

SENSORY INTEGRATION

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DEFINITION (1)

"the neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment. The spatial and temporal aspects of inputs from different sensory modalities are interpreted, associated, and unified" (Ayres, 1989).

"the combination of facilitatory and inhibitory messages produces modulation which is the nervous system's process of self organization" (1979). "Modulation is the process of increasing or reducing neural activity to keep that activity in harmony with all the other functions of the nervous system" (Ayres, 1979).

Ayres defined modulation as the "brain's regulation of it's own activity" (1979).

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DEFINITION (2)

She highlighted the role of the vestibular system in modulating the activity of the other systems. The central connections of the vestibular system place it in a key position to modulate activity in the brain stem, cerebellum, and related ascending pathways.

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Sensory modulation is the intake of sensation via typical sensory processing mechanisms such that the degree, intensity and quality of response is graded to match environmental demand and so that a range of optimal performance/adaptation is maintained.

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Characteristics of Sensory Integration Procedures

- active participation
- child directed
- individualized treatment
- purposeful activity
- need for adaptive responses
- input varies based on child's response
- activity rich in proprioceptive, vestibular and tactile input
- implied or stated goal of improving processing and organization of sensation (not the teaching of specific skills)
- administered by a trained therapist (OT or PT)

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TACTILE DEFENSIVENESS

Ayres introduced the concept of tactile defensiveness as avoiding or negative reactions to non-noxious tactile stimuli (Ayres, 1964). She conceptualized tactile defensiveness as an imbalance between discriminative and protective sensory processing. While the concept of tactile defensiveness received the bulk of the attention, Ayres also suggested that hypersensitivities might be observed in other sensory modalities. Ayres is also responsible for coining the terms gravitational and postural insecurity.

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SENSORY INPUT

children who register sensory input but failed to modulate it responded better to therapy than those who were hypo-responsive or failed to orient to sensory input" (1980). They described this failure to orient as inadequate registration of incoming sensory stimuli. They further proposed that SI treatment, "was more effective in modulating sensory input than in helping the brain to register or orient to it"

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Koomar and Bundy

Koomar and Bundy (1991) state, "*when an individual overresponds, underresponds or fluctuates in response to sensory input in a manner disproportional to that input, we say that the individual has a sensory modulation disorder"* (p. 268, 1991).

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Wilbarger & Wilbarger

Wilbarger & Wilbarger (1991) promote the concept of sensory defensiveness as consistent with normal defensive responses. They propose that sensory defensiveness is on a continuum of approach and avoidance behaviors.

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Kimball

Kimball (1993) describes sensory modulation problems in terms of the arousal state created due to the influences of sensation. "Persons who have sensory system modulation problems have more changeable arousal or reaction levels than normal. This results in problems with adaptive responses because their systems lack stability"

Importantly, Kimball also introduced the concept of shut down which she described as a protective mechanism against severe overload. She illustrated the notion of a non-linear continuum by describing individuals at the extremes of behavior i.e., "some children even react in a dangerous way and go from overarousal to physiological shut down."

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Parham and Mailloux

Parham and Mailloux (1996) define sensory modulation as *"a tendency to generate responses that are appropriately graded in relation to incoming sensory stimuli rather than under reacting or overreacting to them."*

They further describe sensory registration problems as a failure to attend to or register relevant environmental stimuli

Parham and Mailloux note that registration problems are often seen in children with autism and developmental delays. Usually more than one sensory system is involved, but there are inconsistencies such as ignoring *"relevant stimuli while overfocusing on irrelevant stimuli"* (p. 324), or *"to lack sensory registration in some situations but react with extreme sensory defensiveness in others"* (p. 324). Children lacking appropriate registration may engage in intense or dangerous behaviors. They also describe a situation where lack of registration creates a lack of inner drive to engage in typical childhood occupations and is detrimental to long term development

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Sensory Profile (Dunn & Westman, 1997)

- sensory seeking,
- emotional reactivity,
- low endurance/tone,
- oral sensitivity,
- inattention/distractibility,
- poor registration,
- sensory sensitivity,
- sedentary,
- fine motor/perceptual

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Why and How Does Sensory Integration Work

- SI theory, hypothesize that we are influencing brain organization and brain change
- Brain change can be inferred only from indirect observable variables
- Kavar (1973), suggested that SI therapy positively influenced hemispheric specialization as measured by a dichotic listening task in a sample of children with LD
- Ottenbacher (1982) demonstrated change in postrotary nystagmus, as measured by the Southern California Postrotary Nystagmus Test
- The use of PET scans or EEG may, in the future, be used to examine the CNS integration of afferent input

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Factors Influencing the Effectiveness of Therapy

- Treatment variables: sequence of kinds of sensory input; therapist induced vs. child induced stimulation
- Patient variables: age, sex, diagnosis, severity
- Therapist variables: sex, personality, expectations

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Are Sensory Integration Procedures Effective?

- there is not consistent agreement
- clinicians who are using SI are convinced that it is effective.
- many testimonials from parents
- Ottenbacher (1982) stated that "the meta-analysis of the SI research literature did provide suggestive support for the effects of SI therapy,

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Criticisms of Sensory Integration Efficacy

- SI procedures have not been conclusively demonstrated to be effective
- Maturational changes in development, especially in motor development, will occur as part of the natural history of the disease
- There is no hard evidence to indicate that treatment programs which attempt to modify or inhibit abnormal movement patterns are ever successfully incorporated into the maturing nervous system with resulting improvement in motor function
- The Committee on Children with Disabilities (1985) concluded that "The motor disabilities of the dyspraxic child will generally improve over time without a specific treatment program
- If the irrational methodology in question is continued for long enough, then spontaneous cerebral maturation might occur coincidentally, and the child might acquire additional mental skills regardless of - or even in spite of - the training procedures." (Kinsbourne & Caplan, 1979, p. 200).

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Flaws in SI Efficacy Research

- Subject Characteristics
 - Lack of clear definition of subject population
 - Lack of stringent sampling
 - Lack of operational definition of sensory integration dysfunction and LD
- Design
 - Maturation not controlled
 - Lack of control/contrast group
 - Non-equivalence of groups at pretest
 - Lack of control for tester bias
 - Treatment procedures not specified and/or not specifically SI
- Instrumentation
 - Relevant info re: reliability/validity of instruments not reported or inadequate
 - Lack of good measures of treatment effectiveness
- Data Analysis
 - Inappropriate analysis

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