

Sensory Integration in Autism

Essay

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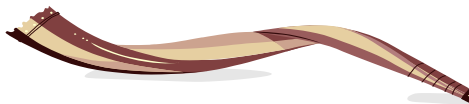
*First and foremost thanks to **Allah**, who is behind every success.*

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List of Abbreviations

Abb.	Mean
ASD	Autism spectrum disorder
BA	Brodmann's area
BDNF	Brain-derived neurotrophic factor
CNS	Central nervous system
DbH	Dopamine b-hydroxylase
DSM	Diagnostic and Statistical Manual of Mental Disorders
EEG	Electroencephalographic
ERP	Event related potentials
GABA	Gamma –Aminobutyric acid
ICD	International Statistical Classification of Diseases and Related Health Problems
MRI	Magnetic resonance imaging
MSI	Multisensory integration
<i>SID</i>	Sensory integration dysfunction
SIT	Sensory integration therapy
SPD	Sensory processing disorder
<i>SPECT</i>	Single-photon emission computed tomography
SSP	Short sensory profile
Wg	Weeks' gestation

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Introduction

Autism is a neurodevelopmental disorder with symptom onset prior to age 3. Although there is great variability in symptom severity and intellectual functioning, autism is defined by a triad of symptoms, that includes impairments in social functioning and interaction, impairments in communication, and restricted, repetitive, and stereotyped behaviors. Stereotyped behaviors typically associated with autism include hand-flapping, finger flicking, rocking, spinning and self-injury such as head-banging and hand biting (*DSM-IV-TR: American Psychiatric Association, 2000, World Health Organization 2007*). It is known that typical social and communicative functioning rests on a foundation of intersensory /multisensory processing skills that develop and emerge across the first 6 months of life and are further refined across development (*Bahrnick, 2010*). Attention, perception, learning, and interacting with the social world of people, language, and meaningful action depend on integrating dynamic, rapidly changing auditory, visual, tactile, and proprioceptive information from social and nonsocial events (*Bahrnick & Todd, 2012*).

By 3 years of age, children with autism show a variety of impairments in social and communicative functioning, including reduced eye contact and attention to social partners, poor joint attention skills, little imitation, poor facial recognition, and altered emotional responsiveness (*Volkmar et al., 2005*). Children with autism also show atypical patterns of attention and sensory processing. Compared to typically

developing children, children with autism are said to show sticky attention or over selectivity, including impairments in disengaging attention from competing stimulation to orient to new events, particularly to social events . They also show heightened attention to detail relative to global information (**Happé & Frith, 2006**), enhanced visual search, and certain enhancements in visual and auditory processing, including discrimination of surface properties such as pattern and feature information (**Bahrack & Todd, 2012**).

To be able to process sensory information is an important part of our daily function. Our understanding of life as humans is rooted in our sensory experiences. Data suggests that there are individual differences in sensory processing. Thus, how we experience life and how we interpret our world could conceivably vary depending on our individual and unique way of processing of sensory information (**Kern et al., 2007**).

For persons with significant sensory processing differences, the world may be viewed very differently, and in some cases, sensory experiences could be different to the point of being altered or confusing. Some researchers have suggested that there is a link between the sensory processing problems that a person with autism experiences and the difficulties in managing daily life (**Kern et al., 2007**).

Individuals with autism have been reported to process sensation differently from others. However, recent studies have provided evidence that these behaviors are multifunctional and are motivated by a desire to reduce anxiety, to gain attention or a desired object, or to escape (**Joosten & Bundy, 2010**).

In addition to emotional and behavioral problems, dysfunction in processing sensory information has been frequently reported in children with autism (**Tomchek & Dunn, 2007**). Sensory processing refers to reception, modulation, integration, and organization of sensory stimuli, including behavioral responses to sensory input. Sensory processing dysfunction is defined as difficulties in regulating and organizing the type and intensity of behavioral responses to sensory input to match environmental demands (**Miller et al., 2007**). Children with sensory processing dysfunction manifest unusual sensory responses such as over- or under-responsivity to sensory stimuli. The prevalence of Sensory Processing dysfunction for children with autism ranges from 42–95%, (**Tomchek & Dunn, 2007**). Some of the documented associated problems of sensory processing dysfunction include hyperactivity, distractibility, poor organizational skills, social and behavioral difficulties which often impair a child's ability to explore and interact with physical and social environment, and, thus successful participation in daily life (**Tseng et al., 2011**).

In addition to these readily apparent core symptoms, the temperament of children with autism often influences their social-emotional development and long-term adjustment (**Garon et al., 2009**). Children with autism have frequently been reported to have difficult temperament characteristics, such as high activity level, withdrawal responses to new stimuli, and low persistence (**Chaund et al., 2012**). The behaviors associated with sensory processing dysfunction paralleled the difficult temperament characteristics and affect not only the ability of the child to sustain engagement with people or in activities, but also interaction with environment,

and thus successful participation in daily life (*Tsenget al., 2011*).

Using the sensory processing, researchers have demonstrated that children, adolescents and adults with autism show a different profile in sensory processing compared to typically developing individuals as well as to individuals with a general developmental delay (*Reynolds et al., 2011*). *Kern et al. (2006, 2007)* investigated a sample spanning from toddlers to adults using the children's version of the sensory processing, showed that individuals with autism differed from community controls on all four sensory quadrants (Low Registration, Sensation Seeking, Sensory Sensitivity, Sensation Avoidance) (*Kern et al., 2007*) and in four sensory modalities (auditory, visual, oral, tactile) (*De la Marche et al., 2012*) in the absence of known peripheral dysfunction such as a visual or hearing loss (*Baranek, 2002*).

A study comparing sensory processing in children with autism to age-matched, typically developing controls reported that 95% of the sample with autism versus 16.8% of the controls demonstrated some degree of sensory processing difficulty (*Tomchek & Dunn, 2007*). Sensory responses have also been shown to fluctuate such that both hyper- and hypo-responsiveness to sensory stimuli can occur in the same individual (*Baranek et al., 2006*). Further, findings from other studies, which specifically compared the sensory processing patterns of individuals with autism or another pervasive developmental disorder (PDD) with controls, all revealed the presence of significantly different sensory processing profiles for individuals with autism/PDD. These findings suggest

that sensory processing dysfunction is a feature of autism (**Baker et al., 2008**).

Despite the fact that current diagnostic criteria do not consider sensory processing disturbance as a core deficit in the diagnosis of autism, individuals with autism may also appear to seek or avoid ordinary auditory, visual, tactile, and oral stimuli (**Ben-Sasson et al., 2009**). For example, individuals with autism may perseverate on objects that have a specific texture or visual pattern, may cover their ears when they hear a specific noise (e.g., car horn), or may not respond to stimuli that should elicit their attention (e.g., someone calling their name). These unusual behaviors are sometimes described as “sensory behaviors” (**Lang et al., 2012**).

Abnormal behaviors associated with autism are caused by a defect in the nervous system in which sensory stimuli are processed and integrated abnormally (**Schaaf & Miller, 2005**). Originally developed by Jean Ayres (1972), the classic sensory integration approach is based on the understanding that disruptions in neurological processing of sensory information interfere with the production of organized and purposeful behaviors that provide the foundation for learning and skill development. Sensory Integration Therapy is an extension of this hypothesis and further speculates that, given the nervous system's ability to change, providing specific forms of sensory stimulation in the appropriate dosage may improve the nervous system's ability to process sensory stimuli (**Lane et al., 2010**). Because vestibular, proprioceptive, and tactile sensations have powerful effects on the regulatory mechanisms of the nervous system, Ayres's sensory integration uses these sensations to facilitate

production of adaptive behavior. Ayres's sensory integration enhances nervous system processing of sensation to provide a stable foundation for the formulation and execution of appropriate behavior. Classic Ayres's sensory integration uses enhanced sensory experiences in the context of meaningful, self-directed activity to support a person's ability to function adaptively and meet the contextual demands of daily occupations (*Watling & Dietz, 2007*).

Ultimately, the improved nervous system may then result in reductions in inappropriate social behaviors and help in more efficient learning (*Lang et al., 2012*).

Aim of Work

1. Describe the pattern of sensory processing difficulties within autism.
2. Explore the relationship between sensory processing patterns and emotional, social, and behavioral responsiveness in individuals with autism.
3. Systematically identify, analyze, and summarize research involving the use of sensory integration therapy in the education and treatment of individuals with autism.
4. Determine if sensory integration therapy can be classified as a research-based or scientifically-based intervention for individuals with autism.
5. A review of this type may provide useful information to practitioners and agencies interested providing effective education/rehabilitation to individuals with autism.

Autism: Overview

What is Autism?

Autism Spectrum disorder (ASD) is a heterogeneous disorder with multiple causes and courses, a great range in the severity of symptoms, and several associated co-morbid disorders. Increasingly, researchers refer to 'the autisms' rather than a single autism phenotype. It would be surprising, therefore, if the neuropathology of ASD was identical across all affected individuals (*Tuchman et al., 2009*).

According to the Oxford Dictionary, the word Autism is derived from the Greek word autos that mean self. *Fraser (1981)* describes autistic children and mentions that many of them are moderately or severely intellectually retarded. Citing *Rutter (1978)*, he defines Autism as "a disorder evident before 30 months of age, in which there is a profound and general failure to develop normal social relationships, together with delayed, and deviant language development and the presence of ritualistic or compulsive phenomena" (*Cervantes, & Matson, 2015*).

Minshew & Williams (2007) describe ASD as "a medical disorder with neurobiological basis, most likely due to unusual connections within a child's brain". They remark that in the United States, 1 out of 110 children are autistic and argue that early recognition of ASD and intense interventions may help in the improvement of autistic child's developmental delays. They state that this disorder can be easily detected at age 3; this is probably so because most normal children are able to talk at this age. ASD can be detected earlier for the reason that at age 12 to

18 months almost all autistic children show a delay in eye contact, responsiveness and social smiling compared to normal children (*Rapin et al., 2008*).

ASD is a behaviorally defined developmental disorder characterized by social and communicative impairments and repetitive behaviors. The primary cause of ASD is as yet unknown. Explanatory hypotheses have been constructed at the genetic, neurobiological and neuropsychological levels but no individual hypothesis has yet stood up to rigorous evaluation. Given the developmental nature of these disorders, research following the maturation of very young children with autism is likely to provide crucial information. Unfortunately, thus far little research of this nature has been conducted. (*Dunbar et al., 2012*).

In contrast to other fields in medicine, for most psychiatric disorders there are still no biological, psychological or genetic markers to validate the diagnostic process. As a consequence, diagnostic classification systems were introduced, to enhance agreement on a specific psychiatric diagnosis among clinicians. Two of the most well-known and widely used classificatory systems are the Diagnostic and Statistical Manual of Mental Disorders (DSM) of the American Psychiatric Association and the International Statistical Classification of Diseases and Related Health Problems (ICD) of the World Health Organization (WHO) (*Carrington et al., 2015*).

ICD-10 Criteria:

Childhood ASD a type of pervasive developmental disorder that is defined by: **(a)** the presence of abnormal or impaired

development that is manifest before the age of three years, and **(b)** the characteristic type of abnormal functioning in all the three areas of psychopathology: **i.** Reciprocal social interaction, **ii.** Communication and, **iii.** Restricted, stereotyped, repetitive behavior. In addition to these specific diagnostic features, a range of other nonspecific problems are common, such as phobias, sleeping and eating disturbances, temper tantrums, and (self-directed) aggression (*Matson & Goldin, 2014*).

Diagnostic criteria for autism spectrum disorder (DSM-V):

- A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history:
 - 1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
 - 2. Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and non-verbal communication.
 - 3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in