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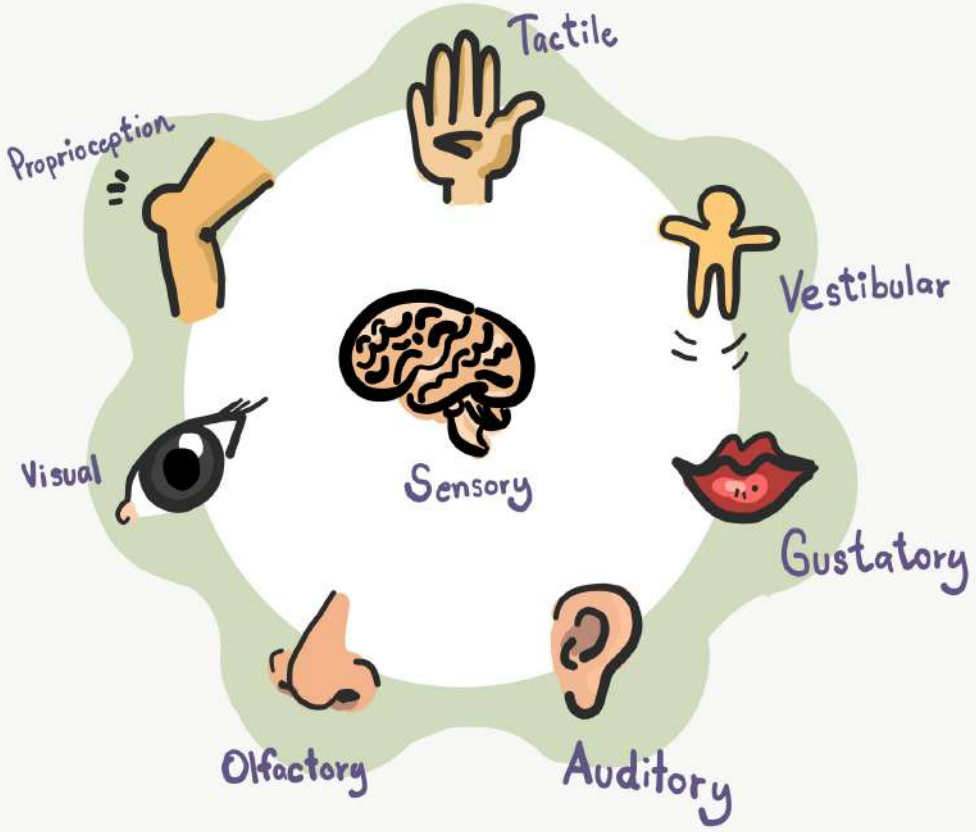
Sensory Processing



Introduction

Sensory processing, also known as sensory integration, refers to effectively receiving, organizing, interpreting, and responding to sensory stimuli from the environment. Sensory information comes in many forms. Some people may readily interpret and process certain types of input but have difficulty with other forms. In order for people to behave in a consistent, even manner, it is important to have effective sensory processing skills. It is for this reason that sensory processing can also be called sensory regulation.

Occupational therapists receive education and training in how to address sensory processing deficits in patients of all ages. Therapists can complete evaluations to determine the types of sensory input that an individual struggles to process. The treatment process then consists of therapists making recommendations to promote regulated behaviors and providing various modalities to improve a patient's ability to regulate certain types of input.

Section 1: Background [1,3,4]

In order to understand sensory processing and how it helps individuals with these deficits, you must understand the terminology that is commonly used in this area of practice.

First off, occupational therapists may treat individuals with sensory processing disorder (SPD). SPD is a condition where the brain struggles to process sensory information. This difficulty usually leads someone to display large-scale behavior changes in response to this input. Therapists may also treat individuals with mild sensory deficits in one or two areas. For this reason, sensory integration treatment may consist of some minor recommendations or more intensive therapy across a patient's plan of care.

Individuals with sensory processing disorder may have issues in one or more of the three subtypes: sensory modulation, sensory discrimination, and sensory-based motor issues. Sensory modulation refers to the way that kids and adults/adolescents process each type of sensory information. Modulation also governs their level of alertness, which has an impact on the process.

Sensory modulation consists of four categories: over-responsive, under-responsive, sensory-avoidant, and sensory seeking. Individuals who are over-responsive will be hyper-sensitive to small amounts of sensory input in certain categories. For example, everyday sounds, smells, sights, and textures may be too much for them to process and

can cause them to entirely shut down or demonstrate an intense behavioral reaction. Individuals who are over-responsive will often enter new situations with much caution and hesitance.

On the other hand, some individuals are under-responsive to certain sensory stimuli. As such, they will require a lot of input in order to register the information they are getting. Individuals who are under-responsive may also be described as passive, tired, quiet, or withdrawn. They may also be slower to respond to certain input. The last type is sensory seeking. Again, this type can be specific to any of the senses and involves individuals craving that type of input and consistently engaging in activities that offer such stimulation.

The next component of sensory processing disorder is difficulty with sensory discrimination. Trouble in this area means that someone will be unable to tell various types of sensory input apart. Lastly, sensory-based motor disorders consist of concerns like dyspraxia, also known as developmental coordination disorder (DCD). Dyspraxia and other brain-based motor deficits cause individuals to have delays in motor coordination, fine motor skills, gross motor skills, and motor planning. Sensory-based motor disorders can also result in issues with postural control and core strength.

Individuals who are sensory-avoidant are typically overly sensitive to certain types of input. Rather than someone who reacts strongly to certain input, these individuals will go out of their way to sidestep it altogether. As a result, they will often be labeled timid, shy, or introverted because of how these protective mechanisms present in social situations. They may also be called picky eaters because they stay away from food that they are sensitive to.

When individuals are constantly exposed to stimuli that their bodies are sensitive to or don't know how to process, they may react poorly. This typically causes a behavioral outburst such as yelling, kicking, screaming, running away, blocking ears, etc. These types of reactions are not considered regulated nor do they promote function.

The goal of sensory integration in occupational therapy is to create an adaptive response to the identified stimuli. An adaptive response is when the body develops an appropriate and healthy reaction to the information, which allows someone to safely engage in learning and exploration.

Each person has a different perception of various types of sensory input. No one perception is right or wrong, rather it demonstrates the brain and body processing this information differently. What is most important is an individual finding or learning

adaptive responses to help them manage this data in a way that promotes function and improved quality-of-life.

Section 1: Personal Reflection

How can sensory integration skills impact someone's motor abilities?

Section 1: Key Words

Sensory processing: Effectively receiving, organizing, interpreting, and responding to sensory stimuli from the environment

Sensory modulation deficit: This results in difficulty processing types of sensory input and managing levels of alertness

Under-responsive: A type of sensory modulation deficit where individuals require more than the average amount of sensory input to process the information; also known as hyposensitive, hyporesponsive, or low registration

Over-responsive: A type of sensory modulation deficit that causes individuals to be overly sensitive to certain types of basic, everyday stimulus; also known as hyperresponsive, hypersensitive, or sensory avoidant

Sensory seeking: A type of sensory modulation deficit that causes individuals to crave certain types of sensory input; also known as sensory craving

Sensory discrimination concerns: A type of sensory processing deficit that causes issues determining the difference between various types of sensory input

Sensory-based motor condition: A type of sensory processing deficit that causes movement-related issues such as poor coordination, impaired motor planning, and more; may be formally broken into dyspraxia and postural control

Dyspraxia: A type of sensory-based motor condition that causes delayed fine motor control, gross motor control, impaired motor planning, and poor coordination

Adaptive response: When the body develops an appropriate and healthy reaction to certain difficult sensory information, which allows someone to safely engage in learning and exploration

Section 2: The Senses [1,2,4]

Before we discuss any other details of sensory processing, we must first identify the main senses that the body recognizes. Most people are familiar with five senses: taste, touch, sight, hearing, and smell. While these are crucial, there are several others that can impact an individual's life. Each of the following can be addressed by sensory integration therapy:

- Taste (gustatory input, or gustation)
- Smell (olfactory input, or olfaction)
- Touch (tactile input, or tactition)
- Sight (visual input, or vision)
- Sound (auditory input, or audition)
- Proprioception
- Vestibular

Taste

Taste refers to the sense of flavor that someone perceives when they put something in their mouth or throat. This flavor is registered through tiny taste buds located on the tongue.

Individuals who are hypersensitive to gustatory stimuli will demonstrate some of the following behaviors:

- Dislikes new foods or beverages
- Enjoys plain foods such as bread, crackers, rice, and pasta with no seasonings or spreads
- Gags in response to new foods or when utensils are put in their mouth
- Hates toothbrushing or going to the dentist

On the other hand, individuals who are under-responsive to or seek gustatory stimuli will demonstrate some of the following behaviors:

- Seeks food with lots of flavor such as spicy, savory, or sweet foods

- Guzzles down milk, juice, or water
- Bites or chews on inedible items like clothing, nails, hair, toys, pens, etc.
- Avoids foods that require a lot of chewing like meat, whole fruit, carrots, etc.

Individuals may also have trouble discriminating between certain types or flavors of food. This is less common and may or may not be addressed in therapy sessions since it may not have an impact on an individual's function.

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing gustatory stimuli:

- For those who shy away from flavor, slowly add new ingredients or seasonings (spices and herbs, rather than salt)
- For those who chew on non-food items, try getting oral chews or starting a daily practice of brushing the teeth, tongue, and cheeks with a rubber brush and water
- Teach stress-reducing exercises to help slow down eating
- Help with pacing by offering half a cup of liquids during meals and the other half after meals
- For gagging, present food in different ways by having the client help serve or starting with touching or smelling before tasting
- For those who stress about food touching on their plate, give them more control over the food they eat: Serve foods like casserole or salad family-style so they can see others eating it, keep multi-ingredient meals in separate bowls to start
- For those who don't initiate touching, smelling, or looking at certain foods, give them the chance to learn about it in a different environment
- Use food bridges -- foods with similar colors, textures, and flavors to what they are already eating
- For those who dislike one type of flavor, but like others, try slowly mixing them together in meals (try mixing strong flavors like bitter and sour with sweet and salty)
- For those who outright refuse leafy, green foods like spinach or kale, try other vegetables that look different

Smell

Smell refers to the sense of detecting odors and scents using the sinuses in the nose.

Individuals who are hypersensitive of olfactory stimuli will demonstrate some of the following behaviors:

- Displays difficulty with scented lotions, shampoos, deodorants, perfumes, candles
- Dislikes the smell of certain strong, pungent foods
- Refuses to touch, eat, or look at food based on its smell
- Does not like standard, everyday smells that others may not even notice
- Determines whether they like people based on their smell

On the other hand, individuals who are under-responsive to or seek olfactory stimuli will demonstrate some of the following behaviors:

- Smells everything, edible or inedible
- Frequently smells people
- Craves certain preferred scents and may become attached to certain objects or clothes with this smell

Individuals may also have trouble discriminating between certain smells. This is less common, but can be seen as a safety risk since a bad smell may not prevent them from drinking hazardous or inedible substances.

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing olfactory stimuli:

- Train individuals (with vision occluded) to describe certain smells to help guess what they are
- For those who like certain smells, offer these scents during therapy to keep their attention
- For those who crave smelling everything, experiment with various smells
    - Calming scents like lavender or chamomile can help regulate behaviors
    - Alerting scents like spearmint or lemon can help increase energy and

attention

Touch

The sense of touch refers to detecting various textures or materials primarily using the hands and fingers. Individuals can also determine texture and other characteristics based on food inside their mouth and throat.

Individuals who are hypersensitive to tactile stimuli will demonstrate some of the following behaviors:

- Avoids getting their hands dirty with soil, sand, glue, shaving cream, water, paint, etc.
- Places inedible objects such as clothes, hair, fingers, toys, pencils, etc. in their mouth
- Exhibits trouble with certain textures of clothing or tags on shirts
- Dislikes wearing socks and/or shoes
- Does not like getting hair brushed, teeth brushed, going to the dentist, or getting hair cuts
- Dislikes getting hugs, kisses, or other forms of light touch, but may enjoy initiating or controlling the touching
- Frequently tugs at or adjusts clothing
- Demonstrates restless behaviors like pacing, tapping feet, fidgeting, playing with hair, etc.
- Scratches or excessively rubs areas where they have been touched
- Avoids baths, showers, pools, sprinklers, or other sources of splashing water
- Demonstrates difficulty tolerating food textures such as soft, mushy, or lumpy

On the other hand, individuals who are under-responsive to or seek tactile stimuli will demonstrate some of the following behaviors:

- Doesn’t notice when someone touches them
- Isn’t aware when clothes are hanging off them, twisted, on backwards, etc.

- Touches people, objects, and themselves frequently
- Often breaks pencils, crayons, or writes too hard to be legible
- Plays rough with others by kicking, biting, or pushing
- Enjoys anything that involves jumping, crashing, running, kicking, and climbing

Individuals may also have trouble discriminating between certain temperatures or textures. This can be especially problematic because such individuals are not aware of stimuli that may cause them pain.

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing tactile stimuli:

- Play in sensory bins
- Use a mirror to improve body awareness and help reposition clothing appropriately
- Encourage them to wear tighter, more fitted clothing
- Offer objects to keep their hands occupied like fidget spinners, stress balls, stretchy bands, velcro, snaps, buttons, etc.
- Encourage activities like blowing pinwheels, bubbles, balloons, or making silly faces to strengthen facial muscles
- If they are sensitive to touch in the mouth, try using straws to limit the amount of liquid in their mouth at one time
- Teach boundaries by using marks on the floor to help them know where to stand
- Exercises like chair push-ups, wall push-ups, tug-of-war, carrying items around, and jumping jacks before seated activities can help minimize seeking behaviors and improve focus
- If they don't like certain textures of foods, encourage trying food with the teeth first rather than the tongue. Try cooking food in a different way.

Sight

Sight refers to the images that someone sees and perceives with their eyes.

Individuals who are hypersensitive to visual stimuli will demonstrate some of the following behaviors:

- Likes wearing sunglasses or keeping head covered with a hood or a hat
- Rubs eyes, squints, or holds forehead when reading or looking at something for too long
- Avoids eye contact often
- Has trouble looking at the board or copying items from book to paper or board to paper

On the other hand, individuals who are under-responsive to or seek visual stimuli will demonstrate some of the following behaviors:

- Stares at bright, loud, shiny, or moving objects
- Turns their whole body to look at you rather than just their head
- Closes or covers one eye when coloring or writing
- Mistakes one letter for another and may write them incorrectly
- Ignores minor or major details about their surroundings

Individuals may also have trouble discriminating between certain types of visual stimuli. This can cause:

- Difficulty telling the difference between facial expressions
- Trouble with games like puzzles and mazes
- Trouble separating visual and auditory information when given at once

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing visual stimuli:

- Minimize distractions in the environment
- Give either visual or verbal directions, not both
- Practice similar letters in a variety of interactive ways to solidify learning
- Complete table top tasks in small chunks with breaks in between

- Offer dim lighting when they are overstimulated
- Decorate their room with simple decor
- Practice games with minimal images and concepts, then work up to simple puzzles, then harder ones
- Offer eye mask to help relax during the day or fall asleep at night
- Consider a vision consult to determine if certain eyeglasses may help
- Allow them to sit close to the board during classes
- Change settings on computer to modify brightness and minimize glare/blue light

Sound

Sound refers to the perception of auditory waves. This input is registered through the eardrum and other small structures in the ear.

Individuals who are hypersensitive to auditory stimuli will demonstrate some of the following behaviors:

- Screams, covers ears, is startled by, or runs away at loud noises
- Gets upset or distracted by background noise like fans, lawnmowers, or TV static

On the other hand, individuals who are under-responsive to or seek auditory stimuli will demonstrate some of the following behaviors:

- Doesn't often respond to name when called
- Trouble following directions given aloud
- Can't tell when they are speaking louder than other people

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing auditory stimuli:

- Use headphones or earbuds in loud or crowded places
- Separate visual and auditory directions when teaching them how to do something
- Play calming classical music in the background

- Identify triggers for noise
- Instruct them not to entirely avoid certain stimulus, rather to develop coping strategies to manage behaviors in response to them
- Give them warning when loud noises are about to start, if they are predictable
- Carve out a calm corner where they can go to de escalate from the noise

Proprioception

This refers to a person's awareness of the position of their body. This input is registered through special receptors and spindles in the muscles. Since this is a more complicated sense, it doesn't present as the other ones do. It is not possible for someone to be hypersensitive to proprioceptive input.

Individuals can, however, be under-responsive to proprioceptive input. This may cause them to seek more proprioception, since this sense is universally known to calm the body and mind. This may result in behaviors such as:

- Using too much force when writing or handling objects
- Hyperextending their joints
- W-sitting
- Hanging off of objects
- Getting tired quickly
- Playing rough with others
- Jumping, climbing, or pushing objects often
- Enjoying crashing into pillows, furniture, bed, etc.
- Appearing stiff
- Walking or moving clumsily or in an uncoordinated manner
- Slouching in a seated position
- Bumping into people

Therapists can provide some of the following treatments and/or recommendations for

individuals who need more proprioceptive input:

- Any form of weight-bearing exercise like yoga, push-ups, running, weight lifting, and sports
- Deep pressure like getting big hugs, log rolling on the floor, getting swaddled or wrapped in a big blanket
- Resistance activities like weight lifting and crossfit
- Lifting heavy items such as carrying groceries, doing lawn work, and moving boxes
- Aerobic activities like running and jumping rope
- Chair push-ups or wall push-ups
- Theraband on the chair
- Bouncing on a ball
- Doing household chores such as cleaning, moving furniture, stacking chairs, sweeping, mopping, wiping down tables, putting groceries away, and carrying boxes
- Wearing tight, well-fitting clothing or a weighted vest

Vestibular

Vestibular input registers sensation related to movement of the head. This can include the position, direction, or the type of motion. This input is registered through small structures in the inner ear.

Individuals who are hypersensitive to vestibular stimuli will demonstrate some of the following behaviors:

- Avoiding any swinging, sliding, rocking, or rotational movements
- Getting seasick or car sick easily
- Tripping or falling often
- Bumping into things frequently
- Suffering from blurry vision or confusion when they are sick

On the other hand, individuals who are under-responsive to or seek vestibular input will demonstrate some of the following behaviors:

- Can go on roller coasters, do back flips, and spin continually without getting dizzy
- Demonstrates poor posture (difficulty remaining upright) when sitting or standing
- Struggles to complete tasks that require both arms, legs, or both sides of the body

Individuals who seek vestibular stimulation may rock while standing or sitting. They may also enjoy reading or watching devices in the car, whereas this may make others sick.

Therapists can provide some of the following treatments and/or recommendations for individuals who have concerns related to processing vestibular input:

- For those who are under responsive, try small amounts of rotational spinning to increase alertness
- For those who are over-responsive, try rocking side to side or front to back for a calming effect
- Gently stretch to the neck, back, and head by placing the ear to the shoulder and rolling the head slowly in circles
- Slowly glide on a therapy ball or rocking chair
- Practice slow, intentional movements associated with tai chi and yoga
- Do activities with slow marching or stepping in place

Section 2: Personal Reflection

How might each of these recommendations or activities be tailored to a person's work or school environments?

Section 2: Key Words

Food bridge: Foods with similar qualities (texture, color, shape, flavor) that can be used to expand the diet beyond familiar food items

Aerobic activities: Any type of exercise that gets your heart rate up, such as running or swimming

Proprioception: A person's awareness of the position of their body

Vestibular system: The system located in the inner ear that detects certain types of movement related to the head

Section 3: Praxis & Motor Planning [1,3,12]

As we mentioned earlier, another big part of sensory processing is motor skills. The two are intertwined, so delays in sensory processing can lead to motor concerns.

Praxis is defined as the brain's ability to control motor actions. Deficits in praxis are known as dyspraxia. This can cause concerns such as:

- Trouble learning new exercises, games, or sports
- Delayed ability to run, skip, hop, and jump
- Delayed ability for fine motor skills like coloring, cutting, writing, and drawing
- Trouble following multi-step directions
- Clumsy, messy, and bumping into things/people often
- Preferring to play alone or only do familiar activities
- Avoiding doing things in lieu of talking or pretend play
- May put clothes or shoes on backward, inside out, with buttons misaligned, etc.

Motor planning is a similar concept within the larger umbrella of praxis that governs organization, sequencing, execution, and memory of the steps for new and familiar motor processes.

Some people have difficulty with ideation, which is the processing of initiating a motor task. This involves thinking of a process to guide them through it, including what tools to use, how to move their body, what body parts will be involved, and more. Those with poor ideation skills may benefit from tools like visual schedules and other forms of reminders to prompt them to begin certain tasks.

Sequencing comes next, which entails arranging these concepts and steps in the appropriate order to ensure successful task completion. Execution is when the motor planning process leaves the brain and enters the environment, as this is when the

actions begin happening. Termination involves stopping each step at the right time in order to finish the task.

Bilateral coordination plays a part in motor planning and praxis, since most tasks require the simultaneous use of both hands. This may also include alternating use of one side of the body for a time and then switching, for example, when someone is rowing a canoe. This is a good indicator of how the brain is working, as someone's bilateral coordination skills show that communication within the brain is intact.

Postural control is another concern that exists with those who have dyspraxia. Postural control is a child's ability to assume a certain position, most commonly remaining upright while sitting or standing. This type of motor skill can also impact the ability to assume certain hand positions and grasp patterns.

Those with impaired postural control may demonstrate some of the following behaviors:

- Demonstrates weakness when gripping objects like writing utensils, handles, toys, and more
- Avoids heavy work such as lifting, carrying, or pushing
- Struggles to sit or stand upright
- Has muscles that appear weak or loose
- Is often referred to as lazy
- Struggles with automatic movements

A range of physical activities are indicated to address the motor-based sensory concerns such as poor postural control and dyspraxia:

- Activities like tug-of-war and hopscotch that require shifting weight
- Catching a ball thrown to the side
- Using various cushions and pads to support sitting posture
- Doing push-ups, crunches, hula hoops, and obstacle courses to improve trunk and back strength
- Playing catch or doing other activities while standing on a balance board
- Encourage walking on uneven surfaces to improve balance

- Get utensil modifications like pencil grips, padded forks and spoons, and alternative scissors
- Use smaller crayons and pencils to improve grasp pattern
- Trial a slant board to make writing angle easier
- Jumping on a trampoline to improve lower body and core strength
- Give directions one at a time to improve their processing
- Balloon toss for balance

Section 3: Personal Reflection

Can you think of some ways that postural control can be addressed in the workplace?

Section 3: Key Words

Ideation: The first step of task completion (initiation) that involves creating an idea of how to go about a motor plan

Bilateral coordination: The coordinated and simultaneous use of both hands and arms **at the same time**

Praxis: The brain's ability to control motor actions

Dyspraxia: Delays in the brain's ability to control motor skills

Motor planning: The brain's ability to organize, sequence, execute, and recall the steps for new and familiar motor processes

Postural control: The body's ability to maintain an upright position in space

Section 4: Assessments [1,3,5,6,7,8,9]

It is important to preface any therapeutic intervention with an evaluation or standardized assessment. This is not only important to better tailor treatments toward a person's exact deficits, but this will also help you track their progress over the plan of care.

The best way to identify sensory issues is through standardized assessments. Several assessment measures cover all areas of sensory processing.

The Sensory Processing Measure (SPM) can be used on children ages 5-12 either in the home, at school, or in the community to determine the range and severity of sensory processing deficits. This test is simple enough that parents or therapists can use it. If parents use it, the information should be given to an occupational therapist to interpret the data, provide treatments, and make recommendations accordingly.

The Sensory Profile 2 is a series of checklists that can be used in the home, school, or in the community for the same purpose. This measure is more specific to sensory needs across the lifespan, as there are separate checklists for infants/toddlers, children, adolescents, and adults. This assessment is used to identify the specific sensory areas that an individual struggles with. For example, checklists may identify that someone has an average ability to process tactile information but moderate to severe issues responding to visual stimuli.

The Sensory Integration Praxis Tests (SIPT) can be used to identify sensory concerns in children ages 4-8. The SIPT consists of 17 portions that test reactivity and discimination in each category. Through activities that test motor skills, body awareness, vision, tactile abilities, and other senses, the SIPT identifies the impact that sensory concerns have on learning and cognition.

The Test of Sensory Function in Infants (TSFI) serves a much younger population, but there is unfortunately not much reliable evidence regarding its use. However, this does offer a unique opportunity for therapists to gauge sensory reactions of much younger children, those from 4-18 months. This assessment is intended to identify the presence and extent of sensory concerns.

The DeGangi-Berk Test of Sensory Integration (TSI) measures general sensory function and has subtests that evaluate important related concerns, including bilateral integration, postural control, and reflex integration. This assessment is self-report based on therapist observations of children ages 3-5. The TSI aims to identify the extent of sensory processing deficits to prevent them from impeding learning as a child develops.

Section 4: Personal Reflection

Why do you think there might be little reliability and evidence behind sensory assessments for infants?

Section 5: Writing Sensory Goals [1,2,3]

As with all occupational therapy goals, each sensory integration goal must have certain criteria to be successful. Each goal must have a strong emphasis on function, since improving functional capabilities and adaptive responses are the main goal of sensory integration therapy.

It is helpful for sensory goals to follow the SMART format, which states that goals must be short, measurable, achievable, realistic, and time-sensitive in order to be effective.

Additionally, sensory goals should include the necessary modifications that will be used. For example, goals and documentation should mention certain tools or educating patients on certain techniques. When applicable, sensory goals should include the level and type of assistance that is needed to achieve the goal. Visual, tactile, or verbal cues are the most common to include (especially when working with children) along with standard levels of assist ranging from modified independent to total assist. When applicable, it makes sense to specify the sensory system that is being targeted.

Here are some examples of sensory goals that hit the main components above:

- Jessica will tolerate 5 minutes of vestibular stimulation to increase attention for independent completion of fine motor activities.
- Following a 3-step sensory obstacle course with proprioceptive and tactile input, Daniel will complete his upper body dressing sequence.
- Mary will identify when she is experiencing tactile overstimulation and request her weighted vest in 3 consecutive trials.
- After weight-bearing activities, Antoine will use a visual schedule to correctly sequence 4/4 steps to brush his teeth.

The main focus is on the adaptive response that a therapist hopes to elicit as well as the functional piece that will be achieved as a result of that response. It's important to be specific about the type of input you will be giving the patient but, as with session notes, it's not important to describe the exact activity you will use to provide the input. This gives just enough direction for any therapist who may treat the individual.

Section 5: Personal Reflection

How does goal-writing for children differ from goal-writing for adults? Are there any

components that must be in one type of goal but not another?

Section 6: Milestones [1,2,3,4,10,11]

While each person's development varies based on many factors, sensory growth typically follows a certain trajectory over the course of a young person's life.

In the womb at about 5 weeks gestation, a fetus will first process sensory input. Afterward, the first reflexive responses are to tactile stimulus. Early vestibular reflexes (Moro) are also present.

Month one

During the first month, a baby's sense of touch and vestibular input are fairly well-developed aside from discrimination. Reflexes for both of these systems should also begin to integrate. Early on, touch and gentle vestibular input are universally used as mechanisms of comfort.

Proprioceptive input begins to evolve in the area of neck reflexes and stability that are present with bodily movement. Arms and legs will thrust in response to being picked up.

Sight is not well-developed. A baby will turn their head in response to sound and also make sounds. Smell and taste are also somewhat organized at this point.

Months two and three

At this point, a baby's eyes and neck have better movement and they are intrinsically motivated to move against gravity and grasp at things.

Months four to six

Sense of touch further develops as a way to explore the environment. A baby will bring their hands together at midline and begin to motor plan. They can enter prone extension (the airplane position) and balance on their stomach with an urge to raise their head, back, and limbs. Babies at this age also enjoy being swung, rocked, and held upward. Babies will start to use their vision to guide their reaching. Babies will begin to reach forward with both hands.

Months six to eight

Babies will begin to crawl, have greater neck control, and become more aware of space around them. They will begin to use a pincer grasp and poke items. They can put simple objects together and will begin babbling more.

Months nine to twelve

Toddlers should effectively cross midline and begin to bang, throw, and pull on things. They can stand up and have more integrated vestibular, proprioception, and visual systems.

Year two

Toddlers can tell where they've been touched and develop a better sense of body awareness. They have an inner drive to explore their surroundings and become more used to roughhousing and bigger swinging motions.

Years three to seven

Kids at this age have more mature adaptive responses and can run, jump, hop, skip, climb, and swing. They can also effectively use writing utensils, toys, eating utensils, and other tools. By the age of 8, a child's sensory systems are nearly mature.

Section 6: Personal Reflection

How do you think sensory processing impacts changes in adolescence?

Section 6: Key Words

Reflex: An unconscious action that is involuntary performed in response to a stimulus; it is a healthy sign of development when certain reflexes are integrated

Integrated reflex: A reflexive action that has not disappeared, but does not appear as readily; it may come back in response to stress or other environmental factors

Section 7: Certifications for Therapists [13,14,15]

One of the most popular certifications in this practice area was the certification needed to administer the Sensory Integration and Praxis Tests (SIPT). Since this rather rigorous examination has been phased out, there are other comparable ones that have grown in popularity and credibility.

The University of Southern California's Chan Division of Occupational Therapy offers sensory integration continuing education for therapists who wish to gain extra training in this area. It consists of three core classes plus some special topic courses to tailor your learning. This program is self-paced, online, and does not require any live attendance.

The Collaborative for Leadership in Ayres Sensory Integration (CLASI) offers a renowned Certificate in Ayres Sensory Integration. This consists of six modules, two being in-person and the remainder online. This program trains therapists on the traditional sensory integration theories and interventions as developed by sensory trailblazer Jane Ayres.

Another esteemed organization in the sensory integration arena is the STAR Institute for Sensory Processing. They offer a variety of Level 1 intensive mentorship programs focused on advanced clinical reasoning tools. Therapists have the option of an on-site training, off-site mentorship at an approved institution, or a hybrid model.

Section 7: Personal Reflection

What type of learning approaches may be used in online sensory continuing education?

Section 8: Educating Clients and Caregivers [1,2,3,4]

All those involved in the care of someone with sensory processing deficits should know the basics of their child's condition.

As we've mentioned, someone can experience a wide range of sensitivities including having no concerns with one type of sensory input and multiple or complex concerns related to another type.

For this reason, parents should receive information about their child's sensitivities. Therapists can provide educational materials that should offer details on how to modify the home environment and engage the child in activities that help calm or activate their system.

If parents choose to do their own research, direct them toward government websites with clear information from reliable and accurate sources. Parents should also be encouraged to meet with and openly discuss these issues with their child's teachers. This way, they will be able to gain an idea of how their child is performing in class and the particular areas they may be struggling with.

Occupational therapists in the school environment often have a close relationship with teachers and paraprofessionals, whom they rely on to implement certain classroom strategies to improve success. Educators and therapists alike should collaborate to ensure a child with sensory concerns can manage these issues in a productive way.

Children with sensory processing concerns that have a major impact on their ability to learn and academically progress may qualify for a 504 plan to allow them certain accommodations in the classroom.

Certainly, children are not the only ones who can struggle with sensory processing deficits. Adults who are navigating the waters of managing sensory concerns in the workplace can also receive modifications that make their employment tenure at a company more productive. Workplaces are required to make all reasonable accommodations to support workers in effectively fulfilling their job duties. This includes any individual with one or more emotional, cognitive, or physical disabilities.

If workers are employed by large or even mid-sized organizations, then starting with the human resources department may likely be the best route to initiate this process. For smaller workplaces, employees may be best served by discussing this directly with their supervisor, if they are comfortable doing so.

There are a range of avenues that individuals can go to pursue formal treatment and informal modifications for sensory processing concerns. The path that is best for each individual depends on their age group, the setting where they are having the most difficulties, and their personal goals related to function and quality-of-life.

Section 8: Personal Reflection

How might scheduling serve as a classroom modification for sensory deficits? How might it benefit someone in the workplace?

Section 9: Case Study

A 5-year-old child just began attending kindergarten. He is demonstrating aggressive behaviors such as biting, yelling, and hitting other children. The teacher reports he struggles to remain seated for longer than 5 minutes and is often disruptive during class time. He is unable to assume an age-appropriate grasp on utensils and has difficulty following verbal directions during activities.

The school's occupational therapist recently completed a Sensory Profile on this child and will be using the results to determine whether therapy is recommended and, if so, what the treatment plan will look like.

1. Can you predict what specific sensory areas this child may score below average in?

2. What might be some recommendations the therapist makes for the teacher?

Section 10: Case Study Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. Can you predict what specific sensory areas this child may score below average in?

   Based on teacher reports of trouble with motor skills and following directions, a therapist may identify deficits in postural control as well as dyspraxia. Aggressive behaviors may indicate that this child is seeking tactile input and does not get enough proprioception to assist in regulation.

2. What might be some recommendations the therapist makes for the teacher?

   For his difficulty sitting down, a modified seat such as a yoga ball or stool may help. This will encourage core strength by requiring him to sit up tall and use his abs to remain upright on the chair. The teacher would also benefit from assigning this child some physical classroom tasks so he can get the regulating input he needs. A good starting point would be having him push a laundry basket full of the day's materials to the head of the class. This will help regulate at the start of the day. He can then unstack and organize chairs at lunch time to prepare for circle time. He should have the option of playing with a sensory bin at recess or a larger version of one such as a sandbox. This more sedentary activity should be done after some jumping jacks or wall push-ups to get some energy out.

Section 11: Case Study

An 11-year-old girl recently began struggling with some new behaviors at home. Mom reports that she covers her ears and runs away in response to sounds like the vacuum or the garbage truck.

Her teacher also reports that her usual seat in the middle of class is proving highly distracting to her, as she turns her head as soon as anyone in the class whispers or drops something. This derails her focus for at least several minutes. Her gym teacher is noticing that she is becoming more clumsy and has fallen several times when attempting

to kick the ball.

Her outpatient occupational therapist recently administered the Sensory Profile 2. Her results showed below average scores in auditory processing, visual processing, and sensory-based motor skills (dyspraxia).

1. What recommendations might the occupational therapist make for her mom to assist at home?
2. What recommendations can help her perform better in school given her range of sensory concerns?

Section 12: Case Study Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What recommendations might the occupational therapist make for her mom to assist at home?

   She should try using earbuds or headsets to deal with unavoidable noises such as the garbage truck. In regards to other difficult noises like the vacuum, this can be assisted by some simple planning. Instruct mom and daughter to create a schedule for this where daughter is on an outing with a friend or other family member or playing in the backyard when vacuuming. If this is not possible due to weather or supervision issues, create a safe space with some favorite objects (toys, books, devices, calming music on headphones, soothing essential oils, manipulatives, etc.) and utilize this 10 minutes before the vacuuming starts and then through the cleaning process.

   Mom can also guide her through activities to assist with hand-eye coordination, such as batting a balloon, playing catch, scavenger hunts, “find the difference” pictures, word searches, and other similar activities. Some basic physical activity can also assist with the motor difficulties. Start small with short nature walks and slowly progress to swimming at the local pool or jogging.

2. What recommendations can help her perform better in school given her range of sensory concerns?

The teacher can optimize her success by changing her seating to the front to minimize visual distractions and remain further away from auditory distractions. She should also have the option of listening to recordings of class afterward to reinforce material learned. The teacher should close the drapes and doors of the class to block outside distractions. She can also be given a typed set of class notes to follow at her desk so she doesn't miss the main points of the lecture. She should have the option of taking 2-3 minute breaks as needed, with teacher permission, to place earplugs in and calm her system.

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