

Letter to the Editor: Sensory Integration and Autistic Spectrum Disorder



Greg Kelly^{1*} 

1. PhD in Life and Health Sciences, Retired Reader in Teaching and Learning and Course Director for MSc in Sensory Integration.



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Dear Editor

The theory and practice of sensory integration were developed in the late 1960s by an occupational therapist and psychologist, Dr. A. Jean Ayres [1]. Also, known as sensory processing, it is “the neurological process that organizes sensation from one’s own body and from the environment and makes it possible to use the body effectively within the environment” [1].

Sensory processing refers to the way, in which the nervous system receives and responds to information that comes in through the senses and translates them into motor responses. Sensory Processing Disorder (SPD), previously described by Ayres as sensory integration dysfunction, is a condition, in which multisensory input is not adequately processed; thus, it does not provide appropriate responses to the demands of the environment. Individuals with SPD are over- or under-responsive to their environment and this can cause challenges in their everyday life [2].

SPD involves the registration, modulation, and discrimination of the sensations received through the sensory systems that enable a person to respond appropriately to their environment in a purposeful and adaptive manner. In addition to the traditional five senses, the sensory systems involved in sensory integration include the

proprioceptive (joint position), vestibular (balance and movement), and interoceptive (within the body) sensory systems. It is the successful integration of these sensory inputs that enable the development of the skills that are needed to effectively participate in a range of everyday activities [2].

However, sometimes difficulties occur with receiving or processing sensory information from inside the body and from the outside environment. These may lead to difficulties at school or with activities of everyday life. Sensory integration difficulties (also known as sensory processing difficulties or SPD) can occur in combination with Autistic Spectrum Disorders (ASD). ASD is a neurological developmental disorder typically characterized by impairment in social interaction and communication and restricted or repetitive patterns of behavior, interests, or activities [3]. It is estimated that over 90% of those diagnosed with ASD have symptoms of sensory abnormalities, including both hyper- and hypo-reactivity [4]. Ayres observed hyper- and hypo-responses to sensory stimuli in individuals with ASD remarking that they demonstrated problems in registration, modulation, and motivation [5]. Ayres and Tickle found that individuals with ASD with hyper-reactivity (a disorder of modulation) had better outcomes than those who were hypo-reactive [6]. They suggested that children who registered sensory input responded better to intervention than those who did not. Although Ayres did not specifically identify

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*** Corresponding Author:**

Greg Kelly, PhD.

Address: PhD in Life and Health Sciences, Retired Reader in Teaching and Learning and Course Director for MSc in Sensory Integration.

Tel: +44 (780) 1842333

E-mail: gpkelly@nthworld.com

the neural structures underlying these disturbances, she implicated the limbic, vestibular, and proprioceptive systems and theorized that disruptions in the limbic system might also lead to a lack of motivation in ASD. Hyper- and hypo-sensory reactivity have been included as diagnostic criteria of ASD in the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5) [3]. A child is believed to have ASD if he meets the three main characteristics: 1) a speech disorder, 2) sensory integration dysfunction, and 3) stereotypical behavior. Current neuroscience research supports Ayres' predictions of impairments of registration and modulation of sensory processing in ASD. There is also some evidence for her theory indicating that sensory-motor impairment in ASD is related to brainstem structures [7]. Kashefimehr et al. found that poor sensory processing interfered with the functional movements required by children with ASD for their daily occupational performances [8].

Some interventions based on the work of Ayres have been used to treat ASD, including Sensory-Based Interventions (SBIs) and Ayres Sensory Integration® (ASI®). SBIs are typically sensory strategies applied by clinicians who practice OT using an OT-SI frame of reference [2] to children to regulate their reactivity. However, they are not consistent with the core principles of ASI® as described by Ayres, such as actively engaging the child, [9] and operationalized in the Ayres Sensory Integration Fidelity Measure (ASIFM) [10].

In contrast, they are therapist or adult-led, based in the child's home, school, or community environments and tend to be passively applied in the same way to all children [11]. Furthermore, they may provide either a single sensory or multisensory stimulation, including environmental modifications, such as noise-canceling headphones to moderate unpleasant auditory input experienced by children with ASD [12]. While some SBIs may be effective in reducing challenging behaviors in children with ASD, when using tactile input, such as massage [12], most other SBIs used by clinicians are not supported by the literature, including the use of weighted vests or compression garments. Further research is needed to evaluate the effectiveness of such interventions.

ASI® includes the theory of SI, assessment methods used to measure SI, and a core set of essential intervention constructs utilized to intervene with individuals who have difficulty processing sensory input. It is a clinic-based approach that concentrates on the therapist-child relationship using play-based sensory-motor activities to improve sensory processing and integration [13] and is one of the most often requested and frequently used in-

terventions in ASD. Literature suggests that the intervention should be used by a trained practitioner and should include a holistic intervention rather than isolated strategies [14]. A recent systematic review of studies providing ASI® therapy to 4-12-year-old children with ASD suggests that it is an evidence-based practice according to the criteria of the Council for Exceptional Children [15]. Furthermore, Steinbrenner et al. published a systematic review of literature related to interventions for individuals with ASD [16]. This updated report recognizes SI therapy, specifically ASI®, as an evidence-based practice.

In conclusion, there is much evidence to support the theory that the majority of individuals with ASD also have SPD. However, while there is some evidence that some SBIs might reduce challenging behaviors in children with ASD, the evidence supporting the effectiveness of SBIs, in general, is limited. More promising are recent studies, using ASI® to improve sensory processing and integration in individuals with ASD, which meet the criteria for evidence-based practice. Further research is needed. In the United Kingdom, a large-scale, multi-site, randomized controlled trial of SI therapy (SenITA) for sensory processing difficulties in children with ASD, sponsored by Cardiff University and funded by the National Institute for Health Research, is due to publish its results early next year.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

The author contributed to preparing all parts of the research.

Conflict of interest

The author declared no conflict of interests.

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