



Sensory Integration Theory and Ayres Sensory Integration®

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Authors' Note: This treatment summary discusses Ayres Sensory Integration®, a sensory approach that has recently been shown to be associated with some change for some learners. This represents a change in existing literature, and stands in contrast to the literature on other sensory approaches, which have not been shown to have a positive impact for autism. Still, it should be interpreted with caution for several reasons: 1) Results are limited to just a couple of published studies, and replication is needed to increase confidence; 2) Sensory interventions are designed for individuals with sensory challenges. As such, they should be used only with individuals who exhibit these issues and who have been diagnosed with sensory difficulties. (These interventions are not universally relevant for people with autism; they may have some relevance for those with documented sensory challenges); and 3) The effective treatment of autism requires the use of evidence-based interventions for autism.



Description: Prior to highlighting the research on Ayres Sensory Integration®, we wanted to provide the reader with a brief overview of how the broader framework of Sensory Integration Theory intersects with autism treatment. It is common for individuals with autism to experience atypical responses to sensory experiences in regards to touch, sound, or smell. Interventions that are based on sensory integration theories are founded on the notion that these responses are due to difficulties modulating sensory information (Whitney, 2018).

While sensory processing disorder is not included in the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5), it is important to note that sensory sensitivities are recognized within other categorization systems. For instance, part of the diagnostic criteria for autism spectrum disorder does acknowledge difficulties processing sensory input. It lists “hyper or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment” as a possible component (Grapel, Cicchetti, & Volkmar, 2015, p. 69). These sensory needs often lead to the involvement of therapists utilizing sensory interventions.

Occupational therapists (OTs) utilize various frames of reference guided by theories and science. Frames of reference integrate one or more theories and provide an outline that therapists use during assessments and when providing interventions. One theory that is more specific to OT professionals is sensory integration. OTs utilize this frame of reference to improve sensory integration as a means to improve participation in daily occupations (Whitney, 2018).

It's important to understand the history of sensory integration theory and how it developed, in order to have a better understanding of its efficacy. Jean Ayres established sensory integration theory in the 1950s. Sensory processing refers to how the nervous system interprets the senses and turns them into motor and behavioral responses. Adaptive behavior, according to sensory integration theory, seems to be dependent on how the individual perceives and processes sensations (Schoen, Miller, & Nielsen, 2014). For example, sensitivity to sensory input may make toothbrushing difficult to tolerate.

Since Ayres' initial findings, there have been many publications which have contributed to the development and refinement of sensory integration theory (Mulligan, 2002). In addition to Ayres Sensory Integration® (ASI®), additional models have emerged that have expanded on sensory integration theory including Miller's Sensory therapies and Research (STAR) Framework, and Dunn's Model of Sensory Processing. From this, additional variations in terminology have been utilized and cited within the literature. Furthermore, disciplines outside of the OT profession (i.e., neuroscience, behavioral science) have also utilized varying terminology when referring to sensory integration theory and the intervention techniques that have become associated with it. Even more so, Bodison and colleagues (2019) discussed that research has included the use of the term sensory integration even when the interventions only use some of the elements of sensory integration theory (i.e., sensory-based interventions such as weighted vests, sensory diets, Wilbarger Protocol/brushing, etc.), adding to the confusion over terminology. To be clear, this review is referring to ASI only, and focuses on literature examining ASI®.

As mentioned above, the focus of this treatment summary is to take a look at one intervention. The Baker/Ayres Trust trademarked the term Ayres Sensory Integration® (Smith Roley, et al., 2007) to distinguish ASI® from other sensory interventions (Parham et al., 2007). Because some researchers have strayed from strict adherence to ASI® throughout its history, consumers should know what true ASI® is. ASI® is performed within a clinic setting through a series of increasingly intensive sessions. In treatment, the client participates in individualized activities that aim to improve deficits within the individual's sensory integration functioning (Schoen, Miller, & Nielsen, 2014). For example, if through evaluation, it was identified that the individual had difficulties in the area of vestibular perception,

a therapist may utilize a swing to facilitate activities that would encourage active play, based on the client's preferences. The therapist may contrive opportunities to stop and start the swing and encourage rotations fostering senses of vestibular perception. It should be noted that the specific activities the client engages in (i.e. the swing) is not the primary intervention per se, but rather, the primary intervention is the individualized sensory-motor experience that the activity provides (i.e. vestibular input). The activity provides an experience that targets the identified underlying sensory integration dysfunction (Schaaf & Mailloux, 2015).

The premise is that internal neurophysiological processes are modified, and then observable changes should occur in how the individual responds to sensory input and engages in functional behavior (Schoen, Miller, & Nielsen, 2014). Through engagement of tailored sensory-motor activities, an individual would improve in their ability to participate in home, school, and community activities (Schaaf & Mailloux, 2015). While advanced training in ASI® is not required, most occupational therapists assessing and treating children with sensory integration difficulties have received specialized training and mentoring in ASI® theory including evaluation and intervention techniques (AOTA, 2018).

At one time, the most intensive and well-known certification in sensory integration was the University of Southern California/Western Psychological Services® Sensory Integration and Praxis Test (USC/WPS SIPT) certification. Upon completion of this certification, one would also possess credentials to administer the SIPT. In 2015, this certification was phased out. Currently, USC provides the Sensory Integration Continuing Education Certificate Program. Upon completion, one is entered into a database verifying this certification. While the program is primarily designated to OTs, speech therapists and physical therapists may be certified as well. One can identify a Sensory Integration (SI)-certified therapist on USC's database through their website. Two additional certification programs include the Collaborative for Leadership in Ayres Sensory Integration® (CLASI), and STAR Institute: Intensive Mentorship Programs. Outside of ASI®, as noted above, additional research has expanded on Ayres' work and sensory integration theory building on to the available data on its effectiveness (e.g., Bodison et al., 2019).

Research Summary: The research on sensory integration theory, and the interventions that have emerged from it, is limited and the outcomes have been mixed. Some systematic reviews of the literature on sensory integration therapy have concluded that there is insufficient evidence to support the efficacy of this treatment, including American Academy of Pediatrics (2012), Lang and colleagues (2012), and the National Autism Center (2015; 2009). It is important to note, however, that while the National Autism Center has not yet published their third phase of classifications, they have published their research review focusing on ASI®. Notably, based on this systematic review completed by Hume and colleagues (2021), the classification of ASI® has changed to evidence based. In general, while there is not yet full consensus, more data are emerging on the benefits of ASI®. The remainder of this research summary is focused specifically on the literature for ASI®.

Watling and Hauer (2015) completed a systematic review specific for ASI®. They used the hierarchy of evidence, which groups research into four levels. Level I, the highest level of evidence, consists of evidence obtained from properly designed and relevant randomized controlled trials or a systematic review of such trials with consistent results. From this, Watling and Hauer found some evidence supporting ASI®. This was based on three Level I studies (Pfeiffer et al., 2011; Piravej et al., 2009; Schaaf et al., 2013), which demonstrated positive and meaningful effects on individualized goals. As noted above, some published research findings were misconstrued, and were not truly Jean Ayres' Sensory Integration® (ASI®).

Schaaf and colleagues (2018) discussed the limitations of previous studies, specifically those investigating using ASI® with children with autism. Some studies lacked replicable intervention protocols, while other studies presented interventions that did not stay true to the core principles of ASI®. These inconsistencies in how the term is used and in how the research is described make it difficult to assess the literature as a whole. Furthermore, other studies demonstrated a lack of thorough assessment of sensory – motor factors with their participants, which might eliminate the overall need for ASI® treatment. Schoen and colleagues (2019) also note how many studies do not provide replicable descriptions or manuals in order to ensure fidelity. Additionally, current research studies have a wide range of outcome measures which makes it difficult to accurately depict findings in a systematic review (Schoen, et al., 2019). Therefore, questions about how the treatment was delivered, how data were collected, or what 'mastery' meant for these participants, all continue to go unanswered.

More recently however, there have been more studies supporting ASI®. Schoen and colleagues (2019) evaluated the effectiveness of ASI® intervention for children with autism by examining published research from 2006 to 2017 using the Council for Exceptional Children (CEC) Standards for Evidence-Based Practices in Special Education. Three studies met these criteria: Iwanaga et al. (2014), Pfeiffer et al. (2011), and Schaaf et al. (2014). These studies used manualized approaches, as well as adhering to the ASI® core principles. According to Schoen and colleagues (2019), based on CEC guidelines, ASI® intervention does meet the criteria for an evidence-based practice for 4–12-year-old children with autism and whose IQs are above 65.

Furthermore, Hume and colleagues (2021) recently completed a review of evidence-based practices for individuals with autism. This is their third review in which they have included interventions which were previously omitted for lack of evidence.

Hume et al. (2021), now categorizes ASI® as an evidence-based practice for autism treatment. This re-categorization was based on three randomized group design studies: Kashefimehr, Kayihan, & Huri (2018), Pfeiffer et al. (2011), and Schaaf et al. (2014). It is important to note that Hume and colleagues specifically refer to Jean Ayres classical Sensory Integration (currently known as ASI®), and not any other intervention derived from sensory integration theory.

Recommendations: In general, if sensory interventions are implemented, they should only be utilized for individuals with documented difficulties with sensory processing as determined through evaluation results, and not based solely on an individual's diagnosis of autism (AOTA, 2018). Overall, there is currently limited reported evidence for the effectiveness of interventions based on sensory integration theory as a whole; however, more recently, the data specifically on ASI® are encouraging, albeit still preliminary.

Consumers should be aware of the training and professional experience and credentials possessed by the therapist. Schoen and colleagues (2019) stress the importance of therapists adhering to the core principles and treatment elements when providing ASI® intervention. Future researchers should ensure intervention is true to ASI® principles and procedures are manualized to ensure fidelity; that is, that procedures are carried out as designed. It is important for consumers to recognize that not all occupational therapists have a scope of practice that includes ASI®.

While more research continues to be published, the majority of current research studies lack clear replicable protocols, as well as a lack of clarity on which model/intervention is truly being implemented. There is a need for more examination of the effectiveness of sensory interventions in regards to enduring outcomes and generalization with a broad array of functional skills. Bodison and Parham (2018) also noted that interventions with limited or no research evidence should only be used after initially considering interventions with stronger evidence. Additional safeguards are recommended, and regular monitoring is imperative. A means to measure effects must be in place to determine if the intervention is benefiting the child, as well as to identify any potential unwanted effects. The American Academy of Pediatrics also suggests setting a time limit to observe progress, so that the intervention can be done on a trial basis and discontinued if ineffective (AAP, 2012).

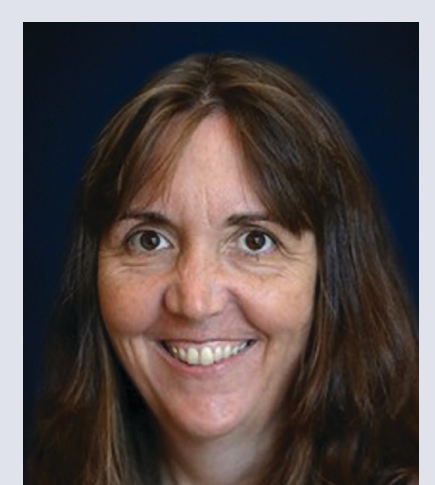
Families considering utilizing intervention derived from sensory integration theory should carefully explore data for the specific model/intervention being recommended. Additionally, if a procedure is implemented, systematic data should be collected and used to decide on continuance or discontinuation for that particular individual. Resources are limited for every family, and resources allocated to ineffective intervention potentially take away from effective treatment. Families must make judicious decisions about which interventions to pursue.

It is important for researchers to continue to study the impact of specific sensory interventions and publish work to add to the database for these procedures. Furthermore, researchers should be cautious, and ensure terminology is accurately represented, within their profession as well as across disciplines. It is important for researchers to examine the characteristics of individual learners who might benefit from particular interventions, to further guide matching of interventions to individuals. Ultimately, the mechanism for improvement must also be identified; for example, improvement may stem from indirect sources and not from the interventions themselves. This has implications for any further assessments of utility.

The information that is being available about the effectiveness of ASI® is helping to clarify which types of sensory interventions may have merit for individuals with sensory challenges. It is important to note that ANY potential positive impact would be on the sensory issues that sometimes present comorbidly with autism. As such, it is not an autism intervention and does not address core deficits or fundamental learning needs of individuals with autism. Any potential merit should be considered in light of these two points: ASI addresses sensory issues (not autism per se) and ASI does not mitigate the fundamental, defining features of autism. It may help with sensory challenges; evidence-based interventions for autism will always still be the foundational approach to treatment. It will be important to see the further development of additional research on interventions derived from sensory integration theory.



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