Sensory Integration Therapy and Auditory Integration Therapy

I. Description
Sensory integration therapy (SIT) has been proposed as a treatment of developmental disorders in patients with established dysfunction of sensory processing, particularly autism spectrum disorder. SIT may be offered by occupational and physical therapists who are certified in SIT. Auditory integration therapy (AIT) uses gradual exposure to certain types of sounds to improve communication in a variety of developmental disorders, particularly autism.

For individuals who have developmental disorders who receive SIT, the evidence includes randomized controlled trials, systematic reviews of these trials, and case series. Relevant outcomes are functional outcomes and quality of life. Due to the individualized approach to SIT and the large variations in patients’ disorders, large multicenter randomized controlled trials are needed to evaluate the efficacy of this intervention. The most direct evidence on SIT outcomes derives from several small randomized trials. Although some of these trials demonstrated improvements for subsets of outcomes measured, they had small sample sizes, heterogeneous patient populations, and variable outcome measures. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have developmental disorders who receive AIT, the evidence includes several randomized controlled trials and systematic reviews of these trials. Relevant outcomes are functional outcomes and quality of life. For AIT, the largest body of literature relates to its use in autism spectrum disorder. Several systematic reviews of AIT in the treatment of autism have found limited evidence to support its use. No comparative studies identified evaluated use of AIT for other conditions. The evidence is insufficient to determine the effects of the technology on health outcomes.

The goal of sensory integration therapy (SIT) is to improve how 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 SIT. Organizations like Western Psychological Services currently offer certification for SIT. The sessions are often provided as part of a comprehensive occupational therapy or cognitive rehabilitation therapy and may last for more than one year.

Auditory integration therapy (AIT; also known as auditory integration training, auditory enhancement training, audio-psycho-phonology) involves having individuals listen to music modified to remove frequencies to which they are hypersensitive, with the goal of gradually increasing exposure to sensitive frequencies. Although several methods of AIT have been developed, the most widely described is the Berard method, which involves two half-hour sessions per day separated by at least three hours, over 10 consecutive days, during which patients listen to recordings. AIT has been proposed for individuals with a range of developmental and behavioral disorders, including learning disabilities, autism spectrum disorder, pervasive developmental disorder, and attention-deficit/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.

REGULATORY STATUS
SIT is a procedure and, as such, is not subject to regulation by the U.S. Food and Drug Administration. No devices designed to provide AIT have been cleared for marketing by the Food and Drug Administration.

II. Criteria/Guidelines
Sensory Integration Therapy and auditory integration therapy are not covered because they are not known to be effective in improving health outcomes.

III. Administrative Guidelines
A. The provider cannot bill or collect charges for these services unless a written acknowledgement of financial responsibility, specific to the service, is obtained from the Member prior to the time services are rendered.
B. Patients requesting services that are not covered should be informed that they will be responsible to pay for the services. To prevent misunderstandings about financial responsibility, the provider may ask the patient to sign an Agreement of Financial Responsibility prior to performing the services.

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<tr>
<th>CPT Codes</th>
<th>Description</th>
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<tr>
<td>97533</td>
<td>Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient</td>
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Sensory Integration Therapy and Auditory Integration Therapy

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<th>ICD-10-CM</th>
<th>Description</th>
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<tr>
<td>F84.0-F84.9</td>
<td>Pervasive developmental disorders code range (includes infantile autism, etc.)</td>
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**IV. Scientific Background**

This evidence review was created in April 2000 and has been updated regularly with searches of the MEDLINE database. The most recent literature update was performed through January 8, 2018. This review was informed by a TEC Assessment (1999) that evaluated sensory integration therapy (SIT).

Evidence reviews assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

**SENSORY INTEGRATION THERAPY**

Schaaf et al (2014) published an overview of current measurement issues in sensory integration. They proposed several changes to the outcomes used in sensory integration research, as follows:

- “Additional measures ... to ensure a comprehensive assessment of the sensory and motor factors that may be influencing function and participation”;
- “Assessment measures ... to address a wider age range”
- Neurophysiologic studies.
- “Fidelity to the core principles of SIT”
Sensory Integration Therapy and Auditory Integration Therapy

- “studies ... to evaluate the dosage of therapy to understand the best candidates for intervention and the appropriate intensity and frequency of intervention”;
- “Outcomes that are meaningful to clients and sensitive to the changes observed after intervention.”

The Sensory Processing Disorders Scientific Workgroup (2007) has also 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.

**Systematic Reviews**

Several systematic reviews have addressed the use of SIT in various clinical conditions. Four of the 6 systematic reviews included in this evidence review pertain to studies evaluating SIT for autism spectrum disorder (ASD), while the other two include a broader range of developmental disabilities.

The TEC Assessment (1999) compared the outcomes of SIT with those of standard occupational or physical therapy among children with ASD, cognitive disorders, or learning disabilities.2 One study identified evaluated the use of SIT in patients with ASD, which was noted to be limited by its lack of a control group. Three studies identified evaluated the use of SIT in patients with cognitive disorders, which were noted to be inconsistent in their results on the superiority of SIT. Eleven studies identified evaluated SIT in patients with learning disabilities or motor delay, including, in total, more than 600 children with learning disability. Studies that used random assignment and blinded assessors suggested that SIT was not superior to conventional therapy and, in many cases, was not demonstrably superior to any treatment at all.

Case-Smith et al (2015) updated a systematic review on sensory processing interventions, including SIT, which they 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 applied to the child to improve behaviors associated with modulation disorders), for children with ASD with concurrent sensory processing problems.6 This review was designed to focus on interventions that activate the somatosensory and vestibular systems for patients with ASD with co-occurring sensory processing problems. Nineteen studies published since 2000 were included, five of which evaluated SIT in patients with ASD and sensory processing disorders. Two studies reviewed were RCTs; both were small (n=20 and n=17 in the SIT groups). Reviewers noted that the studies showed low or low-to moderate effects and concluded that “It is premature to draw conclusions as to whether SIT for children with ASD, which is designed to support a child’s intrinsic motivation and sense of internal control, is ultimately effective.”

Brondino et al (2015) published a systematic review of complementary and alternative therapies for autism, which included SIT and auditory integration therapy (AIT).7 Regarding SIT for ASD treatment, reviewers identified 4 trials, including the 2016 RCT reported by Pfeiffer et al (described below), and additional studies published in 1983, 2008, and 2011, with sample sizes of
18, 30, and 50, respectively. All 4 studies reported significant improvements in autistic core symptoms, including communication, social reciprocity, and motor activity. However, reviewers noted that 2 studies did not use a standardized form of SIT, and 2 did not use standardized outcome measures.

Also, Watling and Hauer (2015) published a systematic review of Ayres Sensory Integration (ASI) and sensory-based interventions for individuals with ASD. Reviewers described ASI as a play-based method that “uses active engagement in sensory-rich activities to elicit the child’s adaptive responses and improve the child’s ability to successfully perform and meet environmental challenges.” The therapy is individualized by the therapist in response to an initial assessment. Sensory-based interventions are described as “applying adult-directed sensory modalities to the child with the aim of producing a short-term effect on self-regulation, attention, or behavioral organization.” Twenty-three articles met reviewers’ inclusion criteria, three of which were systematic reviews and five of which were RCTs. Overall, 4 studies evaluated ASI and the remaining 18 evaluated sensory-based interventions. Of the 4 studies evaluating ASI, three were RCTs, including the trials by Pfeiffer et al and Schaaf et al (described below). Findings from 1 RCT included significant improvement in individualized goals, improved sleep, decreased ASD mannerisms, and reduced caregiver burden.

Case-Smith and Arbesman (2008) reviewed the evidence for SIT as part of a systematic review of interventions for ASD used in occupational therapy. Reviewers identified a level I study, which was a 2002 systematic review that had found only lower quality evidence (levels III and IV, with small sample sizes and lack of control groups), suggesting that sensory integration intervention was associated with positive changes in social interaction, purposeful play, and decreased sensitivity. Reviewers concluded: “although each of these studies had positive findings, when combined, the evidence remains weak and requires further study.”

May-Benson and Koomar (2010) published a systematic review of SIT, identifying 27 research studies (13 randomized trials) that met their inclusion criteria. Most studies had been performed with children who had learning or reading disabilities; there were 2 case reports/small series on the effect of SIT in children with ASD. Reviewers concluded that although the sensory integration approach might result in positive outcomes, findings were limited because of small sample sizes, variable intervention dosages, lack of fidelity to interventions, and selection of outcomes that might not be meaningful or might not change with the treatment provided.

Randomized Controlled Trials
Schaaf et al (2014) reported on results from a randomized trial of a manualized intervention for sensory difficulties in children with ASD. The trial enrolled 32 children from a convenience sample of eligible families with children ages 4 to 8 years who had a diagnosis of ASD 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 ASI. The intervention was delivered by three licensed occupational therapists experienced working with children with ASD. The primary outcome was Goal Attainment Scaling, a systematic process for identifying goals relevant
to individuals and their families that has been used to evaluate patients with ASD. 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 intervention 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 intervention group subjects had significantly greater improvements in the 2 subscales of 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. Strengths of this trial were its use of a protocolized intervention and its attempt to use an outcome measure relevant to patients and families. However, replication of this trial in a larger sample of patients is required.

A pilot study by Pfeiffer et al (2011) randomized 37 children with a sensory processing disorder (21 with ASD, 16 with pervasive developmental disorder not otherwise specified) to sensory integration interventions or to fine motor interventions (18 treatments over 6 weeks).12 Fidelity to sensory integration interventions was verified with a fidelity measure developed for research by Parham et al (2007). Blinded evaluation at the conclusion of the intervention found no significant differences between the 2 groups on the Quick Neurological Screening Test or sensory processing scores, except for the autistic mannerisms (eg, stereotyped or self-stimulatory behavior) subscale. The sensory integration group demonstrated greater improvement than the fine motor group on individualized Goal Attainment Scaling scores. Post hoc analysis found that more children in the SIT group were able to complete parts of the standardized Quick Neurological Screening Test after the intervention. This finding is limited by the post hoc analysis and differences between the groups at baseline.

In 2007, members of the Sensory Processing Disorders Scientific Workgroup reported on results from a single-institution randomized pilot study for a proposed multicenter trial. Thirty families 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 randomized to 1 of 3 groups consisting of occupational therapy with sensory integration (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 using five validated/standardized parental rating scales. Significant improvements relative to both control groups were obtained for Goal Attainment Scaling. 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 a study of 45 children with Down syndrome allocated to 3 treatment groups (SIT alone, vestibular stimulation plus SIT, neurodevelopmental therapy), Uyanik et al (2003) reported greater improvements in outcomes for the vestibular stimulation plus SIT group and in the neurodevelopmental therapy group than for the SIT alone group.14 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 that all methods of treatment should be considered when planning rehabilitation therapies for children with Down syndrome, even though SIT alone was not shown to be superior to the other therapy groups.

**Section Summary: Sensory Integration Therapy**

The most direct evidence related to outcomes from SIT comes from randomized trials and systematic reviews of these trials. Although certain studies demonstrated some improvements on subsets of the outcomes measured, the studies were limited by small sample sizes, heterogeneous patient populations, and variable outcome measures. As a result, the evidence is not sufficiently robust to draw conclusions about the effects of, and the most appropriate patient populations for, SIT.

**AUDITORY INTEGRATION THERAPY**

Although AIT has been proposed as a therapy for a number of neurobehavioral disorders, the largest body of evidence, including systematic reviews, relates to its use in ASD.

A Cochrane review (2011) evaluated AIT along with other sound therapies for ASD.1 Included were 6 RCTs on AIT and one on Tomatis therapy, comprising a total of 182 subjects (age range, 3-39 years). For most trials, the control condition was listening to unmodified music for the same amount of time as the active treatment group. Allocation concealment was inadequate for all trials, and 5 trials had fewer than 20 participants. Meta-analyses could not be conducted. Three studies did not demonstrate any benefit of AIT over control conditions, and 3 studies had outcomes of questionable validity or outcomes that were not statistically significant. Reviewers found no evidence that AIT is an effective treatment for ASD; however, evidence was insufficient to prove that it is not effective.

In the systematic review examining complementary and alternative therapies for ASD, Brondino et al (2015; described above) identified the same 6 RCTs of AIT included in the 2011 Cochrane review. Like the Cochrane review, Brondino et al concluded that the largest studies did not report improvements with AIT.

A 2010 systematic review of therapies for ASD evaluated the evidence for AIT. The reviewer identified a 2002 systematic review (an early version of the 2011 Cochrane review by Sinha et al, previously discussed), which identified no RCTs meeting the author’s inclusion criteria, and no subsequent RCTs or cohort studies comparing AIT with usual care.

Rossignol (2009) conducted a systematic review of novel and emerging treatments for ASD, including AIT. Reviewers identified one 3-month, double-blind, controlled study of AIT in 17 individuals with autism, which demonstrated significant decreases in irritability, stereotypy, hyperactivity, and excessive speech in patients in the AIT group. The study also examined an earlier version of the 2011 Cochrane review by Sinha. Overall, Rossignol concluded that there was grade C evidence related to the use of AIT for ASD.
Section Summary: Auditory Integration Therapy
The largest body of evidence on the use of AIT relates to treatment of ASD. A 2011 Cochrane review and several earlier systematic reviews generally found that studies of AIT failed to demonstrate meaningful clinical improvements. No subsequent comparative studies of AIT were identified.

SUMMARY OF EVIDENCE
For individuals who have developmental disorders who receive SIT, the evidence includes randomized controlled trials, systematic reviews of these trials, and case series. Relevant outcomes are functional outcomes and quality of life. Due to the individualized approach to SIT and the large variations in patients’ disorders, large multicenter RCTs are needed to evaluate the efficacy of this intervention. The most direct evidence on SIT outcomes derives from several small randomized trials. Although some of these trials demonstrated improvements for subsets of outcomes measured, they had small sample sizes, heterogeneous patient populations, and variable outcome measures. The evidence is insufficient to determine the effects of the technology on health outcomes.

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SUPPLEMENTAL INFORMATION

PRACTICE GUIDELINES AND POSITION STATEMENTS

Sensory Integration Therapy

American Academy of Pediatrics
A 2012 policy statement by the American Academy of Pediatrics on sensory integration therapy (SIT) for children with developmental and behavioral disorders stated that “[o]ccupational 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 Academy indicated that these limitations should be discussed with parents, along with instruction on how to evaluate the effectiveness of a trial period of SIT.

American Occupational Therapy Association
In 2009, the American Occupational Therapy Association (AOTA) stated that “AOTA recognizes SI [sensory integration] 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.

In 2011, AOTA published evidence-based occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration. AOTA gave a level C recommendation for SIT 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 harm 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 recommend SIT for academic and psychoeducational performance (eg, math, reading, written performance).

**Auditory Integration Therapy**

**American Speech-Language-Hearing Association**

In 2004, the American Speech-Language-Hearing Association issued a report on auditory integration therapy. The Association concluded that “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.”

**American Academy of Pediatrics**

In 1998, the Academy issued a statement on auditory integration therapy and facilitated communication for autism spectrum disorder, 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.”

**U.S. PREVENTIVE SERVICES TASK FORCE RECOMMENDATIONS**

Not applicable.

**MEDICARE NATIONAL COVERAGE**

There is no national coverage determination. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

**ONGOING AND UNPUBLISHED CLINICAL TRIALS**

Some currently unpublished trials that might influence this review are listed in Table 1.
V. Important Reminder
The purpose of this Medical Policy is to provide a guide to coverage. This Medical Policy is not intended to dictate to providers how to practice medicine. Nothing in this Medical Policy is intended to discourage or prohibit providing other medical advice or treatment deemed appropriate by the treating physician.

Benefit determinations are subject to applicable member contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control.

This Medical Policy has been developed through consideration of the medical necessity criteria under Hawaii’s Patients’ Bill of Rights and Responsibilities Act (Hawaii Revised Statutes §432E-1.4), generally accepted standards of medical practice and review of medical literature and government approval status. HMSA has determined that services not covered under this Medical Policy will not be medically necessary under Hawaii law in most cases. If a treating physician disagrees with HMSA’s determination as to medical necessity in a given case, the physician may request that HMSA reconsider the application of the medical necessity criteria to the case at issue in light of any supporting documentation.

VI. References