

# Sensory Processing and Tourette's Syndrome (TS): the sensory part of the puzzle.



How sensory processing issues can impact individuals with Tourette's.

# Unlimited Potentials' Clinic

Unlimited Potentials Occupational and Sensory Integration (OT-SI) Therapy Clinic:

A clinic outfitted with specialized equipment for Occupational & Sensory Integration (OT-SI) therapy. Helping individuals improve their sensory processing for play, school, work, social and family. Specifically designed therapy and programs that address occupational performance areas such as self care, learning, attention and focus, motor skills and reduction of anxiety and behavioural challenges related to sensory processing.



Play and functionally-based therapy that focuses on goal attainment through realistic, measurable aims. At the heart of OT-SI therapy is using activity that is fun and intrinsically motivating to help individuals reach their potential.



# Sensory Integration/Sensory Processing

“ Sensory integration, is the ability to organize sensory information for use...that enables man to interact effectively with the environment”.

Ayres, 1972, p. 1

# Sensory Processing & the 7 senses

**What Is SPD**

Sensory Integration or Sensory Processing Disorder (SPD) is when there is a dysfunction in the way the nervous system receives messages from the senses and turns them into responses. Whether you are eating chicken nuggets, sitting in class listening to the teacher or coloring with a crayon, your successful completion of the activity requires processing sensation or sensory feedback.

**In-Put and Out-Put of the Senses**

The diagram illustrates the flow of sensory information from the outside world through the body and nervous system to the brain. It shows a human silhouette with a spine and a brain. On the left, five circular icons represent the senses: touch (hand), smell (nose), taste (tongue), sight (eye), and hearing (ear). Blue arrows lead from these icons to the body, then to the spine, and finally to the brain. On the right, three icons represent the brain's response: a checkmark, a scale of justice, and a red X. Below the diagram, five numbered steps describe the process.

1. Outside world (environment) enters inside world (body, CNS) through the sensory receptors
2. The peripheral nerves take the info to the spinal cord
3. The info goes then to the brain via nerve tracts
4. Over-arousal: superfluous sensory info passes through the brain "filter" causing excitement, confusion, and distractibility
5. Under-arousal: insufficient sensory info gets processed in the brain, causing absence of mind, delay, and accidents



### The “Far” (external) Senses

**Tactile (touch)** – sensory input mostly through skin. Pressure, pain, temperature and vibration

**Vision** – visual input is taken in through the eyes such as light, colour, depth and shape

**Gustatory (taste)** – where information is taken in through the mouth/tongue flavor

**Auditory (hearing)** – where sound is received via the ears and bones in the form of sound waves and vibrations

**Olfactory (smell)** – input through the nose



The Invisible Senses:  
proprioception & vestibular



**The “Near” (internal) Senses also known as ‘invisible senses’** Information for these invisible senses comes from within our bodies:

**Proprioception** - understanding where your body is in space. Sensory information helps to give meaning to where the different parts of your body are in relationship to others and to objects around you. Proprioceptive input comes through internal signals about muscles, tendons and joints.

**Vestibular** - the sense of movement and balance comes from the inner ear. Vestibular information gives us the sense of gravity, how to move and balance in a coordinated way.

# Difficulty with Sensory Processing



Noise

Sound

visual overload



touch



movement sensitivity



smell



Can create Anxiety & Sensory Overload

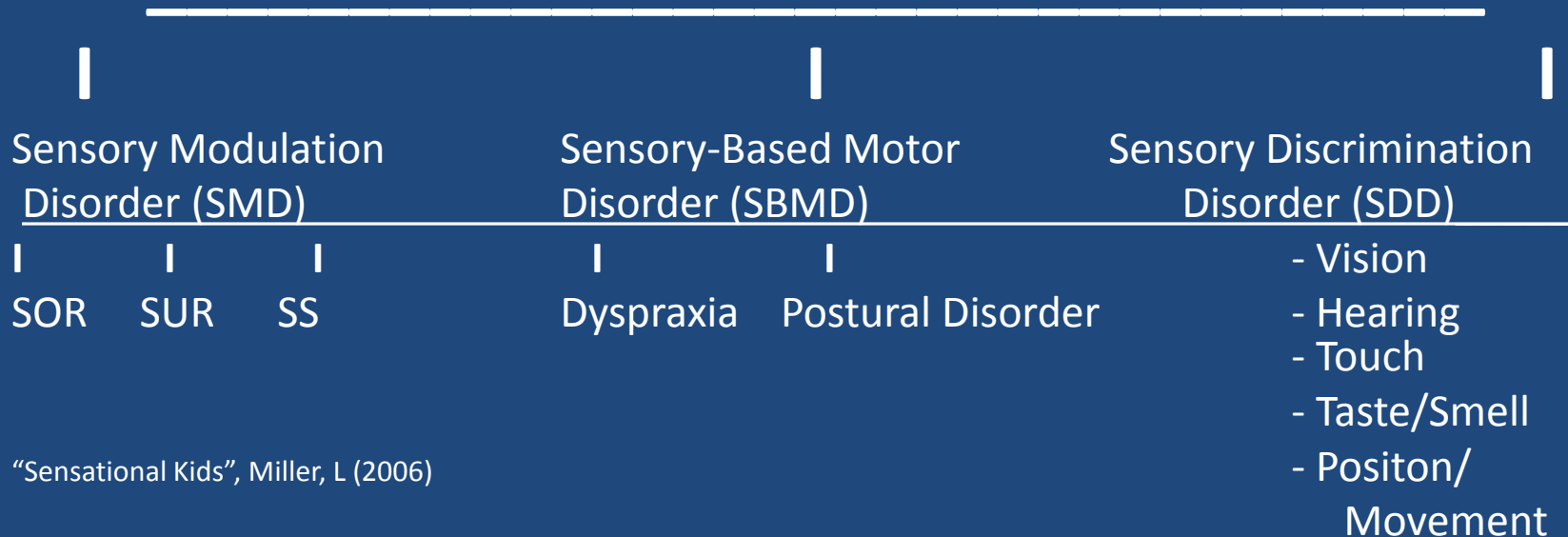


# What is SPD?

## (Sensory Processing Disorder)

- Sensory processing simply put means the ability of the central nervous system (brain & spinal cord) to take in sensory input by detecting/registering it properly, interpreting and organizing the sensory input for use. This is known as the 'adaptive response'. So right now I am detecting sounds, smells, touch, visual inputs etc. in the room and my CNS is choosing what is relevant or needed, and sensation is filtered or inhibited if it irrelevant or not needed.
- Theory that individuals with SPD are not processing sensation in a typical way and don't show an 'adaptive response' to certain sensory stimuli
- SPD affects an individual's
  - Arousal and Regulation
  - Attention and Focus
  - Registration abilities
  - Modulation
  - Motor function
- 3 symptom clusters of SPD
  - i. SMD (Sensory Modulation Disorder): SOR (Sensory Overresponsive), SUR (Sensory Underresponsive) SS (Sensory Seeking)
  - ii. SBMD (Sensory-Based Motor Disorder)
  - iii. SDD (Sensory Discrimination Disorder)

# SENSORY PROCESSING DISORDER (SPD)

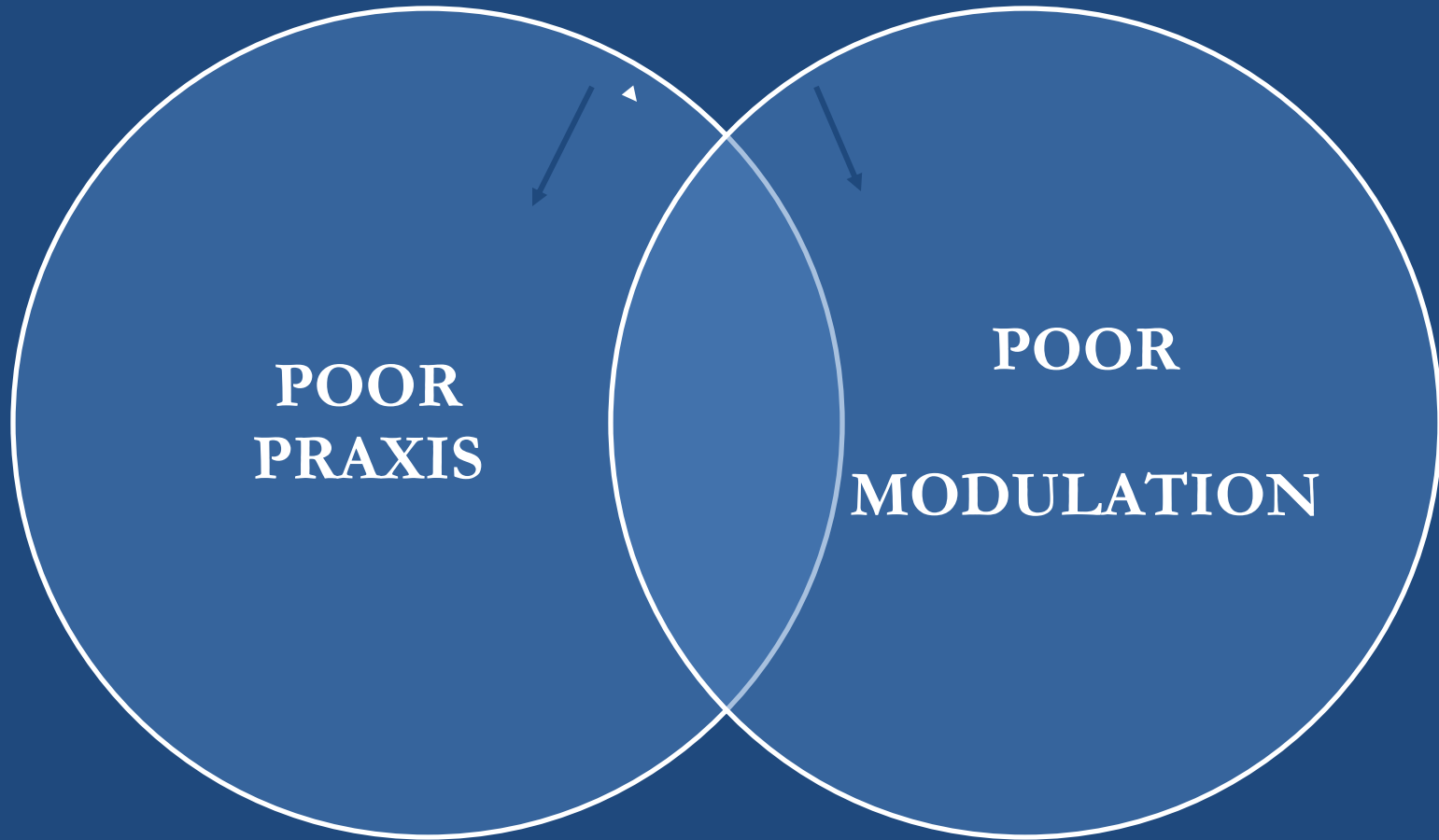


“Sensational Kids”, Miller, L (2006)



# Sensory Integrative Dysfunction manifests in 2 major ways:

**SI DYSFUNCTION**



# SI Dysfunction/SPD

SPD: Poor Modulation and/or Poor Praxis

1. Poor Sensory Modulation is difficulty responding to sensation flexibly and adapting to it. SOR respond negatively to sensation, SUR poor response to sensation, SS crave sensation excessively.

2. Dyspraxia (Poor Praxis) is the ability to plan new movements. SI-based dyspraxia – deficits in processing one or more types sensations

# How to recognize SPD

- SPD affects 5-16 % of children (Ben-Sasson, et.al, 2009)
- What we know about SPD from research:
  - 2014 showed abnormal microstructure of sensory white matter tracts in brain imaging. Processing of sensory stimuli may be affected (Pratik Mukherjee MD, PhD, Marco, E MD et. al. 2014)
  - In one study, 60% children with ADHD also have symptoms of SPD (Miller, 2006)
  - Medical researchers more recently have found a correlation between sensory processing and ritualistic behaviors in children. A 2011 study purports that some children who experience heightened levels of sensitivity, can develop ritualistic behaviors to better manage their environment (American Friends of Tel Aviv University, 2011).
- Sensory Modulation and Optimal arousal plays an important role in the ability of individuals to learn, focus, process information, and carry out functional tasks.
- Sensory tools, sensory diets and sensory strategies can be helpful
- What is the relationship of SPD to TS?

# TS & Sensory

- Research literature, TS and SPD
- TS: Well known that there are sensory urges that precede tics (Houghton, D, Capriotti, M, Conelea, C and Woods, D 2014)
- Co-morbid conditions with TS (ADHD, LD, OCD) may be contributing to the sensory puzzle of those with TS.
- TS: Sensitivity to external sensory information (Belluscio, B, Jin, et al, 2011)
  - » Increased sensitivity to clothing items
  - » Sounds/Images trigger tics
- Neurology
  - » Disturbances in neural pathways between the basal ganglia (Abbruzze & Berardelli; Albin & Mink, 006;Leckmann & Cohen,1999)
  - » Cortical thinning in sensorimotor cortices of children with TS (Sowell et al., 2008)

# OT-SI & TS

- As an OT trained in sensory integration I am looking at a person with TS and sensory issues similarly to any person showing the symptoms and sign of SPD.
- Step 1 is to assess the individual to determine the significance of their sensory issues and how the SPD impacts their function.
- After the assessment is completed, a treatment plan and goals are determined with the individual/family's input. The main aim to help provide the best strategies and treatment approaches that will help improve sensory processing and arousal/regulation.
- Treatment sessions focus on:
  - 1. Education about arousal levels and learning to self regulate through a 'Sensory Diet' which is a systematic, timed recipe of sensory activities (diet) that helps the brain organize and use sensory input optimally. Play-based or functional activities that are enjoyable and engaging.
  - 2. Desensitization techniques if needed to help an individual who over responds to sensation i.e. sensitivity to clothing, noise, movement, etc.
  - 3. Behavioural techniques and plans to help persons manage their sensory defensiveness, under arousal or sensory seeking behaviours.
  - 4. How to use sensory tools to calm anxiety, improve attention and occupational performance in play, school work and relationships.

# How can I know if me or my child have sensory issues?

- **Sensory Checklists**
  - From Raising a Sensory Smart Child, © Biel & Peske, 2005
  - <https://www.spdstar.org/basic/symptoms-checklists>
- **Standardized Parent Questionnaires**
  - Sensory Profile <sup>TM</sup>2. The Sensory Profile <sup>TM</sup> is a standardized parent questionnaire that measures a child's sensory processing abilities for children and adults (Winnie Dunn, 2014).
  - Sensory Processing Measure <sup>TM</sup>(SPM). SPM <sup>TM</sup> is a standardized parents rating scale that enables assessment of sensory processing issues, praxis and social participation in elementary school-aged children (L. Diane Parham, PhD, OTR/L, FAOTA, Cheryl Ecker, MA, OTR/L, Heather Miller Kuhaneck, MS, OTR/L, Diana A. Henry, MS, OTR/L, FAOTA, and Tara J. Glennon, EdD, OTR/L, FAOTA, 2010).
- **Sensory Testing**
  - Discuss with school administrator for screening by an Occupational Therapist with experience in sensory integration
  - Contact a private Occupational Therapist for a comprehensive sensory evaluation. Go to [www.saot.ca](http://www.saot.ca) to find a private OT trained in evaluating and treating children &/or adults with OT-SI issues.

# Books & Resources

## Sensory Processing Disorder (SPD) Information Page

For more information about SPD and Sensory Integration I have compiled some resources for you:

### Websites:

\*[www.spdfoundation.net](http://www.spdfoundation.net)

\*[www.spdalberta.org](http://www.spdalberta.org)

### Books:

Available at Chapters and the Edmonton Public Library:

\*The Out-of-Sync Child *Carol Stock Kranowitz*

\*Sensational Kids: Hope and Help for Children with Sensory Processing Disorder by *Lucy Jane Miller, PhD, OTR*

\*The Sensory – Sensitive Child. Practical Solutions for Out-of-Bounds Behaviour by *Karen A. Smith, Ph.D. and Karen R. Gouze, Ph.D.*

### Books available through Amazon:

\*Sensory Integration and the Child by *Jean Ayres, PhD, OTR*

\*Asperger Syndrome and Sensory Issues. Practical Solutions for Making Sense of the World by *Brenda Smith Myles, Katherine Tapscott Cook, Nancy E. Miller, Louann Rinner and Lisa A. Robbins*

\*Love, Jean. Inspiration for Families Living With Dysfunction of Sensory Integration by *A. Jean Ayres, Philip R. Erwin and Zoe Mailloux*

\*The Out-of-Sync Child Has Fun. Activities for Kids with Sensory Integration Dysfunction by *Carol Stock Kranowitz, M.A.*

\*Sensitive Sam: Sam's Sensory Adventure has a Happy Ending! By *Marla Roth-Fisch*

\*Einstein Never Used Flash Cards. How our Children REALLY Learn- And Why They Need to Play More and Memorize Less. By *Kathy Hirsh-Pasek, Ph. D., and Roberta Michnick Golinkoff, PH. D., with Duane Eyer, PH.D.*

\*Understanding the Nature of Sensory Integration with Diverse Populations. By *Susanne Smith Roley, M.S., OTR, Erna Imperatore Blanche, Ph.D., OTR, FAOTA, Roseanne C. Schaaf, M.Ed., OTR/L, FAOTA.*

### \*For Adults affected by sensory issues:

Too Loud, Too bright, Too Fast, Too Tight by *Sharon Heller, PhD*

# Apps

- Sensory Treat – from the authors: products were inspired by our own SPD kids: a boy who is both hypo and hyper sensitive, and a classical ‘seeker’ girl. Seven years of sensory therapies in clinics and at home helped create the pool of initial activities offered in Sensory Treat products.
- Zones of Regulation – developed by an OT to help individuals with self regulation



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7. Emmanuelle Dionne-Dostie, Natacha Paquette, Maryse Lassonde, and Anne Gallagher Scott Adler, Academic Editor. *Multisensory Integration and Child Neurodevelopment. Brain Sci. 2015 Mar; 5(1): 32–57.*
8. Autism and Sensory Processing Disorders: Shared White Matter Disruption in Sensory Pathways but Divergent Connectivity in Social-Emotional Pathways. Pratik Mukherjee MD, PhD, Marco, E MD et. al. *NeuroImage: Clinical.* Published: July 30, 2014
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11. American Friends of Tel Aviv University. "Childhood hypersensitivity linked to OCD." *ScienceDaily, 28 December 2011.*
12. Reference List on sensory processing and sensory integration: [www.caot.ca](http://www.caot.ca). On CAOT's main page go to "Networks and Portals" scroll down to "Occupational Therapists and Sensory Processing"; Log In to get to the Occupational Therapy and Sensory Processing Network". There is a blog, network members list, resources and objectives of the group.
13. The Zones of Regulation® A Curriculum Designed to Foster Self-Regulation and Emotional Control (2011, Social Thinking Publishing) is a curriculum comprised of lessons and activities designed by Leah Kuypers, M.A. ED. OTR/L to help students gain skills in the area of self-regulation.
14. *How Does Your Engine Run? Leader's Guide to the Alert Program for Self Regulation.* by Mary Sue Williams & Sherry Shellenberger.
15. Diana Henry products: Tools for Tots/Teenagers and numerous other resources. <http://www.ateachabout.com/>
16. *The Out of Sync Child* by Carol Stock Kranowitz.