Cigna Medical Coverage Policy- Therapy Services Sensory and Auditory Integration Therapy - Facilitated Communication

Effective Date: 6/15/2023
Next Review Date: 6/15/2024

INSTRUCTIONS FOR USE

Cigna / ASH Medical Coverage Policies are intended to provide guidance in interpreting certain standard benefit plans administered by Cigna Companies. Please note, the terms of a customer's particular benefit plan document may differ significantly from the standard benefit plans upon which these Cigna / ASH Medical Coverage Policies are based. In the event of a conflict, a customer's benefit plan document always supersedes the information in the Cigna / ASH Medical Coverage Policy. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Determinations in each specific instance may require consideration of:

1) the terms of the applicable benefit plan document in effect on the date of service
2) any applicable laws/regulations
3) any relevant collateral source materials including Cigna-ASH Medical Coverage Policies and
4) the specific facts of the particular situation

Cigna / ASH Medical Coverage Policies relate exclusively to the administration of health benefit plans.

Cigna / ASH Medical Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines.

Some information in these Coverage Policies may not apply to all benefit plans administered by Cigna. Certain Cigna Companies and/or lines of business only provide utilization review services to clients and do not make benefit determinations. References to standard benefit plan language and benefit determinations do not apply to those clients.

Coverage for sensory integration therapy (SIT), auditory integration therapy (AIT) or facilitated communication (FC) therapy varies across plans. Refer to the customer's benefit plan document for coverage details.

Note: This Medical Coverage Policy does not address sensory desensitization therapy.

GUIDELINES

Medically Necessary

Ayres Sensory Integration Therapy® is considered medically necessary for treatment of individuals with Autism Spectrum Disorder when ALL of the following have been met:

- The individual's condition has the potential to improve or is improving in response to therapy, maximum improvement is yet to be attained; and there is an expectation that the anticipated improvement is attainable in a reasonable and generally predictable period of time.
- The program is individualized, and there is documentation outlining quantifiable, attainable treatment goals.

- Progress toward short and long term goals is documented to support continuation of treatment and goals are not yet met.
- Improvement is evidenced by successive objective measurements.
- Generalization and carryover of targeted skills into natural environment is occurring.

- Individual is actively participating in treatment sessions.
- The services are delivered by a qualified provider of therapy services (i.e., appropriately trained and licensed by the state to perform therapy services).
- Therapy occurs when the judgment, knowledge, and skills of a qualified provider of therapy services (as defined by the scope of practice for therapists in each state) are necessary to safely and effectively furnish a recognized therapy service due to the complexity and sophistication of the plan of care and the medical condition of the individual, with the goal of improvement of an impairment or functional limitation.

Experimental, Investigational, Unproven

Ayres Sensory Integration Therapy is considered experimental, investigational or unproven for any other indication.

All other forms of sensory integration therapy (SIT), auditory integration therapy (AIT) or facilitated communication (FC) therapy are each considered experimental, investigational or unproven for any indication.

Sensory Integration Therapy (SIT)
Sensory Integrative Techniques (SIT), also known as Sensory Integrative Therapy, are performed to enhance sensory processing and promote adaptive responses to environmental demands by changing underlying neurological processing through the use of activities that challenge a child to gradually engage in more challenging tasks and thus produce more complex and adaptive responses. Simply, SIT has been proposed as a method to improve the way the brain processes and organizes external stimuli, such as touch, movement, body awareness, sight and sound. The ultimate goal of SIT is to improve cognitive, behavioral, and social functioning of children (Hayes, 2017).

Auditory Integration Therapy (AIT)
Auditory integration therapy or training (AIT) refers to listening to music that has been computer modified to remove frequencies to which an individual demonstrates hypersensitivities and to reduce the predictability of auditory patterns. The individual listens via headphones to a program of specially filtered and modulated music with wide frequency range. A special device is used to modify the music for the treatment sessions. The treatment program consists of 20 half-hour sessions during a 10- to 12-day period, with two sessions daily. Auditory thresholds are determined via audiograms. The audiogram is then reviewed for evidence of hyperacusis (i.e., an abnormal sensitivity to sound). A clinical history of sound sensitivities and behavior is also reviewed. Audiograms are repeated midway and at the end of the training session to document progress and to determine whether further treatment sessions are necessary. AIT is usually provided by a speech-pathologist or audiologist.

Facilitated Communication (FC)
Facilitated Communication (FC) is a method of providing assistance to a nonverbal person by typing out words using a typewriter, computer keyboard, or other communication device. FC involves supporting the individual's hand to make it easier for him or her to indicate the letters that are chosen sequentially to develop the communicative statement.

GENERAL BACKGROUND
Sensory Integration Therapy
SIT techniques are performed when a deficit in processing input from one of the sensory systems (e.g., vestibular, proprioceptive, tactile, visual or auditory) decreases an individual's ability to make adaptive sensory, motor and behavioral responses to environmental demands. Sensory stimulation is provided in combination with muscle activities, theoretically in order to improve how the brain processes and organizes sensory information. The therapeutic techniques may include deep brushing, swings for vestibular input,

textures, bounce pads, scooter boards, weighted vests and other clothing, ramps and generally increasing or decreasing sensory diet depending on the needs of the child (Shaw, 2002). SIT has been proposed as a treatment of developmental disorders in patients with established dysfunction of sensory processing, e.g., children with autism, attention deficit hyperactivity disorder (ADHD), brain injuries, fetal alcohol syndrome, and neurotransmitter disease. Sensory integration therapy may be offered by occupational and physical therapists. Practitioners have used SIT for years selecting patients who demonstrate a variety of problems, including sensory defensiveness, over-reactivity to environmental stimuli, attention difficulties, and behavioral problems. Sensory integration techniques are used to organize the sensory system by involvement of full body movements that provide vestibular, proprioceptive and tactile stimulation. As mentioned, brushes, swings, balls, and other specially designed therapeutic or recreational equipment are used to provide these stimuli. Proponents believe the goal of SIT is to improve the way the brain processes and organizes sensations, as opposed to teaching higher order skills themselves. 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 may be 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. Sensory integration techniques are generally associated with pediatric populations. Advocates have proposed SIT as a treatment for developmental disorders in patients with established dysfunction of sensory processing, [e.g., children with autism, attention deficit hyperactivity disorder (ADHD), brain injuries, fetal alcohol syndrome, and neurotransmitter disease]. According to the American Academy of Pediatrics (AAP), (2012) “Sensory-based therapies are increasingly used by occupational therapists and sometimes by other types of therapists in treatment of children with developmental and behavioral disorders. 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.” Additionally, it is unclear whether children who present with sensory-based problems have an actual "disorder" of the sensory pathways of the brain or whether these deficits are characteristics associated with other developmental and behavioral disorders. Because there is no universally accepted framework for diagnosis, sensory processing disorder generally should not be diagnosed. Other developmental and behavioral disorders must always be considered, and a thorough evaluation should be completed. Difficulty tolerating or processing sensory information is a characteristic that may be seen in many developmental behavioral disorders, including autism spectrum disorders, attention-deficit/hyperactivity disorder, developmental coordination disorders, and childhood anxiety disorders.

The therapeutic approach of sensory integration was originally developed by A. Jean Ayres, PhD, OTR, and is known as Ayres Sensory Integration® (AIS®). Once the evaluation is complete, the therapist will design an intervention plan aimed at enhancing the child’s unique ability to utilize sensation. The fidelity principles of Ayres sensory integration include (Parham, et al., 2011):

- Children integrate sensory information from their bodies and the environment.
- Include visual, auditory, tactile, proprioceptive, and vestibular input.
- Individually tailored activities that challenge sensory processing and motor planning, encourage movement and organization of self in time and space, and utilize “just right” challenges.
- Incorporate clinical equipment in purposeful and playful activities to improve adaptive behavior.
- Implemented by trained therapy practitioners.
- Used only after an evaluation is completed and a need for such intervention is identified.

Auditory Integration Therapy

AIT has been proposed for improving abnormal sound sensitivity in individuals with behavioral disorders, including autism spectrum disorders. AIT aims to address the sensory problems which are said to cause discomfort and confusion in people with learning disabilities, including autism spectrum disorders. These hypersensitivities are believed to interfere with an individual’s attention, comprehension, and ability to learn. Thus, it has been proposed for improving abnormal sound sensitivity in these individuals with behavioral disorders, including autism spectrum disorders. Berard, whose method is the most widely studied, theorizes that auditory distortions may result in such behavioral disturbances as autism spectrum disorders, learning disabilities, depression, and aggressiveness. Berard suggests that AIT treats these distortions by exercising the middle ear muscles and auditory nervous system similar to physical therapy retraining muscles for orthopedic conditions. An audiogram, frequently the first step in the Berard method of AIT, is believed to help identify the presence of the auditory abnormalities and is used to monitor possible changes as a result of treatment. Berard claims that following AIT, children's audiograms

that previously had peaks and valleys, demonstrating areas of hyper- and hyposensitivity, are “flattened,” reflecting the elimination of auditory distortions and, subsequently, an improvement in behavioral abnormalities. According to Berard, optimal treatment consists of two half-hour sessions per day separated by a minimum of 3 hours, for 10 consecutive working days. A 2-day weekend interruption is acceptable. Despite current practice in the United States, Berard does not recommend follow-up sessions or any modifications to this treatment regimen. Results are evaluated by reviewing the audiogram obtained at the end of the 20 sessions and behavior changes at other post-treatment intervals.

Facilitation Communication
Facilitated communication bills itself as a way to allow individuals with autism, intellectual disability, or a condition like cerebral palsy to communicate by means of a “facilitator.” Facilitators provide pressure to the hand, wrist, or arm, guiding the individual to letters, words, or pictures—typically on a keyboard, smartphone, or tablet. Given it is a technique whereby individuals with disabilities and communication impairments allegedly select letters by typing on a keyboard while receiving physical support, emotional encouragement, and other communication supports from facilitators, the validity of FC stands or falls on the question of who is authoring the typed messages--the individual with a disability or the facilitator. Thus, FC has been at the center of debate because several scientific studies have suggested that facilitators may unintentionally influence the communication, perhaps to the extent of actually selecting the words themselves.

LITERATURE REVIEW

Sensory Integration Therapy
A meta-analysis was conducted for the purpose of determining whether existing studies of treatment using sensory integration approaches support the efficacy of this method (Vargas, et al., 1999). Sixteen studies were used to compare SIT with no treatment, and 16 studies were used to compare SIT with alternative treatments. The review noted that there was a significant difference between the average size of effect of the earlier studies compared to the more recent studies. The authors concluded that in the SIT and no treatment studies, the recent studies did not demonstrate an overall positive effect and that the sensory integration methods were found to be as effective as various alternative treatment methods. Dawson and Watling (2000) conducted a systematic review of the research regarding the effectiveness of interventions for sensory and motor abnormalities in autism. The interventions included SIT and auditory integration training (AIT). Four studies on the effectiveness of sensory integration therapy in autism that utilized objective measures of behavior to assess outcome were found. All but one had sample size of fewer than six subjects and none of the studies had a comparison group. One study that had a larger sample size and better design found no change in vocal behavior following brief participation in sensory activities. The review concluded that although sensory and motor impairments are commonly found in autism, the interventions developed to address them have not been well validated. In the case of SIT, it was noted, “there exist so few studies that conclusions cannot be drawn” (Dawson and Watling, 2000). In the case of AIT, it is noted that “there is no, or at best equivocal support for this intervention approach based on the available controlled studies” (Dawson and Watling, 2000).There is little known regarding which ages or subgroups of individuals are most likely to benefit from therapies addressing sensory and motor difficulties, and further research is recommended.

A review of SI outcomes research in relation to faithfulness of intervention to underlying therapeutic principles or fidelity was performed (Parham, et al., 2007). The review included 34 studies which were analyzed for consistency of intervention descriptions with the following elements: structural (e.g., equipment used, therapist training) and therapeutic process categories. The reviewers made the following findings:

- Most studies described structural elements related to therapeutic equipment and interveners' profession.
- Only one of the 10 process elements, presentation of sensory opportunities, was addressed in all studies. Most studies described fewer than half of the process elements.
- Intervention descriptions in 35% of the studies were inconsistent with one process element, therapist-child collaboration. The authors note that the validity of SI outcomes studies is affected by weak fidelity in regard to the therapeutic process.

Lane and Schaaf (2010) sought to critically examine the basic science literature to specifically identify evidence for the assumptions and tenets of Ayres' theory of SI. The review focused on sensorimotor-based neuroplasticity; explored the data that addressed the links among sensory input, brain function, and behavior; and evaluated its relevance in terms of supporting or refuting the theoretical premise of occupational therapy

using an SI framework (OT/SI) to treatment. Although direct application from basic science to OT/SI is not feasible, they concluded that there was a basis for the assumptions of Ayres' SI theory.

Several studies have been published that examined the effectiveness of SIT. While some of the studies indicated that there may be some effect noted with treatment with SIT, many of these studies involve small number of children and short follow-up time periods (Schaaf, et al,. 2012; Wuang, et al., 2009; Fazlioglu, et al., 2008; Miller, et al., 2007; Watling and Dietz, 2007; Smith, et al., 2005). The peer-reviewed literature fails to demonstrate that SIT, compared with other treatments or with no treatment, provides clinically relevant, long-term improvements in outcomes in children with learning disabilities, Down syndrome, developmental disorders or SI disorders. Studies of SIT in children with cerebral palsy or autism are also lacking, and therefore the evidence is insufficient to evaluate SIT for these indications as well. May-Benson, et al. (2010) reported on a systematic review of literature on the effectiveness of sensory integration (SI) interventions on the ability of children with difficulty processing and integrating sensory information to engage in desired occupations and to apply these findings to occupational therapy practice. The review included 27 studies and the results indicated that the SI approach may result in positive outcomes in sensorimotor skills and motor planning; socialization, attention, and behavioral regulation; reading-related skills; participation in active play; and achievement of individualized goals. It appeared that gross motor skills, self-esteem, and reading gains may be sustained from three months to two years. Studies were limited by small sample sizes, variable intervention dosage, lack of fidelity to intervention, and selection of outcomes that may not be meaningful to clients and families or may not change with amount of treatment provided. The authors note that replication of findings with methodologically and theoretically sound studies is needed to support the current findings.

The AAP Council on Children with Disabilities published guidelines for the management of children with autism spectrum disorders. Regarding sensory integration therapy, the guidelines note “Sensory integration (SI) therapy often is used alone or as part of a broader program of occupational therapy for children with ASDs [autism spectrum disorders]. The goal of SI therapy is not to teach specific skills or behaviors but to remediate deficits in neurologic processing and integration of sensory information to allow the child to interact with the environment in a more adaptive fashion. Unusual sensory responses are common in children with ASDs, but there is not good evidence that these symptoms differentiate ASDs from other developmental disorders, and the efficacy of SI therapy has not been demonstrated objectively. Available studies are plagued by methodologic limitations, but proponents of SI note that higher-quality SI research is forthcoming.” (Myers, et al., 2007; Reaffirmed Dec 2010). The Agency for Healthcare Research and Quality (AHRQ) published a comparative effectiveness review of therapies for children with autism spectrum disorders. The review was prepared by the Vanderbilt Evidence-based Practice Center (Warren, et al., 2011). Among the allied health therapies in the review were sensory and auditory integration therapy. The research provided little support for their use. Specifically, all studies of sensory integration and music therapy were of poor quality. Pfeiffer et al. (2011) reported on a randomized study to address the effectiveness of sensory integration (SI) intervention in children with autism spectrum disorders. The children were randomized to SI intervention or fine motor intervention and received three sessions per week for six weeks. The study included 21 children diagnosed with autism and 16 with pervasive developmental disorder-not otherwise specified (PDD-NOS). Pretests and posttests measured social responsiveness, sensory processing, functional motor skills, and social– emotional factors. Results identified significant positive changes in Goal Attainment Scaling scores for both groups; more significant changes occurred in the SI group, and a significant decrease in autistic mannerisms occurred in the SI group. No other results were significant. The results are preliminary and further research is needed.

In 2011, AOTA published evidence-based occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration (SI). AOTA gave a level B recommendation for sensory integration for gross motor and motor planning skills for children with learning disabilities, sensory integration to address maladaptive behaviors in children with problems in sensory processing, and sensory integration to address self-esteem in children with learning disabilities and sensory integrative dysfunction. Level B means there is moderate evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. At least fair evidence was found that the intervention improves important outcomes and concludes that benefits outweigh harm. AOTA gave a level C recommendation for SI therapy for sensory integration, sensory diets, and therapeutic riding to address performance on functional, parent-centered goals in children with problems with sensory processing, individual functional goals for children, for parent-centered goals, for participation in active play in children with sensory processing disorder, to address play skills and engagement in children with autism, for visual perception in children with Developmental Coordination Disorder (DCD), for sensory integration combined with perceptual–motor curriculum for visual, auditory, and

tactile perception for children with suspected neurological problems, for occupational therapy using a sensory integration approach for decreasing externalizing and internalizing behaviors in children with problems in sensory processing, for engagement and reduced aggression in children with sensory modulation disorder, for improved social interaction and reduced disruptive behaviors in children with autism, for attention in children with autism, and to address tactile discrimination for children with suspected neurological problems. 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 in a recommendation that occupational therapy practitioners routinely provide the intervention to eligible clients 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 provide a recommendation on sensory integration for academic and psychoeducational performance (e.g. math, reading, written performance).

The American Academy of Child and Adolescent Psychiatry (AACAP)'s practice parameter for "The assessment and treatment of children and adolescents with autism spectrum disorder" (Volkmar, et al., 2014) stated that "There is a lack of evidence for most other forms of psychosocial intervention, although cognitive behavioral therapy has shown efficacy for anxiety and anger management in high functioning youth with ASD. Studies of sensory oriented interventions, such as auditory integration training, sensory integration therapy, and touch therapy/massage, have contained methodologic flaws and have yet to show replicable improvements". A 2013 practice parameter for the assessment and treatment of children and adolescents with autism spectrum disorder states that "Studies of sensory oriented interventions, such as auditory integration training (AIT), sensory integration therapy (SIT) and touch therapy/massage, have contained methodological flaws and have yet to show replicable improvements." Hayes (2014; reviewed 2015, 2016, 2017) conducted a technology assessment to evaluate the evidence on the safety and effectiveness of sensory integration therapy (SIT) for non-autistic children. According to Hayes, most of the reviewed studies found no benefit of SIT over time or were compared with control groups (no treatment or active interventions) across a range of outcomes for non-autistic children. None of the reviewed studies reported safety-related concerns or complications associated with SIT. Currently there is insufficient evidence regarding the effectiveness of SIT in non-autistic children to establish patient selection criteria given the varying diagnoses represented across studies reviewed (i.e., intellectual disabilities, cerebral palsy, motor coordination difficulties, Down Syndrome, sensory integration difficulties/sensory processing disorder) and absence of clear effects of SIT. The existing body of literature provides little evidence that SIT improves functioning for non-autistic children across time, or compared with no treatment or alternative interventions.

Case-Smith et al. (2015) completed a systematic review of sensory processing interventions for children with autism spectrum disorders. Children with autism spectrum disorders often exhibit sensory processing problems and receive interventions that target self-regulation. This systematic review examined the research evidence (2000-2012) of two forms of sensory interventions, sensory integration therapy and sensory-based intervention, for children with autism spectrum disorders and concurrent sensory processing problems. A total of 19 studies were reviewed: 5 examined the effects of sensory integration therapy and 14 sensory-based interventions. The studies defined sensory integration therapies as clinic-based interventions that use sensory-rich, child-directed activities to improve a child's adaptive responses to sensory experiences. Sensory-based interventions are characterized as classroom-based interventions that use single-sensory strategies, for example, weighted vests or therapy balls, to influence a child's state of arousal. Few positive effects were found in sensory-based intervention studies. Studies of sensory-based interventions suggest that they may not be effective; however, they did not follow recommended protocols or target sensory processing problems. Although small randomized controlled trials resulted in positive effects for sensory integration therapies, additional rigorous trials using consistent protocols for sensory integration therapy are needed to evaluate effects for children with autism spectrum disorders and sensory processing problems. Barton et al. (2015) conducted a comprehensive and methodologically sound evaluation of the efficacy of sensory-based treatments for children with disabilities. Thirty studies involving 856 participants met our inclusion criteria and were included in this review. Considerable heterogeneity was noted across studies in implementation, measurement, and study rigor. The research on sensory-based treatments is limited due to insubstantial treatment outcomes, weak experimental designs, or high risk of bias. Authors conclude that although many people use and advocate for the use of sensory-based treatments and there is a substantial empirical literature on sensory-based treatments for children with disabilities, insufficient evidence exists to support their use. Watling and Hauer (2015) completed a systematic review on the effectiveness of Ayres Sensory Integration® and Sensory-Based Interventions for People with Autism Spectrum Disorder. Of the 368 abstracts screened, only 23 met the inclusion criteria and were reviewed.

Moderate evidence was found to support the use of ASI. The results for sensory-based methods were mixed. Weitlauf et al. (2017) evaluated the effectiveness and safety of interventions targeting sensory challenges in ASD. Twenty-four studies, including 20 randomized controlled trials (RCTs), were included. Limited, short-term studies reported potential positive effects of several approaches in discrete skill domains. Specifically, sensory integration-based approaches improved sensory and motor skills-related measures (low strength of evidence).

Pfeiffer et al. (2017) examined the evidence for the effectiveness of cognitive and occupation-based interventions to improve self-regulation in children and youth who have challenges in processing and integrating sensory information in a systematic review. Five studies were identified through a comprehensive database search and met the inclusion criteria and were separated into categories of cognitive and occupation-based interventions. Synthesis of the articles suggests that self-regulation (e.g., sensory processing, emotional regulation, executive functioning, social function) improved with cognitive and occupation-based interventions. Because the number of studies that measured sensory processing or SI challenges was limited, authors suggest that researchers should include these measures in future research to understand the impact of a broader range of cognitive and occupation-based interventions.

Kashefimehr et al. (2018) examined the effect of sensory integration therapy (SIT) on different aspects of occupational performance in children with ASD. The Short Child Occupational Profile (SCOPE) and the Sensory Profile (SP) were used to assess outcomes. The intervention group showed significantly greater improvement in all the SCOPE domains, as well as in all the SP domains, except for the "emotional reactions" and "emotional/social responses" domains, ($p < .05$). The effectiveness of SIT in improving occupational performance in children with ASD as a health-related factor is supported by our findings. Schaaf et al. (2018) addressed the question "What is the efficacy of occupational therapy using Ayres Sensory Integration® (ASI) to support functioning and participation as defined by the International Classification of Functioning, Disability and Health for persons with challenges in processing and integrating sensory information that interfere with everyday life participation?" in a systematic review. Only 5 studies met inclusion criteria with only 3 being RCTs. Based on these studies, authors report the evidence is strong that ASI intervention demonstrates positive outcomes for improving individually generated goals. Moderate evidence supported improvements in impairment-level outcomes of improvement in autistic behaviors and skills-based outcomes of reduction in caregiver assistance with self-care activities. Child outcomes in play, sensory-motor, and language skills and reduced caregiver assistance with social skills had emerging but insufficient evidence. Kilroy et al. (2019) reviewed the neural underpinnings of sensory processing and integration in ASD by examining the literature on neurophysiological responses to sensory stimuli in individuals with ASD as well as structural and network organization using a variety of neuroimaging techniques. Authors noted that many aspects of Ayres' hypotheses about the nature of the disorder were found to be highly consistent with current literature on sensory processing in children with ASD but there are some discrepancies across various methodological techniques and ASD development. Further research is necessary to support ASI for individuals with ASD. Schoen et al. (2019) evaluated the effectiveness research from 2006 to 2017 on Ayres Sensory Integration (ASI) intervention for children with autism using Council for Exceptional Children (CEC) Standards for Evidence-Based Practices in Special Education. The results of this systematic review indicate that SIT meets the criteria for an evidence-based practice according to the CEC Standards for Evidence-Based Practices in Special Education. It also appears to meet the criteria for an evidence-based practice as defined by the United States Preventative Services Task Force and the FPG Child Development Institute Guidelines. Authors concluded that consumers, third-party payers, and professionals concerned with the well-being of children with autism spectrum disorders can feel confident that ASI is an effective intervention for this population, particularly for those with IQs above 65 and who are 4– 12 years of age. However, authors caveat this conclusion by stating it is critical that therapists providing ASI intervention adhere to the essential elements of this intervention, to ensure that the intervention delivered is in keeping with an evidence-based practice.

Camarata et al. (2020) reviewed sensory integration/processing treatments (SI/SP) and the objective analysis challenges for children with Autism Spectrum Disorders (ASD), ADHD and disruptive behavioral dysfunction secondary to impaired sensory modulation and integration of sensory stimuli. The treatment modalities reviewed focused on tactile, proprioceptive, and vestibular systems, utilizing equipment, devices and activities of daily living. Treatments were based on the theories of Ayres (1975) which suggest the previously mentioned modalities may facilitate the organization and use of sensory stimulation in conjunction with motor activities to enhance sensory integration and processing skills. The review included discussions of emerging evidence based treatments such as NDBI (Naturalistic Behavioral Intervention) treatment, Multisensory Integration, and Auditory-visual integration as approaches to control confounds to objectively test the sensory integration and

processing theory and outcome changes. Based on this review, the research supporting the effectiveness of SI/SP is not conclusive. There are few larger-scale, randomized control trials that directly test the intervention with control for confounds and include objective measurements to support evidence of the SI/SP approaches as the treatment which impacted functional change. Standardized outcome measurements and data collection are needed that reflect daily functional changes. Therefore, insufficient evidence was found to determine that the effects of sensory integration training on communication and daily activities impacted outcomes for children with ASD, ADHD and disruptive behavioral dysfunction.

Lane (2020) reviewed the current best evidence regarding measurement of and interventions for sensory symptoms. She notes there is ample evidence to support the association of sensory symptoms with childhood function including social engagement, repetitive behaviors, anxiety, and participation in self-care routines. The evidence for interventions for sensory symptoms is emerging but still limited by low quantity and methodological concerns. This author concluded that effective management of sensory symptoms may mitigate the burden of neurodevelopmental disability and mental illness in young people. Identification of sensory symptoms should be conducted by a skilled practitioner utilizing multiple measurement methods. Intervention protocols for sensory symptoms should be informed by current best evidence which is strongest for Ayres Sensory Integration®, Qigong massage, the Alert Program®, and Social Stories.

Mailloux et al. (2021) reported on reliability and validity of six tests of vestibular and proprioceptive functions of the Evaluation in Ayres Sensory Integration (EASI). The sample contained typically developing children (n = 150) and children with sensory integration concerns (n = 84); all participated voluntarily. Outcomes and Measures: The EASI is used to measure sensory and motor functions in children ages 3 to 12 yr. The six tests of vestibular and proprioceptive functions were analyzed in this study. Data from >96% of items conformed to the expectations of the model. Authors found statistically significant group differences with the typically developing children group scoring significantly higher on all but one test, and moderate to strong evidence of internal consistency for five of six tests. Authors concluded that the EASI vestibular and proprioceptive tests have strong construct validity and internal reliability, indicating that they are psychometrically sound clinical measures. Authors also state that the development of occupational therapy assessments with strong psychometric properties, such as the EASI tests of vestibular and proprioceptive functions, enhances clinical practice and research by elucidating the factors affecting participation in accurate and dependable ways so that occupational therapy interventions can be focused and effective.

Randell et al. (2022) aimed to determine the clinical effectiveness and cost-effectiveness of sensory integration therapy for children with autism and sensory difficulties across behavioral, functional and quality-of-life outcomes. Inclusion criteria were having an autism diagnosis, being in mainstream primary education and having definite/probable sensory processing difficulties. Exclusion criteria were having current/previous sensory integration therapy and current applied behavior analysis therapy. The intervention was manualized sensory integration therapy delivered over 26 weeks and the comparator was usual care. The primary outcome was problem behaviors (determined using the Aberrant Behavior Checklist), including irritability/agitation, at 6 months. Secondary outcomes were adaptive behavior, functioning and socialization (using the Vineland Adaptive Behavior Scales); carer stress (measured using the Autism Parenting Stress Index); quality of life (measured using the EuroQol-5 Dimensions and Carer Quality of Life); functional change (according to the Canadian Occupational Performance Measure); sensory processing (determined using the Sensory Processing Measure™ at screening and at 6 months to examine mediation effects); and cost-effectiveness (assessed using the Client Service Receipt Inventory). Every effort was made to ensure that outcome assessors were blind to allocation. A total of 138 participants were randomized (n = 69 per group). Usual care was significantly different from the intervention, which was delivered with good fidelity and adherence and minimal contamination, and was associated with no adverse effects. Carers and therapists reported improvement in daily functioning. The primary analysis included 106 participants. There were no significant main effects of the intervention at 6 or 12 months. Authors concluded that the intervention did not demonstrate clinical benefit above standard care.

For adult patients, sensory integration techniques have been used for acquired sensory problems resulting from head trauma, illness, or acute neurologic events including cerebrovascular accidents. They are not appropriate for patients with progressive neurological conditions without potential for functional adaptation. Therapy is not considered a cure for sensory integrative impairments, but is used to facilitate the development of the patient's ability to process sensory input differently. Research studies are lacking for the adult population and SI therapy.

Due to the individual nature of sensory integration 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.

Auditory Integration Training

Although at least three AIT methods currently exist, the Berard method has emerged as the most commonly used in the United States and has been described most often in professional literature, which is limited. The Educational Audiology Association (EAA) issued a position statement regarding AIT (EAA, 1997). They stated that “Auditory integration therapy has not been proven to be a viable treatment for any disability. Only inconsistent, uncontrolled, anecdotal evidence has been provided to support claims of changes in auditory performance.” In addition, the position statement noted that without controls to protect against excessively loud auditory stimuli, AIT may cause harm to the auditory system. Mudford et al. (2000) performed a crossover study for the purpose of evaluating the benefits of auditory integration training for children with autism. There were 16 children who had been diagnosed with autism involved in the study, with all children receiving both treatments. There were at least four months between treatments. The control treatment was conducted by the auditory integration training providers in an identical room with identical procedures, with the difference being that the headphones used were nonfunctional. The measures included parent and teacher ratings of behavior, direct observational recordings, IQ, language, and social/adaptive tests. It was noted that significant differences tended to show that the control condition was superior on parent-rated measures of hyperactivity and on direct observational measures of ear-occlusion, and no difference was detected on teacher-rated measures. The children’s IQ and language comprehension did not increase; however, adaptive/social behavior scores and expressive language quotients decreased. The authors concluded that no children could be identified as benefiting from AIT clinically or educationally to any significant degree. American Speech-Language-Hearing Association (ASHA) prepared an evidenced-based technical report regarding AIT (ASHA, 2004). They noted that, despite approximately one decade of practice, this method has not met scientific standards for efficacy and safety that would justify its inclusion as a mainstream treatment for a variety of communication, behavioral, emotional and learning disorders. Sinha et al. (2004) completed a Cochrane Database Systematic Review to determine the effectiveness of AIT or other methods of sound therapy in individuals with autism spectrum disorders (ASD). Randomized controlled trials of adults or children with ASD were included using AIT or other sound therapies involving listening to music modified by filtering and modulation. Control groups could be no treatment, waiting list, usual therapy or placebo equivalent. Outcomes sought were changes in core and associated features of ASD, auditory processing, quality of life and adverse events. Meta-analysis was attempted but deemed inappropriate at present due to heterogeneity. No trials assessing sound therapies other than AIT were found. Six RCTs of AIT, including one cross-over trial, were identified with a total of 171 individuals aged 3-39 years. Four trials had fewer than 20 participants. Seventeen different outcome measures were used. Only two outcomes were used by three or more studies: Aberrant Behaviour Checklist (ABC) (5) and Fisher's Auditory Problems Checklist (FAPC) (3). Three studies (Bettison 1996, Zollweg 1997, Mudford 2000) did not demonstrate benefit of AIT over control conditions. The remaining trials (Veale 1993, Rimland 1995, Edelson 1999) reported improvements at 3 months for the AIT group based on improvements of total mean scores for the ABC, which is of questionable validity. Rimland (1995) also reported improvements at 3 months in the AIT group for ABC subgroup scores. No significant adverse effects of AIT were reported. Based on these results, authors concluded that more research is needed to inform parents', caregivers' and practitioners' decision making about this therapy for individuals with autism spectrum disorders.

The study addressing Tomatis therapy (Corbett 2008) described an improvement in language with no difference between treatment and control conditions and did not report on the behavioral outcomes that were used in the auditory integration therapy trials. Again, authors concluded that there is no evidence that auditory integration therapy or other sound therapies are effective as treatments for autism spectrum disorders. As synthesis of existing data has been limited by the disparate outcome measures used between studies, there is not studies including 182 participants that have been reported to date, only two (with an author in common), involving a total of 35 participants, report statistically significant improvements in the auditory integration therapy group and for only two outcome measures (Aberrant Behaviour Checklist and Fisher's Auditory Problems Checklist). The Agency for Healthcare Research and Quality (AHRQ, 2011) published a comparative effectiveness review of therapies for children with autism spectrum disorders. Among the allied health therapies in the review was

auditory integration therapy. The research provided little support for its use. Specifically, two fair-quality studies of auditory integration showed no improvement associated with treatment. AHRQ also published a comparative effectiveness review on interventions for adolescents and young adults with ASD. Among the allied health therapies, studies of music therapy reported some improvements in social skills using invalid measures, thus there is little support for its use. The American Academy of Pediatrics (AAP) published a statement noting that as yet, there are no good controlled studies to support the use of AIT for children with autism. It is also noted that, until further information is available, the use of these treatments does not appear warranted at this time, except within research protocols (AAP, 1998/2006/2010). The American Academy of Audiology (2010) believes AIT by any name to be entirely investigational. The Academy believes that prospective, systematic research of this technique is needed to demonstrate its efficacy. Pursuant to Principle 5 of the Code of Ethics, the Academy believes that the experimental status of this technique must be clearly explained to consumers before they are entered into treatment. In 2011, Sinha published an update to the 2004 Cochrane review of AIT and other methods of sound therapy. At this time, authors identified six randomized controlled trials of auditory integration therapy and one of Tomatis therapy, involving a total of 182 individuals aged three to 39 years. Two were cross-over trials. Five trials had fewer than 20 participants. Twenty different outcome measures were used and only two outcomes were used by three or more studies. Again, meta-analysis was not possible due to very high heterogeneity or the presentation of data in unusable forms. The same conclusions were determined as the 2004 review for the AIT studies. As such, there is no evidence to support the use of auditory integration therapy at this time. The National Institute for Health and Clinical Excellence (NICE) published guidelines for the management and support of children and young people on the autism spectrum (NICE, 2013). The recommendations for treatment address interventions that should not be used for autism in children and young people including auditory integration training to manage speech and language. The American Academy of Child and Adolescent Psychiatry (AACAP)'s practice parameter (2014) for "The assessment and treatment of children and adolescents with autism spectrum disorder" stated that "There is a lack of evidence for most other forms of psychosocial intervention, although cognitive behavioral therapy has shown efficacy for anxiety and anger management in high functioning youth \with ASD. Studies of sensory oriented interventions, such as auditory integration training, sensory integration therapy, and touch therapy/massage, have contained methodologic flaws and have yet to show replicable improvements". Given these findings, the published peer-reviewed scientific literature does not support the efficacy of AIT for the treatment of patients with learning disabilities, autism, and other behavioral disorders. Li et al. (2018) investigated the efficacy of AIT for children with ASD compared with those in control group by using meta-analysis. Outcome of interest included childhood autism rating scale (CARS), autism behavior checklist (ABC), intelligence quotient (IQ), and autism treatment evaluation checklist (ATEC). Thirteen RCTs with 976 children with ASD were included for analysis. Results showed that children with ASD had significantly lower ABC scores and ATEC scores in AIT group compared with that in control group. The analysis of pooled statistics put forward AIT could increase the IQ score when compared with that in control group. A negative association was found about CARS scores between AIT group and control group. In conclusions, AIT can reduce the score of ABC and ATEC and can increase the IQ score among children with ASD in Chinese. Therefore, it is recommended for Chinese children with ASD to receive AIT. Several study limitations existed and thus, findings need confirmation with improved study design.

Shahrudin et al. (2022) mapped the evidence from the relevant studies regarding the use of music and sound-based intervention for autism spectrum disorder (ASD) using a scoping review study design. Four major themes emerged from 39 studies that matched the inclusion criteria as follows: 1) forms of sound therapy discussing methods of sound therapy and stimulus used, 2) duration of the intervention explain in terms of listening time and total listening sessions, 3) clinical characteristics of the intervention exploring the main interest of sound therapy study in ASD, and 4) evidence for the intervention effectiveness looking into the positive, negative, and mixed findings of previous studies. Each theme was explored to identify the knowledge gaps in sound-intervention therapy. This review demonstrated the need for further studies to address several issues including identifying the effectiveness of sound-therapy intervention for ASD according to the individual sound types, the minimum duration for ASD sound-therapy intervention and more details on the use of technology, and clinical features of the sound-therapy intervention. These elements are important to further demonstrate the effectiveness of sound therapy intervention for ASD children.

Auditory integration training (AIT) devices do not have FDA approval for treating medical, behavioral, or emotional disorders. The FDA has banned the importation of AIT devices such as AudioKinetron (SAPP, France) and Electronic Ear (Tomatis Electronics, France).

Facilitated Communication (FC)

In 1994, the American Psychological Association (APA) declared that there was no scientific evidence proving that FC worked—and that it constituted “immediate threats to the individual civil and human rights” of the person being facilitated. One of the primary concerns, both scientific and ethical, was the issue of “authorship”: whether the thoughts being expressed truly arise from the facilitated, and not the facilitator. The American Speech-Language-Hearing Association and the American Academy of Pediatrics joined in and by the late ‘90s, 20 facilitated-communication proponents were largely dismissed as faith-healers or even predators. The May Institute’s National Autism Center, considered to be among the very best resources regarding evidence-based treatment of autism, found in both 2009 and again in 2015 in its National Standards Project that there is “little or no evidence in the scientific literature.” The AACAP published a policy statement regarding facilitated communication that states, “Studies have repeatedly demonstrated that FC is not a scientifically valid technique for individuals with autism or mental retardation. In particular, information obtained via FC should not be used to confirm or deny allegations of abuse or to make diagnostic or treatment decisions” (AACAP, 1993/2008). The AAP has published a statement regarding two treatments proposed for autism: AIT and facilitated communication. According to the AAP, there is good scientific data showing FC to be ineffective; therefore, its use is not an accepted treatment at this time. Currently available information does not support the claims of proponents that these treatments are efficacious. Its use does not appear warranted at this time, except within research protocols (AAP, 1998/2006/2010). AHRQ also published a comparative effectiveness review on interventions for adolescents and young adults with ASD. Among the allied health therapies, studies assessing facilitated communication noted little communication improvement associated with facilitation and some evidence of facilitator influence on participants’ responses (Warren et al., 2011).

Tostanoski et al. (2013) reviewed the history and damage caused by facilitated communication (FC) and highlights the parallels between FC and the Rapid Prompting Method (RPM). FC involves a therapist (or facilitator) supporting the hand of a person with autism while a message is typed on a letter board. Authors state that FC is widely acknowledged to be a pseudoscientific, unsafe, and unethical treatment for people with autism. RPM is a more recent intervention for people with autism that involves the facilitator holding and moving the letter board while the individual with autism moves their own hand. Those who espouse the perceived benefits of FC and RPM make strikingly similar claims of hidden intelligence and extraordinary communication abilities in people with autism following treatment. Authors conclude clients, proponents, and practitioners of RPM should demand scientific validation of RPM in order to ensure the safety of people with disabilities that are involved with RPM. Saloviita et al. (2014) studied the authorship of messages produced through facilitated communication (FC) for all users of FC in two comprehensive schools in a small city in Finland. The participants were 11 children with intellectual disabilities, including autism, all having used FC from 1-3 years. The test conditions involved open and blind information-passing tasks in which the participants were directed to write down the contents of written or pictorial stimuli. The results failed to validate FC as a method of communication for any participant or facilitator. An analysis of the messages produced under the FC condition revealed a large degree of facilitator influence on the content of the messages produced. Additionally, FC impaired the performance of the two participants who had previously demonstrated some independent writing skills. Schlosser et al. (2014) reported a synthesis of the peer-reviewed literature on the question of authorship in FC. The International Society for Augmentative and Alternative Communication (ISAAC) formed an Ad Hoc Committee on FC and charged Schlosser et al. (2014) to synthesize the evidence base related to this question in order to develop a position statement. The authors considered synopses of systematic reviews, and systematic reviews, which were supplemented with individual studies not included in any prior reviews. Additionally, documents submitted by the membership were screened for inclusion. The evidence was classified into articles that provided (a) quantitative experimental data related to the authorship of messages, (b) quantitative descriptive data on the output generated through FC without testing of authorship, (c) qualitative descriptive data on the output generated via FC without testing of authorship, and (d) anecdotal reports in which writers shared their perspectives on FC. Only documents with quantitative experimental data were analyzed for authorship. Results indicated unequivocal evidence for facilitator control: messages generated through FC are authored by the facilitators rather than the individuals with disabilities. Hence, FC is a technique that has no validity. Based on these results, there is insufficient evidence found in the medical literature regarding the effectiveness of this therapy. Associations have a long history stating their lack of support for FC. The International Society for Augmentative and Alternative Communication, in its own review of the science around FC, concluded in 2014 that all indications are that authorship stems from the facilitator, and not the facilitated. The Scottish Intercollegiate Guidelines Network (SIGN): The updated SIGN national clinical guideline on assessment, diagnosis and interventions for autism spectrum disorders states that facilitated communication should not be used as a means to communicate with adults, children and young people with ASD (2016). In 2016, NICE updated the clinical guideline, diagnosis and management of adults on the autism spectrum. The guideline

recommendations for psychosocial interventions for the core symptoms of autism state to not provide facilitated communication for adults with autism. There is insufficient evidence found in the medical literature regarding the effectiveness of this therapy. Hemsley et al. (2018) conducted a systematic review of the literature on FC published between 2014 and 2018 to inform the 2018 update of the 1995 American Speech-Language Hearing Association Position Statement on FC. In total, 18 studies met the inclusion criteria. There were no new empirical studies and no new descriptive quantitative studies addressing the authorship of messages delivered using FC. Three new qualitative studies qualified for inclusion; these did not first establish authorship. Of the 15 new commentary papers on FC located, 14 were critical and one was non-critical. There are no new studies on authorship and there remains no evidence that FC is a valid form of communication for individuals with severe communication disabilities. There continue to be no studies available demonstrating that individuals with communication disabilities are the authors of the messages generated using FC. Furthermore, there is substantial peer-reviewed literature that is critical of FC and warns against its use.

Heyworth et al. (2022) presents an analysis of the research arguing for-and against-the use of FC, combined with the lived experience knowledge of autistic adults who utilize FC, to rehabilitate its current standing as discredited and unevidenced in a perspective article. Debate surrounding the validity of the method of supported typing known as facilitated communication (FC) has been continuous since its inception in the 1990s. Views are polarized on whether FC can be considered an authenticated method for use by people with complex communication needs (CCN) or significant challenges in speech, language, and communication. By considering extant qualitative and quantitative studies, as well as personal accounts of the use of this particular Augmentative and Alternative Communication (AAC) method, the authors argue that the current dismissal of FC is rooted in ableist and outdated approaches. Authors conclude that FC research should be reconsidered and reconducted using current best practice autism research approaches, including coproduction and a presumption of autistic communication competence, to assess its validity as a potential AAC method for autistic individuals.

An UpToDate review on "Evaluation and treatment of speech and language disorders in children" (Carter and Musher, 2018) states that "Investigational therapies – Facilitated communication, auditory integration training (AIT), sensory integration (SI) therapy, and Fast ForWord are examples of controversial practices that have not been validated in large, controlled trials".

Coding Information

Note: 1) This list of codes may not be all-inclusive.
2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Medically Necessary when criteria in the applicable policy statements listed above are met:

CPT®* Codes	Description
97533	Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient contact, each 15 minutes

ICD-10-CM Diagnosis Codes	Description
F84.0	Autistic disorder

Considered Experimental/Investigational/Unproven:

ICD-10-CM Diagnosis Codes	Description
	All other codes

References

1. American Academy of Audiology. Position Statement: Auditory Integration Training. October 2010. Accessed April 17, 2023. Available at URL address: https://audiology-web.s3.amazonaws.com/migrated/AIT_Position%20Statement.pdf_539978b2a238a5.97970694.pdf

2. American Academy of Child & Adolescent Psychiatry (AACAP). Policy statement facilitated communication. Approved by Council, October 20. 1993. Reviewed June 2008. Accessed April 17, 2023. Available at URL address: https://www.aacap.org/aacap/policy_statements/2008/facilitated_communication.aspx

3. American Academy of Pediatrics (AAP). Auditory integration training and facilitated communications for autism. Pediatrics. 1998 Aug;102 (2 Pt 1):431-3.[reaffirmed May 2006; Feb 2010; retired July 2017]. Accessed April 17, 2023. Available at URL address: http://pediatrics.aappublications.org/content/102/2/431.full

4. American Academy of Pediatrics (AAP). Sensory integration therapies for children with developmental and behavioral disorders. Section On Complementary And Integrative Medicine; Council on Children with Disabilities; American Academy of Pediatrics, Zimmer M, Desch L. Pediatrics. 2012 Jun;129(6):1186-9.

5. American Occupational Therapy Association (AOTA). Frequently Asked Questions About Ayres Sensory Integration®. Accessed April 17, 2023. Available at URL address: https://ocde.us/SPED/Documents/OT%20PT%20Continuing%20Education%20Day/AOTA_SI_Fact_Sheet%20.pdf

6. American Occupational Therapy Association (AOTA). Fact Sheet. Addressing Sensory Integration and Sensory Processing Disorders Across the Lifespan: The Role of Occupational Therapy. Accessed April 17, 2023. Available at URL address: https://www.aota.org/-/media/corporate/files/aboutot/professionals/whatisot/cy/fact-sheets/factsheet_sensoryintegration.pdf

7. American Occupational Therapy Association (AOTA). Sensory Integration. Accessed April 17, 2023. Available at URL address: http://www.aota.org/en/Practice/Children-Youth/SI.aspx

8. American Speech-Language-Hearing Association (ASHA). Auditory integration therapy. Technical Report. 2004. Accessed April 17, 2023. Available at URL address: https://www.asha.org/policy/tr2004-00260/

9. Auditory integration training and facilitated communication for autism. American Academy of Pediatrics. Committee on Children with Disabilities. Pediatrics. 1998 Aug;102(2 Pt 1):431-3.

10. Barton EE, Reichow B, Schnitz A, Smith IC, Sherlock D. A systematic review of sensory-based treatments for children with disabilities. Res Dev Disabil. 2015 Feb;37:64-80.

11. Berard, G. (1995). Concerning length, frequency, number, and follow-up AIT sessions (Available from The Society for Auditory Intervention Techniques, 1040 Commercial St. S.E., Suite 306, Salem, OR 97302). The Sound Connection Newsletter, 2(3), 5–6.

12. Berard, G. (1993). Hearing equals behavior. New Canaan, CT: Keats Publishing.Case-Smith J, Bryan T. The effects of occupational therapy with sensory integration emphasis on preschool-age children with autism. Am J Occup Ther. 1999 Sep-Oct;53(5):489-97.

13. Camarata S, Miller LJ and Wallace MT. Evaluating Sensory Integration/Sensory Processing Treatment: Issues and Analysis. Front. Integr. Neurosci. 2020 Nov 26;14:556660. doi: 10.3389/fnint.2020.556660

14. Carter J, Musher K. Evaluation and treatment of speech and language disorders in children. UpToDate. Waltham, MA: UpToDate; reviewed December 2018. Accessed April 17, 2023. Available at URL address: https://www.uptodate.com/contents/evaluation-and-treatment-of-speech-and-language-disorders-in-children

15. Case-Smith J, Weaver LL, Fristad MA. A systematic review of sensory processing interventions for children with autism spectrum disorders. Autism. 2015 Feb;19(2):133-48.

16. Dawson G, Watling R. Interventions to facilitate auditory, visual, and motor integration in autism: a review of the evidence. J Autism Dev Disord. 2000 Oct;30(5):415-21.

17. Eide, F. Sensory integration - current concepts and practical implications. American Occupational Therapy Association. Sensory Integration Special Interest Section Quarterly. 2003;26(3).

18. Fazlioğlu Y, Baran G. A sensory integration therapy program on sensory problems for children with autism. Percept Mot Skills. 2008 Apr;106(2):415-22.

19. Hayes, Inc. Hayes Medical Technology Directory Report. Sensory Integration Therapy for Non-Autistic Children. Lansdale, PA: Hayes, Inc; published mar 2014; reviewed Mar 2015; Feb 2016; Feb 2017

20. Hemsley B, Bryant L. Schlosser RW, Shane HC, Lang R, Paul D, Banajee M, Ireland M. Systematic review of facilitated communication 2014–2018 finds no new evidence that messages delivered using facilitated communication are authored by the person with disability. Autism & Developmental Language Impairments. 2018; 3: 1–8.

21. Heyworth M, Chan T, Lawson W. Perspective: Presuming Autistic Communication Competence and Reframing Facilitated Communication. Front Psychol. 2022;13:864991. Published 2022 Mar 10. doi:10.3389/fpsyg.2022.864991

22. Hoehn TP, Baumeister AA. A critique of the application of sensory integration therapy to children with learning disabilities. J Learn Disabil. 1994 Jun-Jul;27(6):338-50.

23. Kashefimehr B, Kayihan H, Huri M. The Effect of Sensory Integration Therapy on Occupational Performance in Children With Autism. OTJR (Thorofare N J). 2018 Apr;38(2):75-83.

24. Kilroy E, Aziz-Zadeh L, Cermak S. Ayres Theories of Autism and Sensory Integration Revisited: What Contemporary Neuroscience Has to Say. Brain Sci. 2019 Mar 21;9(3). pii: E68.

25. Lane SJ, Schaaf RC. Examining the neuroscience evidence for sensory-driven neuroplasticity: implications for sensory-based occupational therapy for children and adolescents. Am J Occup Ther. 2010 May-Jun;64(3):375-90.

26. Lane AE. Practitioner Review: Effective management of functional difficulties associated with sensory symptoms in children and adolescents. J Child Psychol Psychiatry. 2020 Sep;61(9):943-958. doi: 10.1111/jcpp.13230. Epub 2020 Mar 13.

27. Leemrijse C, Meijer OG, Vermeer A, Ader HJ, Diemel S. The efficacy of Le Bon Depart and Sensory Integration treatment for children with developmental coordination disorder: a randomized study with six single cases. Clin Rehabil. 2000 Jun;14(3):247-59.

28. Leong HM, Carter M, Stephenson J. Systematic review of sensory integration therapy for individuals with disabilities: Single case design studies. Res Dev Disabil. 2015 Dec;47:334-51.

29. Li N, Li L, Li G, Gai Z. The association of auditory integration training in children with autism spectrum disorders among Chinese: a meta-analysis. Biosci Rep. 2018 Dec 11;38(6). pii: BSR20181412.

30. Lilienfeld SO. Scientifically unsupported and supported interventions for childhood psychopathology: a summary. Pediatrics. 2005 Mar;115(3):761-4.

31. Mailloux Z, Grady-Dominguez P, Petersen J, et al. Evaluation in Ayres Sensory Integration® (EASI) Vestibular and Proprioceptive Tests: Construct Validity and Internal Reliability. Am J Occup Ther. 2021;75(6):7506205070.

32. May-Benson TA, Koomar JA. Systematic review of the research evidence examining the effectiveness of interventions using a sensory integrative approach for children. Am J Occup Ther. 2010 May-Jun;64(3):403-14.

33. Michaud LJ; American Academy of Pediatrics Committee on Children With Disabilities. Prescribing therapy services for children with motor disabilities. Pediatrics. 2004 Jun;113(6):1836-8.

34. Miller LJ, Coll JR, Schoen SA. A randomized controlled pilot study of the effectiveness of occupational therapy for children with sensory modulation disorder. Am J Occup Ther. 2007 Mar-Apr;61(2):228-38.

35. Mudford OC, Cross BA, Breen S, Cullen C, Reeves D, Gould J, et al. Auditory integration training for children with autism: no behavioral benefits detected. Am J Ment Retard. 2000 Mar;105(2):118-29.

36. Myers SM, Johnson CP; American Academy of Pediatrics Council on Children with Disabilities. Management of children with autism spectrum disorders. Pediatrics. 2007 Nov;120(5):1162-82. [Reaffirmed Dec 2010] Accessed April 17, 2023. Available at URL address: http://pediatrics.aappublications.org/content/120/5/1162

37. National Institute for Clinical Excellence (NICE). Autism: Management and Support of Children and Young People on the Autism Spectrum. National Clinical Guideline Number 170. London, UK; NICE; August 2013, June 2021. Accessed April 17, 2023. Available at URL address: http://www.nice.org.uk/CG170

38. National Institute for Health and Clinical Excellence (NICE). Autism spectrum disorder in adults: diagnosis and treatment. London (UK): National Institute for Health and Clinical Excellence (NICE); 2012 Jun; 2016 Aug, 2021 June. (NICE clinical guideline; no. 142). Accessed April 17, 2023. Available at URL address: http://guidance.nice.org.uk/CG142

39. Parham LD, Cohn ES, Spitzer S, Koomar JA, Miller LJ, Burke JP, et al. Fidelity in sensory integration intervention research. Am J Occup Ther. 2007 Mar-Apr;61(2):216-27.

40. Parham LD, Roley SS, May-Benson TA, Koomar J, Brett-Green B, Burke JP, Cohn ES, Mailloux Z, Miller LJ, Schaaf RC. Development of a fidelity measure for research on the effectiveness of the Ayres Sensory Integration intervention. Am J Occup Ther. 2011 Mar-Apr;65(2):133-42.

41. Pfeiffer BA, Koenig K, Kinnealey M, Sheppard M, Henderson L. Effectiveness of sensory integration interventions in children with autism spectrum disorders: a pilot study. Am J Occup Ther. 2011 Jan-Feb;65(1):76-85.

42. Pfeiffer B, Clark GF, Arbesman M. Effectiveness of Cognitive and Occupation-Based Interventions for Children With Challenges in Sensory Processing and Integration: A Systematic Review. Am J Occup Ther. 2018 Jan/Feb;72(1):7201190020p1-7201190020p9.

43. Randell E, Wright M, Milosevic S, et al. Sensory integration therapy for children with autism and sensory processing difficulties: the SenITA RCT. Health Technol Assess. 2022;26(29):1-140. doi:10.3310/TQGE0020

44. Roley SS, Bissell J, Clark GF; Commission on Practice. Providing occupational therapy using sensory integration theory and methods in school-based practice. Am J Occup Ther. 2009 Nov-Dec;63(6):823-

45. Rossignol DA. Novel and emerging treatments for autism spectrum disorders: a systematic review. Ann Clin Psychiatry. 2009 Oct-Dec;21(4):213-36.

46. Saloviita T, Leppänen M, Ojalammi U. Authorship in facilitated communication: an analysis of 11 cases. Augment Altern Commun. 2014 Sep;30(3):213-25.Schaaf RC, Miller LJ. Occupational therapy using a sensory integrative approach for children with developmental disabilities. Ment Retard Dev Disabil Res Rev. 2005;11(2):143-8.

47. Schaaf RC, Benevides TW, Kelly D, Mailloux-Maggio Z. Occupational therapy and sensory integration for children with autism: a feasibility, safety, acceptability and fidelity study. Autism. 2012 May;16(3):321-7.

48. Schaaf RC, Benevides T, Mailloux Z, Faller P, Hunt J, van Hooydonk E, et al. An intervention for sensory difficulties in children with autism: a randomized trial. J Autism Dev Disord. 2014 Jul;44(7):1493-506.

49. Schaaf RC, Dumont RL, Arbesman M, May-Benson TA. Efficacy of Occupational Therapy Using Ayres Sensory Integration(®): A Systematic Review. Am J Occup Ther. 2018 Jan/Feb;72(1):7201190010p1-7201190010p10.

50. Schlosser RW, Balandin S, Hemsley B, Iacono T, Probst P, von Tetzchner S. Facilitated communication and authorship: a systematic review. Augment Altern Commun. 2014 Dec;30(4):359-68.

51. Schoen SA, Lane SJ, Mailloux Z, May-Benson T, Parham LD, Smith Roley S, Schaaf RC. A systematic review of ayres sensory integration intervention for children with autism. Autism Res. 2019 Jan;12(1):6-19.

52. Scottish Intercollegiate Guidelines Network (SIGN). Assessment, diagnosis and interventions for autism spectrum disorders. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2016 June. (SIGN publication; no. 145).

53. Shahrudin FA, Dzulkarnain AAA, Hanafi AM, et al. Music and Sound-Based Intervention in Autism Spectrum Disorder: A Scoping Review. Psychiatry Investig. 2022;19(8):626-636. doi:10.30773/pi.2021.0382

54. Shaw, SR. National Association of School Psychologists (NASP). NASP Communiqué, Vol. 31, #2. A School Psychologist Investigates Sensory Integration Therapies: Promise, Possibility and the Art of Placebo. October, 2002.

55. Sinha Y, Silove N, Hayen A, Williams K. Auditory integration training and other sound therapies for autism spectrum disorders (ASD). Cochrane Database Syst Rev. 2011 Dec 7;12:CD003681.

56. Sinha Y, Silove N, Wheeler D, Williams K. Auditory integration training and other sound therapies for autism spectrum disorders. Cochrane Database Syst Rev. 2004;(1):CD003681.

57. Sinha Y, Silove N, Wheeler D, Williams K. Auditory integration training and other sound therapies for autism spectrum disorders: a systematic review. Arch Dis Child. 2006 Dec;91(12):1018-22.

58. Smith SA, Press B, Koenig KP, Kinnealey M. Effects of sensory integration intervention on self-stimulating and self-injurious behaviors. Am J Occup Ther. 2005 Jul-Aug;59(4):418-25.

59. Steinbrenner, J. R., Hume, K., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., Szendrey, S., McIntyre, N. S., Yücesoy-Özkan, S., & Savage, M. N. (2020). Evidence-based practices for children, youth, and young adults with Autism. The University of North Carolina at Chapel Hill, Frank Porter Graham Child Development Institute, National Clearinghouse on Autism Evidence and Practice Review Team.

60. Tochel C. Sensory or auditory integration therapy for children with autistic spectrum disorders. In Bazian Ltd (Ed) STEER: Succinct and Timely Evaluated Evidence Reviews 2003; 3(17). Wessex Institute for Health Research & Development, University of Southampton and Bazian Ltd.

61. Tostanoski A, Lang R, Raulston T, Carnett A, Davis T. Voices from the past: comparing the rapid prompting method and facilitated communication. Dev Neurorehabil. 2014 Aug;17(4):219-23.

62. Vargas S, Camilli G. A meta-analysis of research on sensory integration treatment. Am J Occup Ther. 1999 Mar-Apr;53(2):189-98.

63. Volkmar F, Siegel M, Woodbury-Smith M, et al; American Academy of Child and Adolescent Psychiatry (AACAP) Committee on Quality Issues (CQI). Practice parameter for the assessment and treatment of children and adolescents with autism spectrum disorder. J Am Acad Child Adolesc Psychiatry. 2014;53(2):237-257

64. Warren Z, Veenstra-VanderWeele J, Stone W, Bruzek JL, Nahmias AS, Foss-Feig JH, et al. Therapies for Children With Autism Spectrum Disorders. Comparative Effectiveness Review No. 26. (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290-2007-10065-I.) AHRQ Publication No. 11-EHC029-EF. Rockville, MD: Agency for Healthcare Research and Quality. April 2011. (Archived June 2013). Accessed April 17, 2023. Available at URL address: https://effectivehealthcare.ahrq.gov/sites/default/files/pdf/autism-update_research.pdf

65. Watling RL, Dietz J. Immediate effect of Ayres's sensory integration-based occupational therapy intervention on children with autism spectrum disorders. Am J Occup Ther. 2007 Sep-Oct;61(5):574-83.

66. Watling R, Koenig KP, Davies PL, Schaaf RC. Occupational therapy practice guidelines for children and adolescents with challenges in sensory processing and sensory integration. Bethesda (MD): American Occupational Therapy Association Press; 2016.

67. Weber W, Newmark S. Complementary and alternative medical therapies for attention-deficit/hyperactivity disorder and autism. Pediatr Clin North Am. 2007 Dec;54(6):983-1006; xii.

68. Weissman L. Autism spectrum disorder in children and adolescents: Behavioral and educational interventions. Jun 2018. In: UpToDate, Torchia, MM (Ed), UpToDate, Waltham, MA. (Accessed on April 17, 2023).

69. Weitlauf AS, Sathe N, McPheeters ML, Warren ZE. Interventions Targeting Sensory Challenges in Autism Spectrum Disorder: A Systematic Review. Pediatrics. 2017 Jun;139(6).

70. Wuang YP, Wang CC, Huang MH, Su CY. Prospective study of the effect of sensory integration, neurodevelopmental treatment, and perceptual-motor therapy on the sensorimotor performance in children with mild mental retardation. Am J Occup Ther. 2009 Jul-Aug;63(4):441-52.