The Sensory Integration Perspective

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What is Sensory Integration?

- Dynamic & Ecological Theory of Brain/Behavior Relationships
- Way of understanding behavior

What is Sensory Integration?

"the organization of sensation for use"
- Ayres

Ayres Sensory Integration®
(Roley, Mailloux, Miller-Kuhanek & Glennon, 2007)

- Trademarked term by Franklin Baker/A. Jean Ayres Family Trust
  - for theory and methods
  - based on the work of A. Jean Ayres
  - developed within occupational therapy
  - outlined on siglobalnetwork.org

Sensation

- Interoception – inside the body
- Proprioception – body position and movement
  - Vestibular
  - Proprioception
- Exteroception – outside the body
  - Hearing
  - Vision
  - Smell
  - Touch
  - Taste
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.”
• A. Jean Ayres, 1988

Sensory Integration & Performance Skills and Patterns

• Sensations must be perceived, organized and interpreted
• Contributes to
  — Arousal, alertness and attention
  — Cognitive, motor and praxis skills
  — Emotional regulation
  — Social communication and interaction
  — Organization of behavior in time and space

Sensory Integration & Daily Life Influences

• Occupational choices
  — Exploration and engagement
  — Schoolwork and chores
  — Play
  — Self care
  — Sleep and rest
• Health and well being
• Formation of identity

A. Jean Ayres, Ph.D., OTR
1920 -1988
Practitioner
Educator
Researcher
Theorist
Test developer
Therapeutic equipment inventor

ASI Theory

• Early model of SI identified sensory and motor constructs thought to provide a foundation for occupation
• Early in the 1960s, she began developing tests and conducting research to develop her theory
• Also one of first occupational therapists to conduct research to examine intervention effectiveness

A. Jean Ayres

• Discovered “Hidden Disabilities”
• Studied neuropathological underpinnings of behavior
• Synthesized literature from neurology, psychology, neuropathology, education
Background

- Occupational Therapist
- Clinical psychologist
- Post-doctoral scholar at Brain Research Institute, UCLA
- Taught at USC and in her private clinic
- Mentored many therapists

Basic assumptions

- Primitive sensory functions provide a foundation for more complex abilities
- Sensory information is integrated for functional behavior
- The child is an active participant in development

Overview:
Process of Sensory Integration

- Sensory Input
- Sensory Integration
- Adaptive Response
- Feedback

Sensory Input

Sensory Systems:

- Tactile (touch)
- Proprioceptive (muscle & joint position)
- Vestibular (head movement through space)
- Olfactory (smell)
- Gustatory (taste)
- Visual (seeing)
- Auditory (hearing)

Sensory Input

- Receptor capability
- Transmission capability
- CNS detects & registers sensation
Sensory Nourishment

- Sensory information is necessary for brain function
- Too little or too much will cause problems
  - Deprivation
  - Over stimulation

Adaptive Response

- A successful response to an environmental challenge
- Child is an active participant
- An appropriate supportive environment can encourage it
- Adaptive responses create changes in the brain

Neuroplasticity

- Potential for the brain to change
- Neural changes are made through
  - increased connections/synapses
  - and through pruning/elimination of connections for refinement
- Active, exploratory, attentive organism is necessary for brain changes
- Most dramatic potential is in young organisms, but potential is present throughout life

Key Neurobehavioral Processes

- Sensory Processing
- Sensory Registration
- Sensory Modulation
- Sensory Discrimination
- Sensory Integration
- Body Scheme
- Praxis
- Organization of Behavior

The Integrative Process

- Pleasure – Aversion continuum
  - Hyperresponsive
  - Hyporesponsive
- Arousal/Alertness
- Affect/Emotion
- Attention
- Activity Level
- Social Interactions
Sensory Discrimination & Perception

- touch
- vestibular
- proprioception

Tactile Discrimination

- Emotional development
  - Rooting, sucking, grasping
  - Attachment
- Motor control
  - Body scheme
  - Oral motor skills
  - Hand skills
  - Spatial location of body relative to people and objects

Vestibular

- Gravity awareness
- Postural Control
  - Holding still and upright
  - Maintaining balance while moving
  - Head, neck and eye control
  - Coordinating head movement with trunk and limb movements – both sides of body

Proprioception

- Sense of body position and movement
- Joint Stability
- Grading the force and direction of movement
- Timing of movement
- Internalized movement patterns

Praxis

- Ideation/creativity
- Imitation
- Construction
- Sequencing
- Tool use
- Gesture to command
  - Unfamiliar
  - familiar

Sensory Integrative Development

- Prenatal Period
- Neonatal – 1st yr
- Toddlerhood
  - 3 – 7 years
  - 7+ -

- sensory organs develop
- interoception predominates
- Vestibular and somatosensory processing predominates
- Increased praxis and motor planning
- Increased self-regulation, cognition, motor and social skills
Sensory Integrative Development

- Ayres believed that the first 7 years of life is a period of rapid development of sensory integration
- Normative data show that children’s scores on standardized tests of SI are almost equivalent to an adult’s by age 7
- Increased sensory integration leads to increased adaptive responses which then leads to more refined integration...

Assessment Process

- Referral
- History
- Observation
- Formal assessment
  - Transdisciplinary/multidisciplinary tools
  - Specific SI assessment tools
- Interpretation of status of SI functioning
- Integration of specific SI findings with other assessment information

When a child’s SI development is different

- Slower to acquire reliable motor and social skills
- Increased stress in ordinary activities
- Participation in occupations of childhood is compromised
- Self-confidence and mastery are compromised
- May establish view of self as incompetent
- Identity as one who doesn’t “do” certain things

Neurological Findings for SI Problems

- SI difficulties often co-occur with many medical, developmental, and learning disorders
  - Autism, ADHD, learning disability, Fragile X syndrome
- When seen with no other diagnosis, neurological examination is usually normal

Proposed Nosology

(Miller et al., 2007)
What's the Evidence?

- Not enough to support proposed nosology or discrete subtypes of SI disorders
- **Does** support existence of different kinds of sensory integrative challenges or problems encountered by children
- Sources: Schaaf & Davies, 2010; Davies & Tucker, 2010; Mailloux et al., 2011

Sensory Integration Problems

- Research supports different patterns of SI problems
  - Perceptual / sensory discrimination problems
  - Sensory modulation problems
  - Vestibular, postural & bilateral coordination problems
  - Dyspraxia
- Different SI problems often co-occur

Sensory Integrative Dysfunction

- Based on 40 years of research
- Factor Analyses
  - Ayres
  - Mulligan
  - Mailloux et al.
- Studies focused on sensory processing difficulties in children

Between 1965 & 1989, Ayres conducted 7 Factor Analyses which revealed the following patterns

- Other factors (auditory language; somatosensory perception) seen in some studies (1969, 1972, 1977, 1989)

Mulligan (1998) N = 10,475 found similar patterns:

- Bilateral integration & sequencing
- Somatopraxis
- Visuopraxis
- Somatosensory perception
- Postural/ocular

Mailloux et al. 2011 N=273 found similar patterns

- Visual and Somatodyspraxis
- Vestibular Bilateral Integration and Sequencing
- Tactile & Visual Discrimination
- Tactile Defensiveness and Attention
Defined in Fidelity Measure
(Parham et al., 2007; 2011; in press)

- Fidelity Measure of ASI
  - Created by Ayres’ students/colleagues
  - International participation of OT-SI experts
  - Reliability and Validity excellent

- Purpose
  - Allows systematic analysis of the intervention
  - Ensures that the methods are “faithful”
  - Essential in effectiveness studies

Fidelity Measure Differentiates ASI
from other approaches with different underlying theories/models

- Perceptual Motor:
  - planned and directed
  - focus is on skills

- Neuromotor:
  - planned and directed
  - focus is on motor skills/postural control

- Sensory Stimulation:
  - Imposed; no adaptive response

- Floor Time:
  - Focus is on socialization

- Behavioral Approach:
  - stimulus/response/reward

ASI Intervention

- Characterized as the art and science of using sensory integration theory and methods in Occupational Therapy

- Key Elements
  - Structure such as therapist qualifications and equipment
  - Process such as dynamics of therapist/child interactions

ASU Intervention

- Contextualized within professional practice
  - Occupational therapy
  - Occupational Science
  - Play and Exploration

Review of SI Intervention Research

- Over 70 studies published examining “sensory integration intervention” based on Ayres’ work with varying results

- Fidelity is a major concern
  - Most addressed structural elements
  - Sensory strategies described in all studies
  - Most process elements seldom mentioned
  - In 1/3 of studies therapist followed a pre-determined prescription of sequence i.e. not collaborative in activity choice

Part I Therapist Qualifications

- Occupational therapist, speech-language pathologist or physical therapist
- Post-graduate training in SI
- Supervision and mentorship
Part II Assessment Report

- Historical information
- Reason for referral
- Performance patterns
- Sensory analysis – sensitivity and discrimination
- Postural ocular control
- Visual perceptual/fine motor
- Motor coordination/gross motor/praxis
- Organizational skills
- Performance
- Interpretive summary

Part III Physical Environment

- Adequate space for vigorous physical activity
- Flexible arrange of equipment
- Suspended equipment

Part IV Communication with Parents/Teachers

- Set goals and objectives
- Educate significant caregivers
  - Potential influence of sensory-related difficulties
  - Influence of sensory difficulties and dyspraxia on daily activities, performance, and participation

Part V Process of ASI Intervention

- Ensures physical safety
- Presents sensory opportunities
- Therapist helps child attain/maintain optimal level of alertness
- Challenges postural, ocular, oral, & bilateral motor control
- Challenges praxis and organization of behavior
- Collaborates in activity choice
- Tailors activities to present just-right challenge
- Ensures activities are successful
- Supports child's intrinsic motivation to play
- Establishes therapeutic alliance

ASI Intervention - Outcomes

- Health & Participation
- Creation of identity by engagement
  - Alone
  - With friends and family
  - In cooperative groups
- Building
  - Sense of self
  - Life skills, routines and plans

Evidence-Based Practice in SI

- Outcome measures (Parham & Mailloux, 1996)
  - Adaptive responses (complexity and frequency)
  - Self confidence and self-esteem
  - Gross and fine motor skills
  - Daily living skills and activities
  - Personal-social skills
  - Cognitive/language/academic
Evidence

- Special Issues of AJOT
  - March/April, 2007 identification and intervention studies
  - May/June, 2010
  - Systematic Reviews of OT for Children & Adolescents with Difficulty Process and Integration Sensory Information
  - Arbesman & Lieberman, 2010

Evidence

- 1. Examining neuroscience evidence for sensory-driven neuroplasticity: Implications for sensory-based OT for children and adolescents
- 2. Evidence review to investigate the support for subtypes of children with difficulty processing and integration sensory information

Evidence

- 3. Systematic review of the research evidence examining the effectiveness of interventions using a sensory integrative approach for children
- 4. Exploring the effectiveness of occupational therapy interventions other than the sensory integration approach, with children and adolescents experiencing difficulty processing and integration sensory information

Evidence

- 2011; in press – Development of a Fidelity Measure for Research on Effectiveness of Ayres Sensory Integration® Intervention
- 2011 - Verification and Clarification of Patterns of Sensory Integrative Dysfunction