ADHD and Sensory Processing: Theory, Research, and Clinical Implications

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ADHD & Sensory Processing
An Introduction

- Recognition of a need for multidisciplinary treatment approaches
- Disconnect between disciplines
- ADHD and comorbidity
- ADHD and sensory processing difficulties
DSM-5
ADHD Criteria
Sensory Processing (Sensory Integration) Disorder/Difficulties

- Ability to register, screen, organize and interpret information from our senses and environment to enable adaptive responses to changing circumstances and contexts.

- Part of our foundation for sense of security, competence, social-emotional, cognitive, motor, communication and other life functions.
Sensory Systems Considered

- Vision
- Hearing
- Touch – light touch, pressure, pain, temperature
- Taste
- Smell
- Vestibular
- Proprioception
- Interoceptive
Sensory Processing Disorder (SPD)

- Sensory Modulation Disorder (SMD)
  - SOR
  - SUR
  - SC

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

- Sensory Discrimination Disorder (SDD)
  - Visual
  - Auditory
  - Tactile
  - Taste/Smell
  - Position/Mvmt
  - Interoception

SOR = Sensory Over-Responsivity
SUR = Sensory Under-Responsivity
SC = Sensory Craving

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Miller LI et al., 2012
Over-Responsivity

Under-Responsivity

Sensory Craving

Sensory Based Motor Disorder
Risk Factors for SPD

- Genetics
- Preterm birth
- Prenatal risk factors
  - Birth trauma, complication during labor or delivery, jaundice, infant health issues, hospitalizations and medical procedures
- Exposure to toxins
- Adoption – orphanage, sensory deprivation
- Exposure to trauma, neglect/abuse
Estimated 5-13% children have SPD, 73% male

Estimated Frequency Common Co-morbidities:

- 40-60% ADHD & SPD
- 70-90% Autism Spectrum Disorder & SPD
Is SPD a valid separate syndrome?

Convergent and Divergent Validity of Childhood Developmental Disorders

- Bipolar Disorder
- Schizophrenia
- Autism
- SPD?
- Depression
- ADHD
- FXS
- QCD
- Anxiety

Adapted from Randy Ross, M.D. © 2013
Review: ADHD-Sensory Research

● Methodological issues
  – Who is conducting the research?
  – How are ADHD and sensory processing measured?
  – How aware/sensitive are parents to challenges with sensory processing?
Figure 1: Short Sensory Profile Raw Scores by Referral. SMD and Dual Referral groups were more impaired than typically developing children on all subtests of the SSP (p < 0.001 and p < 0.01, respectively). The ADHD group was more impaired than typical on all subtests (at least p < 0.01), except Taste/Smell and Movement Sensitivity. *The SMD group was more impaired than ADHD on all subtests (at least p < 0.01), except Seeks Sensation and Auditory Filtering.
Differences between ADHD and SPD: Research

- ADHD = more impulsive (Ognibene, 2002; Miller, 2006)

- SPD = more difficulties habituating to sensory stimuli (Ognibene, 2002)

- ADHD = anxiety specific to social concern (Lane, Reynolds, and Thacker, 2010)
Combined ADHD + SPD: Research (when both are present)

- Greater anxiety (Reynolds and Lane, 2009; Lane, Reynolds, and Thacker, 2010)

- Problems with aggression, delinquency, academic achievement, and cognitive processing (Ghanizadeh, 2011)

- Greater sensory-related behaviors than ADHD alone and greater attention difficulties than SPD alone. (Miller, Nielsen, and Schoen, 2012)
ADHD/Executive Functions Theory

- Barkley’s model of ADHD and executive functions (Barkley, 1997)
  - Executive functions are higher order cognitive skills
  - Inhibition most important

- ADHD reflects deficits in executive functioning

- Evaluate with checklists, normed questionnaires, and cognitive skill measurement
ADHD Testing and Research

- Less inhibitory motor control in children and adults with ADHD *(Lijffijt, 2005)*

- In adults, inhibition may be the strongest predictor of ADHD compared to measurement of other executive functions *(Boonstra, et al., 2010)*

- Working memory deficits persist into adulthood, increasing the difficulty of working memory measures will improve identification *(Alderson, et al., 2013)*
## Differentiating ADHD vs. Sensory

### Helpful Hints

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>SPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistently disruptive behavior</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Anxiety and irritability</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Measured executive deficits</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>ADHD medication is effective</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Negative effects of ADHD meds</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>More organized/regulated after OT</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Still impulsive with OT</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Seeks new, nonspecific stimulation</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Best Clinical Practices

Client with ADHD symptoms...

- Refer for psychological testing of executive functions
- Include sensory and motor questions in intake
- If sensory/motor differences suspected, refer for occupational therapy evaluation
- Mental health and O.T.s coordinate interventions
- If no psych testing – consider outcome of occupational therapy/evaluation
References


Lane, SJ, Reynolds, S., Thacker, L. 2010. Sensory over-responsivity and ADHD: Differentiating using electrodermal responses, cortisol and anxiety. *Frontiers in Integrative Neuroscience*


