RESEARCH PAPER | Medical Science | Volume : 6 | Issue : 6 | June 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Endorsement: Ayres Sensory Integration® for Attention Deficit and Hyperactivity Disorder

KEYWORDS

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ABSTRACT *Attention Deficit and Hyperactivity Disorder (ADHD) is a neuro developmental disorder that affects children as well as adults throughout the life span. There is abundant literature to justify the use of many therapies. However, there is paucity of literature related to justify the use of Ayres Sensory Integration Therapy for children with a diagnosis of ADHD.*

Introduction to Sensory Integration
Anna Jean Ayers defined Sensory Integration as "the organization of sensation by the brain for use in everyday life".(1) Many terms have multiple meanings, such as *sensory integration* as a theory and frame of reference, and as a process related to multimodal processing that supports the formation and retrieval of multisensory perceptions in the central nervous system.

Sensory processing is a broad term used to describe the way in which nervous system detects, transduce, and transmit the sensation. *Sensory processing deficits,* therefore, describes the any imperfections in the above-mentioned process. Sensory Processing disorders are Sensory Modulation Disorder[1] (SMD), Sensory Discrimination Disorder (SDD) and Sensory Based Motor Disorder. Sensory Modulation disorder can exemplify as Sensory Over Responsivity, sensory under responsivity or sensory craving. Dyspraxia and postural disorder represent for sensory-based motor disorder. SDD can be present in the visual system, proprioceptive system or other sensory systems.

The identification of sensory processing challenges in children is important because the challenges can affect their behavior, learning, and the way they negotiate the world. Symptoms may be difficult to assess. They are present alone or embedded within disorders, such as attention deficit/hyperactivity disorder (ADHD), autism spectrum disorder, or cognitive disorder. Left unrecognized and untreated, children are often mislabeled, mismanaged, and misunderstood.(2)

Ayres developed original Sensory Integration theory on the children with a diagnosis of learning disabilities. Other clinicians realized the utility of the theory for other clinical populations. They applied sensory integrative principles to various populations, including ADHD.

Studies are underway to elucidate the underlying mechanisms of the impairment of sensory processing disorder, to define the phenotypic characteristics of the SPD, to discriminate SPD from other developmental disorders like ADHD. The fact is that, often both can coexist.

Possible risk factors associated with SPD are Low birth weight (less than 2200 grams, Prematurity (less than 36 weeks gestation), Prenatal complications, Maternal stress, Maternal illness, Maternal use of medications, Delivery complications, Assisted delivery methods, Ethnic minority, Living with a single parent, Lower socioeconomic status and other.

Sensory Processing in children with ADHD
Diagnosis and assessment focuses on more obvious dysfunctions in children with ADHD. Research in the sensory processing problems in children with ADHD shows features of under- and over- sensory reactivity, Neurophysiological measures displayed greater abnormalities in sensory modulation[2] and greater risk for problems in sensory discrimination. (2) Children with ADHD vary significantly from children without disabilities in their sensory responsiveness on the Sensory Profile. (3) It is the fact that sensory modulation disorder is present is children with ADHD. Dr. Miller and its team using EEG technology and electro dermal response prove it empirically. (3)

A child with ADHD demonstrates significantly more sensory processing dysfunction for the total score and all seven subtests of the Sensory Processing Measure (SPM)[3] compared to the children without ADHD. There is an impairment sensory function in the areas of visual, auditory, tactile, proprioceptive, and vestibular processing in children with ADHD. Social participation, planning, and ideas (praxis) are also significantly impaired in children with ADHD compared with children without ADHD. Thus in addition to core sensory systems, there is a compromise of higher integrative sensory functions in children with ADHD.(4)

Children with ADHD have more difficulties in tactile processing. The level of tactile defensiveness in females with ADHD is higher than that of males with ADHD. Many children with ADHD have poor balance and coordination. The sensory inputs, the sensory integration, and/or the inhibition of excessive movement are impaired in ADHD children, which result in the balance dysfunction(5). Please note that ADHD subtypes are not distinct disorders with regard to sensory processing problems. (6)

We can broadly classify the sensory processing issues in the children with a diagnosis of ADHD as Sensory Modulation Disorder (SMD), Dyspraxia and Visual Perception problems.

Visual Perception
Visual perception is an information-processing task involving the reception, organization, and assimilation of visual

Volume : 6 | Issue : 6 | June 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

information in the central nervous system. If the information-processing centres of the brain do not run well, incomplete visual perception is the result. Professionals might easily overlook visual perception problems. Without a visual perception assessment perceiving how they process visual information in their central nervous system, it is difficult to understand and help their daily activities such as performance in school. There is an influence of sensory processing on visual perception in children with ADHD. Different visual perceptions do exist between children with ADHD with and without SPD. Also, sensory processing, especially vestibular and proprioceptive processing, is related to the visual perception among children with ADHD. (7)

Several studies have confirmed hyper reactivity to sensory stimuli in children with ADHD through parent-report and physiological testing, and they showed greater reactivity to sensory stimuli, with larger initial reactions and subsequent lack of habituation, which is a natural tendency to diminish the distraction created by incoming sensory information.

In addition, children with ADHD often suffer visual hypersensitivity, diminished ability to process auditory or tactile input, and poor balance performance, equilibrium, postural control or coordination. For these reasons, overactive and impulsive symptoms in sensory processing disorder can be easily confused with (and often co-occur with) ADHD and children with ADHD often have comorbid sensory processing disorder. As a result, ADHD children who have sensory problems may also present different visual perception than children with ADHD who have typical sensory processing.

Children with ADHD often have vestibular or proprioceptive problems, which relates to visual perception affectation. Vestibular input and proprioception from eyes, neck and body, and visual information integrate in the brain stem. All of them form a "map" that is used to "navigate" the body successfully in space. This sensory process helps us to direct our eyes when we look at things. Disorganized vestibular and proprioceptive sensations prevent the eyes from moving smoothly, the child may suffer great discomfort when reading.

Therefore, children with ADHD and sensory processing disorder who suffer vestibular or proprioception process problems have deficits of focusing on an object to provide visual information, and of maintaining their posture to perform tabletop activities such as writing or reading. In addition, children whose major problem is in processing vestibular input may also score low in visual perception tests. Visual perceptual problems can affect many areas of activities of daily living, especially school performance, for children. Sensory processing which affects several factors related to visual perception is essential performing visual-processing tasks such as matching shapes or objects, or tasks containing unfamiliar stimuli or subtle discriminations. Children may have trouble in recognizing similar letters or words, and may reverse letters and numbers in spelling. They may not be able to interpret charts, maps, graphs, symbols, and diagrams. In addition, visual perceptual problems affect activities that require fine motor and gross motor skills, such as handwriting and left/right discrimination. Sensory Integration and Praxis Tests (SIPT)[4] Space Visualization test indicates that non-motor visual perception is a relative strength for them.(8)

Motor Planning

Developmental coordination disorder (dyspraxia) often co-occurs with ADHD. Patients with ADHD, particularly those with the inattentive type, more often exhibit DCD than their healthy peers. Children born with DCD depict a high prevalence of attention deficits, and that individuals with ADHD demonstrate motor coordination disabilities consistent with a diagnosis of DCD. There is strong association between DCD-fine motor and ADHD-inattentive subtypes. This common association led to the introduction of the concept of deficits in attention, motor control, and perception (DAMP)(9).

Sensory Modulation

In SMD, in addition to the dysfunctional sensory behaviors, emotional and attentional behaviors have been associated with the phenotype. Emotional responses associated with sensory avoiding are typically explosive, aggressive, and hostile behaviors or, when over-stimulated, anxious, clingy, or withdrawn behaviors. Emotional behaviors associated with sensation seeking include disregard for others, inability to regulate the intensity and duration of interactions with others, and mania. Abnormal attentional symptoms are part of the SMD phenotype. In sensory avoiders, there is a hyperfocused attention. In sensory seekers, there is inattention, poor impulse control, and hyperactivity. Clearly some of these behaviors overlap with behaviors described in the ADHD phenotype. Both conceptual and empirical evidence highlights the importance of examining symptoms of sensory dysfunction among children with ADHD. First, descriptions of ADHD and SMD include an inability to modulate systematically physiological, sensory, and affective responses that can have an effect on emotion regulation. Both ADHD and SMD include hyperactivity and impulsive behaviors. Second, a high percentage of children with attention disorders also have sensory processing disorders. Children diagnosed with ADHD are overly sensitive to sensory stimuli, and easily upset by environmental changes in infancy. Moreover, children with ADHD show behavioral evidence of difficulty modulating sensory responses and demonstrate over responsivity significantly more frequently than typically developing children. Hence, in children with ADHD, there is under diagnosis of Sensory problems. We need to recognize to treat these problems. (11)

Confirm the Intervention

We reasoned many symptoms of ADHD, in the areas of attention, activity, coordination, visual perception, balance and others from the Sensory Integration point of view. In this context, clinician should comprehensively assess of sensory processing in all the children with a diagnosis of ADHD. After the assessment and validation of the sensory processing disorder, intervention according to Ayres Sensory Integration® Therapy should begin along with other valid frames of reference.

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Volume : 6 | Issue : 6 | June 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

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