Advances in Understanding and Treating Sensory Symptoms in Autism
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Goals of Presentation
• Understand the basic principles of the sensory integrative approach
• Understand the incidence and nature of sensory dysfunction in Autism
• Learn the evidence to support this approach
• Learn about intervention for SD in Autism

What are the Senses?
The 7 Senses
• The big 5
  • Proprioception
  • Vestibular
• Others
  • Interoception
  • Temperature
  • Pain

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• The big 5
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What is Sensory Integration?

- A theory that describes how the nervous system translates sensory information into action (Ayers, 1972)
- Behavior is linked to neural processes
- Treatment is OT/SI

The Theory of Sensory Integration

- The theory of sensory integration combines concepts from human development, neuroscience, psychology and occupational therapy into a holistic framework for viewing behavior and learning

History

- Dr. A. Jean Ayres, an occupational therapist (OT) and neuroscientist, identified the construct of sensory integration, which has been expanded primarily in the field of Occupational Therapy.

“Learning is function of the brain”

(Ayres, 1972 page 1),
- Adequate processing and integration of sensory information is an important substrate for adaptive behavior.
What is Sensory Integration Dysfunction or SPD?

• “The brain is not processing and organizing sensory information in a manner that gives the individual precise information about himself or his world (Ayres, 1972)

Or Said another way…

• A neural processing disorder that affects children and adults. People with SI Dysfunction or SPD misinterpret everyday sensory information, such as touch, sound, & movement; are unable to discriminate the fine qualities of sensation, or have awkward motor or behavioral responses to sensory input to the extent that participation in daily life activities is restricted (Miller & Schaaf, 2007 – Encyclopedia of Infant and Early Child Development - Elsevier)

What is the treatment for Sensory Integrative Disorders?

• Occupational Therapy using a Sensory Integrative Approach
  – Grounded in the principles of occup therapy
  – Ayres believed that sensory integration provides an important foundation for participation in meaningful, health promoting activities.
  – Distinguish OT/Si from other sensory therapies
    • Key features make it unique and different
The Treatment is contextualized in profession
- OT/SI (or other professional domain)
- Uses concepts from OT and SI
- Treatment is not applied but includes active participation of the child with focus on play

What are the Types of Sensory Integrative Dysfunction?
At least 2 different ways to view it

Subtypes of Dysfunction in Sensory Integration (WPS/USC) (Based on SIPT Factor Analysis and Mulligan 1999 confirmatory Factor analysis)
- Dyspraxia (Visuo-somato dyspraxia: visual & tactile)
- Deficits in Bilateral Integration and Sequencing (vestibular base – includes postural issues)
- Somatosensory factor (tactile defensiveness)
- Visuoperception
- Describes Sensory Modulation Factor but not included in SIPT Cluster groups (Ayers, 1979; Ayres and Tickle, 1980)

Mulligan, S (1998) Confirmatory Factor Analysis n = 10,000
- Found that a 4 factor solution with a general practic function was the best fit
- Visuoperception
- Dyspraxia
- Somatosensory
- Bilat Integ & Sequencing
**Other Models of Dysfunction in Sensory Integration**

  - Limited empirical data for nosology except for SMD
  - Useful clinically – requires further testing to determine utility
  - Bundy, Lane and Murray, 2002
  - Expand praxis and sensory modulation
- Smith-Roley, 2001 (in Smith Roley, Blanche & Schaaf – 2001
  - Focuses on inter-relationships between sensory modulation, sensory discrimination and praxis
  - Models are summarized in Schaaf, et al. 2009 – Kramer and Hinojosa. The Sensory integration Frame of Reference

**Observing Sensory Based Behaviors**

- Sensory Integration/ Sensory Processing is invisible, therefore we must learn how to observe behavior that will tell us how the child is processing sensory information and managing environmental challenges.

**Behaviors that can tell us about Sensory Processing**

- Moves away when you touch them
- Avoids climbing up sliding board
- Loves playing on swings and spins around
- Crashes and bangs into others
- Leans into you
Connect the Behavior with the Sensory Deficit (Schaaf, RC. & Smith Roley, 2006)

1 – Doesn’t feel pain
2 – Can’t tolerate loud, crowded shopping area
3 – Spills food/messy eater
4 – Bumps into things
5 – Can’t perform daily routines independently
6 – Diff learning new skills

a) Organization of Behavior
b) Vestibular
c) Tactile discrim
d) Proprioception
f) Praxis
g) Sensory Registration

Answers- From Schaaf and Smith Roley(2006)
SI: Applying Clinical Reasoning to Practice with Diverse Populations (Pro- ed Publishers)

• 1 – g lack of registration of important sensation
• 2 – e Poor ability to modulate intensity of stimuli
• 3 – c lack of tactile sensitivity to mouth, face, hands, etc
• 4 – b poor info from vestib receptors for balance and righting
• 5 – d lack of proprioceptive body awareness
• 6 – a lack of sequencing and timing
• 7 – f poor ideation and motor planning

Sensory Registration

• Point at which individual registers sensory stimuli
• Not a fixed point, but a tendency
• Low thresholds \(\rightarrow\) increased sensitivity
• High thresholds \(\rightarrow\) decreased sensitivity

Sensory Registration

• Children with poor registration do not respond to typical levels of sensation
• LoSlo type
Sensory Modulation

- Adjusting the stimuli so that one focuses on the important or salient features.
- Regulating behavioral response to the stimuli (e.g., attention to it; ignoring it; enhancing it by “tuning into it” such as attenuating auditory signal or tactile signal)

We Continually Modulate sensation to Regulate our Arousal & Organization

Source: Williamson & Anzalone, 2001

Sensory Discrimination

- Perceiving the qualities of sensations: sharp/dull, light/heavy, location, weight, rough/smooth, etc.
- We discriminate with all our senses: touch; audition; vision; smell; taste, etc.
- Try it (reach into your wallet or pocket and find a quarter. Note how you use the qualities described above.

Praxis

- Coming up with ideas/movement strategies, putting the plan together, and executing the act.
- 3 types of Praxis
  - Ideation – getting the idea. Cognitive
  - Planning – putting the steps together
  - Execution – doing the movement sequence
Many children with autism have difficulty with praxis:
- Can’t create ideas for how to approach a task
- Can’t put the steps together
- Can’t get their body to move in the way they would like.

They may have difficulty with one or all of the types.

Praxis is related to knowledge of your body:
- Knowing where your body is
- Creating a “body map”
- Using your body map to create, plan and execute movement strategies.

The SI approach addresses praxis at the sensory-motor level.

Use Evidence to guide assess & Tx: PubMed
- Evidence-based practice is the gold standard
- Requires that you are familiar with the literature and can critically analyze
- Includes clinical intuition based on experiences
- Utilizes systematic assessment and intervention planning based on theory and evidence

Evidence Available

Positive evidence
- OT/SI (see AJOT March 2007; Baranek, 2002)
- Weighted vests
- Using therapy balls as seating in the classroom
- Adapting the environment to match child’s needs

Good Evidence
- Sensory input affects motor performance, learning and memory (Greenough, W.; Diamond, M.
- Lifestyle redesign (including sensory-motor activities) improves functional outcomes (Clark, F. et al)
Emerging evidence

- Sensory Integration Intervention
- The Brushing Program
- Auditory Integration Training
- Others??

- Need to read evidence as it emerges and scrutinize it.

Neuroscience Evidence

To support Ayres idea that sensory input is “nourishment” for the brain

Experience Dependent Learning

- Detailed wiring of the brain is dependent upon specific interactions between organism and environment (Greenough et al., 1987)

The One with the Most Neurons Wins

These artist’s renderings show the effect of brain stimulation (or the lack of it) on lab rats, which, unlike humans, may be dissected and studied at any point in their development. The image at left depicts a brain cell from a rat raised without any special stimulation. The dendrites are relatively small, uncomplicated and few. The image at right depicts a cell from a rat that has been provided with toys and gadgets for stimulation. The dendrite growth is far more extensive and complex, allowing many more connections with other brain cells. (more is not always better)
AOTA Evidence Based Review
What is the Evidence for Occupational Therapy for Children and Adolescents with Sensory Processing Disorder/Sensory Integrative Dysfunction
Will be published in the American Journal of Occupational Therapy in June 2010

Question 1: What is the Neurophysiologic Evidence that Using a Sensory-Based Approach in Occupational Therapy with Children and Adolescents will be Effective?

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Theme 1

- Specific Sensory Input influence brain structure and function at the cellular, functional and behavioral level.
- Tactile, Vestibular, Auditory and visual stimuli studied.

Example: Schaefer, M., Heinze, H-J., & Rotte, M., 2005
Examined influence on tactile input on tactile maps in somatosensory area I for the fingers during an activity.
MEG imaging of cortical representation of stimulated fingers (digits 1 and 5) during the three task conditions.
Task (tower of Hanoi) can influence somatosensory map.
Theme 2: Effects of Enriched Environments

Enriched sensory (and sensory motor) environments influence brain morphology and maps.

1. Animal and Human Studies

Enrichment involved large cage with toys, tunnels, and running wheels and periodic extra treats (fruits and crackers).

Changes in Neuronal Structure in Response to Enriched Environments

- Re-organization of cortical maps
  - Changes in organization and structure of cortical areas after exposure to tactile-rich manipulative environments

Human Studies – The Piano Players

- Pianists showed better 2 point discrimination tip of index fingers for both hands than do non-pianists (even after ‘intervention’ that involved tactile co-activation applied for 3 hours to activate large number of receptive fields on the right index finger)
- Suggest that early exposure influences SM maps and function


- Links motor and sensory
- Motor practice (s-m activity) enhances synaptic efficiency peripherally, leading to reorganization centrally. The premise of providing specific input to a sensory system to make central organization within the system happen is central to sensory integration.
- The difference here is that change was driven by sensory motor skill; and linked to hours of practice.
Sub Theme: Active Involvement is a Key Factor in Plasticity

- Divided rats into “climbers and non-climbers”
- Climbers had significantly larger brains (Kolb & Gibb, 1991)
- Suggests that exposure alone is not sufficient to elicit neuronal (and behavioral) changes; must be active involvement.

S-M activity is especially potent (Kemperman and Gage, 1991 running rats study)

Lacourse et al. (2004) – Importance of active participation

- Examined whether Physical Performance (PP) of a learned task (pushing a button in a sequence with different fingers) differed from Mental Practice (MP) in terms of areas of cortex and cerebellum activated, and performance level in comparison to No Practice (NP)
- PP - 121% improvement *IMP OF ACTIVE PART
- MP demonstrated 86%
- NP improved 38%.

Summary

- Environments rich in novel experiences of sensory, motor, social, & problem solving, result in CNS changes. This is true of young and old animals, and seems to be true in humans.

- Both physical activity and enriched environment exposure can impact some aspects of neurogenesis, but this effect may not be global within the CNS – effects may be in specific brain areas (e.g.: exercise effected brain function in hippocampus)

Implications (continued)

- The idea that early sensory motor experience (s.a. musical training) lead to changes in the way the brain processes information is one that the SI approach is founded on – that early, meaningful (behaviorally relevant) sensory-motor experiences form an important foundation for learning (that can be measured by brain processing).
Limitations of Interpretation

- Classic work suggesting enriched environment altered brain structure. This work provides food for thought about the link of structure and function. We may be able to influence brain structure, if this can be applied to humans; but impact on function based on this work remains uncertain.
- Individual’s with ASD have a neurodevelopmental disorder and this may affect their capacity for neuroplasticity.

Sensory Dysfunction in ASD

- Previously considered one of key features of ASD.
- Subsumed under "Restrictive and Repetitive Behaviors in DSM IV-tr.
- Increased recognition.
- More attention to assessment and treatment of sensory behaviors.

Autism Affects Info Processing

- Neurobiological disorder of development that causes discrepancies or differences in the way the brain process information.

Sensory Processing in ASD

- People with autism process and respond to sensory stimuli in a much different way (than typically developing).
- "There is an obstruction between the senses and the mind, or put somewhat differently, the door to the outside (sensory) world is blocked... incoming information may be incomplete or distorted" (Bryson, SE, 2005 in the Neurobiology of Autism, 2nd ed, p 35).
The Incidence Sensory Symptoms in ASD


Parent Reports of Sensory Behaviors

• In a 2007 study, a sample of 281 children between 3-6 years of age with autism, over 95% were described as having a sensory dysfunction (Tomchek and Dunn, 2007).

Sensory Symptoms are More Prominent in Autism

• Review of 48 empirical papers and 27 theoretical or concept papers suggests that sensory symptoms are more prominent in children with autism but there is not good evidence to suggest that they differentiate children with autism from other clinical groups (FXs, DD). Rogers, SJ & Ozonoff, S. (2005).

Exact Nature of the problem is Unclear

• While there seems to be an abundance of literature supporting the existence of sensory processing abnormalities in children with autism, it is difficult to pinpoint the exact areas of difficulty because of significant individual variability.
The Nature of Poor Sensory Processing in ASD

- Individuals with autism may not always respond to stimuli, but when they do, their response is stronger than typical (McIntosh, Miller, et al. 1999).
- Individuals with autism have:
  - poor modulation (poor ability to regulate responses)
  - responses that may vary from hypo to hyper depending on the situation (Dunn et al., 2002)

Mixed Patterns

- Children with ASD often demonstrate mixed patterns: hyper-responsivity to auditory and tactile stimuli, and hypo-responsivity to proprioceptive or vestibular stimuli (Anzalone & Williamson, 1997; Kientz Dunn, 1997).
- Vision is a preferred sensory channel
- Dypraxia is also common (Mailloux, 2002, Anzalone & Williamson, 1997)

Characteristics of Atypical Responses to Sensory Stimuli In ASD

- Sometimes seems deaf/overly sensitive to sound
- Is attracted to patterns, textures, odors
- Whirls, spins, bangs head, bites wrist
- Jumps up and down, flapping hands
- Exhibits unusual or no response to pain
- Plays with light and reflections
- Flicks fingers before eyes
- Pulls away when touched
- Strongly avoids certain clothes, foods

How do Sensory Symptoms Manifest?

- What sensory symptoms do you see?
- Discuss the potential underlying mechanisms (over/under arousal, attention, self-stim, etc)
- How do they interfere ability to participate in his learning activities?
First Person Accounts
highlight unusual sensory experiences (Grandin, 1995; Williams, 1994; Cesaroni & Garber, 1991)

- Temple Grandin (1995), an adult on the autistic spectrum describes problems in over and under-reactivity or distorted sensory perception and how they lead to affective unavailability and fear reactions. Grandin (1992) describes distortion with tactile input. She calls it an ‘approach-avoid’ situation. She craved hugs but the sensation was so overwhelming that she avoided them.

Difficulty Attending to More Than One Stimuli Simultaneously

- Difficulty maintaining eye contact while listening to someone speak. When forced to establish eye contact, she describes that her mind would shut down, as she was only able to attend to one sensory modality at a time (Donna Williams (Somebody Somewhere (1994).

Confusion/Misinterpretation of Sensation

- Jim, a 27 year-old male with high functioning ASD, describes touch as being overwhelming and confusing. He describes sensory experiences like mixed up channels. Sounds could be confused as colors, or he would experience a sound when he was being touched. He would often need to turn off kitchen appliances in order to taste something (Cesaroni & Garber, 1991).

Kientz & Dunn (1997)

- Found that children with Autism have widespread sensory issues as measured by the Sensory Profile.
- Found no relationship between severity of autism and sensory symptom severity.
Rogers, S., et al, 2003

- Found significantly more sensory symptoms in children with autism in comparison to other groups (IDs, DD and Typ) (using Sensory Profile).
- Children with autism were more abnormal in taste and smell than all other groups.
- Sensory Profile total score was moderately correlated with ADOS repetitive/restricted behavior score.

Rogers, S., et al, 2003

- Regression analysis showed that sensory responsivity contributed significantly to adaptive behavior (measured by the Vineland), even more than autism severity (accounts for 4% of variance; developmental level accounts for greatest amount of variance).
- No rel between sensory symptoms and social communication suggesting that sensory impairment is an additional primary impairment, but not an autism-specific impairment.


- Found elevated levels of sensory symptoms in children with autism compared with children with other developmental delays.
- Findings were consistent across ages as young as 2 years of age.
- Also found suggestion that sensory symptoms might increase throughout preschool period and then decrease.

Sensory Processing and Attention

- Many children with Autism demonstrate difficulty maintaining, selecting and allocating attention due to poor registration of sensory input (Courchesne, Townsend & Akshoomoff, 1994).
Dypraxia

- “Ideational dyspraxia (frequently) present in Autistic Disorder can be a factor in the tendency to favor sameness and routines” (Mailloux, 2001)
- May limit play behavior

Mailloux, Parham & Smith Roley, 2000

- SIPT test results (n = 20) showed that children with autism had lower scores on all praxis tests, as well as, poor tactile, proprioceptive, and vestibular processing when compared to typically developing children. Lowest scores on oral praxi
- Suggest that poor praxis may impact on poor social skills

SSP Scores for Autism Group (Miller, et al, 2005) (n = 37)

How Does Sensory Dysfunction affect Participation and QOL for the Child and Family?

Gina Outten, Stephanie Johnson, Nicole Nowkowski, Jillian MacDonald, Keri Crochetiere

Graduate Students at Thomas Jefferson University
Qualitative phenomenological study

- Participants:
  - 4 caregivers who have children diagnosed with autism between the ages of 5 and 12
- Instruments:
  - Completion of Sensory Processing Measure by the caregiver for each child
  - Audiotaped semi-structured interview
  - Focusing on the impact of sensory processing behaviors on the routines of the family in and outside the home

Take a Guess

- What do you think parents had to say about how their child’s sensory behaviors impacted their routines inside and outside the home?

Essential Themes

- Flexibility
- Familiar vs. Unfamiliar Space
- Difficulty completing family activities
- Impact on siblings’ occupations
- Hyper-vigilance
- Strategies developed to improve participation for family
- “We at least try to do everything”

Difficulty Completing Family Activities

- Inside the home
  - “The mornings are hard because demands are being made on him.”
  - “So he has to take two bites of a non-preferred food and then reward him with a preferred food. So you know, it's not like the most relaxing dinner.”
- Outside the home
  - “Our last commercial flying experience, we both swore off of it. Never again. I'm still there. I'm not ready... He was just inconsolable.”
  - “Waiting in line is just a nightmare.”
Summary of Qualitative Studies

- Sensory Dysfunction has an impact on the family’s ability to carry out daily routines both inside the house and out in the community.
- Implications for intervention – Occupational therapist can 1) help families orchestrate routines to match child’s needs; and 2) work on decreasing impact of SD on family routines.

Intervention

For Children with ASD and Atypical Sensory Processing

Treatment for Autism

- There is no cure at the present time
- A supportive educational environment with related services (Speech, OT, etc) appears most beneficial at this time.
- An intensive, comprehensive program is usually indicated (Landa, R. 2004, NRC 2001).
- There is no one treatment that works exclusively – Rather a unique, comprehensive program

Intervention for ASD

- It is widely accepted that a comprehensive educational program for children with ASD is the most effective in achieving optimal outcomes (National Research Council, 2001).
Early Intensive Behavioral Interventions & Sensory Symptoms

- Pilot data from T. Smith, et al (IMFAR, 2009) suggests that EIBI does not significantly impact sensory behaviors.
- Other treatment approaches may be needed as an adjunct to EIBI to address sensory issues (Tristram Smith, personal conversation, May 22, 2009).

Sensory Integration

- “The neurological process that organizes sensations from one’s body and from the environment and makes it possible to use the body effectively in the environment” (Ayres, 1979)

Frequently Used in ASD

- A study examined the current practice of occupational therapists working with children with autism. The results indicated that 99% of therapists who participated used sensory integration as part of their treatment approach (Watling, Deitz, Kanny, and McLaughlin, 1999)

Frequently Requested Intervention

- Found that Sensory Integration Intervention is the most frequently requested non-biological service by parents of children with Autism Spectrum Disorders (Mandell, Novak & Levy, 2005)
- Survey of 1,009 caregivers of children with ASD
Characteristics of OT/SI Intervention

- Rich in tactile, proprioceptive and vestibular input
- Enhance organization and self-regulation
- Facilitate participation in daily life activities
- Addresses fit/match (goodness of fit) child and sensory environment
- Sensory Motor based
- Just Right Challenge/Adaptive Response
- Active Engagement/Child Directed

Example – of OT/SI

**Problem Behavior** = child constantly rocking in seat and unable to participate in learning and mealtime activities.

1. **Systematic assessment** suggests a greater need for vestibular input.
2. Hypothesis generation
3. Treatment (see next page)
4. Hypothesis revision (based on observation and systematic data collection)
5. Ongoing outcome measures relate to problem behavior

Clinical Reasoning Strategy

OT/SI

- Occupational therapists follow a professional clinical reasoning framework to evaluate and design interventions for children with SD. Treatment follows a well-documented theoretical framework (Ayres, 1979; 1989; Parham and Mailloux, 2001; Schaaf, Schoen, et al, 2009) directed by a set of principles that guide the therapists’ clinical reasoning and interactions with the child (Schaaf & Miller, 2005).

- The therapist chooses individually tailored sensory-motor activities for the child based on areas of need identified by systematic assessment.

Not a quick fix
Intervention - a three-pronged approach

1. Work directly with the child using specialized equipment in a clinic that allows the child to experience vestibular input such as swings, bolsters, or scooter boards – indicated when need is greater than can be obtained in natural environment.

2. Provide environmental adaptations such as a small inflated cushion for the child to sit on in the classroom (weekly providing needed vestibular input and decreasing disruptive rocking behaviors) and

3. Collaborate with the parent and/or teacher: suggest that the school team provide greater opportunities for the child access playground equipment such as swings to provide regular intervals of the needed input and thus decrease the rocking behaviors (environmental adaptation); parents provide opportunities for movement throughout day (swings, bounce-town, etc.

Meaningful Activities Measuring Outcomes

- The prescribed activities are meaningful to the child (i.e.: developmentally appropriate and contextualized in play) and embedded within the daily routines when possible.
- The therapist maintains data on whether these strategies are effective in reducing the disruptive behaviors and improving the child’s attention and participation in class and/or home and community activities.

The Evidence for OT/SI for ASD

- Fazlioglu & Baran, 2008
- N = 30 children between 7 and 11 years old diagnosed with autism according to the DSM-IV criteria
- Significant improvements in sensory-related behaviors pre and post intervention (p<.05) as measured
The Intervention and Findings

• This study used a combination of sensory integration strategies (individually designed vestibular, somatosensory and other sensory activities where the child was an active participant)
• Statistically significant differences in The Sensory Evaluation Form for Children with Autism with the treatment group p<.05

Other Studies of OT/SI

Individuals with ASD and SD who receive occupational therapy using a sensory integrative approach demonstrated gains in play, individualized goals and social interaction (Schaaf & Nightlinger, 2007; Watling & Dietz, 2007; Case-Smith & Bryan, 1999; Linderman & Steward, 1999; Ayres & Tickle, 1980)

Treatment Studies

• As with most treatments for autism, data on treatment of sensory symptoms are needed.
• These must be well designed treatment trials in order to 1) test and validate their efficacy in autism and 2) determine what aspects of the treatment are responsible for positive outcomes.

Study at Children’s Specialized Hospital

• Examining feasibility, acceptability and utility of intervention for children with ASD
• 5-12 years of age w/ diagnosis of ASD
• Study initiated in October 2008
• Completed 2 subjects and 2 more are enrolled
Proposed Treatment Model (Schaaf & Anzalone, 2001)

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<thead>
<tr>
<th>Physical Environ</th>
<th>Social Environ</th>
<th>Parent Training and Education</th>
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<tbody>
<tr>
<td>Direct Intervention with Child</td>
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Study Design

- Does a manualized protocol of occupational therapy to address sensory dysfunction (OT/SD) decrease sensory dysfunction and improve adaptive behaviors; participation in activities for the child and family and QOL?
  - Collaborative study
    - Children’s Specialized Hospital in NJ (funded by AS)
    - Pediatric Therapy Network (pending)

Intervention

- 10 weeks 3 times per week direct intervention with occupational therapist and child
  - Intervention follows a manualized protocol
  - Fidelity to intervention measure is used
- Family training to recognize sensory behaviors and adapt environment and family routines to meet child’s needs

SMART

- “Sensory Motor Activities in daily Routines and Tailored to the Individual (SMART)"
- Specifies the essential components of Intervention
Four Sections with Guidelines

- Section I: Evaluation and Goal Setting
- Section II: Intervention Delivery (Direct Therapy and Family Education and Support)
- Section III: Follow-up and Outcome Review
- Section IV: Supporting Documentation
  - A: Therapist’s Qualifications
  - B: Therapeutic Environment Requirements
  - C: Sample Goal Attainment Scale

SMART Intervention Manual
Draft 2 – October 2008

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Clinical Reasoning Strategy

Clinical Reasoning

Total body and oral motor tactile activities followed by oral motor heavy work and snack time
Evaluation and goal setting

- Consists of a systematic assessment of the child’s strengths and needs, interview with the family to determine how the child’s problem sensory behaviors are affecting functional behaviors and participation in daily routines and outings, and the development of goals to address SD and improve adaptive behavior and participation.

Intervention Delivery

- Implements intervention directly with the child and through family training by following key principles that guide the intervention.

Examples of Intervention Principles

- The therapist provides the child with a variety of sensory-motor play opportunities that are designed to provide needed sensory experiences (determined by assessment) that are graded to a greater or lesser intensity depending on the needs of the child.

Outcome evaluation and follow-up

- Designed to evaluate the outcomes of the intervention. Specific outcome measures will include assessment of attainment toward individual goals (Goal Attainment Scales), assessment of adaptive behavior (Vineland Adaptive Behavior Scales-II) and The Family Interviews of QoL and Participation.
Preliminary Data (Miller, et al. 2007)

- N = 30, children with sensory modulation dysfunction
- One group pretest-posttest design
- Significant improvements in Goal Attainment Scale $p < .001$
- Significant improvements in Total SSP score $p < .001$
- Significant improvements in Vineland socialization ($p = 0.02$), CBCL externalizing ($p = .02$) and Leiter-R Cognitive/Social ($p = .03$)

Time Frames

- Begin CSH study September 1, 2008
- Pilot data published by December 2009
- Begin R34 Study (if funded) by July 2009
- Pilot data published by December 2010

Case Study Report – Schaaf and Nightlinger, 2007

- Four year old child
- Potentially on the Autism Spectrum
- Sensory Symptoms were preventing child from participating in play with peers, limited food repertoire, and impaired learning opportunities
- OT/SI was used to address sensory motor delays and improve participation in life activities

Typical Individual Treatment Session

- Warm Up
- Active Sensory Motor Play with a focus on multi-sensory input
- Active sensory motor play with a focus on praxis
- Oral motor activity (snack) to decrease oral sensitivities

NOTE: Treatment sessions are individually tailored to child’s needs
### Warm up

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<tr>
<th>Purpose</th>
<th>Example</th>
<th>Comments</th>
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<tbody>
<tr>
<td>To ensure that the child is comfortable and relaxed for play</td>
<td>Greeting and playful interactions: “Hi J, did you come to play with X today?” What would you like to play with today?</td>
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### Active Sensory Motor Play with a focus on multi-sensory input

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<tr>
<td>To decrease sensory sensitivities and increase praxis</td>
<td>Swinging on space bag and crashing into large pillows and bolsters. Space bag is set low to ground to offset any fear that J might have and to encourage independence during this activity</td>
<td>Therapist “sets up environment with J’s needs in mind and then observes child, following the child’s cues, to select activity.</td>
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### Active Sensory Motor play with a focus on praxis

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<tr>
<td>To decrease sensory sensitivity, improve body awareness and increase praxis</td>
<td>“Bridge”</td>
<td>Therapist vigilantly observes J’s reactions and actions, encouraging J as needed but allowing for as much self-direction and independence as possible.</td>
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#### “Bridge”

- Therapist helps J create a “bridge” (two triangular climbing devises with a flat bolster suspended between them). J climbs up ladder (with assistance), climbs onto bolster and then jumps into large “crash pad” (pillows).
Snack with a focus on socialization and oral sensitivities

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Example</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>To decrease oral-sensitivities, expand food repertoire, and enhance socialization</td>
<td>J brings a snack to share with another child. J sets up snack, invites other child, and participates in snack</td>
<td>Mother packs food and beverage that J enjoys in addition to one or two foods that J is not familiar with or usually avoids.</td>
</tr>
</tbody>
</table>

Caveats

- 1: If not response: I have your favorite game ready, do you want to play?
- 2: Upgrade - add tactile and motor planning component (count to 3 & "crash" into pillows)
- 3: If child is not willing to climb up to bridge, therapist downgrades by lowering
- 4: Therapist uses playful language, (singing) or pretend play (climbing into spaceship)

Activities are upgraded and downgraded to meet the child's needs and to ensure success.

Therapy is contextualized in sensory-rich play and taps into the child's inner drive for competence (Ayres, 1979). The therapist artfully and skillfully creates enticing, achievable challenges for the child to promote the ability to process and integrate sensory information, and observes adaptive responses to these challenges.

Let's Watch

- Occupational Therapy improves Occupational Performance
- Kathy Nightlinger, MS, OTR/L

OT/SI Improves Participation (Schaaf and Nightlinger, 2007)
More Improvements

Summary

• Sensory Symptoms are a common feature of autism
• Parents and teachers identified the need for intervention for these as key
• One important treatment for sensory symptoms is occupational therapy using a sensory integrative approach
• There is good evidence that enriched S-M environments influence the brain in positive ways
• Evidence for intervention in emerging

Thank You

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