

# An Introduction to Sensory Integration

Alfred Tomatis's theory and methods, for both assessment and intervention, center around the role of the vestibular-cochlear system in the life of an individual. His work places critical value on the development and function of a sensory system in the growth and maturation of an individual, in that individual's awareness, understanding and acceptance of him/herself and his/her world, and in the interaction between self and environment, both physical and non-physical. For many, the belief that a sensory system could have such far-reaching influence is regarded as highly speculative. Yet for a specialized group of practitioners, the fundamental role of the sensory systems and sensory input in daily life is the foundation of their practice. Many of these clinicians are occupational and/or physical therapists practicing Sensory Integration, an approach by A. Jean Ayres, Ph.D. Many others are neurodevelopmental specialists working with the National Academy for Child Development applying an approach to remediation involving protocols of sensory stimulation to integrate the senses and to facilitate motor output and higher level processing. Theories behind the Tomatis method and sensory-based approaches are similar and many clients involved in either of these interventions would perhaps benefit from the other.

## History of Sensory Integration

"Sensory integration", as a term, has been used by a variety of professions to describe various aspects of the process of responsiveness to sensory stimulation. Recognizing the work of Temple Fay, MD, who in the early 1940's was a principal initiator of sensorimotor approaches, therapists including Margaret Rood, the Bobaths, Margaret Knott and Dorothy Voss, and developmentalists including Piaget, Doman and Delcato, Kephart, and many others, "sensory integration", for the purposes of this course, will focus primarily on the work of A. Jean Ayres, Ph.D., O.T.R., another contemporary of Alfred Tomatis, MD.

In the 1950's, A. Jean Ayres, an occupational therapist and educational psychologist working with learning-disabled and autistic populations, began developing her theories, evaluation tools and treatment principles for an intervention approach she called "Sensory Integration". As a result of her life's work, standardized testing with the Sensory Integration and Praxis Tests, a means of objectively identifying sensory integration dysfunction in children 4-10 years of age, is available. Continuing education courses in sensory integration theory and treatment for professionals specializing in this area are



offered internationally, and, inclusion of sensory integration is included in the curricula of both undergraduate and graduate academic programs in occupational therapy. Dr. Ayres died in 1988. The Ayres Clinic in Torrance, California and Sensory Integration International are institutions continuing her work. Her theories and approaches to assessment and treatment are continuously being expanded upon, substantiated, and/or challenged by a variety of specialists in the fields of health/medicine, education and psychology.

In her second book, Sensory Integration and the Child, Dr. Ayres identified four levels of integration as a foundation for skill development:

- a. First level function is based upon reception/processing of gravity's influence, overall movement, sensory input from muscles and joints, and touch input, which contribute to muscle tone, posture, eye movements, balance, sucking and eating. This level supports emotional tone of gravitational security, mother-child bond and comfort with touch.
- b. Second level abilities develop from the above, influencing bilateral integration of both sides of the body, motor planning and body scheme, along with activity level, attention span and emotional stability.
- c. Third level abilities incorporate information from vision and sound with the foundational senses above to support purposeful activities such as language, eye hand coordination, and visual perception.
- d. The end products of sensory integration are fourth level skills that reflect the integration and development of sensory input to support whole brain activities such as concentration, organization, self-control, self-esteem, self-confidence and academics.

A cornerstone of Dr. Ayres' work is that a sensory integration problem is a physically based problem of inadequate or unreliable processing of sensory information. Given that adequate, reliable sensory input is necessary for higher level skill development, a sensory integration problem is a basic, foundational interference with higher level skills. Treatment is achieved by a.) identifying problematic sensory systems, realizing that very rarely does sensory integration dysfunction occur within only one system, and b.) engaging the child in meeting the "just right" challenge of mastering an environmental or physical demand with an adaptive response. Sensory integration is an active, not passive, process that often times follows the child's lead to meaningful activities in order to promote one's ability to respond adaptively.



### Sensory Integration Defined

"Sensory integration" is the automatic process by which our central nervous system organizes daily information from ourselves and our human and non-human environments to produce an adaptive response of action or inaction. We first learned of our "five senses" in grade school as being: touch, sight, smell, hearing, and taste, but for those persons specializing in sensory integration treatment, two other sensory systems, the vestibular and proprioceptive/kinesthetic systems, provide critical information about our movement, body position, and body parts.

In combination with the sense of touch, the vestibular and proprioceptive sensory systems have traditionally been emphasized in the evaluation and treatment of children with sensory integration dysfunction. Typically, incoming information from these three systems is processed at the level of the brain stem, cerebellum, and midbrain. As such, these systems are working at a non-conscious, or automatic level. Because these three systems combine to provide one with a sense of physical boundaries and touch discrimination, joint and muscle position and body awareness, and a sense of one's head and body position relative to the pull of gravity, they are considered the foundation for sensory motor development and higher level functions. Generalized outcomes of good sensory integration can be seen with appropriate levels of arousal, alertness, attention, and/or emotion, and efficient, well-coordinated motor output, and in automatic "know-how" when engaging with new tasks or movement patterns (praxis).

Related to sensory processing is the term "sensory modulation", or the brain's ability to comfortably or efficiently take in or inhibit neural information. Individuals with difficulty regulating environmental stimulation of touch, sound, movement or vision may perceive ordinary sensory experiences as uncomfortable or unpleasant, and often demonstrate a sympathetic bias within their nervous system, placing them in a "flight or fight" mode, overload or shut-down. Problems with self-regulation often manifest themselves as discomfort (with the feel of certain clothing, movement or sounds causing an individual to avoid situations involving certain types of stimulation), or as atypical and often inappropriate behavioral responses.

### Clinical Considerations for Initiating a Sensory Integration Referral

Since sensory processing does not occur in isolation, clients presenting with auditory processing difficulties may have co-existing issues in other sensory systems. Signs of inadequate dysfunction in sensory integration have been studied more in children than in adults. Certain behaviors in children have been identified as atypical responses to



sensory stimulation or possible indicators of sensory-based problems. The most significant of these behaviors, as identified by Winnie Dunn, Ph.D., O.T.R., and Kay Westman, M.S., O.T.R. in their development of The Sensory Profile, are listed in the atypical behavior list accompanying this introduction. It is strongly suggested that TLP providers familiarize themselves with this list, as well as with The Sensory Profile, to increase their awareness of behaviors possibly associated with dysfunction in sensory integration. Because of a.) the embryological link of the ear and skin in development, b.) anatomical and physiological auditory and vestibular connections, c.) the progressive filtration and recapitulation of ontogenesis that occurs during a neurodevelopmental auditory training program, and d.) the inter-relatedness of sensory systems and sensory-based function, changes may occur during or following a program of listening that reflect an overall improvement in an individual's whole brain activities, enabling that individual to receive/process sensory stimulation more reliably. However, during the course of a listening program, the provider may make specific observations that, combined with functional indicators evident in daily life, should prompt a referral for a sensory integration evaluation or consultation. These observations could include a.) fears or strong negative responses to touch or movement stimulation b.) strong drive for movement or touch during and/or after listening sessions c.) gravitational insecurity (fear/discomfort in response to position changes, especially going upside down) d.) difficulty with balance e.) gross motor awkwardness f.) tactile defensiveness g.) poor handwriting h.) fine motor awkwardness i.) difficulty with new situations j.) difficulty organizing self and/or materials and work/play space k.) persistent deviations in listening test curves in zone 1 upon repeated listening tests. As we know, listening, both receptive and expressive (active) is a whole body experience, so, in addition to the auditory system, the vestibular, proprioceptive, touch and visual systems are involved in listening. Interestingly, gross motor problems and vestibular dysfunction are often seen together, while fine motor problems and touch/tactile dysfunction are often paired.

In attempting to locate a therapist trained in sensory integration, it is important to look for someone with both clinical experience (a minimum of five years) and ongoing participation in continuing education courses in sensory integration and related areas. For the purposes of working in conjunction with a TLP provider, it would be helpful if the therapist has a background or familiarity with the use of sound stimulation programs (i.e., The Listening Program, Listening With the Whole Body, Samonas/Sonas, Dynamic Listening Systems, Listening Fitness, AIT, Tomatis). Continuing education courses in

Sensory Defensiveness (Willbarger), "How Does Your Engine Run" (Shellenberger), M.O.R.E. (Frick, Oetter, Richter) are a few specific courses that are useful in sensory integration practice. Qualified therapists are eligible to become certified in administration and interpretation of the Sensory Integration and Praxis Tests through training programs offered by either Sensory Integration International or Western Psychological Services.

Resources for additional include:

- The American Occupational Therapy Association  
P.O. Box 31220  
Bethesda, MD 20824-1220  
301-652-2682
- Development Delay Resources  
4401 East-West Highway, Suite 207  
Bethesda, MD 20814  
301-652-2263
- The Interdisciplinary Council on Developmental and Learning Disorders  
4938 Hampden Lane, Suite 800  
Bethesda, MD 20814  
301-656-2667  
[www.icdl.com](http://www.icdl.com)
- National Academy for Child Development  
549 – 25<sup>th</sup> Street  
Ogden, UT 84401  
801-621-8606  
[www.nacd.org](http://www.nacd.org)
  - Sensory Integration International  
1514 Cabrillo Avenue  
Torrance, CA 90501-9934  
310-320-9987

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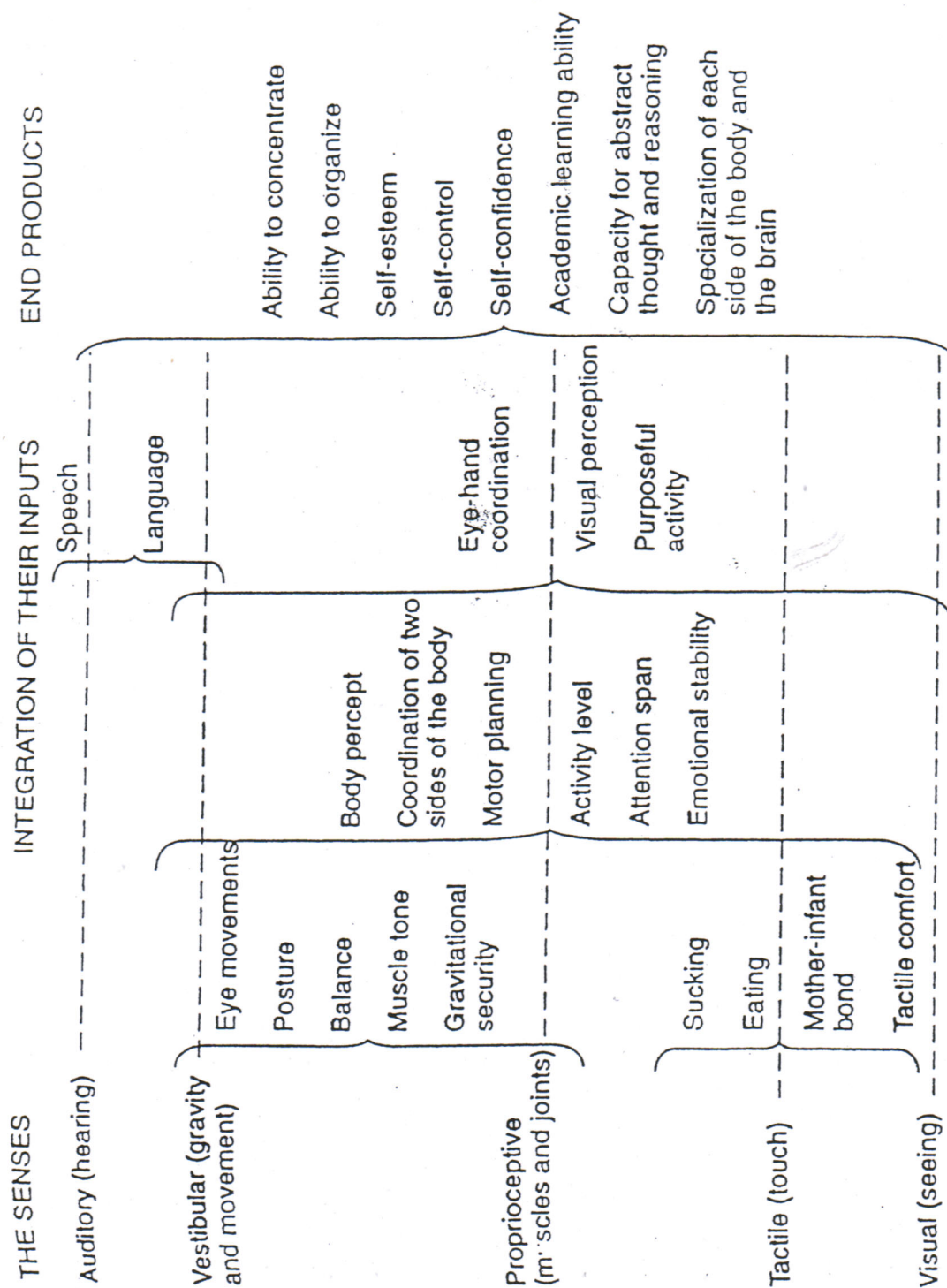


Figure 6.2 The senses, integration of their inputs, and their end products Copyright © 1988 by Western Psychological Services. Reprinted by permission of the publisher, Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, California