An Introduction to Identification & Intervention for Children with Sensory Processing Difficulties

EARLY CHILDHOOD MENTAL HEALTH INSTITUTE
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Presentation Objectives

• WHAT IS IT?
  – Define terms related to Sensory Processing Disorder (SPD).

• WHY IS IT IMPORTANT?
  – Identify behaviors (signs and symptoms) associated with sensory processing difficulties.

• WHO DISCOVERED IT? WHERE HAVE WE BEEN? WHERE ARE WE GOING?
  – Understand a brief history and look into current research.

• HOW DOES IT WORK?
  – Identify the various sensory systems and their functions.

• WHAT DOES IT LOOK LIKE?
  – Identify model of understand and describing Sensory Processing Disorders.

• WHEN DO I ACT and WHERE DO I GO FROM HERE?
  – Identify when to refer a client to a specialist for a screening or evaluation.

• WHAT DO I DO NOW?
  – Become familiar with simple intervention techniques to put into practice.
What is Occupational Therapy?

- Occupational therapy is the scientifically based use of purposeful activity (or occupation) with individuals who are affected by physical injury or illness, psychosocial dysfunction, developmental or learning disabilities, or the aging process, in order to maximize independence, prevent disability, and promote health.
WHAT IS SPD?
What is Sensory Processing or Sensory Integration (SI)?

- Definitions
  - The neurological process that organizes sensation form one’s body and the environment and makes it possible to use the body effectively within the environment. It is information processing (Ayers 1988).
  - The inability to modulate, discriminate, coordinate, or organize sensory information effectively (Kranowitz 1997).
  - We all take in sensory information from our bodies and the world around us. Sensory integration is a neurological process that occurs in all of us. Our brains are programmed to organize or “integrate” this sensory information to make it meaningful to us. This integration allows us to respond automatically, efficiently and comfortable in response to the specific sensory input we receive (Yack, Sutton, Aquilla, 1998).
  - Sensory Integration: The organization of sensory input for use. The “use” may be a perception of the body or the world, an adaptive response, a learning process, or the development of some neural function. Through sensory integration, the many parts of the nervous system work together so that a person can interact with the environment effectively and experience appropriate satisfaction (Ayres, revised and updated by Pediatric Therapy Network, 2005).
  - **Sensory processing** (sometimes called "sensory integration" or SI) is a term that refers to the way the nervous system receives messages from the senses and turns them into appropriate motor and behavioral responses (SPD Foundation).
New Terminology

In summary, the proposal for a new nosology (a branch of medicine that deals with classification of diseases) is:

• The CONDITION is referred to as Sensory Processing Disorder.

• The TREATMENT is referred to as Occupational Therapy with a sensory integration approach.

• The THEORY is referred to as "Sensory Integration theory based on the work of Dr. A. Jean Ayres."

• By:
  Lucy Jane Miller, PhD, OTR, executive director of the SPD Foundation
  Sharon Cermak, EdD, OTR/L, professor, Boston University
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• Adapted from SI Focus, 2004
Why is It Important to Know More About SPD?
Why Is It Important?

- The main task of our central nervous system is to integrate the senses. According to Dr. A. Jean Ayres, “Over 80 percent of the nervous system is involved in processing or organizing sensory input, and thus the brain is primarily, a sensory processing machine.”

- When our brain efficiently processes sensory information, we respond appropriately and automatically. We do this because our brain is equipped to modulate sensory messages. (Kranowitz, 1998).

- **Sensory Processing Disorder (SPD, formerly known as "sensory integration dysfunction")** is a condition that exists when sensory signals don't get organized into appropriate responses. Pioneering occupational therapist and neuroscientist A. Jean Ayres, PhD, likened SPD to a neurological "traffic jam" that prevents certain parts of the brain from receiving the information needed to interpret sensory information correctly. A person with SPD finds it difficult to process and act upon information received through the senses, which creates challenges in performing countless everyday tasks. Motor clumsiness, behavioral problems, anxiety, depression, school failure, and other impacts may result if the disorder is not treated effectively. (SPD Foundation)

- Research by the SPD Foundation indicates that **1 in every 20 children** experiences symptoms of Sensory Processing Disorder that are significant enough to affect their ability to participate fully in everyday life. Symptoms of SPD, like those of most disorders, occur within a broad spectrum of severity. While most of us have occasional difficulties processing sensory information, for children and adults with SPD, these difficulties are **chronic**, and they **disrupt** everyday life.
Four key things to know about SPD

1. Something really *is* wrong when a child has SPD—symptoms aren’t just figments of imagination.
2. SPD *is* real, even though many people do not “believe” in it.
3. Early identification of SPD is critical to prevent the occurrence of secondary problems, such as poor social participation, poor self-regulation, and poor self-esteem/self confidence.
4. Something *can* be done if the disorder is accurately diagnosed.

— from *Parenting a Child with Sensory Processing Disorder: A Family Guide to Understanding & Supporting Your Sensory-Sensitive Child* by Christopher R. Auere, MA, with Susan L. Blumberg, Ph.D. Foreword by Lucy Jane Miller, Ph.D., OTR (2006)
10 Fundamental Facts about SPD

1. Sensory Processing Disorder is a complex disorder of the brain that affects developing children and adults.
2. Parent surveys, clinical assessments, and laboratory protocols exist to identify children with SPD.
3. At least 1 in 20 people in the general population is affected by Sensory Processing Disorder.
4. In children who are gifted and those with ADHD, Autism, and fragile X syndrome, the prevalence of SPD is much higher than in the general population.
5. Studies have found a significant difference between the physiology of children with SPD and children who are typically developing.
6. Studies have found a significant difference between the physiology of children with SPD and children with ADHD.
7. Sensory Processing Disorder has unique sensory symptoms that are not explained by other known disorders.
8. Heredity may be one cause of the disorder.
9. Laboratory studies suggest that the sympathetic and parasympathetic nervous systems are not functioning typically in children with SPD.
10. Preliminary research data support decades of anecdotal evidence that occupational therapy is an effective intervention for treating the symptoms of SPD.

— from Sensational Kids: Hope and Help for Children With Sensory Processing Disorder (SPD) by Lucy Jane Miller, PhD, OTR (2006)
SPD and ADHD

- Scientists and parents alike are keenly interested in understanding the relationship between SPD and Attention Deficit Disorder (ADHD), a better-known condition that is frequently treated with medication. Although the neurological basis of the two disorders is different, children with the sensory-seeking subtype of SPD are especially likely to be diagnosed and treated for ADHD because their behaviors are similar to behaviors in children with Attention Deficit Disorder.

- Studies by SPD Foundation suggest that SPD and ADHD are unique disorders, each with its own distinct symptoms. This means that SPD is not simply a type of ADHD, and ADHD is not simply a subtype of SPD. However, an estimated 40 to 60 percent of the children with one disorder also have symptoms of the other.

- Appropriate intervention for any disorder relies upon accurate diagnosis. Pursuing a sensory evaluation by a qualified occupational therapist with advanced training in sensory integration training facilitates diagnosis that distinguishes attention deficit issues from sensory issues. This distinction increases the likelihood that your child will receive the appropriate treatment for his or her neurological conditions.

- With further research into the relationship of SPD and ADHD, the SPD Foundation hopes to lay a science-based foundation for more precise diagnosis of both disorders, paving the way for better invention for all children with either one.

- From the SPD Foundation Website/ Miller, Sensational Kids: Hope and Help for Children with Sensory Processing Disorder (SPD), 2006.
SPD and Autism

- Children whose Sensory Processing Disorder conforms to the under-responsivity subtype typically require a great deal of stimulation in order to become alert and active, a behavior often seen in children with autistic spectrum disorders. Meanwhile, other children with ASD have symptoms more similar to the over-responsive subtype of SPD. Because Autism and SPD both have over-responding and under-responding categories, they are sometimes mistaken for another.

- The relationship between SPD and Autism is an area of great interest to scientists and families living with the condition. Studies by the SPD Foundation suggest that more than three-quarters of children with autistic spectrum disorders have significant symptoms of Sensory Processing Disorder.

- However, the reverse is not true. Most children with SPD do not have an autistic spectrum disorder! Our research suggests that the two conditions are distinct disorders just as SPD and ADHD are different disorders.

- Appropriate intervention relies upon accurate diagnosis. Pursuing an evaluation for SPD by a qualified occupational therapist with sensory integration training facilitates diagnosis that distinguishes autistic spectrum issues from sensory issues. This distinction increases the likelihood that your child will receive the appropriate treatment for his or her neurological conditions.

- With further research into the relationship of SPD and autistic spectrum disorders, the SPD Foundation hopes to facilitate better more appropriate invention for all children who have either – or both – SPD and Autism.

- From the SPD Foundation website
Emotional and other impacts of SPD

- Children with Sensory Processing Disorder (SPD) often have problems with motor skills and other abilities needed for school success and childhood accomplishments. As a result, they often become socially isolated and suffer from low self-esteem and other social/emotional issues.

- These difficulties put children with SPD at high risk for many emotional, social, and educational problems, including the inability to make friends or be a part of a group, poor self-concept, academic failure, and being labeled clumsy, uncooperative, belligerent, disruptive, or "out of control." Anxiety, depression, aggression, or other behavior problems can follow. Parents may be blamed for their children's behavior by people who are unaware of the child's "hidden handicap."

- Effective treatment for SPD is available, but far too many children with sensory symptoms are misdiagnosed and not properly treated. Untreated SPD that persists into adulthood can affect an individual's ability to succeed in marriage, work, and social environments.
  - From the SPD Foundation website

- SPD is a hidden disability much like other mental health disorders. Therefore consideration of social and emotional pressures for the client and family need to be taken into account.
Who discovered SPD?

Where have we been?
Origins of Sensory Integration Theory based on the work of Dr. A. Jean Ayres

- The theory of sensory integration was developed in the early 1960s by Dr. A. Jean Ayres, an occupational therapist and psychologist.
- When treating children with CP, Ayres noticed that some of these children were unable to perform a motor task for reasons other than the existing neuromotor deficit.
- She hypothesized that in some cases inadequate visual perception, rather than inadequate motor control, hindered these children’s capacities to function.
- At first Ayre’s interest focused on investigating the impact of visual perception on movement.
- Her research findings in visual perception did not provide the answers to all of the existing perceptual problems and led her to study the importance of tactile, kinesthetic, and vestibular processing on movement, learning, behavior, and emotional well-being.
- Ayres conducted numerous factor-analytic studies in children with and without learning difficulties and identified dysfunctions in the tactile, vestibular, proprioceptive and visual systems.
- Dysfunctions in sensory processing were found to interfere with development of motor planning, language, behavior, emotional well-being, and cognition. Research by Ayres and others supported these assumptions and established the foundation for the development of sensory integration theory.
Where are we going?
DSM-V Initiative

- The American Psychiatric Association's *Diagnostic and Statistical Manual*, currently in its 4th edition and often called simply DSM-IV, is the standard diagnostic tool used by mental health professionals worldwide to promote reliable research, accurate diagnosis, and appropriate treatment of cognitive and mental health conditions.

- Currently, SPD is not included in the DSM. This absence limits awareness of SPD, contributes to the misdiagnosis and inappropriate therapeutic treatment of children, and reduces funding for research. Insurance companies often rely upon the DSM-IV diagnoses and may not cover treatment of SPD because it is not listed in the DSM.

- Since 2000, the SPD Foundation has spearheaded an intense campaign for recognition of Sensory Processing Disorder in the revised DSM-V, which will be published in 2012. The SPDF has invested heavily in research and has facilitated complementary studies at premier research institutions across the country and internationally.

- In April 2008, a letter was received from the chair of the DSM committee. It indicated a significant number of additional studies needed before SPD will be recognized.

from the SPD Foundation website
Current Research

• SPD Foundation
  (www.spdfoundation.net)
  – Multisensory integration in typically developing children
  – Multisensory integration in children with SPD compared to typically developing children
  – Treatment effectiveness
  – Gold standard for diagnosis of SPD

• Pediatric Therapy Network
  (www.pediatrictherapynetwork.org)
  – Confirmatory Factor Analysis using the Sensory Integration and Praxis Tests, Sensory Processing Measure and measures of attention.
  – Program evaluation
  – Parent Perceptions of Meaningful Outcomes
  – Physiological Considerations
  – Goal Attainment Scaling and Fidelity to Treatment Measure projects
  – Feasibility Studies
How Does SPD Work?
How Does SPD Work?
How Does SPD Work?

• Williamson and Anzalone (1996) identify five interrelated components that help to understand how sensory integration occurs. These components are:
  – Sensory Registration
  – Orientation
  – Interpretation
  – Organization of a Response (Adaptive Response)
  – Execution of a Response
Sensory Registration

- Occurs when we first BECOME AWARE of a sensory event. We may not be aware of certain types of sensory input until it reaches a certain threshold or intensity. Your “sensory threshold” varies throughout the day, depending on your previous sensory and emotional experiences, how alert or stressed you are, and what you expect.

- Sensory registration
- Orientation
- Interpretation
- Organization of a response
- Execution of a response

*FIGURE 1–1. The circular process of sensory integration.*
Orientation

- Sensory orientation allow you to **PAY ATTENTION** to new sensory information being received.
- We are able to determine what sensory information needs our attention and what information can be ignored. This happens through sensory modulation and the functions of inhibition and facilitation.
- Our brains are programmed to modulate or balance sensory information to function efficiently. We cannot possible attend to all sensory stimuli in our environments. If all sensory input had equal importance, we could not select the relevant stimuli for the specific situation.

![Diagram of the circular process of sensory integration](image)
Integration (Interpretation)

- Our brains can **interpret** sensory information **and describe** its qualities.
- The ability to interpret sensory information allows us to determine what to respond to and if it is threatening. We compare new sensory experiences with old ones. Our language, memory, and emotional centers are involved with the interpretation process.
- Your nervous system is also programmed to respond to sensory input to protect you from harm...the nervous system’s “fright, flight, or fight” reaction that helps to protect the body from potential harm.
Organization of a Response (Adaptive Response)

- Our brains determine if a **RESPONSE** to a sensory message is necessary and we choose the response. They can be physical, emotional, or cognitive.
Execution of a Response

- The **EXECUTION** of the motor, cognitive or emotional response to the sensory message is the final stage of the sensory integration process. However, if there is a motor response that action generates a new sensory experience as the brain receives information about body movement, touch, etc...
Feedback

- ...and the process BEGINS AGAIN.

FIGURE 1-1. The circular process of sensory integration.
What Does SPD Look Like?
What Does It Look Like?

SENSORY PROCESSING DISORDER (SPD)

- Sensory Modulation Disorder (SMD)
  - SOR = Sensory Over-Responsivity
  - SUR = Sensory Under-Responsivity
  - SS = Sensory Seeking/Craving

- Sensory Discrimination Disorder (SDD)

- Sensory-Based Motor Disorder (SBMD)
  - Postural Disorders
  - Dyspraxia

from Sensational Kids: Hope and Help for Children With Sensory Processing Disorder (SPD) by Lucy Jane Miller, PhD, OTR (2006) and the SPD Foundation Website
• **Sensory Modulation Disorder (SMD)** is a problem with turning sensory messages into controlled behaviors that match the nature and intensity of sensory information.

• **Sensory-Based Motor Disorder (SDMD)** is a problem with stabilizing, moving, or planning a series of movements in response to sensory demands.

• **Sensory Discrimination Disorder (SDD)** is a problem with sensing similarities and differences between sensations.

from *Sensational Kids: Hope and Help for Children With Sensory Processing Disorder (SPD)* by Lucy Jane Miller, PhD, OTR (2006)
Sensory Modulation

Sensory modulation describes changes in the state of the nervous system along the continuum of sensory registration and responsivity with orientation at one end and failure to orient at the [other] end.

As a child matures he develops regulation. This enables him to attain and maintain a calm, alert state. It is through regulation that one develops the ability to achieve, monitor and change our state to match the demands of the environment/ situation.

The goal of the nervous system is to attain and maintain homeostasis.
General Responses to Stimuli

• The Under-Responsive Child/ Hyposensitive
  – Is slow to respond to a sensory stimulus.
  – Will require high intensity or increased duration to invoke an observed behavioral response.
  – This is the child whose behavior suggests that he or she has:
    • A diminished perception of sensory input from his or her body,
    • A “hazy” perception of his or her body (a “Novacain” sensorimotor cortex), which may contribute to a diminished perception of him or herself as he or she moves and interacts.
  – Responds to activities that increase their sense of their body map.
General Activities

The Under-Responsive Child/ Hyposensitive

• Contouring your body around the child’s so that they have an increased sense of where their body begins and ends.

• Play in materials that wrap the child. This may include Lycra fabric, hammocks, tunnels.

• “SPIO suits” or Lycra suits may be beneficial as they provide a ‘second skin’ so that each time the child moves the spandex of the suit provides additional feedback as the body’s move.

• Following the child’s cues if they are seeking out sensory input. Often when a child is under-responsive and is engaging in sensory seeking behavior we see the behavior as hyperactive and try to stop it. When we stop the behavior we are taking a hypo-responsive system and taking away stimulation – this often makes the child more distressed and they will continue to try to seek input. We need to provide safe avenues for the child to fill this sensory cup and satiate the need for input.
General Responses to Stimuli

• The Over-Responsive Child/ Hypersensitive
  – Has a quick or intense response that results in:
    • Exaggerated responses (fight or flight)
    • Or withdrawal (flight or freeze)
  – This is the child whose behavior suggests that her or she has:
    • An intense and often scattered perception of sensory input from his or her body,
    • A “firecracker” perception of his body in his sensorimotor cortex, which contributes to an exaggerated but scattered perception of him or herself as he or she moves and interacts.
  – Responds to activities that provides a clear localized sense of their body
General Activities

• The Over-Responsive Child/ Hypersensitivity
  • Providing very specific localized points of contact such as engaging in “play” on firm surfaces that give localized points of input and have minimal variability. This provides the child with very specific and intense sensory input, a sensory anchor, to attend to in the “sea of exaggerated responses.”
  • Avoid activities or handling that wraps the child or encompasses their body as their behavior indicates that this is overwhelming for them. They usually get escalated in soft surfaces, such as hammocks or Lycra material, as the “sensory firecracker is overwhelmed” by too much stimulation.
  • Position yourself in the child’s line of vision so that they can anticipate what you are going to do by interpreting your body language.
  • A brushing program may be recommended to address sensitivity to touch. It is essential to include “compression” after the brushing, as it is the combination of the brushing and the compression that makes this program effective for the sensory defensive child.
Conceptual Model for the Sensory Profile

Based on the work of Winnie Dunn
Winnie Dunn’s Four Quadrants

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<tr>
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<th>Behavioral Response Continuum</th>
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<td>Sensation Seeking</td>
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<tr>
<td>Sensitivity to Stimuli</td>
<td>Sensation Avoiding</td>
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**KEY POINT:** Some children process input from each sensory system in different ways or quadrants.
Conceptual Model for the Sensory Profile

- Neurological threshold refers to the amount of stimuli required for a neuron or neuron system to respond.
  - At one of this continuum, thresholds are very HIGH
    - This means it would take a lot amount of stimuli to meet the threshold and fire the neurons.
  - At the other end of this continuum, thresholds are very LOW
    - This means it takes very little stimuli to meet the threshold and fire the neurons.
Conceptual Model for the Sensory Profile (cont.)

- Behavioral response refers to the way people act in consideration of their thresholds.
  - At one end of this continuum, children respond in accordance with their thresholds.
    - This means they would have a tendency to let the nervous system respond (or not respond), and they would behave consistently with this neural activity.
  - At the other end of the behavioral continuum, children respond to counteract their thresholds.
    - This means they would work against their thresholds as a way to reach homeostasis.
Poor Registration
Under-reactive and Withdrawn

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POOR REGISTRATION

KEY POINT: Some children process input from each sensory system in different ways or quadrants.
High thresholds (requires more sensory input than typical and a tendency to act in accordance with those thresholds (passive).

• General Features
  – Tend to appear uninterested.
  – Can have a flat or dull affect.
  – Low energy levels, act as if overly tired all the time.
  – Self absorbed, focused inward (Greenspan).
  – The rationale for this, using the sensory processing model, is that the brain is not getting what it needs to generate responses, and the child’s tendency to respond in accordance with high thresholds leads to an apathetic, self-absorbed appearance. It is hypothesized that children with poor registration have inadequate neural activation to support sustained performance and therefore may miss salient cues in the context to support ongoing responsivity.
### Sensitivity to Stimuli

over-reactive and distractible

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**SENSITIVITY TO STIMULI**

**KEY POINT:** Some children process input from each sensory system in different ways or quadrants.
Low neurological thresholds requires less sensory input than typical and a tendency to act in accordance with those thresholds (passive).

• General Features
  – Tend to be distractible and may display hyperactivity.
  – They have a pattern of directing their attention to the latest stimulus that presents itself, which draws them away from whatever they are trying to accomplish.
  – They might be cautious about proceeding in some situations because they missed something.
  – Disjointed movement, wander from object to object (Greenspan).
  – It can be hypothesized that children who have sensitivity to stimuli have over-reactive neural systems that make them aware of every stimulus that becomes available, and these children do not have the commensurate ability to habituate to these stimuli.
Sensation Seeking
under-reactive, craving sensation and distractible

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KEY POINT: Some children process input from each sensory system in different ways or quadrants.
High neurological thresholds: requires more sensory input than typical and a tendency to ACTIVELY work to oppose their thresholds

• General Features
  – Active and continuously engaged in their environments.
  – Appear excitable or seem to lack consideration for safety while playing.
  – Add sensory input to every experience in daily life. They make noises while working, fidget, rub, or explore objects with their skin, chew on things, and wrap body parts around furniture or people as ways to increase input during tasks.
  – Breaking toys, things are always in mouth (Greenspan)
  – One might hypothesize that children who are sensation seekers have inadequate neural activation (as do those with poor registration), but they are driven to meet their thresholds and so create opportunities to increase input to meet their high thresholds.
Sensation Avoiding
over-reactive avoidant

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KEY POINT: Some children process input from each sensory system in different ways or quadrants.
Low neurological thresholds: requires LESS sensory input than typical and a tendency to ACTIVELY work to oppose their thresholds.

• General Features
  – Reliant on rigid rituals.
  – “no”, resistant to change (Greenspan).
  – Engage in very disruptive behaviors, either withdrawing or engaging in an emotional outburst that gets them out of the threatening situation.
  – It is hypothesized that meeting thresholds occurs too often, and this event is uncomfortable or frightening to the child. In this case, the coping strategy is to keep these events at bay. Children do this by either withdrawing or engaging in an emotional outburst that enables them to get out of the threatening situation.
When Do I Act?
Act Now!

• General Guidelines for screening and assessment of sensory integration.
  – A **screening** provides an overall measure of the child’s functioning in a particular domain and identifies whether there is a need for further assessment.
    • A professional who is knowledgeable about child development from any of a variety of disciplinary perspectives is capable of conducting a screening.
  – However **assessment** of a child’s functioning in a particular area of concern should be conducted by a professional with specialized training in that domain.

• Thus a well-trained primary health care provider early care and educational professional, or early intervention provider could screen a child to determine whether he or she is having problems in motor control and sensory modulation, BUT an occupational therapist would be the most appropriate professional to complete a comprehensive assessment of sensory integration.


• Brain plasticity is why intervention for sensory problems can make such a huge difference at any age. By providing carefully designed sensory experiences, positive neural connections are enhanced while negative connections are, hopefully, weakened and pruned away.

What Can I Do Today?

• Step One: Educate
  – Yourself about sensory processing
  – Yourself about your child/client

• Step Two: Communicate
  – Communicate with your child/client AND others.

• Step Three: Participate
  – Engage in activities that provide sensory “nutrition” for your child/client.
  – Provide activities or procedures that make engaging in life events, pleasant and natural for your child/client.

From Including SI for Parents: Sensory Integration Strategies at Home and School by Jeanne Sangirardi Ganz, OTR/L, BCP, 2005.
What Can I Do Today? (continued)

• RECOGNIZE the problem.
  – Catching the problem early in life gives the child a better chance of reducing the effects of that problem on his or her life. Early recognition will certainly help the family see the child’s behavior in proper perspective so that they can give him or her the extra acceptance, consideration and structure he or she needs.

• Help the Client Feel Alright About Themselves
  – It’s a physical problem.
  – Foresee emotional crises.
  – Develop solutions INSTEAD of punishment.
  – Discipline is still an option
  – Expectations
  – Accentuate the Positive

• Control the Environment
  – Structure
  – Modify Sensory Experiences

• Help the Client Learn How to Play

• Seek Professional Help

When to Refer a Client?
Red Flags of Sensory Processing Disorder

- **Infants and toddlers**
  - Problems eating or sleeping
  - Refuses to go to anyone but me
  - Irritable when being dressed; uncomfortable in clothes
  - Rarely plays with toys
  - Resists cuddling, arches away when held
  - Cannot calm self
  - Floppy or stiff body, motor delays

- **Pre-schoolers**
  - Over-sensitive to touch, noises, smells, other people
  - Difficulty making friends
  - Difficulty dressing, eating, sleeping, and/or toilet training
  - Clumsy; poor motor skills; weak
  - In constant motion; in everyone else’s face and space
  - Frequent or long temper tantrums

- **Grade schoolers**
  - Over-sensitive to touch, noise, smells, other people
  - Easily distracted, fidgety, craves movement; aggressive
  - Easily overwhelmed
  - Difficulty with handwriting or motor activities
  - Difficulty making friends
  - Unaware of pain and/or other people

- **Adolescents and adults**
  - Over-sensitive to touch, noise, smells, and other people
  - Poor self-esteem; afraid of failing at new tasks
  - Lethargic and slow
  - Always on the go; impulsive; distractible
  - Leaves tasks uncompleted
  - Clumsy, slow, poor motor skills or handwriting
  - Difficulty staying focused
  - Difficulty staying focused at work and in meetings

SPD Foundation
Where Do I Go From Here?
Finding a Trained Professional

- Occupational therapists tend to have the most training in sensory integration theory.
- Advanced training is required for a professional to be qualified to evaluate and treat sensory integrative disorders.
- Reputable therapists should feel comfortable being asked about the following standard qualifications:
  - **A university degree and a license, registration, or credential in a recognized professional field such as occupational or physical therapy, speech and language pathology, psychology, education or medicine.** Sensory integration is an approach applied by these fields, but there is not a separate professional discipline in sensory integration per se. Parents should beware of people who call themselves “sensory integration therapists” if they are not a validated member of one of the professions cited above.
  - **Advanced, postgraduate training in specialized courses in sensory integration theory, evaluation, and treatment.** At least 50 hours of advanced study is usually expected. Therapists should be able to produce a certificate of other documentation of their advanced training.
  - **Clinical experience of at least 3 to 4 months, under the supervision of an experienced mentor.** Therapists should be able to describe the extent of their clinical experience with regard to ages and diagnoses of individuals with whom they have worked.
  - **Evidence of ongoing training, education, and experience.** Sensory integration is an evolving theory that is updated as new research advances knowledge and influences evaluation and intervention choices. Therapists using this approach should be able to show evidence of ongoing, current learning experiences.

Summary of Sensory Integration theory based on the work of Dr. A. Jean Ayres

• Aim of theory
  – Understanding sensory processes and states of sensory integrative dysfunction.

• Focus of treatment
  – Normalizing sensory processing and integration to produce adaptive responses.

• Assessment method
  – Standardized assessment tools from the start (Sensory Integration and Praxis Tests (SIPT), Early Coping Intervention, Miller Assessment for Preschoolers, DeGangi-Berk Test of Sensory Integration, Sensory Profile, Sensory Processing Measure)- clinical observations used in conjunction with standardized assessments.

• Purpose of Treatment
  – Enhance sensory processing to impact movement, learning and socio-emotional well-being.

• Role of Therapist
  – Therapist controls the environment and guides the child; treatment is child-centered.

• Treatment Environment
  – Utilizes suspended equipment, large equipment, and/or textured equipment; needs large space for unlimited possibilities.
How are Sensory Stimulation, Sensory Processing, and Sensory Integration Different?

• Sensory Stimulation
  – Involves primarily passive activities led by the therapist and/or adult.
  – May or may not involve specialized training.

• Sensory Processing
  – Incorporates sensory and motor activities into an individual’s daily life.
  – Can be provided in a group or individual setting.

• Sensory Integration
  – Requires specialized training.
  – Is provided on a one-to-one basis with a sensory integration trained therapist.
  – Incorporates the active participation of the child (child-centered).
Child-directed Therapy

• Consistent with the idea that intrinsic motivation is an essential component of play is the SI treatment concept underscoring the belief that a child who is “inner directed” will gain optimally from therapeutic activities.

• Ways to achieve the freedom of choice:
  – Shape the choices available to the child.
    • Have the equipment you want to use already set-up in the environment and allow them to chose where they want to start.
    • Give them picture choices that meet your needs, which still allow them the freedom of choice.
  – Allow the child to plan or choose equipment (follow the child’s lead), then adapt how you are going to use that piece of equipment to meet your needs.
Therapist Role

- The therapist utilizing an SI approach has a global view of the child that includes arousal level, attention, motivation, motor planning, and problem solving.
- Due to the nature of SI dysfunction (including tactile defensiveness, autism, gravitational insecurity and dyspraxia) and its impact on behavior, the therapist’s role is to:
  - Cue into the child’s deficit,
  - Allow the child to assume control over actions during the treatment session,
  - And modify the environment in order to obtain the desired adaptive response.
- The clinician needs to provide activities that are difficult enough to challenge the child but still ensure success. Therapy sessions that continue to repeat previously performed activities have questionable therapeutic value.
- Successful SI intervention is not strictly controlled by the therapist. The session relies on the child’s inner drive and intrinsic motivation to interact with the environment by encouraging the child to choose the activities to be performed.
- The clinician needs to understand the child’s needs and follow the child’s lead without imposing previously planned activities. Therefore the focus of an SI session may appear less specific.
Therapeutic Use of Self

• Each clinician needs to be aware of his or her own style and its affect on treatment and the child’s behavior.
  – Know your own strengths and weaknesses.
  – Be forgiving of yourself for not being perfect.
• The goal of therapeutic interaction is to facilitate the child to attain and maintain homeostasis.
• Allowing a sense of freedom by providing the child with choices during the treatment session is a successful strategy to use with children diagnosed with autism or who are hesitant and insecure. Increased control and challenge, on the other hand, is a more successful strategy when dealing with more passive children or children who avoid challenging situations.
• In therapy the goal is to:
  – Increase the accuracy or clarity of the child’s perception of sensory stimuli.
  – Increase the accuracy of the child’s response to sensory stimuli.
  – Develop a more complete sensorimotor picture.
Floor-time (Greenspan)

- Six Functional Developmental Levels
  - 1. Attention and Regulation
    - Goal is homeostasis.
    - Sensory modulation and regulation.
      - The outcome of efficient sensory modulation is attention and regulation.
      - The infant and child’s ability to attend and regulate provides the foundation for engagement. When a child has a regulatory disorder it is an indicator of difficulties in the areas of sensory modulation and self regulation.
  - 2. Forming Relationships and Mutual Engagement
    - Sensory modulation and homeostasis.
      - When the child is in a well regulated state he is able to form relationships and is available for mutual engagement.
      - The child’s ability to form relationships and attain and maintain mutual engagement is affected by the child’s attention, their ability to achieve “homeostasis,” and their ability to attend to and reciprocate attention with another. When a child has difficulty with forming relationships and mutual engagement it is an indicator of difficulties in the areas of sensory modulation and self regulation.
    - Praxis (motor planning)
  - 4. Two-Way Purposeful Interactions with Complex Gestures and Problem Solving
  - 5. Elaborating Ideas, Pretend Play, Creating Symbols
  - 6. Building Bridges between Ideas (Emotional Thinking) – Connecting Symbols Logically and Abstract Thinking
Floor-time (Greenspan) Techniques

• Floor Time Strategies for Helping Your Child Tune in to You and to the World, and Build Two-Way Communication.
  – Follow your child’s lead and join him. It doesn’t matter what you do together as long as he initiates the move.
  – Persist in your pursuit.
  – Treat everything your child does as intentional and purposeful. Give her seemingly random actions new meaning by respond to them as if they were purposeful.
  – Help your child do what he wants to do.
  – Position yourself in front of your child.
  – Invest in whatever your child initiates or imitates.
  – Join your child’s perseverative play.
  – Do not treat avoidance or “no” as rejection.
  – Expand, expand, expand: play dumb, make the wrong move, do what your child tells you to do, interfere with what she’s doing. Do whatever it takes to keep the interaction going.
  – Do not interrupt or change the subject as long as your child is interacting.
  – Insist on a response.
  – Use sensory-motor play – bouncing, tickling, swinging, and so on – to elicit pleasure.
  – Use sensory toys in cause-and-effect ways: hide a toy, then make it “magically” reappear; drop a bell so that your child will hear the jingle; bring a “tickle feather” closer, closer, closer until finally you tickle your child with it.
  – Play infant games, such as peek-a-boo, “I’m going to get you,” and patty-cake.
  – Pursue pleasure over other behaviors and do not interrupt any pleasurable experience.
  – Use gestures, tone of voice, and body language to accentuate the emotion in what you say and do.
  – Try to be as accepting of your child’s anger and protests as you are of his more positive emotions.
  – Help your child deal with anxiety (separation, getting hurt, aggression, loss, fear, and so on) by using gestures and problem solving.
## Floor-Time Strategies to Address Processing Difficulties

<table>
<thead>
<tr>
<th>CHILD’S ACTION</th>
<th>THERAPIST or PARENT SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoids, moves away</td>
<td>Persist in your pursuit – Treat as intentional – Provide visual cues – Playfully obstruct – Attract with “magic” – Insist on a response</td>
</tr>
<tr>
<td>Stays stuck, does not know what to do next</td>
<td>Provide destination – Return object of interest – Use object in some way – Expand, expand, expand – Give new meanings – Use ritualized cues to start (“ready, set, go”)</td>
</tr>
<tr>
<td>Uses scripts</td>
<td>Join in – Offer alternative script – Change</td>
</tr>
<tr>
<td>Perseverates</td>
<td>Ask for a turn – Join, imitate, help – Make interactive – Ask “how many” more times – Set up “special” time</td>
</tr>
<tr>
<td>Protests</td>
<td>Act sorry – Play dumb – Restore – Blame figure</td>
</tr>
<tr>
<td>Rejects, refuses</td>
<td>Provide more things for him to say “no” to – EXPAND – Give other choices or time</td>
</tr>
<tr>
<td>Says something unrelated</td>
<td>Insist on a response – Notice change – Bring closure</td>
</tr>
<tr>
<td>Become anxious or fearful</td>
<td>Reassure – Problem solve – Use symbolic solutions</td>
</tr>
<tr>
<td>Acts out, pushes, hits</td>
<td>Provide affective cue (“Uh, uh, oh”; “no, no, no”) to encourage self-regulation – Set limits – Reward for absence of negative behaviors</td>
</tr>
</tbody>
</table>
What Do I Do Now?
Sensory Diet

• Work with a trained professional to create an individualized sensory diet for your client.

• A sensory diet is simply a variety of sensory experiences designed to help a child with SPD properly interpret his or her environment.

  – From Starting Sensory Integration Therapy by Bonnie Arnwine, 2006.
Figure 1-3. Printed with permission. © Taylor/Trett 1991
Visual System

- Cornea
- Optic nerve
- Sclerotic membrane
- Choroid membrane
- Retina
Visual Processing

• Vision is the process in which images captured by the eye excite the light-sensitive cells in the retina and create nerve impulses that are carried by the optic nerves to the brain. Precisely how the brain sorts and processes visual messages back into images is not known.

• The process of seeing begins when light enters the eye and effects the light-sensitive cells in the retina, known as cones and rods. Cones enable the eye to perceive color and fine detail; rods allow vision in dim light. Impulses from the retina’s cones and rods travel through the optic nerves and to the brain in the form of tiny electrical currents.

• At the most basic level is registration of visual input through oculomotor control, visual fields and acuity. This is followed by visual attention, organized scanning, pattern recognition and visual cognition. Visual cognition is an end product of all preceding skills and is the highest level of visual skill integration within the nervous system. Any inefficiency in the lower level skills such as scanning, or visual fields, will alter the patient’s ability to “…cognitively apply these skills to adapt.”
# Visual Processing

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most Visual Stimuli are alerting when first presented</td>
<td>Peripheral Vision</td>
</tr>
<tr>
<td>Unchanging Stimuli</td>
<td>Unexpected Sights</td>
</tr>
<tr>
<td>Subtle or Subdued Patterns</td>
<td>Bright Colors or Lights</td>
</tr>
<tr>
<td>Dim Lighting</td>
<td>Red-Yellow Shades</td>
</tr>
<tr>
<td>Decrease Visual Stimuli in the Environment (clutter)</td>
<td>Black on White or White on Black</td>
</tr>
<tr>
<td>Low Contrast</td>
<td>Use a focused Light on an Object</td>
</tr>
<tr>
<td></td>
<td>High Contrast</td>
</tr>
</tbody>
</table>
Auditory System
Auditory Processing

• Hearing is the perception of physical changes occurring around us, transmitted by means of vibrations in the air.
• There are three main parts that make up our hearing apparatus: the outer ear, the middle ear, and the inner ear. These parts of the ear contain the cells that are sensitive to sound waves.
  – The outer ear is made up of two structures: the auricle (the fleshy part of the ear that extends outside the head) and the beginning of the ear canal.
    • The auricle is made of cartilage and acts as a kind of antenna that captures sound waves.
  – The eardrum divides the outer ear from the inner ear, which has three small bones – the hammer, anvil, and stirrup – and a thin, skin like membrane called the oval window.
    • Incoming sound waves make the eardrum vibrate, which causes the hammer, anvil and stirrup to vibrate.
  – The Eustachian tube allows excess pressure to escape down its passageway. The oval window marks the beginning of the inner ear.
    • By the time a sound wave enters the inner ear, its force is 90 times what it was in the middle ear. The sound wave travels through the oval window, which covers the cochlea, a snail-shaped structure about the size of a fingertip within the inner ear.
    • The fluid in the cochlea helps change the sound into nerve impulses with the help of the organ of Corti, a small body of tissue containing about 17,000 tiny hairs inside the cochlea. The tiny hairs stimulate about 30,000 nerve fibers, which carry nerve impulses to the brain.
# Auditory Processing

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar</td>
<td>Unexpected</td>
</tr>
<tr>
<td>Quiet</td>
<td>Loud</td>
</tr>
<tr>
<td>Gentle Rhythm</td>
<td>Complex or mixed</td>
</tr>
<tr>
<td>Simple Melodies</td>
<td>Pronounced</td>
</tr>
<tr>
<td>Sing-Song Rhythm</td>
<td>Music with a varied pitch or an uneven, fast beat</td>
</tr>
<tr>
<td>Speak in Monotone or Whisper</td>
<td>Speak with a high and low voice (changing volume and pitch)</td>
</tr>
<tr>
<td>Low Tones</td>
<td></td>
</tr>
</tbody>
</table>
Olfactory System
Olfactory Processing (Smell)

- The sense of smell is stimulated when the nose breathes in the molecules that substances (called volatile) give off into the air.
- Air carrying these volatile molecules enters the nose through the nasal cavities and the mouth. Some of the inhaled air reaches the olfactory cells in the upper part of the rear of the nasal cavities.
  - These cells are covered with a thin coat of mucus and have tiny hairs extending into the fluid. The volatile molecules dissolve in the mucus, touch the tiny hairs, and cause nerve impulses to be sent to the brain, which identifies the smell.
  - The upper wall of the nasal cavity is formed by the bones of the nose and the ethmoid bone, which houses the olfactory mucus and the nerve endings that transmit information through the olfactory bulb.
- Pituitary cells help maintain the proper temperature and humidity in the nose, while the olfactory cells respond to volatile molecules and relay information through the nerves in the olfactory bulb. Air is breathed into the nasal cavity and is conditioned to maintain a suitable temperature and humidity.
# Olfactory Processing (Smell)

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Odors tend to be Alerting</td>
<td>Experiment with various scents that the child prefers and think of ways to incorporate more olfactory activities into their daily routines</td>
</tr>
<tr>
<td></td>
<td>Scented Lotions, Powders, Shampoos, Bath Gels, Chapstick, Markers</td>
</tr>
</tbody>
</table>
Gustatory (Oral Sensory) System
Gustatory/ Oral Sensory Processing (Taste)

- Taste begins on the tongue.
- The skin on the top of the tongue contains about 10,000 tiny chemical-sensing bodies called taste buds.
  - These organs are located in the tongue’s visible bumps, called papillae.
    - Each papillae holds between 1 and 200 taste buds.
    - Inside a single taste bud are about a dozen taste cells.
  - There are 4 basic taste sensations: sweet, sour, bitter, and salty.
- We experience taste when food molecules are dissolved in the mouth’s saliva. The molecules are then small enough to come in contact with taste hairs causing a reaction that stimulates nerves at the cell’s root, which sends nerve impulses to the brain.
## Gustatory/ Oral Sensory Processing (Taste)

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suck Mild Flavors</td>
<td>Crunch and Lick Food</td>
</tr>
<tr>
<td>Use a Straw to Blow</td>
<td>Eat Salty, Citrus, Sour or Smoked Flavors</td>
</tr>
<tr>
<td>Drink from a Straw</td>
<td>Suck lemonade ice pops</td>
</tr>
<tr>
<td>Use a Narrow Straw and Thick Liquid to Increase the Intensity</td>
<td>Chew on a Toy, Rubber Tubing, or Chewy Tube</td>
</tr>
<tr>
<td>Blow Bubbles</td>
<td>Blow Whistles</td>
</tr>
<tr>
<td>Warm Liquid</td>
<td>Cold Liquid or Ice</td>
</tr>
<tr>
<td>Take Slow Deep Breaths</td>
<td></td>
</tr>
</tbody>
</table>
Tactile System
Tactile Processing

• 3 functions are protection, temperature control (through perspiration), and perception.

• The protective system (more primitive)
  – Plays an important role in survival by lending a general tactile awareness of the environment.
    • Alerts us when we are in contact with something that may be dangerous.
  – It acts as a protective mechanism to the CNS by giving warning if an outward stimulus is too close for safety.
    • Temperature changes of the skin, light touch and general contact with the skin can activate this function.

• The discriminative system
  – Responds to deep touch-pressure, touch combined with motion, and the precise localization of touch.
  – Enables us to feel the quality of the item we are touching.
  – Plays an important role in adaptive motor behaviors, particularly in the initiation and planning of movement (Ayres 1972) and exploration of the environment.

• Successful function of the tactile system depends on the balance between both the protective and discriminative systems. When the sensory integrative processes of registration, orientation, interpretation, and sensory modulation are intact, we automatically know which touch is alarming, which touch is pleasurable, which touch can be ignored and which touch needs to be explored.
## Tactile Processing (Touch)

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Pressure Touch</td>
<td>Light Touch</td>
</tr>
<tr>
<td>Tight Wrap</td>
<td>Unexpected</td>
</tr>
<tr>
<td>Firm Stroking of Large Areas (Back Massage)</td>
<td>Dabs or Pokes</td>
</tr>
<tr>
<td>Firm Stroking of Large Areas (Back Massage)</td>
<td>Touch to Face</td>
</tr>
<tr>
<td>Familiar, Predictable</td>
<td>Approaching from Behind</td>
</tr>
<tr>
<td>Smooth, Simple Shapes</td>
<td>Moving the Hair</td>
</tr>
<tr>
<td>Rounded</td>
<td>Rough, Cold Texture</td>
</tr>
<tr>
<td>Dull or Blunt</td>
<td>Intricate Shape</td>
</tr>
<tr>
<td>Sit in a Womb-like Place</td>
<td>Source is Sharp</td>
</tr>
</tbody>
</table>
Proprioceptive System
Proprioceptive Processing

• It is the unconscious awareness of body position. It tells us about the position of our body part, their relation to each other and their relation to other people and objects. It communicates how much force is necessary for muscles to exert and allows us to grade our movements. Develops through weight bearing and movement against gravity.

• This sense is critical in the maturation of reflexes, particularly the righting and equilibrium reactions, in perception of body position and movement in space and against gravity, and in providing postural security and stability as the child moves throughout the environment.

• Receptors for the proprioceptive system are located in muscles, tendons, ligaments, joint capsules and connective tissue.

• The receptors of the proprioceptive system respond to movement and gravity. Fisher et al (1991) suggest that you really can not separate the vestibular and proprioceptive systems because many of their functions overlap.

• Typical Behaviors
  – Seeks input by crashing and jumping
  – Clumsy, falls easily
  – May feel heavy when picked up
  – Unable to perform tasks without vision
  – Movement takes more effort
Proprioceptive Processing

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Compression</td>
<td>Fast Paced</td>
</tr>
<tr>
<td>Slow Stretch</td>
<td>Quick Changes</td>
</tr>
<tr>
<td>Heavy or Sustained Resistance</td>
<td>Unexpected Changes</td>
</tr>
<tr>
<td>Slow Alternating Movements</td>
<td>Jarring or Jerking Movements</td>
</tr>
<tr>
<td>Push/Pull</td>
<td>Stops or Starts Abruptly</td>
</tr>
</tbody>
</table>
Vestibular System
Vestibular Processing

• The primary purposes of the vestibular system are to:
  – Detect motion and maintain equilibrium.
  – Detect and respond to the earth’s gravitational pull.
  – Detect motion within the visual field.
    • Preserve a constant plane of vision.
    • Direct gaze.
  – Influence muscle tone, posture and motor coordination.
  – Develop and maintain body scheme.

• The vestibular system consists of the labyrinths in the inner ear and the vestibular nuclei in the brain stem, which detect changes in the position of the head in space. The structures in the labyrinths include the semi-circular canals, which respond to rotary movement such as spinning, and the utricle and saccule which respond to linear movement such as forward-back rocking and gravity. The vestibular system communicates positional changes to the ocular muscles and to other parts of the brain controlling movement, particularly the cerebellum, through nerve pathways.

• The vestibular system is fundamental to all our actions. Ayres (1979) suggests that the vestibular system has a critical role in the modulation of all other sensory systems. She noted that the vestibular system assists with the process of inhibition and facilitation. This ability to balance incoming sensations assists with self-regulation and allows us to maintain appropriate levels of arousal.
# Vestibular Processing

<table>
<thead>
<tr>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow</td>
<td>Rapid or Jerky</td>
</tr>
<tr>
<td>Rhythmical</td>
<td>Changing Directions</td>
</tr>
<tr>
<td>Linear Movement</td>
<td>Angular or Rotary Movement</td>
</tr>
<tr>
<td>One Direction</td>
<td>Wide Arc Movement</td>
</tr>
<tr>
<td>Eyes Level with Horizon</td>
<td>Inverting Head Position</td>
</tr>
<tr>
<td>Grounded Equipment</td>
<td>Suspended Equipment</td>
</tr>
<tr>
<td></td>
<td>Bouncing</td>
</tr>
</tbody>
</table>
## Summary of Sensory Systems

<table>
<thead>
<tr>
<th>SENSE</th>
<th>CALMING INPUT</th>
<th>ALERTING INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Unchanging Stimuli, Dim Lighting</td>
<td>High Contrast, Bright Lights of Colors</td>
</tr>
<tr>
<td>Hearing</td>
<td>Speak in Monotone or Whisper, Music with a Quiet, Gentle Rhythm</td>
<td>Speak with a changing volume and pitch, Music with a varied pitch or an uneven, fast beat</td>
</tr>
<tr>
<td>Smell</td>
<td>All Odors tend to be Alerting</td>
<td>Scented Lotions, Shampoos, Bath Gels, Markers</td>
</tr>
<tr>
<td>Taste</td>
<td>Suck Mild Flavors, Blow Bubbles, Use a Straw to Blow</td>
<td>Eat Salty, Citrus, Sour, or Smoked Flavors, Crunch and Lick Food, Blow Whistles</td>
</tr>
<tr>
<td>Touch</td>
<td>Deep Pressure, Familiar, Predictable</td>
<td>Light Touch, Unexpected, Touch to Face or Hair</td>
</tr>
<tr>
<td>Proprioception</td>
<td>Heavy or Sustained Resistance and Slow Alternating Movements</td>
<td>Fast-paced, Quick, Unexpected changes, Jarring or Jerking Movements</td>
</tr>
<tr>
<td>Vestibular</td>
<td>Slow, Rhythmical, Linear Movement and Grounded Equipment</td>
<td>Rapid or Jerky, Angular or Rotary Movement, Suspended Equipment</td>
</tr>
</tbody>
</table>
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Bibliography (continued)


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Sensory Processing Disorder Foundation. www.spdFoundation.net


