

# Vestibular

The vestibular system operates through receptors in the inner ear in addition to position in space, input from the eyes, and feedback from muscle and joint receptors. The vestibular system develops early in life and plays a major role in early development. It is one of the three systems that impact all the others and, as a result, learning, cognition, and occupational performance. Some of the most common movement activities used in OT that stimulate the vestibular system include swinging, obstacle courses, scooter boards, and slides. The vestibular system is activated by movement and allows for our body's movement and participation in tasks. Think about movements like dancing, spinning, kneeling, laying on a couch, crawling, climbing a ladder, going up and down stairs, riding an elevator, and so many other movements we engage in throughout the day. Everyone has different movement needs and responds to vestibular input differently.



## Sensory Strategies



Sitting for prolonged periods of time can lead to decreased attention and concentration. Children who require increased vestibular stimulation may benefit from:

### Brain Breaks

- Jumping, hopping, spinning, balance exercises, stretching, deep breaths

### Sensory Tools

Fidgets, stress balls, weighted blankets

### Outdoor Activities

Outdoor walks, obstacle courses

### Alternative Seating Options

Stability balls, wobble stools, balance cushions

## Autism Spectrum Disorder

Evidence suggests that children with Autism Spectrum Disorder (ASD) may be hypersensitive to vestibular stimulation, or more sensory seeking, compared to other children. These differences may present as:

- **Hyperresponsiveness:** avoid and dislike motion, experience dizziness, vertigo, nausea caused by changes in position, sensitivity to light and sound, balance issues, anxiety and motion sickness.
- **Hyporesponsiveness:** tend to spin, twirl, swing, rock, jump or bounce. Difficulty sitting still more for prolonged periods of time.

# Proprioception

The proprioceptive system is one of the three systems that impact all the others and, as a result, learning, cognition, and occupational performance. It receives sensory input from the muscles and joints about body position, pressure, weight, stretch, movement, and body position changes. Because of proprioception, we can adjust and coordinate our movements (apply more/less force and pressure in a task). Proprioception is critical for motor planning, posture, balance, body awareness, and sensory processing. Some examples of when we use proprioception in our daily lives includes maintaining balance while walking/ running, ensuring proper pressure during handwriting, ensuring food reaches your mouth while eating, and knowing how much force to use when picking up an object.



## Autism Spectrum Disorder (ASD)

Some individuals with Autism Spectrum Disorder (ASD) may have difficulty processing proprioceptive input which may lead to a variety of challenges:

### Hyporesponsiveness:

- **Poor body awareness:** not knowing where body is in space
- **Lack of coordination/ clumsiness:** difficulty navigating environment, frequent injuries
- **Seeking excess input:** frequent jumping, crashing, seeking deep pressure (hugging, pushing into walls)

### Hyperresponsiveness:

- **Avoidance behaviors:** dislike/ become distressed during certain movements
- **Difficulty relaxing/ increased tension:** tense/ stiff muscles, trouble with fluid movements
- **Poor posture:** decreased balance and forward fold posture, slouching



## Sensory Regulation & Proprioception

### Proprioception

Vital for self-regulation and the ability to manage emotional/physical responses to stimuli.

### Self-Stimulatory Behaviors

- Often a result of insufficient sensory input
- Often appear as rocking, jumping, hand flapping, pacing, head banging, and nail biting just to name a few

### Sensory Diet

A structured schedule for sensory activity designed to meet daily sensory needs. Often includes:

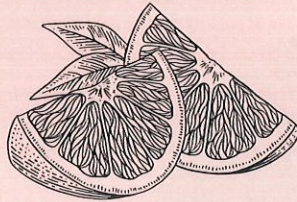
- Deep pressure activities (weighted blanket, squeeze toys, and tight hug for calming)
- Heavy work activities (pushing/ pulling carts, lifting heavy, jumping to organize behavior)

# Olfactory

The olfactory system (sense of smell) has receptors in the nose that connect to pathways that lead to the brain. Some research even shows that the sense of smell is more connected to memory than even vision. Hyper/ hyposensitivity to smells can cause increased anxiety for children with sensory difficulties. Calming scents include vanilla, floral, and chamomile. Alerting scents include citrus and peppermint. Kids with hypersensitivity to smells (hyperosmia) may require accommodations like unscented soaps and lotions, plastic instead of wooden pencils because of the scent, and nose plugs. Because smells aid in bringing about strong memories, pairing scents with play and learning can be very beneficial.

## Alerting Scents

- Citrus
- Peppermint



## Calming Scents

- Vanilla
- Floral
- Chamomile



## Autism Spectrum Disorder (ASD)

### Hypersensitivity (Hyperosmia)

A person with ASD who has hyperosmia may:

- Avoid restaurants due to food smell
- Refuse clothes due to scent of detergent or fabric softener
- Become distressed in public spaces due to strong perfumes

### Hyposensitivity (Hyposmia)

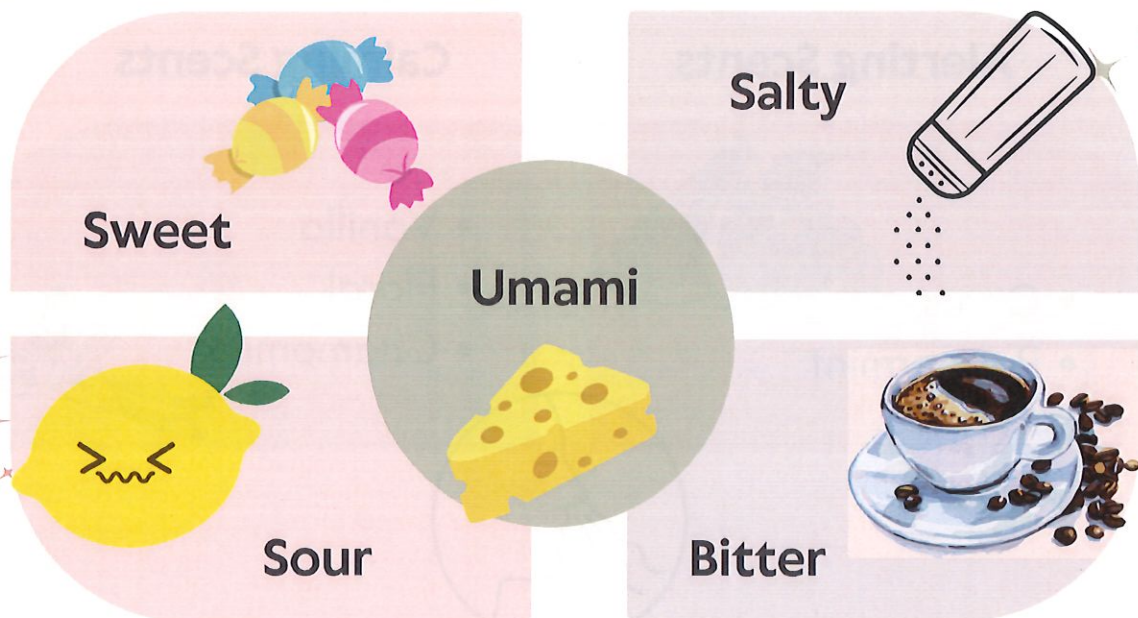
A person with ASD who has hyposmia may:

- Not notice the smell of burning food
- Have difficulty detecting body odor
- Not recognize strong perfumes

# Gustatory

Gustatory refers to our sense of taste and how we respond to food and liquids. It involves perceptions of different flavors and how they are interpreted by the brain to aid in engagement in eating. Occupational therapists often address gustatory challenges through addressing difficulties related to food, feeding, or sensory processing. When the brain has difficulty organizing and interpreting taste, it can impact oral motor function or lead to food preferences, aversions, or sensitivities.

## Flavors



## Autism Spectrum Disorder (ASD)

### Hypersensitivity

Food aversions are common in ASD and can lead to poor nutrition

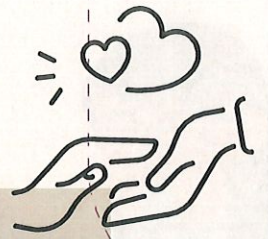
- Food selectivity
- Avoiding strong flavors
- Fear of new food (Neophobia)

### Hyposensitivity

Those with ASD may have strong preferences for specific food

- Seeking strong flavors
- Difficulty discriminating taste
- Increased risk of overeating

# Tactile



Tactile is one of the three systems that impact all the others and, as a result, learning, cognition, and occupational therapy. Tactile refers to the sense of touch and involves receptors on the skin that detect sensations like pressure, temperature, texture, vibration, and pain. The tactile system is responsible for detecting and interpreting touch stimuli which impacts motor skills, body awareness, self-regulation, social participation, and safety.

## Autism Spectrum Disorder (ASD)

### Hypersensitivity

- Discomfort with certain textures (ex. fabrics/ materials)
- Aversion to being touched
- Sensitivity to clothing or tags

### Hyposensitivity

- seeking out tactile stimulation (rubbing hands, frequent touching of objects/ others)
- not noticing pain, hot, or cold accurately
- difficulty detecting textures of objects

## Tactile Defensiveness

### What is it?

- Common for diagnosis of ASD
- Over-sensitivity/ over-responsiveness to touch
- Can result in withdrawal, avoidance, or emotional distress when encountering certain textures or sensations

### What does it look like?

- Withdrawing when touched
- Dislikes face/ hair washed
- Dislikes fingernails cut
- Dislikes seams/ tags on clothes
- Resists haircuts/ hair brushed
- Dislikes closeness of others
- Avoids messy play/ getting dirty
- Dislike restrictive clothing





# Vision

The visual sensory system plays an important role in the way we perceive and interact with our environment. It is responsible for detecting and interpreting light, color, movement, and depth. The visual system works closely with the vestibular system to contribute to balance, coordination, spatial awareness, and processing of environmental information. The two sensory systems are connected to the vestibulo-ocular reflex, which is a neural pathway that enables us to maintain stable vision and balance while the head is in motion.

## Autism Spectrum Disorder (ASD)



### Hyposensitivity

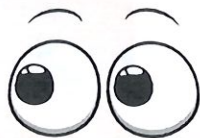
Difficulty noticing or reacting to visual stimuli. Signs include:

- Difficulty noticing visual cues
- Decreased eye contact
- Seeking intense visual stimuli (flickering objects, bright lights, fast-moving visuals)

### Hypersensitivity

Overwhelmed by visual stimuli leading to overstimulation. Signs include:

- Squinting
- Covering eyes
- Avoiding bright or flickering lights
- Avoiding visual tasks (reading/ TV)
- Distress in visually stimulating environments (school/ malls)



### Key Components

- **Visual Acuity:** ability to see fine details at various distances
- **Visual Tracking:** following moving objects with eyes
- **Visual Perception:** interpret and make sense of visual info (color, shapes, sizes, and objects)
- **Visual Motor Integration:** coordinate what we see and how we physically respond (includes hand-eye coordination)
- **Visual Attention:** ability to focus on certain visual stimuli and filter out irrelevant info

# Auditory



The auditory system refers to how we detect, interpret, and respond to sounds within our environment. It is an essential area of focus and can make daily life tasks difficult for those who have difficulties processing sound. Auditory input is key for communication, social interaction, learning, safety and environment awareness, and attention/ focus. It is more common for those with a diagnosis of Autism to process auditory stimuli differently than typical individuals.



## Autism Spectrum Disorder (ASD)

### Hypersensitivity

- Startles easily to unexpected sounds
- Dislikes noisy places
- Overly sensitive to speakers/ radios
- Holds hands over ears
- Hums to block out background noises
- Easily distracted by sounds

### Hyposensitivity

- Seems unaware of sounds
- Holds speaker against ear
- Doesn't respond to alarms
- Mimics sounds of others
- Talks to self
- Difficulty locating sounds
- Hums to hear sound of humming

## Strategies

- **Noise-Canceling Headphones:** helps reduce overwhelming environmental noises for those who are hypersensitive to noise
- **Quiet or Sensory-Friendly Spaces:** allows a safe space to self-regulate when overstimulated by noise
- **Soothing Background Noise:** helps with focus and blocking out distractions, improves auditory attention



# Interoception

Interoception is the sense of oneself and refers to our ability to listen to our body's physical signals. These signals tell us when we are hungry or full, thirsty or quenched, hot or cold, scared or calm. This sensory system is lesser known but so important because it allows us to understand what is going on inside our body. Interoception is strongly related to emotional processing because of the physical way our body experiences different emotions. For example, we may feel queezy when we are nervous, clench when we are angry, and quiver when we are scared.

## Autism Spectrum Disorder

What may this look like for someone who has difficulty processing sensory information

- Emotional dysregulation (aggression, crying, and screaming)
- Difficulty potty training due to decreased awareness of body
- Not knowing when full or hungry (over/under eating)
- Poor temperature regulation (not noticing when too hot/ too cold)
- Not feeling pain or responding to a light touch as pain

## Activities

- **Mindfulness & Body Scanning:** help to focus on different parts of the body and get in time with internal sensations
- **Breathing Exercises:** aid in awareness to body's response to stress and breathing (diaphragmatic breathing, balloon breathing, rainbow breaths)
- **Visual Charts & Social Stories:** can help to recognize and name internal states (ex. zones of regulation chart)
- **Teaching Self-Regulation Strategies:** this can include movement breaks, breathing techniques, listening to music, weighted blanket/ vest, or fidget toys





# Sensory Red Flag Checklist

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- |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> <b>Consider family/caregiver report</b><br>Reports about history, known triggers, preferences, and typical behaviors can help give you a baseline.                                                                                      | <input type="checkbox"/> <b>Review their day with family/caregiver</b><br>Changes in routine, structure to their day, or plans can increase demands on the sensory system.                                                                                                                                                      |
| <input type="checkbox"/> <b>Consider the weather</b><br>Many people can behave differently with extreme weather or quick changes in weather. Some people with ASD can feel heat as pain or have increased demands on their sensory systems from weather changes. | <input type="checkbox"/> <b>Keep in mind before, during, and after the behavior</b><br>Looking at what happened before the behavior can help identify if the behavior is sensory based or not. Looking at what ended the behavior or how they act after the behavior can also help recognize if the behavior was sensory based. |
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- |                                                                                                             |                                                                                            |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Frequently avoids touching people or things                                        | <input type="checkbox"/> Prefers seated or sedentary activities                            |
| <input type="checkbox"/> Avoids touching wet, sticky, messy, dusty                                          | <input type="checkbox"/> Slow reactions to hearing their name or instructions              |
| <input type="checkbox"/> Increased behaviors/emotions in heat                                               | <input type="checkbox"/> Decreased reaction to hot or cold weather                         |
| <input type="checkbox"/> Avoids or sensitive to certain or strong smells                                    | <input type="checkbox"/> Constantly moving or fidgeting                                    |
| <input type="checkbox"/> Difficult to focus in loud/busy environments                                       | <input type="checkbox"/> Frequently bumping into things/people                             |
| <input type="checkbox"/> Upset surrounding transitions or changes                                           | <input type="checkbox"/> Decreased safety awareness or extreme risks during play           |
| <input type="checkbox"/> Heightened reactions to loud or sudden sounds (cover ear, move away, freeze, etc.) | <input type="checkbox"/> Frequently falling on flat or level ground                        |
| <input type="checkbox"/> Frequently licks, chews, or sucks on non-food items                                | <input type="checkbox"/> Increased difficulty sitting upright, increased slouching         |
| <input type="checkbox"/> Increased upset when following directions or needing to stay still                 | <input type="checkbox"/> Difficulty learning new motor skills, appears clumsy in movements |