

**SENSORY INTEGRATION  
AND  
SENSORY INTEGRATION DYSFUNCTION**

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## SENSORY INTEGRATION AND SENSORY INTEGRATION DYSFUNCTION

**Sensory Integration** is the neurological process of organizing information we get from our bodies and the world around us for use in daily life. It takes place in the central nervous system, which consists of countless neurons, a spinal cord, and - at the "head" - a brain.

The **main task** of our central nervous system is to integrate the senses. Over 80 per cent of the nervous system is involved in processing or organizing sensory input, and thus the brain is primarily a **sensory processing machine**.

**Self-regulation** is the ability to control one's activity level and state of alertness, as well as one's emotional, mental or physical responses to sensations. It is **self-organization**.

The **vestibular, tactile** and **proprioceptive** senses are **fundamental**. They lay the groundwork for healthy development.

**Sensory Integration Dysfunction** is the inability to process information received through the senses. Also called **Sensory Integration Disorder, Sensory Integrative Disorder** or **SI** for short.

Sensory integration dysfunction is the result of **inefficient neurological processing**. Dysfunction happens in the central nervous system, at the "head" of which is the brain. When a glitch occurs, the brain cannot analyze, organize and connect - or integrate - sensory messages. The result is the person cannot respond to sensory information to behave in a meaningful, consistent way. He/she may also have difficulty using sensory information to plan and organize what he needs to do. Thus, he may not learn easily.

The **brain-behaviour connection** is very strong. Because a person with Sensory Integration Dysfunction has a disorganized brain, many aspects of his behaviour are disorganized. His overall development is disorderly.

**Behaviour problems** are almost always present with a person with Sensory Integration Dysfunction.

**Self-regulation problems** occur: the person is unable to "rev up" or calm down once aroused. He/she may also perform unevenly.

## THE TACTILE SENSE

The tactile system plays a major part in determining physical, mental, and emotional human behaviour. Every one of us, from infancy onwards, needs constant tactile stimulation to keep us organized and functioning.

We get tactile information through sensory receiving cells, called receptors, in our skin, from head to toe. Touch sensations of pressure, vibration, movement, temperature, and pain activate tactile receptors.

We are always actively touching or passively being touched by something - other people, furniture, clothes, spoons. Even if we are stark naked, our feet still touch the ground, and the air touches our skin.

Therefore, the tactile sense, or sense of touch, is a huge sensory system that gives us information needed not only for visual perception, motor planning, and body awareness, but also for academic learning, emotional security, and social skills.

Two components make up the tactile sense. First is the protective (or defensive) system; second is the discriminative system.

### **The Protective/Defensive System**

Whether we call it protective or defensive, it's the same: the "uh, oh!" system. All creatures are born with a protective/defensive system. Its purpose is to alert us to potentially harmful stimuli. We need it to survive.

The receptors for the protective system are in the skin, especially the hairy skin on the head and the genitals. Light touch is the stimulus that causes the receptors to respond.

Sometimes light touch is alarming, such as a mosquito alighting on our skin. We respond negative, for self-preservation. Sometimes light touch is charming, such as a lover's gentle caress. Ordinarily, we become less conscious of this system as we mature. We learn to tolerate trifling tactile sensations that would have irritated us in infancy. Of course, we can always revert to operating on our defensive system when a true threat occurs. For example, when a stranger gets too close, we shrink: when a lash gets in our eye, we blink.

### **The Discriminative System**

The second component of the tactile sense is the discriminative system: the "aha!" system. It tells us:

- That we are touching something or that something is touching us.
- Where on our body the touch occurs.
- Whether the touch is light or deep.
- How to perceive the attributes of the object, such as its size, shape, temperature, density and texture

It develops as neurological maturation suppresses the defensive system (the defensive system diminishes but doesn't disappear. Indeed, messages between the two systems must continue to flow back and forth all our lives so we can interpret tactile information appropriately).

The receptors for this system are in the skin, especially on the hands and fingers, the soles of the feet, and the mouth and tongue. Deep touch, or "touch pressure," is the stimulus that causes the receptors to respond.

### **The Out of Sync Tactile Sense**

Tactile dysfunction is the inefficient processing in the central nervous system of sensations perceived through the skin.

The person who is hypersensitive to touch has tactile defensiveness, the tendency to react negatively and emotionally to unexpected, light touch sensations. The person will react not only to actual touch but also to the anticipation of being touched. Perceiving most touch sensations to be uncomfortable or scary, he overreacts with a fight-or-flight response.

Parents and caregivers are often mystified when they learn that an individual has a tactile dysfunction. They protest, "But he is forever asking for hugs and back rubs. He is always touching everything, and he usually carries something in his hands. How can you say he has a problem with touch?"

The answer to this question is the type of touch the person avoids or seeks. A person may typically avoid unexpected, light touch, but accept, even crave, deep touch, like a bear hug. A hug provides firm touch and deep pressure. Deep touch feels good and actually helps suppress sensitivity to light touch.

This person needs touch information more than a person with a well-regulated tactile sense. To get the stimulation his brain needs, he may touch repeatedly those surfaces and textures that provide soothing and comforting tactile experiences. He may touch and feel everything in sight, bumping and touching others, running his hands over furniture and walls, and handling items that others understand they shouldn't.

The person who is hyposensitive to touch tends to under-react to tactile experiences. Needing extra stimulation, he may constantly touch objects and people. He may be under-responsive to touch, whether the touch is soothing or painful.

Unlike the hypersensitive person, who over-reacts to protect himself, the hyposensitive person may not react to touch effectively enough to do a good job of self-protection. In fact, he may be unaware of touch altogether, unless the touch is very intense.

It is important to understand that the out-of-sync person may be both hyposensitive and hypersensitive. For instance, he may jump when someone grazes his elbow, yet be indifferent to a broken collarbone.

## THE VESTIBULAR SENSE

The vestibular system tells us where our heads and bodies are in relation to the surface of the earth. This system takes in sensory messages about balance and movement from the neck, eyes, and body; sends these messages to the central nervous system for processing; and then helps generate muscle tone that allows us to move smoothly and efficiently.

The vestibular system tells us whether we are moving or standing still, and whether objects are moving or motionless in relation to our body. It also informs us what direction we are going in, and how fast we are moving.

The receptors for vestibular sensations are in the inner ear - a "vestibule" through which sensory messages pass. The inner ear receptors work something like a carpenter's level. They register every movement we make and every change in head position - even the most subtle. Movement and gravity stimulate these receptors. Gravity receptors serve the following functions:

- To keep us upright
- To provide a sense of our motions so we can move efficiently
- To detect potentially threatening movements around us through vibrations in the air

In addition to the inner ear, we humans also have outer ears as well as a cerebral cortex, which processes precise vestibular and auditory sensations. These sensations are the vibrations of movement and of sound.

In her book, *Sensory Integration and the Child*, Dr. Ayres explains: "The vestibular system is the unifying system. It forms the basic relationship of a person to gravity and to the physical world. All other types of sensation are processed in reference to this basic vestibular information. The activity in the vestibular system provides a "framework" for the other aspects of our experience. Vestibular input seems to "prime" the entire nervous system to function effectively. When the vestibular system does not function in a consistent and accurate way, the interpretation of other sensations will be inconsistent and inaccurate, and the nervous system will have trouble getting "started."

### **The Out of Sync Vestibular Sense**

Vestibular dysfunction is the inefficient processing in the brain of sensations perceived through the inner ear.

The person with vestibular dysfunction is inefficient at integrating information about movement, gravity, balance, and space. She may be oversensitive to movement, or undersensitive, or both.

This person may not develop the postural responses necessary to keep upright. She may sprawl on the floor, slump when she sits, and lean her head on her hands when she is at the table. She may be awkward, uncoordinated, and clumsy. She may fall often, tripping on air when she moves, bumping into furniture, and losing her balance when someone moves her slightly off the centre of gravity.

As eye movements are influenced by the vestibular system, she may have visual problems. She may have inadequate gaze stability and be unable to focus on moving objects or on objects that stay still while she moves. At school, she may have become confused when looking up at the chalkboard and back down to her desk. Reading problems may have arisen if she didn't develop brain functions imperative for coordinating left-to-right eye movements.

Vestibular dysfunction may also contribute to difficulties processing language.

Many types of movement provide a calming effect. The out-of-sync person, however, can't always calm herself because her brain can't modulate vestibular messages. Neural activity that organizes movement is either stuck "on," or turned off. Difficulty moving in an organized way interferes with her behaviour, attention, and emotions.

The person with an inefficient vestibular system may have one or more problems with the integration of movement sensations. She may:

- a) Be hypersensitive to movement and have
  - Intolerance to movement and/or
  - Gravitational insecurity, or
- b) Be hyposensitive to movement, with increased tolerance and desire for movement.

## THE PROPRIOCEPTIVE SENSE

Proprioception refers to sensory information telling us about our own movement or body position. It provides intake that helps integrate touch and movement sensations.

Receptors for the proprioceptive sense are in the muscles, joints, ligaments, tendons, and connective tissue. The stimuli for these receptors are movement and gravity.

Proprioception, the "position sense," sends messages about whether the muscles are stretching or contracting, and how the joints are bending and straightening. Even when we are motionless, gravity stimulates the receptors to create proprioceptive messages without our being consciously aware of them.

Joint and muscle sensations that come through this system are closely connected to both the tactile and the vestibular systems. Because they are so interrelated, professionals sometimes speak of "tactile-proprioceptive" or "vestibular-proprioceptive" processing.

Tactile-proprioceptive (or "somatosensory") perception refers to the simultaneous sensations of touch and of body position. This perception is necessary for such ordinary tasks as judging the weight of a glass of milk or holding a pencil efficiently in order to write.

Vestibular-proprioceptive perception refers to the simultaneous sensations of head and body position when the person actively moves. This perception is needed for throwing a ball or climbing stairs.

The functions of proprioception are to increase body awareness and to contribute to motor control and motor planning (praxis). Proprioception helps us with body expression, the ability to move our body parts efficiently and economically. It allows us to walk smoothly, to run quickly, to climb stairs, to carry a suitcase, to sit, to stand, to stretch, and to lie down. It gives us emotional security, for when we can trust our bodies, we feel safe and secure.

Proprioception is the *unconscious* sense of body movement, such as when we automatically hold our bodies upright in a chair.

### **The Out of Sync Proprioceptive Sense**

Proprioceptive dysfunction is the inefficient processing of sensations perceived through the muscles, joints, ligaments, tendons, and connective tissue. Proprioceptive dysfunction is usually accompanied by problems with the tactile and/or vestibular systems. Whereas it is common for a person to have only vestibular, or only tactile, problems, it is less likely for a person to have only proprioceptive problems.

The person with poor proprioception has difficulty interpreting sensations about the position and movement of his head and limbs. The person lacks instinctive knowledge of these ordinarily subconscious sensations.

The person has a poor sense of body awareness and body position. Because he can't control or monitor his gross motor and fine motor muscles, **motor planning is very challenging**. He may be clumsy and easily frustrated. Other people perceive him to be a "klutz."

He may tackle everything and everybody. He may show confusion when walking down the street, getting into or out of the bathtub, etc.

Manipulating objects may be difficult. He may exert too much or too little pressure on objects, struggling to turn doorknobs and regularly breaking items and pencil points. He may spill the milk every time. The person may have a poor grip on heavy objects, such as buckets of water, or on lightweight objects, such as forks and combs. He may also have trouble lifting and holding on to objects of different weights.

Because of poor body awareness, the person needs to use his eyes to see what his body is doing. Ordinary tasks, like orienting his body to get dressed, zipping a jacket, buttoning a shirt, or getting out of bed in the dark, become very difficult without the aid of vision. Unless the person can watch every move, he may be unable to match a movement of one side of his body with a similar movement on the other side.

The person may be fearful when moving in space because he lacks postural stability. Because each new movement and each new position throw him off guard, he is emotionally insecure.

## BEHAVIOUR PROBLEMS ASSOCIATED WITH SENSORY INTEGRATION DYSFUNCTION

Sensory Integration Dysfunction may contribute to or exacerbate other problems, as well. Please be aware that the symptoms listed below may have an SI component - or they may be caused by some other developmental problem.

1. **Unusually high activity level.** The person may be always on the go, move with short and nervous gestures, play or work aimlessly, be quick-tempered and easily excited, and find it impossible to stay seated.
2. **Unusually low activity level.** The person may move slowly and in a daze, fatigue easily, lack initiative and "stick-to-it-iveness" and show little interest in the world.
3. **Impulsivity.** The person may lack self-control and be unable to stop after starting an activity. For example, she may pour juice until it spills, run into trees and people, and talk out of turn.
4. **Distractibility.** The person may have a short attention span, even for activities he enjoys. The person may pay attention to everything except the task at hand. The person may be disorganized and forgetful.
5. **Problems with muscle tone and motor coordination.** The person's body may be either tense or "loose and floppy". The person may be awkward, clumsy, apparently careless, and accident-prone.
6. **Problems motor planning.** Motor planning is the ability to conceive of, organize, sequence and carry out complex movements in a meaningful way. The person may have trouble climbing stairs, negotiating obstacle courses and equipment, riding bikes, dressing, getting in and out of the car, and using eating and writing utensils. His ability to learn new motor skills, such as clapping out rhythms and skipping, may develop noticeably later than other children's.
7. **Lack of a definite hand preference by the age of four or five.** The person may not use one hand consistently when handling tools such as pens and forks. She may use either hand to reach for an object. She may switch the object from right to left when handling it, eat with one hand but draw with the other, or use both hands to manipulate scissors.
8. **Poor eye-hand coordination.** The person may have trouble using pens, creating art projects, doing puzzles, eating neatly, or tying shoes. The person's handwriting may be sloppy and uneven.
9. **Resistance to novel situations.** The person may object to leaving the house, meeting new people, trying new jobs, or tasting different foods. The person may be panicky for no obvious reason.

10. **Difficulty making transitions from one situation to another.** The person may seem stubborn and uncooperative when it is time to come for dinner, get into (or out of) bathtubs, or change from one activity to another. Minor changes in routine will upset this person who does not "go with the flow".
11. **High level of frustration.** Struggling to accomplish tasks that peers do easily, the person may give up quickly. He may be a perfectionist and become upset when art or work projects don't meet his expectations. Insisting on being the winner, the best, or the first, he may be a poor game-player.
12. **Self-regulation problems.** The person may be unable to "rev up" or calm down once aroused. The person may perform unevenly: "with it" one day, "out of it" the next.
13. **Academic problems.** The person may have difficulty learning new skills and concepts, and may be perceived as an underachiever.
14. **Social problems.** The person may be hard to get along with and have difficulty making friends and communicating. He may need to control his surrounding territory and have trouble sharing.
15. **Emotional problems.** He may be overly sensitive to change, stress, and hurt feelings and be disorganized, inflexible, and irrational. He may be demanding and needy, seeking attention in negative ways. He may be unhappy, believing and saying that he is crazy, no good, a dummy, a loser, and a failure. Low self-esteem is one of the most telling symptoms of poor sensory control.

## ASSOCIATED PROBLEMS

### **Auditory-Language Problems**

The person may have difficulty processing what he hears. This problem is common if he has vestibular dysfunction, because the auditory and vestibular systems are closely linked. The person may have problems with listening skills, auditory perception, and language processing. He may seem noncompliant or may not follow directions well, because he cannot decode what was said.

### **Speech/Articulation Difficulties**

The person may have trouble pronouncing words clearly enough to be understood. He may lack awareness of how his mouth, lips, and tongue feel and work together. He may say "tool" instead of "school", "dese" instead of "these," because of difficulty positioning the muscles necessary for articulation.

### **Vision Problems**

The person may have problems coordinating vision, especially if he has vestibular dysfunction, which influences eye movement. He may not use both eyes together as a team (binocularity). He may have trouble learning because he can't focus on faces, books, checkerboards, or basketball hoops.

Even if he has adequate eyesight, poor binocular vision may cause difficulty in perceiving what he sees. Instead of linking visual information with auditory, touch, and movement sensation, his brain scrambles the messages. For instance, if connecting sights with sounds is a problem, he may not know where to look when he hears someone's voice. If connecting sights with touch is a problem, he may not know-just by looking - that a nail is sharp and a hammer is heavy. If connecting sights with movement sensations is a problem, he may not swerve around the furniture to avoid bumping into it.

Thus he may have difficulty with eye-hand coordination, visual, perceptual, and spatial awareness. If all the sensory pieces don't come together in his brain into a unified whole, it becomes very challenging to respond appropriately to the sights his eyes record.

### **Eating Problems**

The person may not chew carefully and may be a messy eater. He may have unusual food preferences or a limited food repertoire. He may eat only crispy foods, like bacon and crackers, or only soft foods, like soup and yogurt, or only cold or only hot foods. As a result, the person may have nutritional deficits affecting his behaviour and development.

### **Digestion and Elimination Problems**

SI Dysfunction may affect digestion because the child may not recognize signals of hunger and satiety (fullness). He may have poor bladder and bowel control because he may not perceive wetness, or may have insufficient muscle tone to "hold it". He may be a chronic bed-wetter or be frequently constipated.

### **Problems with Sleep Regulation**

The person may need a long afternoon nap, or may never nap even when tired. The person may have trouble calming sufficiently to go to sleep, or may constantly awaken during the night. Separation problems (i.e. separation from parents, favourite staff, etc.) can exacerbate this problem even further.

Sleep problems are often associated with a high need for movement. If the person has had her quota of movement during the day, her arousal levels may fluctuate erratically and she may become over aroused at night. Tactile defensiveness may also cause the person to feel uncomfortable in bed.

### **Allergies**

SI Dysfunction often coexists with allergies. The person may suffer from allergic reactions to foods, dust, pollen, grass, fur, or medicines.

**Who does have SI Dysfunction?** We know specific populations whom it affects. We know that it intensifies the bigger problems of individuals with autism, pervasive developmental disorder, and serious language difficulty. It is usually a considerable, though secondary problem, for those with fetal alcohol syndrome, fragile X syndrome, and severe mental retardation. It often interferes with the development of children who have been adopted after institutionalization in orphanages. It frequently co-exists in individuals with learning disabilities and/or attention deficits. For all these individuals, remediating their sensory issues through occupational therapy has an overall, positive effect.

## CHARACTERISTICS OF TACTILE DYSFUNCTION

An individual with an inefficient tactile system may have one or more problems with the integration of touch sensation. The person may:

1. Be defensive to touch (hypersensitive).
2. Be under-responsive to touch (hyposensitive).
3. Have poor tactile discrimination.

The person with **hypersensitivity (tactile defensiveness)** may:

- React negatively and emotionally to light touch sensations, exhibiting anxiety, hostility, or aggression. He may withdraw from light touch, scratching or rubbing the place that has been touched. As an infant, the person may have rejected cuddling as a source of pleasure or calming.
- React negatively and emotionally to the possibility of light touch. He may appear irritable or fearful when others are close, as when lining up.
- React negatively and emotionally when approached from the rear, or when touch is out of his field of vision, such as when someone's foot grazes under a blanker or table.
- Rebuff friendly or affectionate pats and caresses, especially if the person touching is not a parent or familiar person. The person may reject touch altogether from anyone except his mother (or primary caregiver).
- Prefer receiving a hug to a kiss. He may crave the deep-touch pressure of a hug but try to rub off the irritating light touch of a kiss.
- Overreact to physically painful experiences, making a "big deal" over a minor scrape or a splinter. The person may remember and talk of such experiences for days. He may be a hypochondriac.
- React similarly to dissimilar touch sensations. A raindrop on his skin may cause as adverse a reaction as a thorn.
- Avoid touching certain textures or surfaces, like some fabrics, blankets, rugs, or stuffed animals.
- Fuss about clothing, such as stiff new clothes, rough textures, shirt collars, turtlenecks, belts, elasticized waists, hats, and scarves.
- Fuss about footwear, particularly sock seams. He may refuse to wear socks. He may complain about shoelaces. He may insist upon wearing beach sandals on cold, wet winter days, or heavy boots on hot summer days.
- Prefer short sleeves and shorts and refuse to wear hats and mittens, even in winter, to avoid the sensation of clothes rubbing on his skin.

- Prefer long sleeves and pants and insist on wearing hats and mittens, even in summer, to avoid having his skin exposed.
- Dislike being touched on the face or head, such as having his face washed.
- Dislike baths, or insist that bath water be extremely hot or cold.
- Dislike having his fingernails trimmed.
- Avoid messy play, such as sand, finger paint, glue, mud, or clay.
- Be unusually fastidious, hurrying to wash a tiny bit of dirt off his hands.
- Avoid walking barefoot on grass or sand, or wading in water.
- Walk on tiptoe to minimize contact with the ground.
- Be excessively ticklish.
- Avoid giving kisses.
- Resist brushing his teeth and strongly resist going to the dentist.
- Be a picky eater, preferring certain textures such as crispy or mushy food. The person may dislike foods with unpredictable lumps such as tomato sauce or vegetable soup, as well as sticky foods like rice and cake icing.
- Refuse to eat hot or cold foods.
- Show "fight or flight" response to hair displacement, such as having his hair brushed or receiving a haircut, shampoo, or pat on the head.
- React negatively when hairs on his body (arms, legs, neck, face, back, etc.) are displaced and "rubbed the wrong way." A high wind or even a breeze can raise his hairs (literally "ruffling his feathers") and cause irritability, aggression, or anxiety.

For **self-protection**, the person with tactile defensiveness may:

- Withdraw from a group and resist going to others' homes.
- Treat pets roughly, or avoid pets.
- Arm himself at all times with a stick, rope, or other hand-held weapon.
- Stand still or move against the traffic in group activities such as obstacle courses or movement games, keeping constant visual tabs on others.
- Rationalize verbally, in socially acceptable terms, why he avoids touch sensations; "I'm allergic to mashed potatoes."

The person with **hyposensitivity (under-responsiveness to touch)** may:

- Seem unaware of touch unless it is very intense.
- Be unaware of messiness on his face, especially around his mouth and nose, not noticing a crumby face or a runny nose.
- Show little or no reaction to pain from scrapes, bruises, cuts, or shots.
- Hurt other people or pets during play, seemingly without remorse, but actually not comprehending the pain that others feel.
- Fail to realize he has dropped something.

The person with **poor tactile discrimination** may:

- Seem out of touch with his hands, as if they were unfamiliar appendages.
- Be unable to identify which body parts have been touched without looking.
- Be fearful in the dark.
- Be unable to perform certain motor tasks without visual cues, such as zipping, buttoning, and unbuttoning clothes.
- Be a messy dresser, with shoes untied and waistband twisted.
- Put on gloves or socks in unusual ways.
- Have difficulty holding and using tools, such as pens, scissors, and forks.
- Avoid initiating tactile experiences such as picking up tools that are attractive to others.

For **stimulation**, the person with tactile dysfunction may:

- Need to touch repeatedly those surfaces and textures that provide soothing and comforting experiences, such as a favourite blanket.
- Seem compelled to touch certain surfaces and textures that cause other people discomfort, in order to receive strong tactile information.
- Need to feel and touch everything in sight, e.g., bumping and touching others, running hands over furniture and walls, and handling items that others understand are not to be touched.
- Seek certain messy experiences, often for long durations.
- Rub or bite his own skin excessively.
- Enjoy vibration or movement that provides strong sensory feedback.

- Prefer extra-spicy or excessively sweet foods.
- Use his mouth to investigate objects (the mouth provides more intense information than the hands.)

The person with **poor tactile discrimination** may:

- Have trouble perceiving the physical properties of objects, such as their texture, shape, size, temperature or density.
- Be unable to identify familiar objects solely through touch, needing the additional help of vision, e.g. when reaching for objects in a pocket, box or desk.
- Prefer standing to sitting, in order to ensure visual control of his surroundings.

The person with **poor body awareness** may:

- Not know where his body parts are or how they relate to one another.
- Have trouble orienting his arms and hands, legs and feet to get dressed.
- Withdraw from movement experiences, to avoid touch sensations.

The person with **poor motor planning (dyspraxia)** may:

- Have trouble conceiving of, organizing, and performing activities that involve a sequence of body movements, such as cutting or riding a bike. Novel experiences as well as familiar activities may be difficult.
- Have poor self-help skills and not be a "self-starter," requiring another person's help to get going.
- Have poor gross motor skills for running, climbing, and jumping.
- Have poor fine motor control of his fingers for precise manual tasks, of his toes for tripping sandals or walking barefoot, and of his mouth muscles for chewing and speaking.
- Be a messy eater.
- Have poor eye-hand coordination.

The person with **inadequate visual perception** may:

- Be unable to interpret how objects feel just by looking at them.
- Have trouble comparing and contrasting similar objects.

The person who is **emotionally insecure and has poor social skills** may:

- Exhibit behaviour that seems wilful or "difficult" when it is actually an aversive response to tactile stimuli.
- Act silly, playing the role of "clown."
- Appear very stubborn, rigid, and inflexible.
- Dislike surprises.
- Have a limited imagination.
- Have trouble forming warm attachments with others. Experiencing difficulty in social situations, he may be a loner, with few close friends

## CHARACTERISTICS OF VESTIBULAR DYSFUNCTION

The person with an inefficient vestibular system may have one or more problems with the integration of movement sensations. She may:

1. Be hypersensitive to movement and have:
  - a) Intolerance to movement and/or
  - b) Gravitational insecurity, or
2. Be hyposensitive to movement, with increased tolerance and desire for movement.

The **hypersensitive** person who shows **intolerance for movement** may:

- Dislike playground activities such as swinging, spinning, and sliding.
- Be cautious, slow moving, and sedentary, hesitating to take risks.
- Appear to be a "sissy."
- Seem wilful and uncooperative.
- Be very uncomfortable in elevators and on escalators, perhaps experiencing car or motion sickness.
- Demand continual physical support from a trusted adult.

The person with **gravitational insecurity** may:

- Have a great fear of falling, even where no real danger exists. This fear is experienced as primal terror.
- Be fearful of heights, even slightly raised surfaces. The person may avoid walking on a curb or jumping down from the bottom step.
- Become anxious when her feet leave the ground, feeling that even the smallest movement will throw her into outer space.
- Be fearful of climbing or descending stairs and hold tightly to the banister
- Feel threatened when her head is inverted, upside down or tilted, as when having her head shampooed over the sink.
- Be fearful when someone moves her.
- For self-protection, try to manipulate her environment and other people.

The hyposensitive person **with increased tolerance for movement** may:

- Need to keep moving, as much as possible, in order to function. The person may have trouble sitting still or staying in a seat.
- Repeatedly and vigorously shake her head, rock back and forth, and jump up and down.
- Crave intense movement experiences, such as bouncing on furniture, using a rocking chair, turning in a swivel chair, assuming upside-down positions, or placing her head on the floor and pivoting around it.
- Be a "thrill seeker," enjoying fast moving or spinning playground equipment, or seeking "scary" rides at an amusement park.
- Not get dizzy after twirling in circles or spinning rapidly for a lengthy amount of time.
- Enjoy swinging very high and/or for long periods of time.
- Like teeter-totters, trampolines more than other people.

The person who has difficulty with **movement, balance, and posture** may:

- Easily lose her balance when climbing stairs, riding a bike, stretching on tiptoes, jumping, hopping, standing on one foot, or standing on both feet when her eyes are closed.
- Move in an uncoordinated, awkward way.
- Be fidgety and clumsy.

The person with **low muscle-tone** may:

- Have a loose and floppy body.
- Feel limp (like a wet noodle) when you lift her, move her limbs to help her get dressed, or try to help her balance on something (i.e. balance beam).
- Tend to slump or sprawl in a chair or over a table, prefer to lie down rather than sit upright, and constantly lean her head on a hand or arm.
- Find it hard to hold up her head, arms, and legs simultaneously when lying on her stomach.
- Sit on the floor with her legs in a "W," i.e., with her knees bent and her feet extended out to the sides, to stabilize her body.
- Have difficulty turning doorknobs or handles that require pressure, and have a loose grasp on "tools" such as pencils, scissors, or spoons.

- Have a tight, tense grasp on objects (to compensate for looseness).
- Have problems with digestion and elimination, such as frequent constipation or poor bladder control.
- Fatigue easily during physical activities or family outings.
- Be unable to catch herself from falling.

The person with poor **bilateral coordination** may:

- Not have crawled or crept as a baby.
- Have poor body awareness.
- Have poor gross motor skills and frequently stumble and trip, or be clumsy at sports and active games. She may seem to have "two left feet."
- Have poor fine motor skills and difficulty using tools, such as eating utensils, pencils or comb
- Have difficulty making both feet or both hands work together, such as when jumping up and down or throwing and catching a ball.
- Have difficulty using one foot to assist the other during tasks, such as standing on one foot to kick a ball or holding the paper steady when writing or cutting.
- Have trouble using both hands in a smooth, alternating manner, as when striking rhythm instruments together to keep a musical beat.
- Not have an established hand preference by the age of four or five. The person may use either hand for writing and drawing, or may switch the pencil from one hand to another.
- Avoid crossing the midline. The person may switch the brush from hand to hand while painting a horizontal line, or may have trouble tapping a hand on her opposite shoulder.
- Have a hard time with organization and structured activities.

The person with poor **auditory-language processing** may:

- Seem unaware of the source of sounds and may look all around to locate where they come from.
- Have trouble identifying voices of discriminating between sounds, such as the difference between "bear" and "bore."

- Be unable to pay attention to one voice or sound without being distracted by other sounds.
- Be distressed by noises that are loud, sudden, metallic, or high-pitched, or by sounds that don't bother others.
- Have trouble attending to, understanding, or remembering what she reads or hears.
- She may misinterpret requests, frequently ask for repetition and be able to follow only one or two instructions in sequence.
- Look to others before responding.
- Have trouble putting thoughts into spoken or written words.
- Talk "off topic," e.g., about her new shirt when others are discussing a soccer game.
- Have trouble "closing circles of communication." i.e. responding to others' questions and comments. Have trouble correcting or revising what she has said to be understood.
- Have a weak vocabulary and use immature sentence structure (poor grammar and syntax).
- Have difficulty with reading (dyslexia), especially out loud.
- Have trouble making up rhymes and singing in tune.
- Have difficulty speaking and articulating clearly.
- Improve her speaking ability after she experiences intense movement.

The person with poor **visual-spatial processing** may:

- Shield her eyes to screen out sights, close or cover one eye or squint.
- Complain of seeing double.
- Have difficulty shifting her gaze from one object to another, such as when looking from the blackboard to her own paper.
- Turn or tilt her head as she reads across a page.
- Have difficulty tracking or following a moving object, such as a ping-pong ball, or following along a line of printed words.
- Fail to comprehend what she is reading or quickly lose interest.
- Confuse likenesses and differences in pictures, words, symbols, and objects.

- Have difficulty with fine motor tasks involving spatial relationships, such as fitting pieces into jigsaw puzzles and cutting along lines.
- Orient drawings poorly on a page or write uphill or down hill.
- Misjudge spatial relationships of objects in the environment, often bumping into furniture or misstepping on stairs and curbs.
- Confuse right and left, have a poor sense of direction, and frequently head the wrong way.
- Not understand concepts such as up/down, before/after, and first/second.
- Be uncomfortable or overwhelmed by moving objects or people.
- Fatigue easily during written work.
- Withdraw from participation in group activities in which movement is required.

The person with poor **motor planning** may:

- Have difficulty conceptualizing, organizing, and carrying out a sequence of unfamiliar movements.
- Be unable to generalize what she has already learned in order to accomplish a new task.

The person who is **emotionally insecure** may:

- Get easily frustrated and give up easily.
- Be reluctant to try new activities.
- Have a low tolerance for potentially stressful situations.
- Have low self-esteem.
- Be irritable in others' company, and avoid or withdraw from people.
- Have difficulty making friends and relating to peers.

## CHARACTERISTICS OF PROPRIOCEPTIVE DYSFUNCTION

Proprioceptive dysfunction is the inefficient processing of sensations perceived through the muscles, joints, ligaments, tendons, and connective tissue. Proprioceptive dysfunction is usually accompanied by problems with the vestibular and/or vestibular systems. Whereas it is common for an individual to have only tactile, or only vestibular, problems, it is less likely for an individual to have only proprioceptive problems.

For **sensory feedback**, the person with dysfunction may:

- Deliberately "bump and crash" into objects in the environment, e.g., jump from high places, dive into a leaf pile, and "tackle" people.
- Stamp or slap his feet on the ground when walking.
- Kick his heels against the floor or chair.
- Bang a stick or other object on a wall or fence while walking.
- Rub his hands on tables, bite or suck on his fingers, or crack his knuckles.
- Like to be tightly wrapped in a blanket or tucked in tight at bedtime.
- Prefer shoelaces, hoods, and belts to be tightly fastened.
- Chew constantly on objects like shirt collars and cuffs, hood strings, pencils, and gum.

The person with inefficient **body awareness**, **motor planning** and **motor control** may:

- Have difficulty planning and executing movement. Controlling and monitoring motor tasks such as adjusting a collar or putting on eyeglasses may be especially hard if the person can't see what he is doing.
- Have difficulty positioning his body, as when someone is helping him into a coat or when he is trying to dress or undress himself.
- Have difficulty knowing where his body is in relation to objects and people, frequently falling, tripping and bumping into obstacles.
- Have difficulty going up and down stairs.
- Show fear when moving in space.

The person with **inefficient grading of movement** may:

- Flex and extend his muscles more or less than necessary for tasks such as inserting his arms into sleeves, or climbing.
- Hold pencils too lightly to make a clear impression, or so tightly that the points break.

- Produce messy written work, often with large erasure holes:
- Frequently break delicate objects and seem like a "bull in a china shop."
- Break items that require simple manipulation, such as lamp switches, hair barrettes and items that require putting together and pulling apart.
- Pick up an object with more force than necessary, such as a glass of milk, causing the object to fly through the air.
- Pick up an object with less force than necessary - and thus be unable to lift it. He may complain that objects such as boots are "too heavy."
- Have difficulty lifting or holding objects if they don't weigh the same. He may not understand the concepts of "heavy" and "light."

The person with **postural insecurity** may:

- Have poor posture.
- Lean his head on his hands when he works at a desk.
- Slump in a chair, over a table, or while seated on the floor.
- Sit on the edge of the chair and keep one foot on the floor for extra stability.
- Be unable to keep his balance while standing on one foot.

The person with **emotional insecurity** may:

- Avoid participation in ordinary movement experiences, because they make him feel uncomfortable or inadequate.
- Become rigid, sticking to the activities that he has mastered and resisting new physical challenges.
- Lacks self-confidence, saying "I can't do that." even before trying.
- Become timid in unfamiliar situations.

## A BALANCED SENSORY DIET

A balanced sensory diet is defined as a planned and scheduled -activity programme that an occupational therapist develops specifically to meet the needs of the individual's own nervous system. Its purpose is to help the person become more focused, adaptable and skilful.

Just as the five main food groups provide daily nutritional requirements, a daily sensory diet fulfills physical and emotional needs. The individual with SI Dysfunction needs an individualized diet of tactile, vestibular, and proprioceptive nourishment more than most but doesn't know how to get it. So, we must and can help.

A sensory diet includes a combination of alerting, organizing, and calming activities. An alerting or calming activity may come first, depending on the individual's needs.

**Alerting** activities benefit the undersensitive individual, who needs a boost to become effectively aroused. Some examples are:

- Crunching dry cereal, popcorn, chips, crackers, nuts, pretzels, carrots, celery, apples or ice cubes
- Taking a shower
- Bouncing on a therapy ball
- Jumping up and down on a trampoline

**Organizing** activities help regulate the individual's responses. They include:

- Chewing granola bars, fruit bars, liquorice, dried apricots, cheese, gum, bagels or bread crusts
- Hanging by the hands from a chinning bar
- Pushing or pulling heavy loads
- Getting into an upside down position

**Calming** activities help the oversensitive individual decrease hyper-responsiveness to sensory stimulation. They include:

- Sucking a hard candy, frozen fruit, or spoonful of peanut butter
- Pushing against walls with the hands, shoulders, back, buttocks, and head
- Rocking, swaying, or swinging slowly back and forth
- Deep pressure massage
- Taking a bath