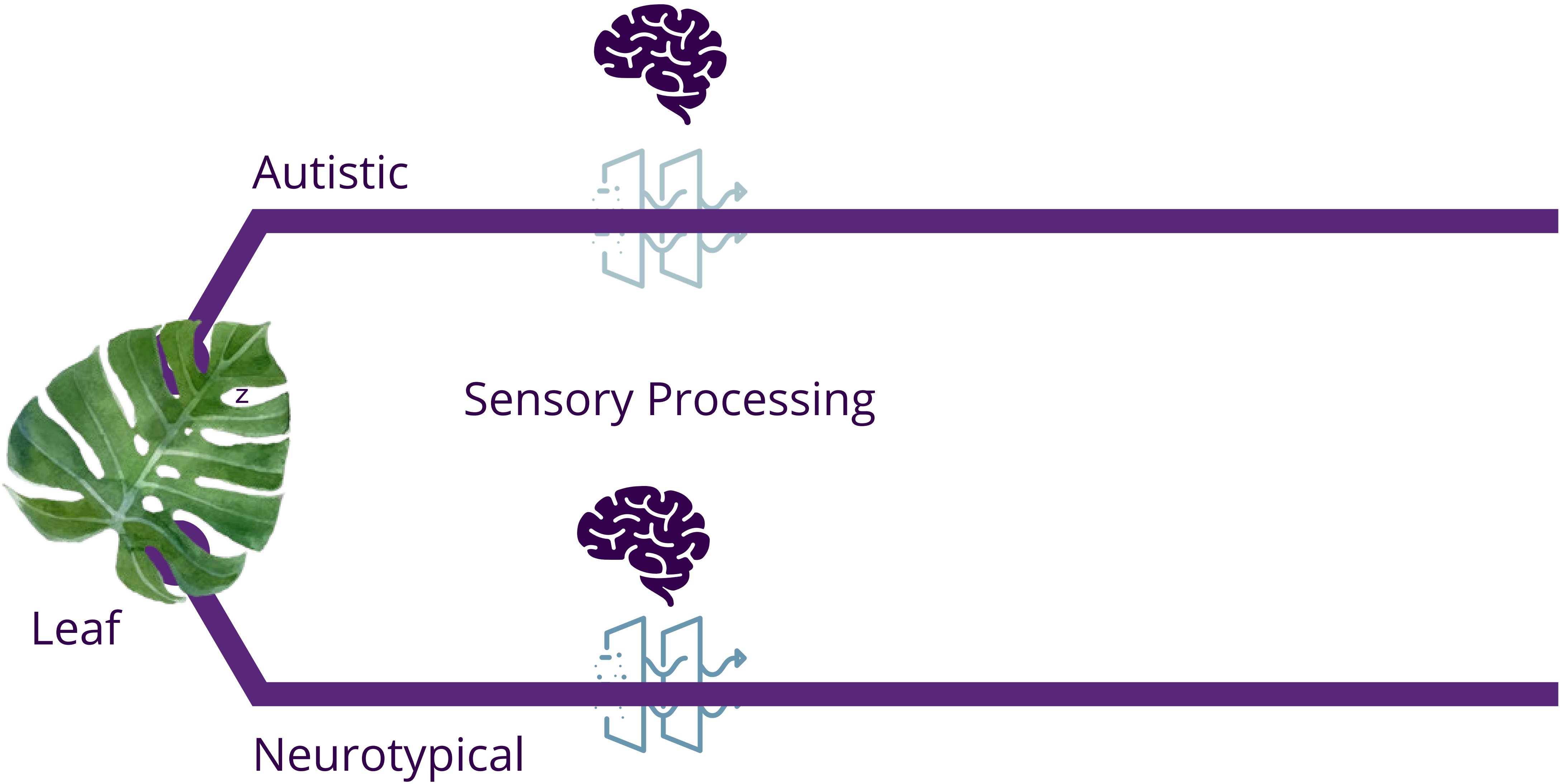
(Mallory et al., 2021)

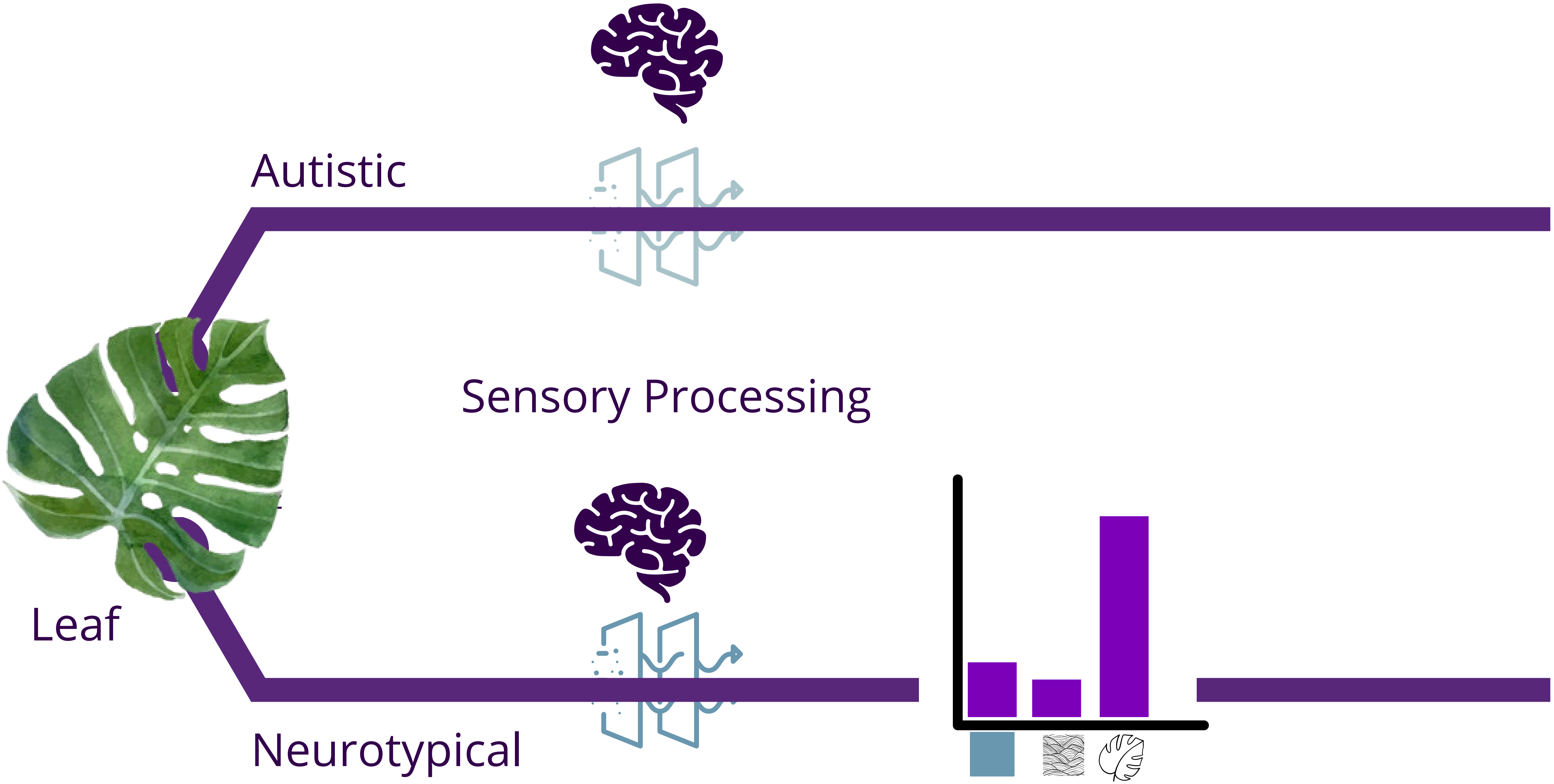
Leaf

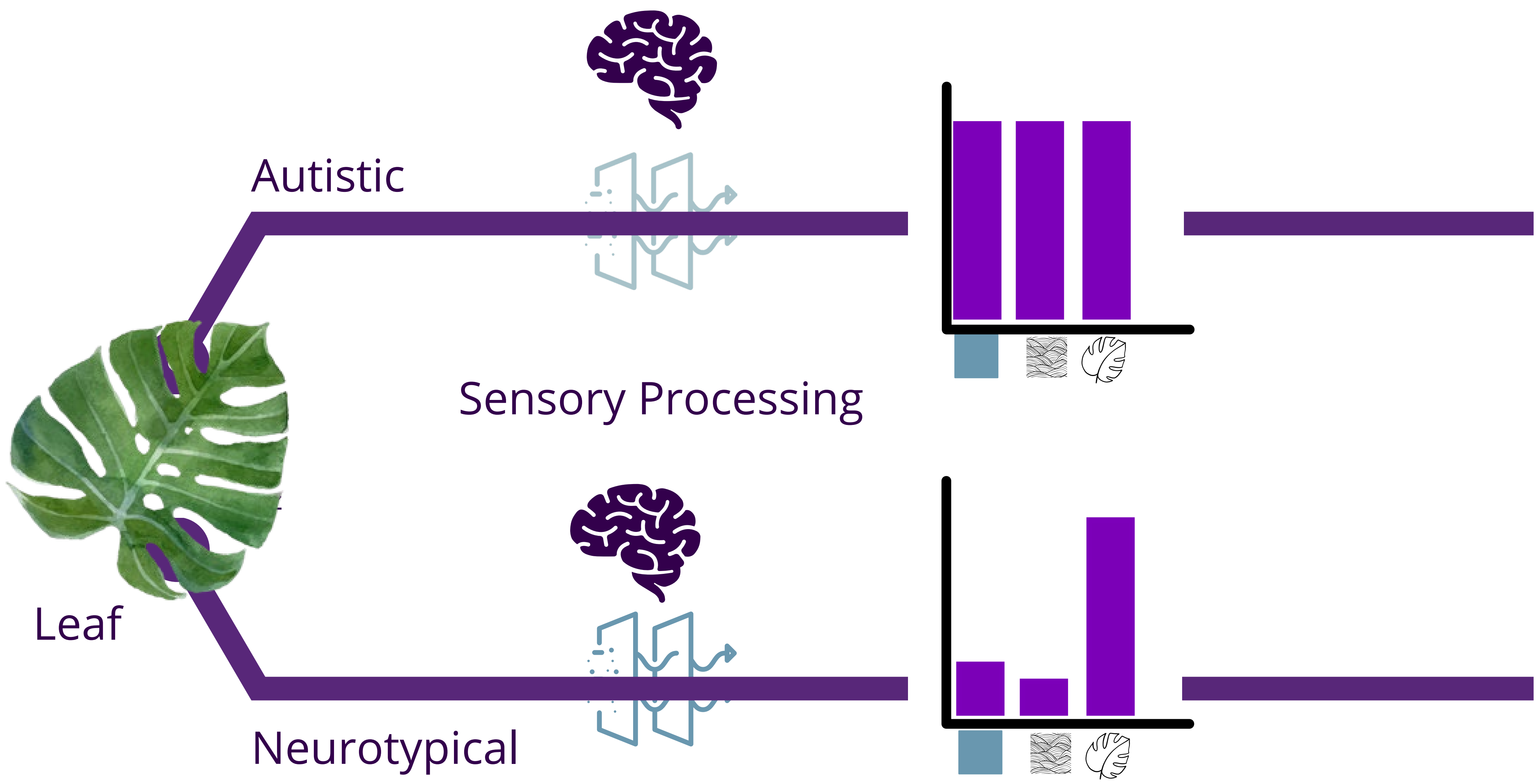
Autistic

Leaf

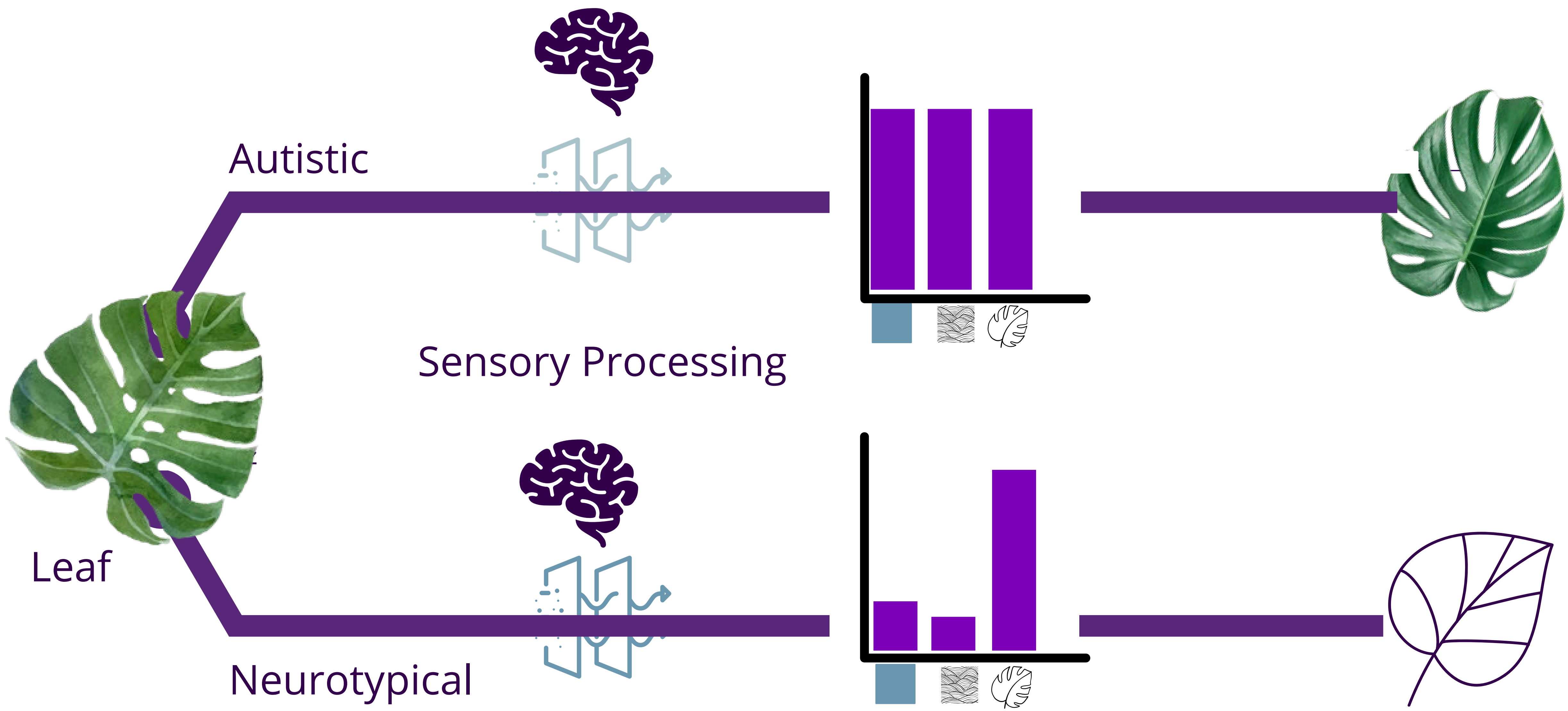
Neurotypical


Autistic
z
Sensory Processing
Leaf
Neurotypical

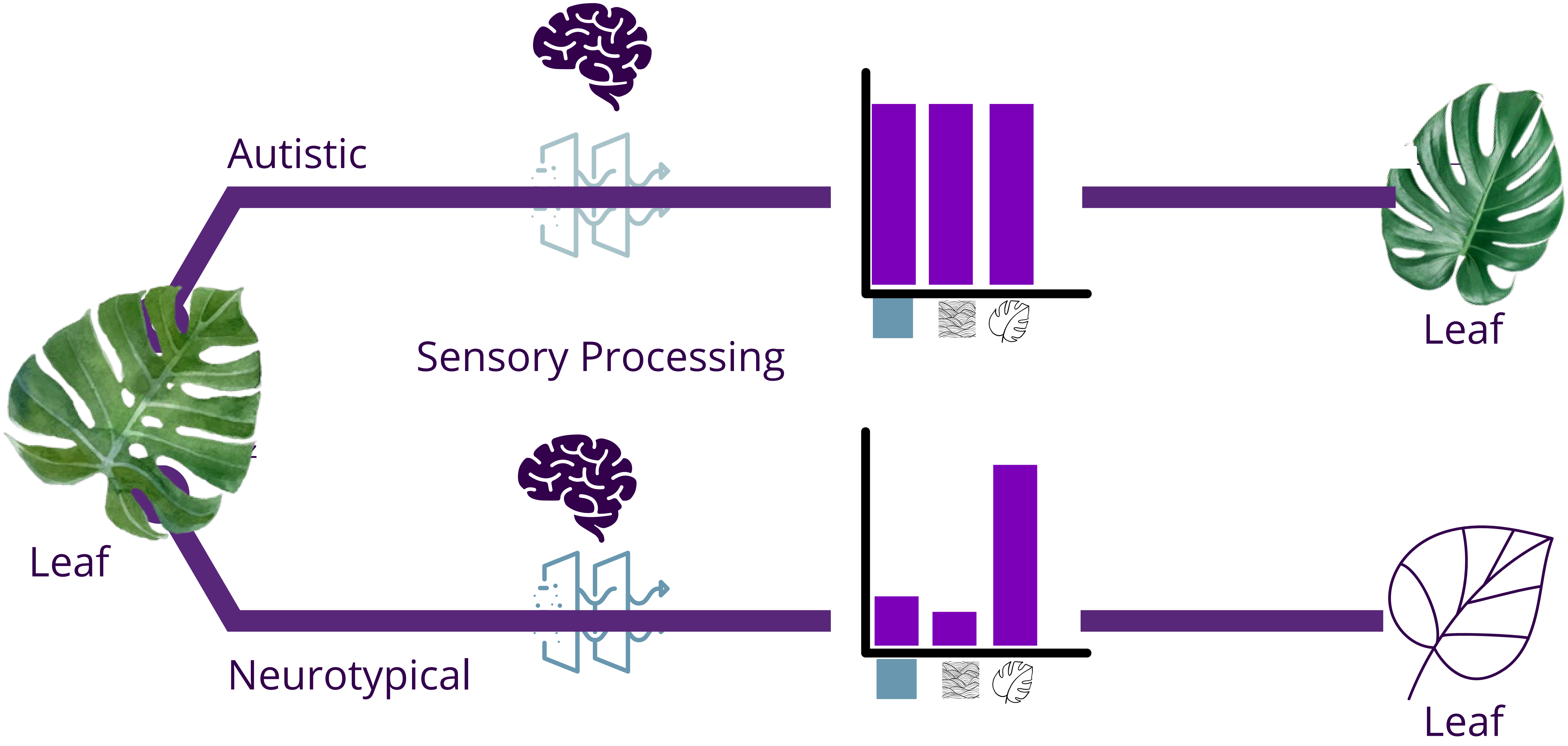

Autistic
Sensory Processing
Leaf
Neurotypical



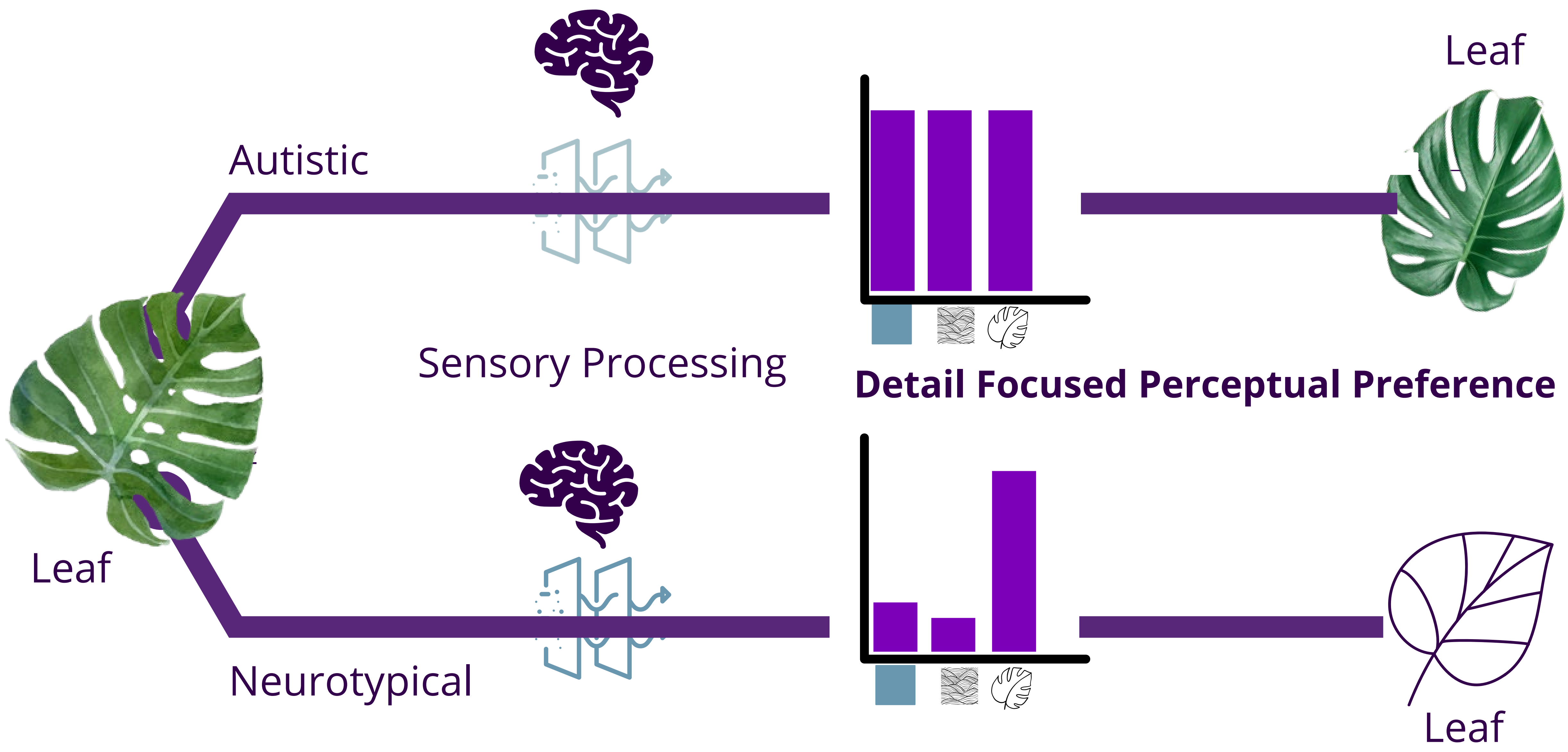
Autistic
Sensory Processing
Leaf
Neurotypical

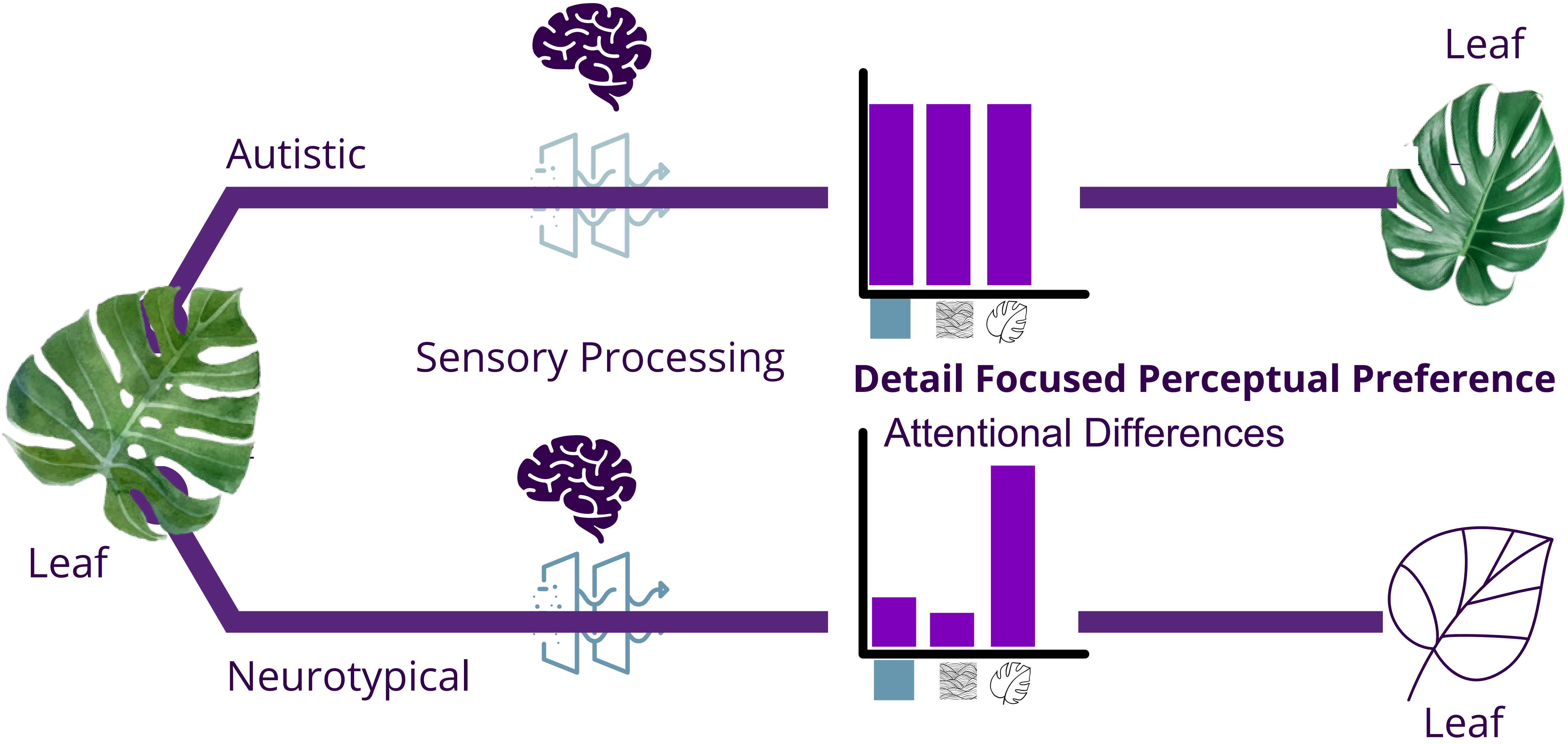


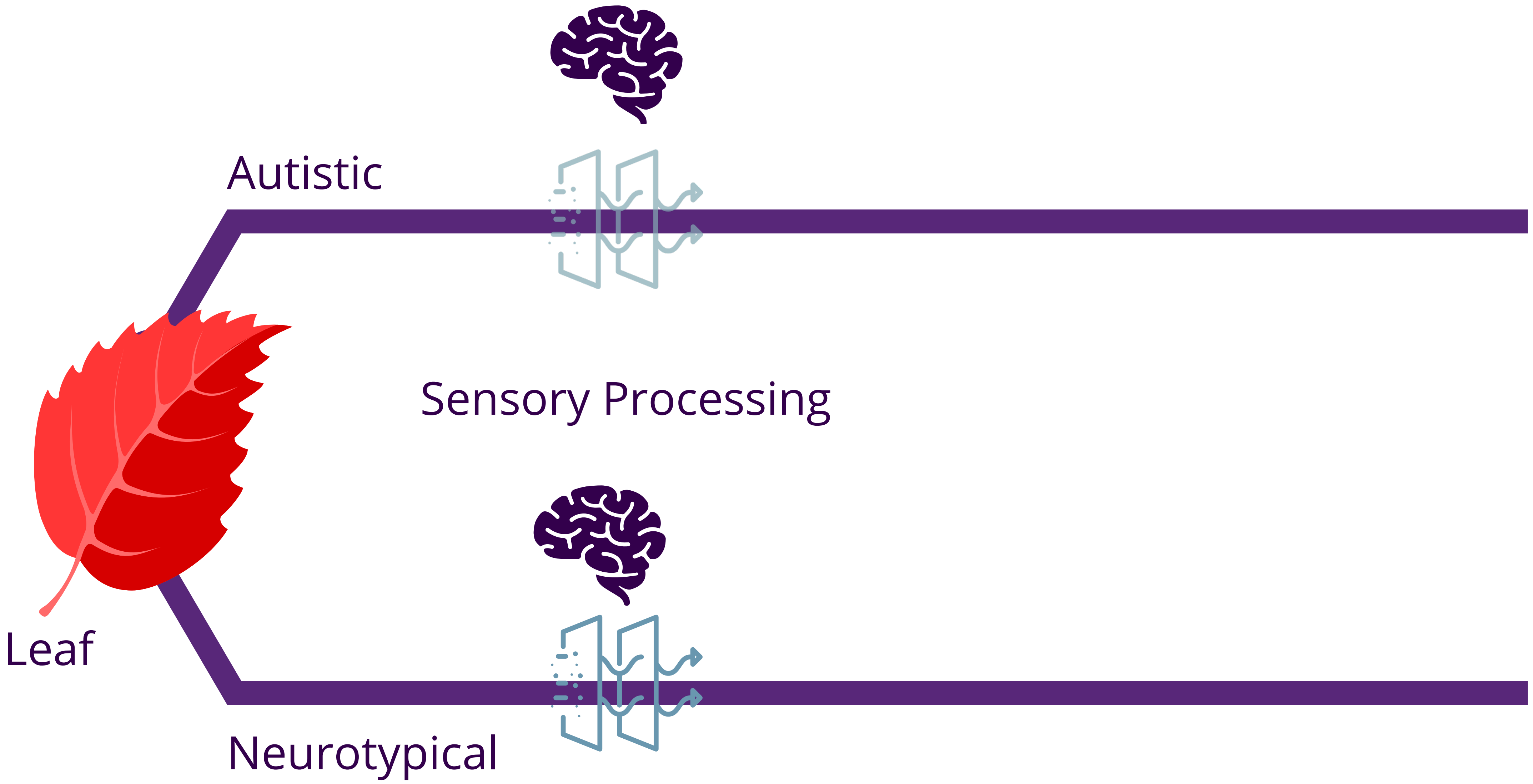
Autistic
Sensory Processing
Leaf
Neurotypical

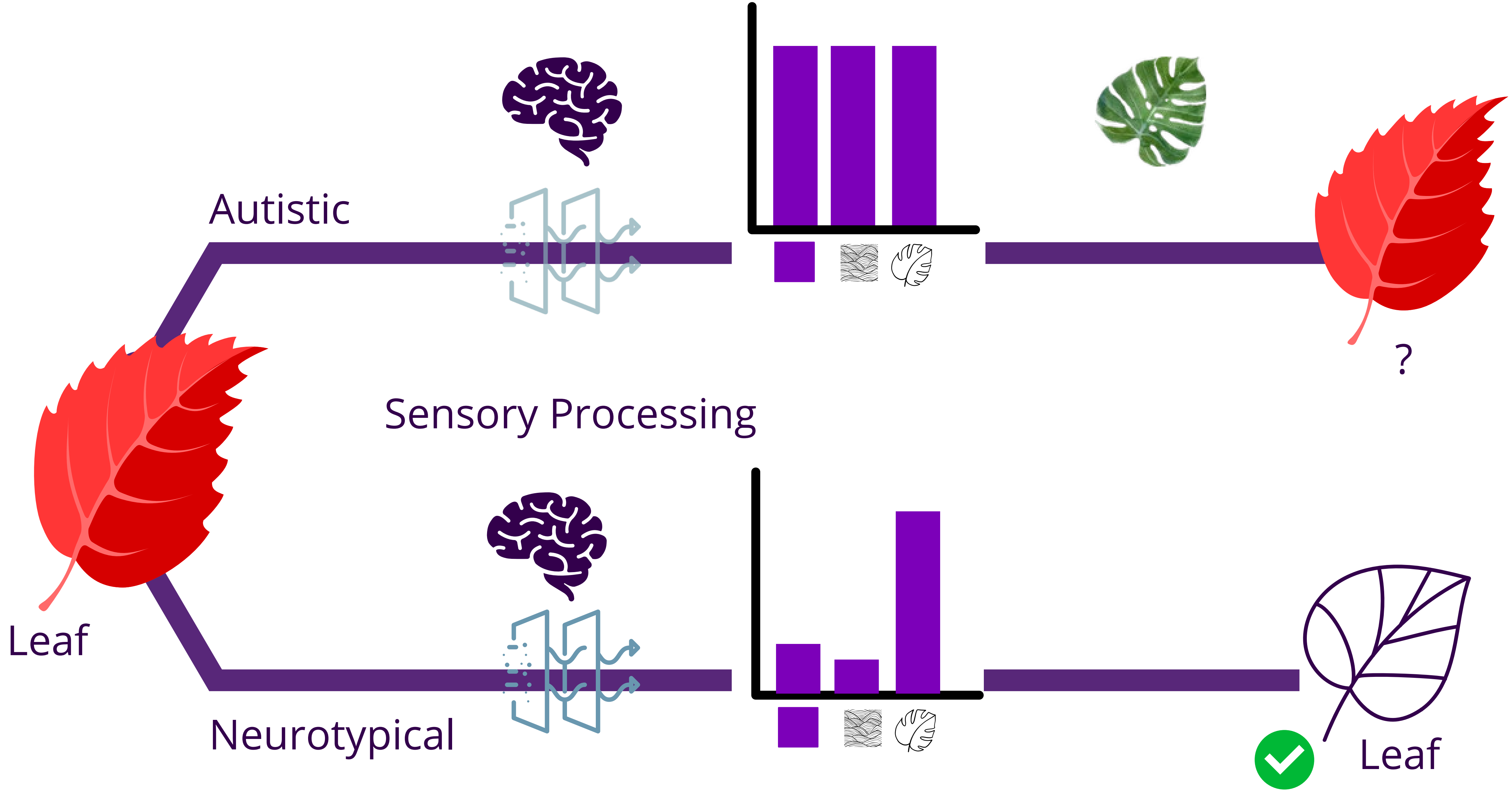


Autistic
Sensory Processing
Leaf
Neurotypical
Leaf
Leaf


Leaf
Autistic
Leaf
Sensory Processing
Detail Focused Perceptual Preference
Neurotypical
Leaf

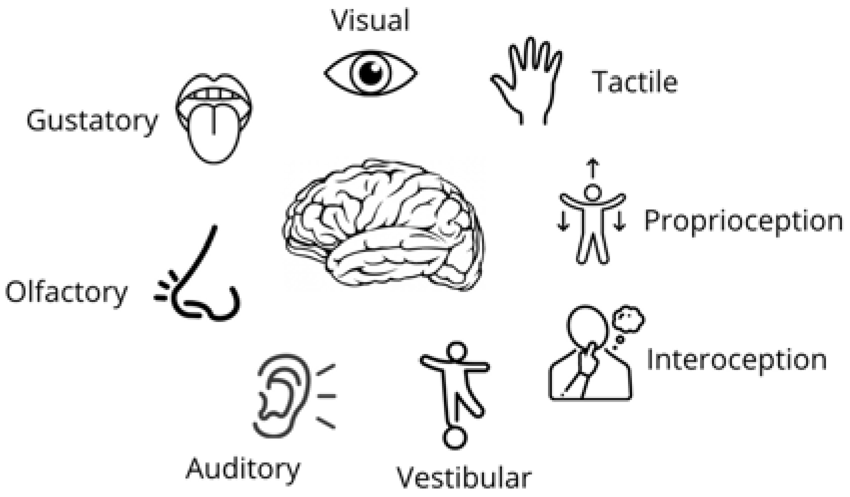

Leaf
Autistic
Sensory Processing
Detail Focused Perceptual Preference
Attentional Differences
Leaf
Neurotypical
Leaf


Autistic
Sensory Processing
Leaf
Neurotypical


Autistic
Sensory Processing
?
Leaf
Neurotypical
Leaf

What am I seeing?

Bottom-Up Processing
Using information from senses to assemble and work upwards to create a perception.



Top-Down Processing
Using mental models, ideas, previous experience to interpret sensory experience

Is that something I've seen before?

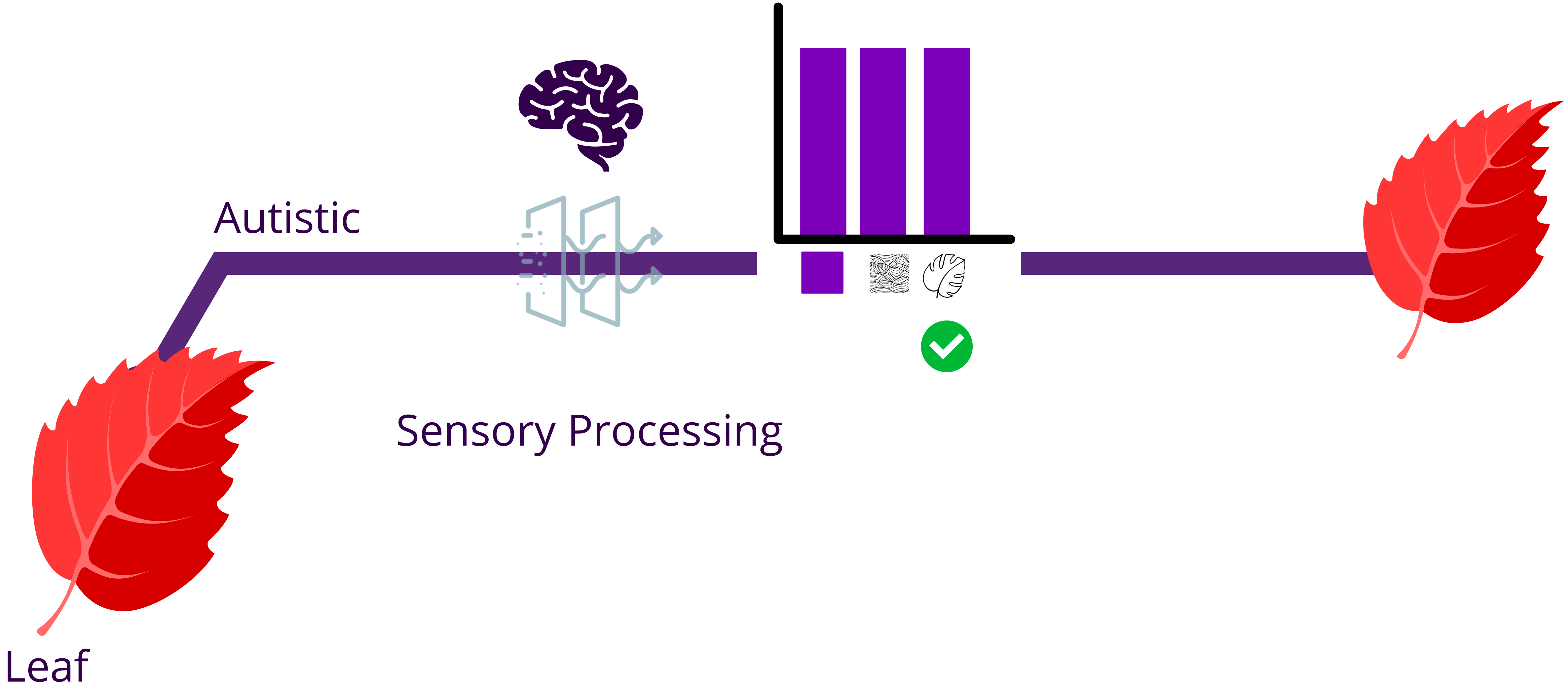
Prefrontal Cortex

Sensory Integration/ Processing

Cerebellum

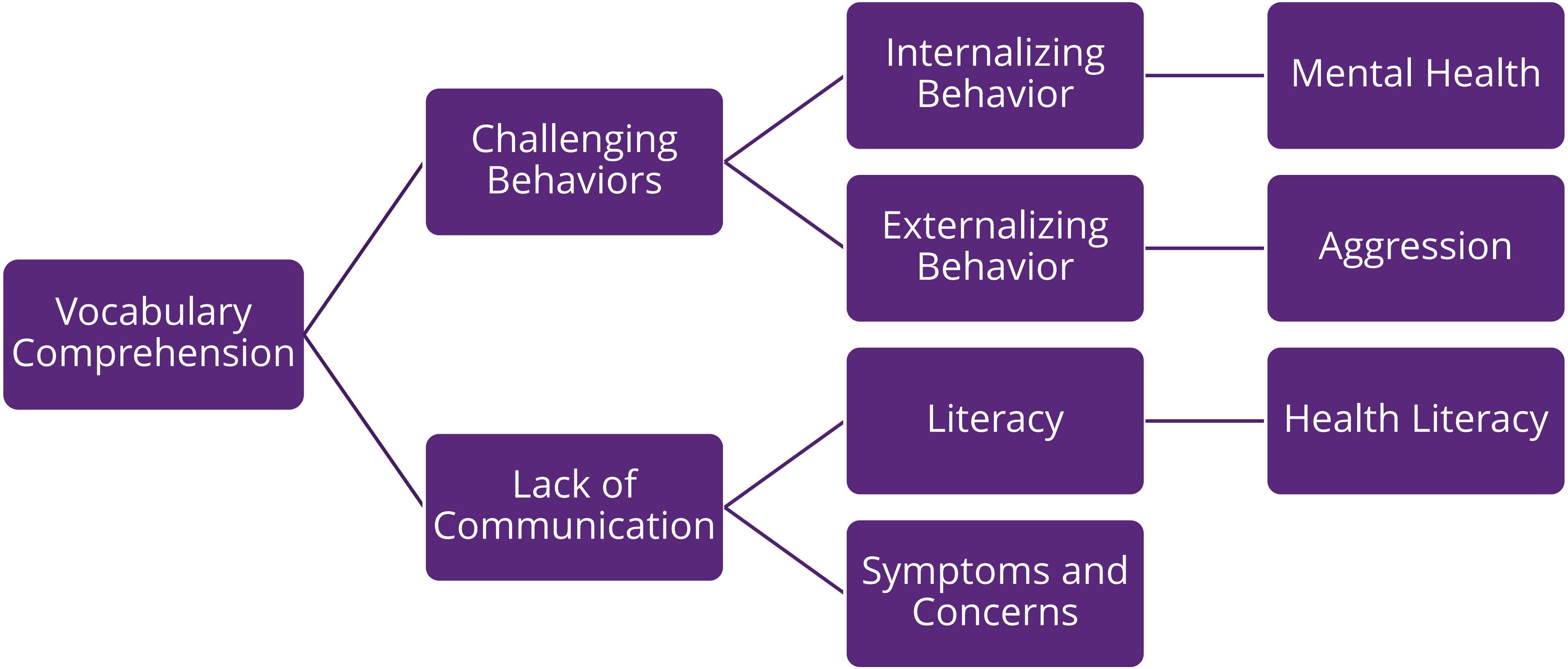





Autistic
Sensory Processing
Leaf

70%+

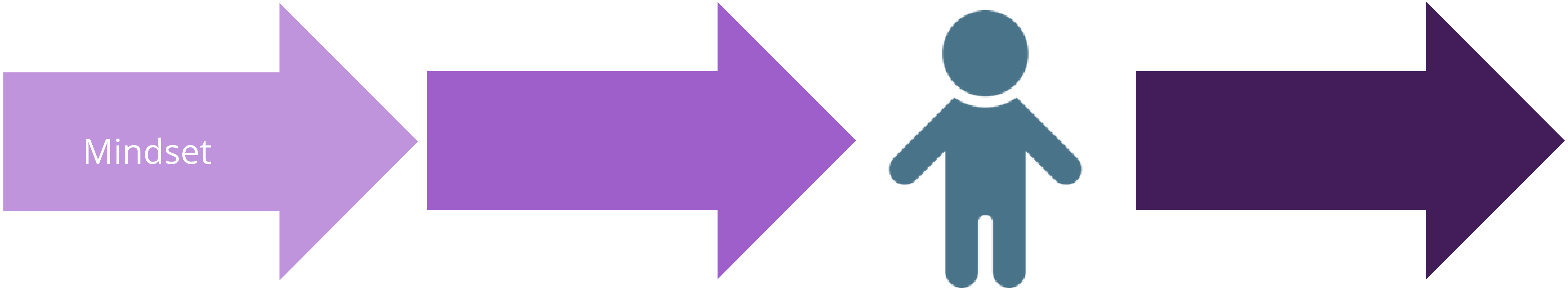
Of autistic students struggle with vocabulary comprehension


Vocabulary Comprehension
Challenging Behaviors
Lack of Communication
Internalizing Behavior
Externalizing Behavior
Literacy
Symptoms and Concerns
Mental Health
Aggression
Health Literacy

Any Questions?

How to Support

Lightening the Load (1)



Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

Lightening the Load (2)

Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

Physical Environment
- Sensory Needs

Embracing Learning Style
- Interests-led programs
- Science of learning for neurodiversity
- Strengths-based Approach

Lightening the Load (3)

Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

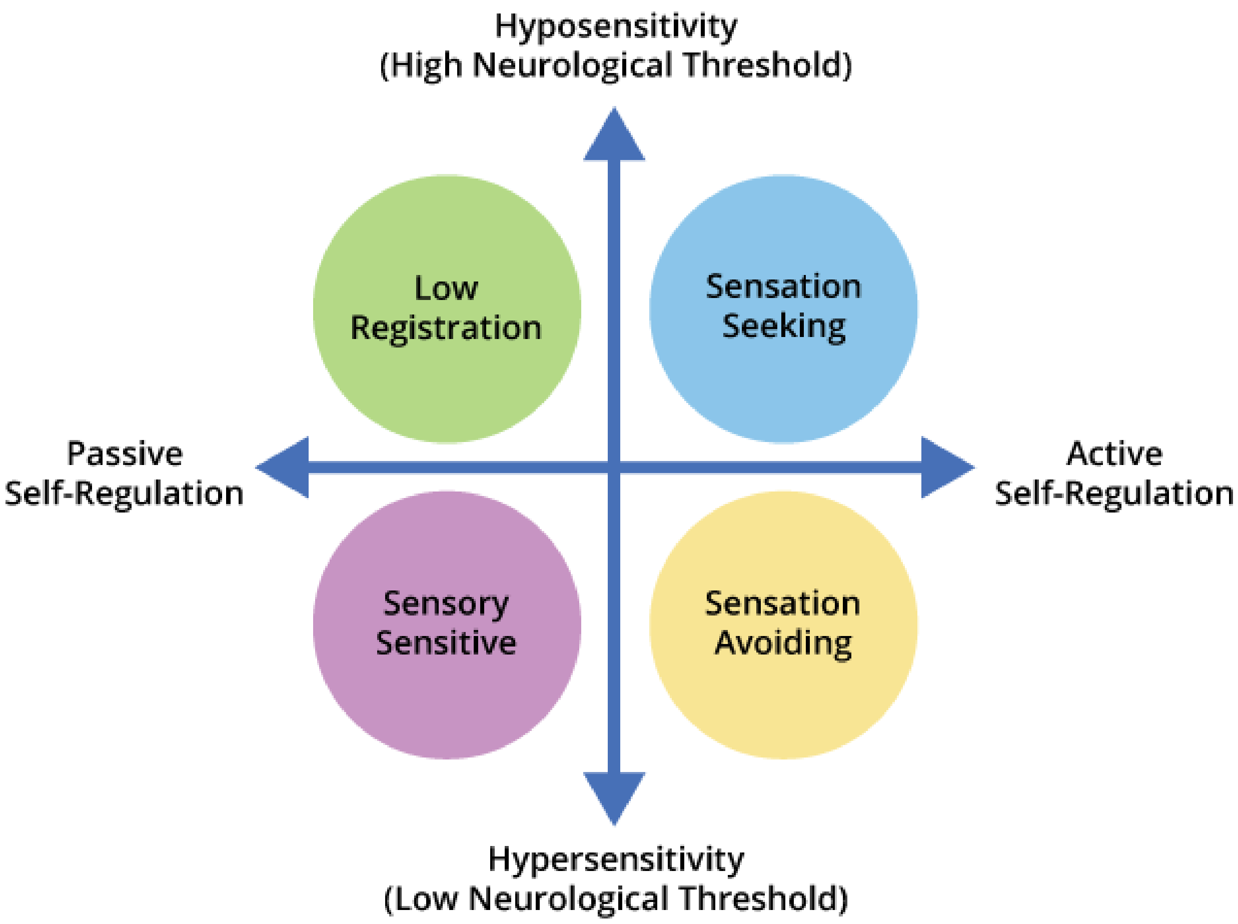
Physical Environment
- **Sensory Needs**

Embracing Learning Style
- Interests-led programs
- Science of learning for neurodiversity
- Strengths-based Approach

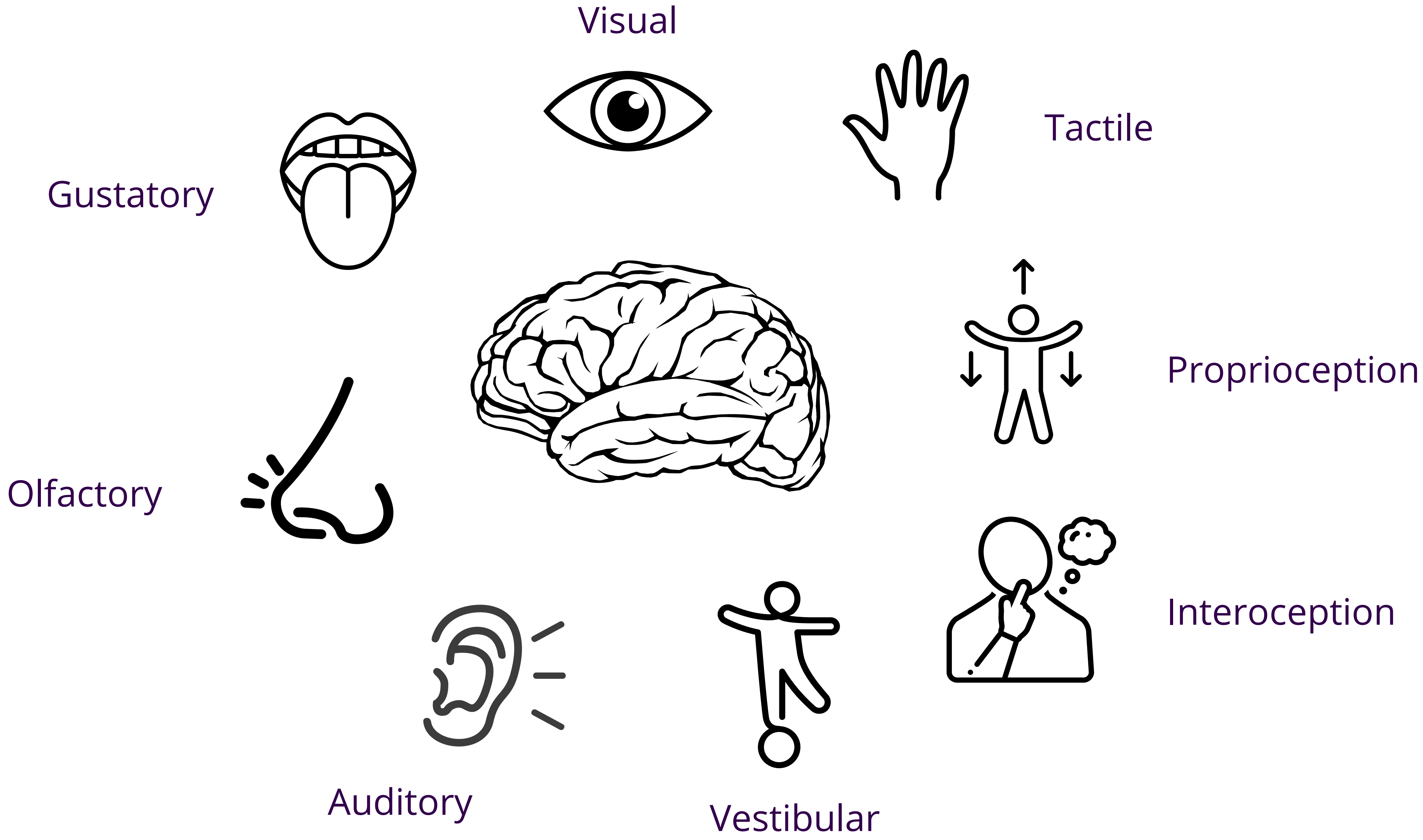
Support a sensory friendly environment

(Image from Storyblocks.com, CC0)

Dunn’s Model of Sensory Processing Continued



(Image Credit: Connectability.ca; Dunn, 2007)

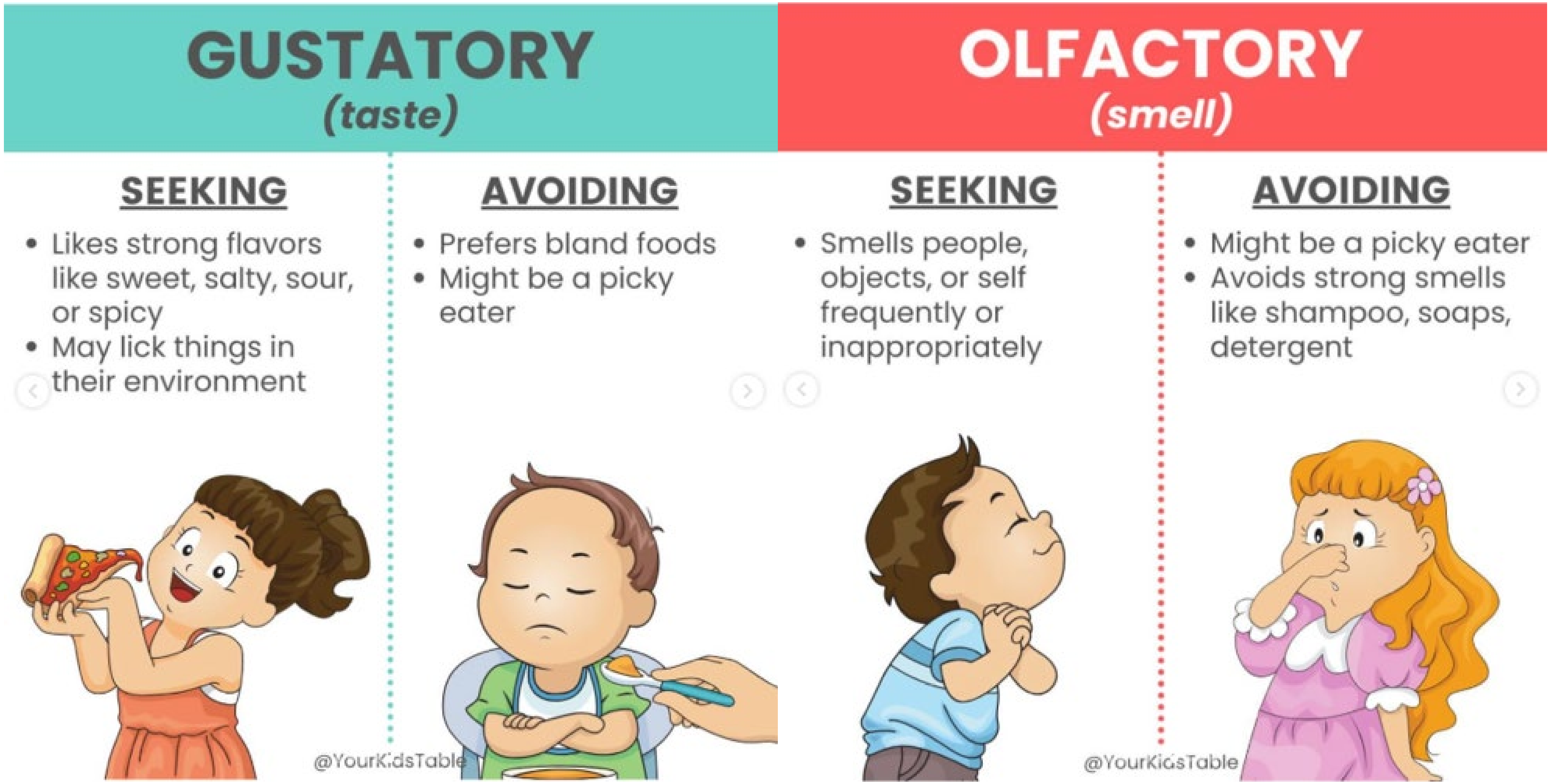


(Mallory et al., 2021)

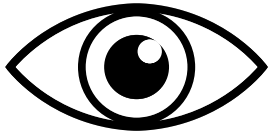
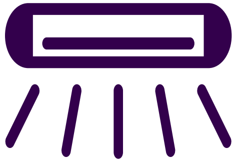
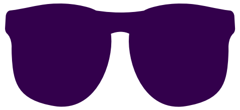
the rest can be found here

(Image from: @YourKidsTable via Instagram)

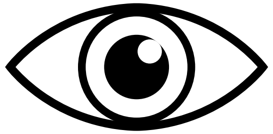
(Image from: @YourKidsTable via Instagram)



(Image from: @YourKidsTable via Instagram)

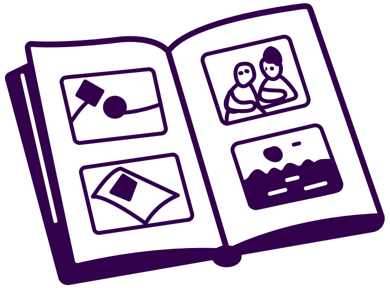
Visual	HYPERsensitive	
		Decrease fluorescent lighting
		Provide sunglasses
		Blackout curtains
		Workstation with walls to hide visual distractions

Visual Continued

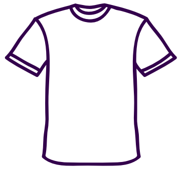


HYPOsensitive

Create visual stimulation breaks with bright reflective lights

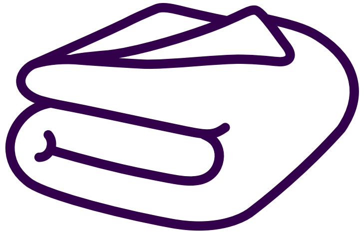


Vibrant visual instructions

Tactile	HYPERsensitive
	 Change texture of food
	 Always warn before physical contact
	 Provide alternative greetings
	 Clothing with no seam or tags

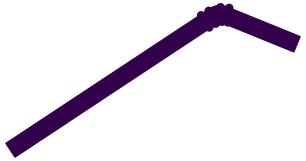
Tactile Continued

HYPOsensitive



Weighted blanket

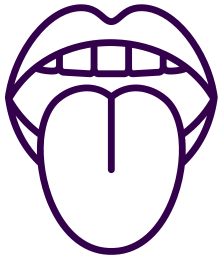
Try jelly, slime, play dough



For chewing: latex free tubes/straws

Physical tasks like pulling a wagon

Gustatory

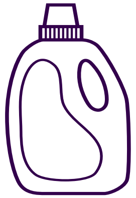


May favor bland (**HYPER**sensitive) or strong-tasting foods (**HYPO**sensitive)

Always make sure there is dietary variety (fiber, etc)

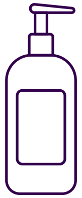
Olfactory Continued

HYPERsensitive



Unscented detergents

Avoid perfumes



Unscented shampoo and soap

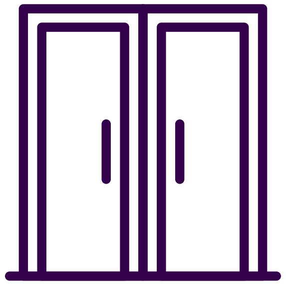
Promote fragrance free environment

Olfactory Continued.

HYPOsensitive

Create hygiene schedule

Explore strong smelling scents

Auditory	HYPERsensitive
	 Ear defenders
	 Shutting doors and windows

Auditory continued

HYPOsensitive

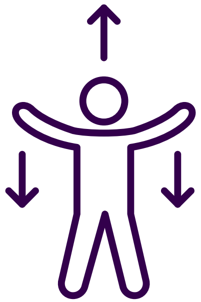
Use visual supports to supplement verbal instructions

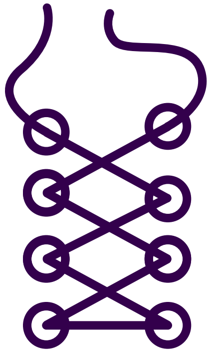
Alert other people in environment

Some may prefer certain music

Toys that make sounds

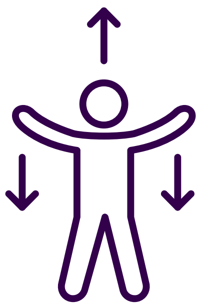
Proprioception | **HYPER**sensitive



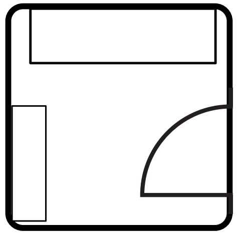


Fine motor activities

Proprioception Continued

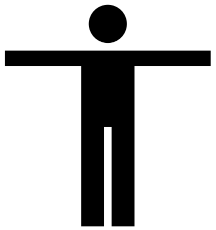


HYPOsensitive

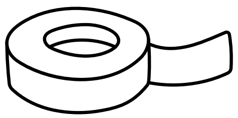


Positioning furniture around the edge of a room to make navigation easier

Weighted blanket

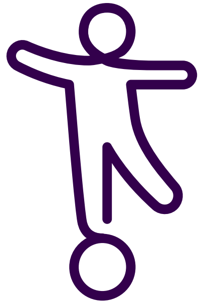


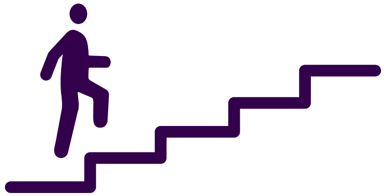
Arms length rule for personal space



Use tape to define boundaries

Vestibular	**HYPER**sensitive

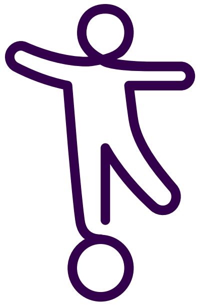




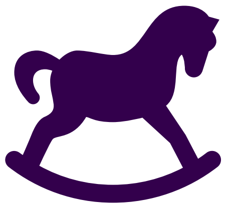
Break down activities into small steps

Visual cues (ex. finish line)

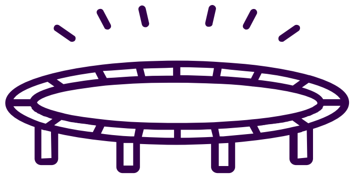
Vestibular Continued



HYPOsensitive



Rocking horse or swing



Trampoline

Sensory Screening Tool

Name of Child/Young Person:	DOB:	NHS No:
Assessor:	Date:	Carer:

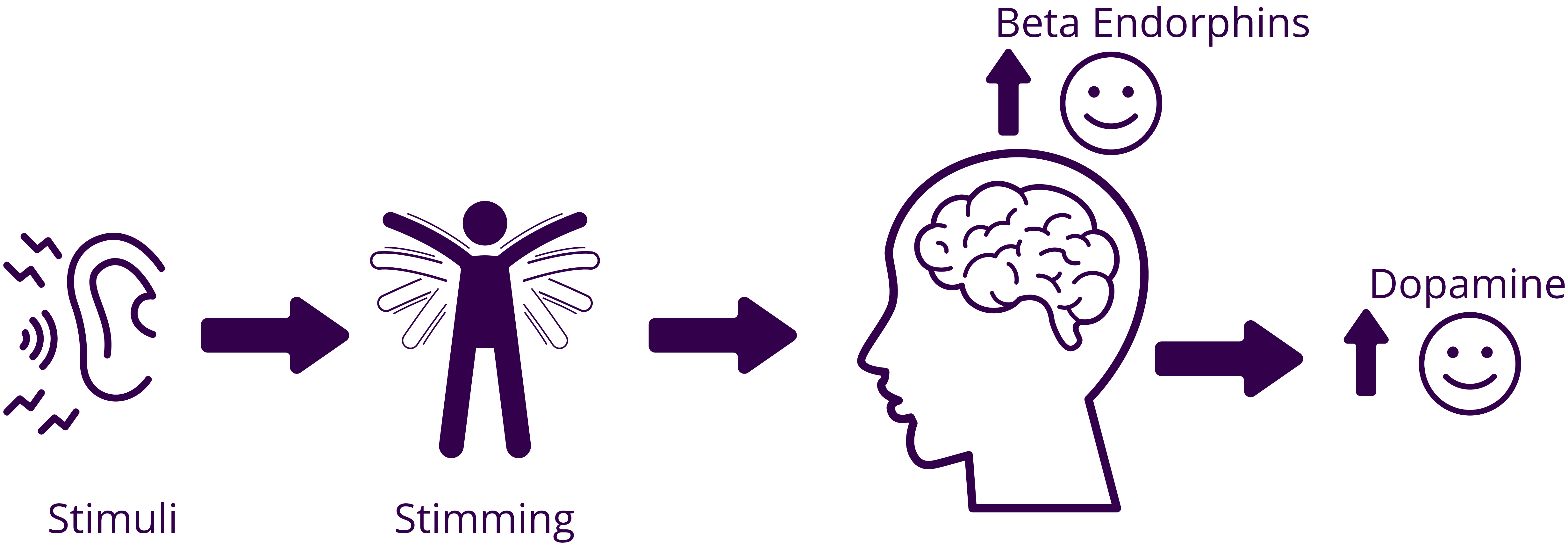
For each behaviour described in the green, pink and blue columns please tick the box that represents the frequency with which this behaviour has occurred over the last month i.e. rarely, sometimes or often.

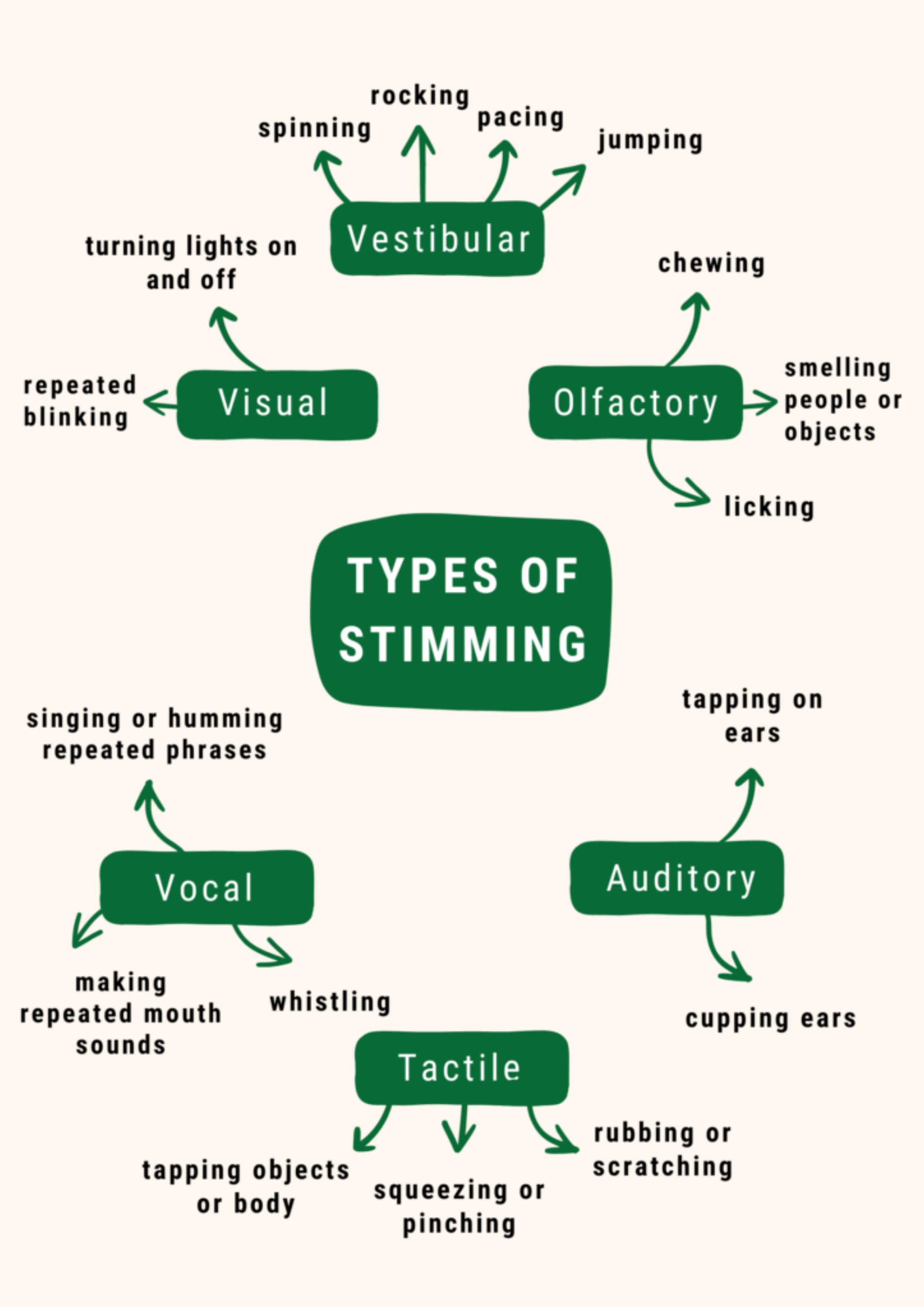
	HYPOSENSITIVITY	Rarely	Some times	Often	HYPERSENSITIVITY	Rarely	Some times	Often
BALANCE (VESTIBULAR)	Seeks all kinds of movements and this interferes with daily routines[12, 5, 7]				Fearful of activities involving movement(e.g. swings, slides, merry-go-round see-saw etc); anxious about moving from place to place[1, 2, 3, 14, 6, 15, 7, 10]			
	Seeks rough and tumble playful interactions[3, 7]				Dislikes trying new movement activities and may have difficulty learning them[15, 2, 10]			
	Becomes overly excitable during movement activity[12]				Becomes anxious or distressed when feet ...			
	Need for rocking, swinging, spinning, jumping[1, 2, 3, 13, 14, 15, 7, 10, 11, 6]							
	Head bangs[3]							
	Enjoys swings, merry-go-round[2, 15, 10]							
	Bumping into people and objects[2, 14]							
	Constantly tilts head back[3] or holds head in odd postures							
	Enjoys being upside down[15, 10]							
	Constantly on the move[3]							
	Loves car rides – may go to sleep in them							

	HYPOSENSITIVITY	Rarely	Sometimes	Often	HYPERSENSITIVITY	Rarely	Sometimes	Often
BODY AWARENESS (PROPRIOCEPTION)	Stands too close to people[1]				Difficulties with fine motor skills, manipulating small objects (buttons, tying shoe laces)[1, 2, 7]			
	A lack of awareness of body position in space[2, 1]				Has difficulty catching balls[2, 10]			
	Bumping into people[1, 2, 8]				Movement of the whole body to look at something[1, 2]			
	Clumsy or awkward in movement[14, 2, 8]				Fall down often and have difficulty with balance (e.g., when climbing stairs)[6, 10]			
	Problems with muscle tone, co-ordination, motor planning[13, 2, 8, 12]				Enjoy movement that he/she initiates but does not like to be moved by others, particularly if the movement is unexpected[10]			
	Slumping posture – leans against walls or people							

	HYPOSENSITIVITY	Rarely	Sometimes	Often	HYPERSENSITIVITY	Rarely	Sometimes	Often
(OLFACTORY)	No sense of smell – failure to notice extreme odours; difficulty identifying things by their smell[1, 2, 11, 15]				Smells can be intensified and become overpowering; dislike of individuals with distinctive perfumes, shampoos; dislikes strong smells[1, 2, 7, 11, 15]			
	Licking of objects[1]				Toileting problems[1, 2, 11] such as fear or reluctance to use the toilet or potty or distress after defecation			
	Smells self, people, objects, food[2, 11, 13]				Hits nose when distressed[2, 11]			
	... plays with faeces[2, 7, 11]				Sudden outbursts of self-abuse/tantrums or withdrawal in response to smells[2, 11]			

Support stimming to self-regulate to sensory stimuli in environment.


Beta Endorphins
Dopamine
Stimuli
Stimming



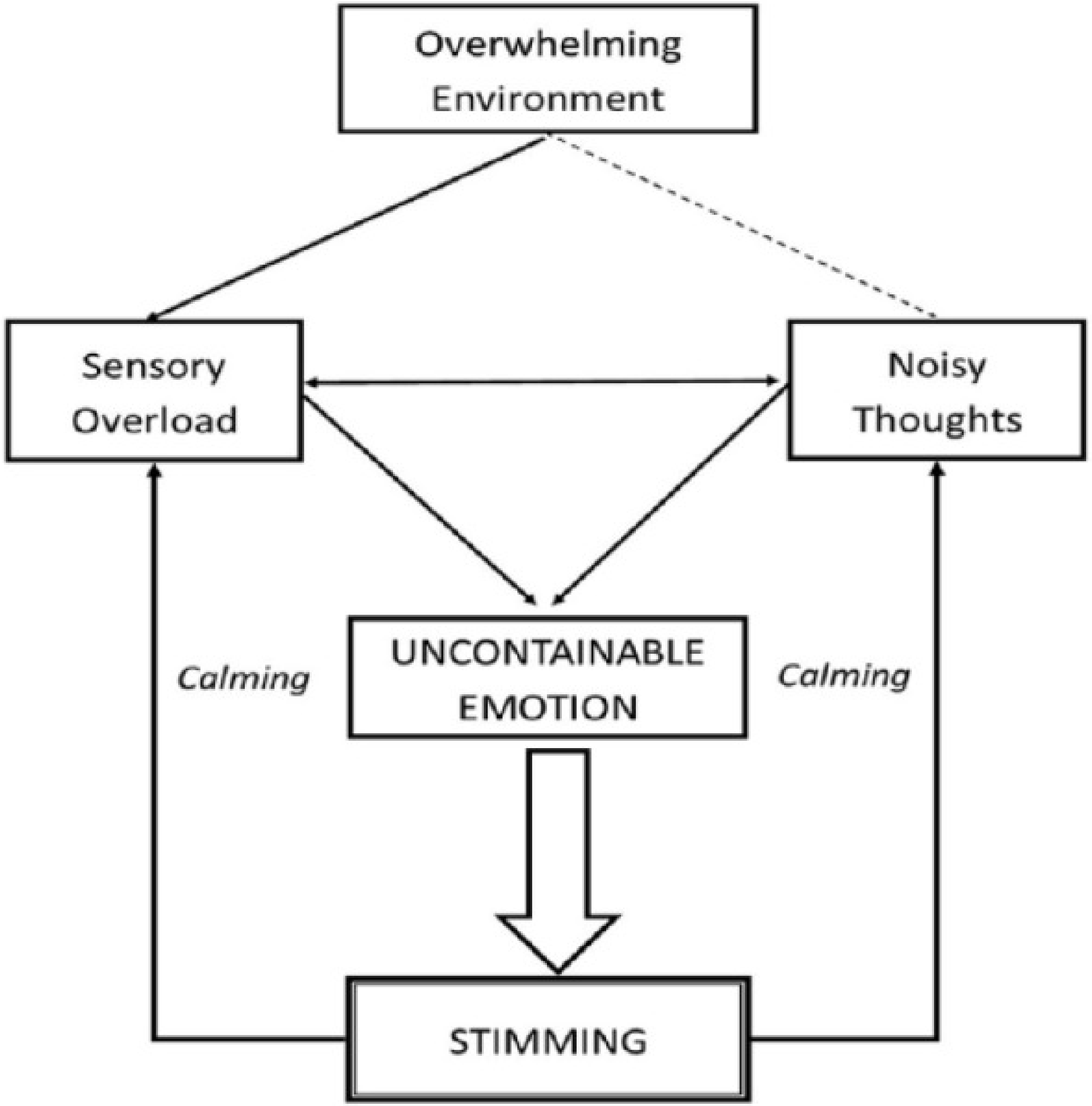
(Image from: New Directions Psychology)

Stimming

Autistic adults report that stimming is a coping mechanism to:

- reduce anxiety (72%)
- reduce overstimulation (57%)
- calm down (69%)

(Steward, 2015)



(Steward, 2015)

Lightening the Load (4)

Family and Care Team

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

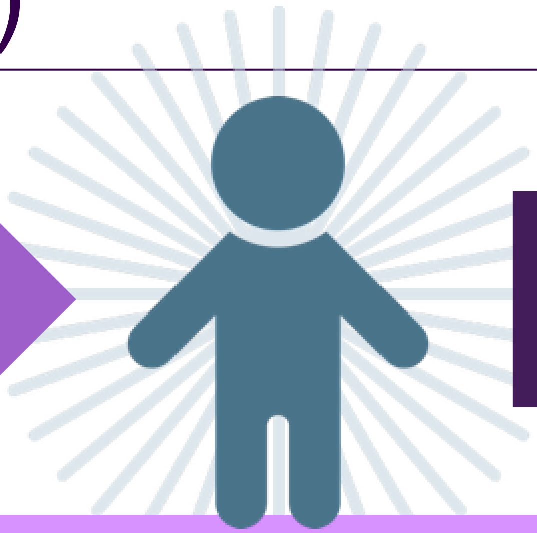
Physical Environment
- Sensory Needs

Embracing Learning Style
- Interests-led programs
- **Science of learning for neurodiversity**
- **Strengths-based Approach**

Lightening the Load (5)

Mindset

Supporting Child's Environment



Self - Advocacy

Family and Care Team

Thrive!

- Be an Ally
- Neurodiversity Lens
- Double Empathy
- Language
- Stay Curious

Physical Environment
- Sensory Needs

Embracing Learning Style
- Interests-led programs
- Science of learning for neurodiversity
- Strengths-based Approach

Needs Met

5 Ways to Support Neurodiversity

Give students the freedom to rise to expectations.

5 Ways to Support Neurodiversity - One

1

IT STARTS WITH MINDSET

5 Ways to Support Neurodiversity - two

2

PRESUME COMPETENCE EVEN WHEN YOU DON'T HEAR OR SEE IT

- Success
- Trust

(Rentenbach et al., 2017)

5 Ways to Support Neurodiversity - three

(Rentenbach et al., 2017)

3 SEE THE WHOLE CHILD AND THEIR STRENGTHS

Find out about their past, their preferences, how they spend their time, and what gives them joy. Having discovered one interest, at least, educators can tap into it as a source of learning opportunities and socialization.

5 Ways to Support Neurodiversity - four

4 PROVIDE SENSORY FRIENDLY ENVIRONMENT

- Reduce visual distraction
- Reduce unnecessary noise
- Eliminate strong smells
- Provide space for relaxing and sensory deprivation
- Provide sensory aids like ear defenders, sunglasses, fidget toys

(Rentenbach et al., 2017)

5 Ways to Support Neurodiversity - five

5 **WAIT**

Allowing some downtime to contemplate words and plan a response in class, during the day, or even overnight may give time for a fresh perspective to materialize

(Rentenbach et al., 2017)

Any Questions?

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Upcoming Event

Inclusive Strategies for Attention and Motivation

Wednesday, Jul. 9, 2025

Join this webinar to learn effective strategies for enhancing attention, motivation, and engagement in neurodiverse or struggling learners across elementary, middle, and high school. Explore practical techniques to create an inclusive and stimulating environment tailored to the needs of neurodiverse children and teens.

OneOp.org/learn/160100

Continuing Education

This webinar has been approved for
1.5 continuing education (CE) credits from:

- American Association of Family & Consumer Sciences (CFCS)
- Certificate of attendance available
- Early Intervention Training Program
- Gateways to Opportunity (Illinois)
- MiRegistry/Michigan Education Association Center for Leadership and Learning
- National Council on Family Relations
- University of Texas at Austin, Steve Hicks School of Social Work

Evaluation Link

Go to the event page for the evaluation and post-test link.

Continuing Education

Questions?

Email: CE@oneop.org

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