Sensory Integration Therapy and Auditory Integration Therapy

Description

The goal of Sensory Integration (SI) therapy is to improve the way the brain processes and adapts to sensory information, as opposed to teaching specific skills. Therapy usually involves activities that provide vestibular, proprioceptive, and tactile stimuli, which are selected to match specific sensory processing deficits of the child. For example, swings are commonly used to incorporate vestibular input, while trapeze bars and large foam pillows or mats may be used to stimulate somatosensory pathways of proprioception and deep touch. Tactile reception may be addressed through a variety of activities and surface textures involving light touch.

Treatment sessions are usually delivered in a one-on-one setting by occupational therapists with special training from university curricula, clinical practice, and mentorship in the theory, techniques, and assessment tools unique to SI theory. Two organizations currently offer certification for SI therapy; Sensory Integration International, a nonprofit branch of the Ayres Clinic in Torrance, California, and Western Psychological Services, a private organization that has a collaborative arrangement with University of Southern California (USC), Los Angeles, to offer sensory integration training through USC's Department of Occupational Science and Therapy. The sessions are often provided as part of a comprehensive occupational therapy or cognitive rehabilitation therapy and may last for more than 1 year. AI therapy (also known as AI training, auditory enhancement training, audio-psycho-phonology) is another method that relies on gradual exposure to sound to which individuals are sensitive, based on having individuals listen to music that has been modified to remove frequencies to which the individual is hypersensitive. Although several methods have been developed, the most widely-described is the Berard method, which involves 2 half-hour sessions per day separated by at least 3 hours, over 10 consecutive days, during which patients listen to recordings. AI training has been proposed for individuals with a range of developmental and behavioral disorders, including learning disabilities, autism spectrum disorders, pervasive developmental disorder, attention deficit and hyperactivity disorder. Other methods include the Tomatis method, which involves listening to electronically-modified music and speech, and Samonas Sound Therapy, which involves listening to filtered music, voices, and nature sounds.(1)

Regulatory Status

SI therapy is a procedure and, as such, is not subject to regulation by the U.S. Food and Drug Administration (FDA). There are no devices designed to provide AI therapy that have clearance for marketing from FDA.
Sensory integration therapy and auditory integration therapy is considered **investigational**.

## Rationale

### Sensory Integration Therapy

The literature related to the use of SI therapy consists primarily of small case series, along with a smaller number of comparative studies and systematic reviews. Given the individualized nature of SI therapy and the potential for confounding due to effects of treatment other than the SI therapy itself, large comparative studies are needed to demonstrate effectiveness.

Systematic reviews and comparative studies are described here.

In 2014, Schaaf et al published an overview of current measurement issues in the area of SI. (2) This review highlights the need for the following: additional measures to ensure a comprehensive assessment of the sensory and motor factors that may be influencing function and participation; assessment measures that address a wider age range; neurophysiologic studies; expansion of the measurement of fidelity to the core principles of SI therapy; studies to evaluate the dosage of therapy to understand the best candidates for intervention and the appropriate intensity/frequency of intervention; and identification of outcomes that are meaningful to clients and sensitive to the changes observed after intervention.

The Sensory Processing Disorders Scientific Workgroup has discussed the methodologic challenges of conducting intervention effectiveness studies of dynamic interactional processes, the lack of scientific evidence to support current practice, and methods for improving the quality of research in this area. (3,4)

### Systematic Reviews

Several systematic reviews have addressed the use of SI therapy in various clinical conditions. The 1999 TEC Assessment compared the outcomes of sensory SI therapy with that of standard occupational/physical therapy among children with autism, mental retardation, or learning disabilities. (5) One study was identified that evaluated the use of SI therapy in patients with autism, which was noted to be limited by its lack of a control group. Three studies were identified that evaluated the use of SI therapy in patients with mental retardation, which were noted to be inconsistent in their results regarding the superiority of SI therapy. Eleven studies were identified that evaluated SI therapy in patients with learning disabilities or motor delay, including, in total, more than 600 learning-disabled children. Studies that used random assignment and blinded assessors suggested that SI therapy
was not superior to conventional therapy and, in many cases, was not even demonstrably superior to any treatment at all.

Case-Smith and Arbesman reviewed the evidence for SI therapy as part of a systematic review of interventions for autism used in occupational therapy in 2008. (6) The authors identified one level-1 study, which was a systematic review from 2002 that had found only lower quality evidence (levels III and IV, with small sample size and lack of control groups), suggesting that SI intervention was associated with positive changes in social interaction, purposeful play, and decreased sensitivity. (7) It was concluded that “although each of these studies had positive findings, when combined, the evidence remains weak and requires further study.”

May-Benson and Koomar published a systematic review of SI therapy in 2010. (8) The review identified 27 research studies (13 randomized trials) that met the inclusion criteria. Most of the studies had been performed in children with learning or reading disabilities; there were 2 case reports/small series on the effect of SI therapy in children with autism. The review concluded that although the SI approach may result in positive outcomes, findings may be limited because of small sample sizes, variable intervention dosage, lack of fidelity to intervention, and selection of outcomes that may not be meaningful or may not change with the treatment provided.

In 2014, Case-Smith et al published an updated systematic review of sensory processing interventions, including SI therapy (defined as clinic-based interventions that use sensory-rich, child-directed activities to improve a child’s adaptive responses to sensory experiences) and sensory-based interventions (defined as adult-directed sensory modalities that are applied to the child to improve behaviors associated with modulation disorders), for children with autism spectrum disorders with concurrent sensory processing problems. (9) This review was designed to focus on interventions that activate the somatosensory and vestibular systems for patients with autism with co-occurring sensory processing problems. Nineteen studies published since 2000 were included, 5 of which evaluated SI therapy in patients with autism spectrum disorders and sensory processing disorders. Two studies reviewed were randomized controlled trials (RCTs), which were small (N=20 and N=17 in the sensory integration groups); the authors noted that the studies showed low or low-to-moderate effects and concluded that “It is premature to draw conclusions as to whether SIT [sensory integration therapy] for children with ASD [autism spectrum disorder], which is designed to support a child’s intrinsic motivation and sense of internal control, is ultimately effective.”

Controlled Trials

In 2014, Schaaf et al reported results from a randomized trial of a manualized intervention for sensory difficulties in children with autism, which was one of the RCTs reviewed by Case-Smith et al previously discussed. (10) The study enrolled 32 children from a convenience sample of eligible families with children aged 4 to 8 years who had a diagnosis of autism and demonstrated difficulty processing and integrating sensory information as measured by the Sensory Profile or the Sensory Integration and Praxis Test. Subjects were randomized to usual care or to an intervention described as following the principles of SI outlined by Ayres. The intervention was delivered by 3 licensed occupational therapists with experience working with children with ASDs. The primary outcome was Goal Attainment Setting, a systematic process for identifying goals that are relevant to individuals
and their families that has been used for evaluation of patients with autism. Sample goals include, “Improve auditory process as a basis for sleeping through the night without getting out of bed for 7–8 h per night,” and “Decrease oral sensitivity and will try 5 new foods” Each goal is associated with a scale for level of attainment. For the primary outcome, the experimental group had a significantly higher goal achievement score than the control group (mean 56.53 [N=17] vs 42.72 [N=14], p=0.003). Change in functional skills did not differ significantly between groups, but experimental group subjects had significantly greater improvements in self-care caregiver assistance (p=0.008) and social function caregiver assistance (p=0.039). The groups did not differ in terms of autistic or adaptive behaviors. A strength of this study is its use of a protocolized intervention and its attempt to use an outcome measure relevant to patients and families. However, further replication in a larger sample of patients and further validation of the Goal Attainment Setting score process.

A pilot study reported in 2011 randomized 37 children with a sensory processing disorder (21 with autism, 16 with pervasive developmental disorder not otherwise specified) to SI interventions or to fine motor interventions (18 treatments over 6 weeks). (11) Fidelity to SI interventions was verified with a fidelity measure developed for research by Parham et al. (4) Blinded evaluation at the conclusion of the intervention found no significant difference between the 2 groups on the Quick Neurological Screening Test (QNST) or sensory processing scores except for Autistic Mannerisms (eg, stereotyped or self-stimulatory behavior) subscale. The SI group demonstrated greater improvement than the fine motor group on individualized Goal Attainment Scaling. Post hoc analysis found that more children in the SI group were able to complete parts of the standardized QNST after the intervention. This finding is limited by the post hoc analysis and the difference in the 2 groups at baseline.

In 2007, members of the Sensory Processing Disorders Scientific Workgroup also reported results from a single-institution randomized pilot study for a proposed multicenter trial. (12) Thirty families (of ≈140 who met the inclusion/exclusion criteria) agreed to participate over a 3-year period. The children had a clinical diagnosis of sensory modulation disorder following a comprehensive evaluation with standardized and clinical testing (including responses to sensory stimuli, attempts by the child to self-regulate, behavioral disorganization, and somatic responses to the testing situations). The 24 children who began treatment were randomly assigned to 1 of 3 groups consisting of occupational therapy with SI (2 times per week for 10 weeks, n=7), equivalent activity control sessions (n=10), or a waiting-list control group (n=7). Functional improvements were assessed by 5 validated/standardized parental rating scales. Significant improvements relative to both control groups were obtained for Goal Attainment Scaling (37 vs 14 vs 7, consecutively). A number of the other outcome measures (Leitner International Performance Scale, Short Sensory Profile, Internalizing on the Child Behavior Checklist) showed trends for improvement in this small study. Additional study with a larger number of subjects is needed.

In a 2003 study of 45 children with Down syndrome divided into 3 treatment groups (SI therapy alone, vestibular stimulation combined with SI therapy, neurodevelopmental therapy), Uyanik et al reported greater improvements in outcomes in the vestibular stimulation with SI therapy group and in the neurodevelopmental therapy group when compared with the SI therapy alone group. (13) Outcomes assessed were the Ayres Southern California Sensory Integration Test, Pivot Prone Test,
Gravitational Insecurity Test, and Pegboard Test along with physical assessment. The authors concluded all methods of treatment should be considered when planning rehabilitation therapies for children with Down syndrome, even though SI therapy alone was not shown to be superior to the other therapy groups.

**Section Summary**
The most direct evidence related to outcomes from SI therapy comes from small randomized trials. Although some of the studies demonstrated some improvements on subsets of the outcomes measured, the studies are limited by small sizes, heterogeneous patient populations, and variable outcome measures. As a result, the evidence is insufficient to draw conclusions about the effects of and the most appropriate patient populations for SI therapy.

**Auditory Integration Therapy**
Although auditory integration (AI) therapy has been proposed as a therapy for a number of neurobehavioral disorders, the largest body of evidence on AI therapy relates to its use in ASD. Several systematic reviews have evaluated the evidence related to AI therapy for ASDs.  
A 2011 Cochrane review evaluated AI training along with other sound therapies for ASDs. (1) Included were 6 RCTs of AI therapy and one of Tomatis therapy, involving a total of 182 subjects aged 3 to 39 years. For most of the studies, the control condition consisted of listening to unmodified music for the same time as the active treatment group. Allocation concealment was inadequate for all studies, and 5 of the trials had fewer than 20 participants. Meta-analysis could not be conducted. Three studies did not demonstrate any benefit of AI therapy over control conditions, and 3 studies had outcomes of questionable validity or outcomes that did not achieve statistical significance. The review found no evidence that AI therapy is an effective treatment for ASDs; however, evidence was not sufficient to prove that it is not effective.

A 2010 systematic review of therapies for autism evaluated the evidence for AI training in the treatment of autism. (14) The author identified a 2002 systematic review (an early version of the 2011 Cochrane review by Sinha et al previously referenced), which identified no RCTs meeting the author’s inclusion criteria, and no subsequent RCTs or cohort studies comparing AI therapy with usual care.

In 2009, Rossignol conducted a systematic review of novel and emerging treatments for ASDs, including AI therapy. (15) The authors identified one 3-month double-blind controlled study of AI therapy in 17 individuals with autism, which demonstrated significant improvements in irritability, stereotypy, hyperactivity, and excessive speech in patients in the therapy group. The study also reviewed an earlier version of the 2011 Cochrane review by Sinha et al previously referenced. Overall, the authors concluded that there was Grade C evidence related to the use of AI therapy in autism (at least 1 level 2b [individual prospective, nonrandomized cohort study or low-quality RCT] or 3b [systematic review of retrospective case-control studies with homogeneity] studies OR 2 level 4 studies [case series or reports]).
Section Summary
The largest body of evidence related to the use of AI therapy is in the treatment of autism. A 2011 Cochrane review and several earlier systematic reviews generally found that studies of AI therapy failed to demonstrate meaningful clinical improvements. No subsequent comparative studies of AI therapy were identified.

Ongoing and Unpublished Clinical Trials
A search of the online database ClinicalTrials.gov in September 2014 identified no ongoing trials of SI or AI therapy.

Practice Guidelines and Position Statements

Sensory Integration Therapy
The 2007 Guidance from the American Academy of Pediatrics (AAP) states that “the efficacy of SI [sensory integration] therapy has not been demonstrated objectively.” (16)

A 2012 policy statement by the AAP on SI therapies for children with developmental and behavioral disorders states that “occupational therapy with the use of sensory-based therapies may be acceptable as one of the components of a comprehensive treatment plan. However, parents should be informed that the amount of research regarding the effectiveness of sensory integration therapy is limited and inconclusive.” The AAP indicates that these limitations should be discussed with parents, along with instruction on how to evaluate the effectiveness of a trial period of SI therapy. (17)

In 2009, the American Occupational Therapy Association (AOTA) stated that the AOTA recognizes sensory integration (SI) as one of several theories and methods used by occupational therapists and occupational therapy assistants working with children in public and private schools to improve a child’s ability to access the general education curriculum and to participate in school-related activities. (18) In 2011, the AOTA published evidence-based occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration. (19) AOTA gave a level C recommendation for sensory integration therapy for individual functional goals for children, for parent-centered goals, and for participation in active play in children with sensory processing disorder, and to address play skills and engagement in children with autism. A level C recommendation is based on weak evidence that the intervention can improve outcomes, and the balance of the benefits and harms may result either in a recommendation that occupational therapy practitioners routinely provide the intervention or in no recommendation because the balance of the benefits and harms is too close to justify a general recommendation. Specific performance skills evaluated were motor and praxis skills, sensory-perceptual skills, emotional regulation, and communication and social skills. There was insufficient evidence to provide a recommendation on sensory integration for academic and psychoeducational performance (e.g., math, reading, written performance).

AI Therapy
In 2003, the American Speech-Language-Hearing Association (ASHA) Working Group on Auditory Integration Training issued a report on Auditory Integration Training. (20) The review concluded,
“Despite approximately one decade of practice in this country, this method has not met scientific standards for efficacy and safety that would justify its inclusion as a mainstream treatment for these disorders.”

In 1998, the AAP Committee on Children with Disabilities issued a statement on AI training and facilitated communication for autism, which concluded, “Currently available information does not support the claims of proponents that these treatments are efficacious. Their use does not appear warranted at this time, except within research protocols.”(21)

U.S. Preventive Services Task Force Recommendations
Sensory integration therapy and auditory integration therapy are not preventive services.

Summary
Due to the individual nature of sensory integration (SI) therapy and the large variation in individual therapists and patients, large multicenter randomized controlled trials are needed to evaluate the efficacy of this intervention. The most direct evidence related to outcomes from SI therapy comes from small randomized trials. Although some of the studies demonstrated some improvements on subsets of the outcomes measured, the studies are limited by small sizes, heterogeneous patient populations, and variable outcome measures. As a result, the evidence is insufficient to draw conclusions about the effects of and the most appropriate patient populations for SI therapy, and the use of SI therapy is considered investigational.

For auditory integration (AI) therapy, the largest body of literature relates to its use in autism. Several systematic reviews of AI therapy in the treatment of autism found limited evidence to support its use. No comparative studies were identified that evaluated the use of AI therapy for other conditions. Therefore, the use AI therapy is considered investigational.

Medicare National Coverage
There is no national coverage determination.

References:

5. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Sensory integration therapy. TEC Assessment. 1999;Volume 14, Tab 22. PMID
This policy was approved by the FEP® Pharmacy and Medical Policy Committee on March 20, 2015 and is effective April 15, 2015.

Signature on file

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