

Is it sensory or social?

Determining the significance of Sensory Processing Disorder as a diagnosable disease by its relation to Autism Spectrum Disorder

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Abstract

Current statistics indicate that 1 in 68 children in the United States are diagnosed with autism spectrum disorder. Autism is a serious, lifelong, pervasive, neurological developmental disorder causing deficits in social interaction and communication. It is said that more than ninety percent of people with autism have atypical responses that are caused by common every day sensory stimuli. These reactions can be described as over responsive (an extreme sensitivity to the texture of clothing or food), under responsive (which may seem something like not being able to notice obstacles in their path), sensory seeking (chewing on various objects like shirt cuffs), or an inability to discriminate various types of sensory stimuli (not being able to differentiate auditory stimuli like *cat* or *cap*). The lack of published research related to individuals with symptoms of sensory processing disorder is an indicator of the importance of collecting data. A literature review of current research regarding both autism and sensory processing disorder discusses how the disorders interact and the biologically significant evidence that supports sensory processing disorder being defined as a separate neurological disorder. While atypical sensory responses are treated for those on the autism spectrum, others who do not qualify under the autism diagnosis are not eligible for therapy relating to sensory processing disorder, as there is not an accepted diagnosis. Establishing a paradigm and outlining diagnostic criteria and potential therapy is essential for providing services and therapies for those individuals living with sensory processing disorder.

Keywords: autism, sensory processing disorder

Introduction

Sensory processing disorder is characterized by an atypical response to sensory stimuli, as outlined above. There is not a standard diagnostic test for sensory processing disorder due to it often being found to have comorbidity with other neurological disorders. As a result, a specific diagnosis has not yet become generally accepted among therapists and professionals. There is treatment available for people on the autism spectrum, but those who do not qualify under an autism diagnosis are not eligible for therapy relating to sensory processing issues. Even though reliable diagnosis rates are not readily available, the number of parent groups devoted to sensory problems has more than tripled in the last few years, to 55 nationwide.¹ These groups strive to involve sensory processing disorder into becoming accepted, researched, and discussed in mainstream medicine. Therapists and researchers petitioned the American Psychiatric Association in hopes that sensory

processing disorder can be included in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*, which is the gold standard for diagnostic criteria. It still has not been accepted as a mental disorder, as many psychiatrists, pediatricians, and family doctors fear that sensory processing disorder could become overly diagnosed without proven research on treatment. This can be argued, as there is data readily available from children who fall under the autism diagnosis and are already receiving treatment for sensory processing disorder. This data can assess current services being provided to those individuals with sensory processing disorder who fall under the autism spectrum diagnosis, and assist in establishing treatment guidelines. Defining the differences between those on the autism spectrum and those with sensory processing disorder can establish a paradigm that will outline diagnostic criteria and create a subset of treatment which is essential for performing the appropriate research that allows for the proper services and therapies.

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¹ Carey, B. (2007, June 05). *The disorder is sensory; the diagnosis, elusive*. Retrieved from <http://www.nytimes.com/2007/06/05/health/psychology/05sens.html>

Discussion

The sensory system is the building block of the central nervous system. Lack of proper function can directly affect other systems and impede learning potential. Research that studies the biological markers in the central nervous system can begin to define the differences between sensory processing disorder and autism spectrum disorder. If we are able establish a model for the relationship sensory processing disorder has with autism spectrum disorder biologically, we can begin to understand how sensory processing disorder is exhibited behaviorally among children who do not exhibit autism symptoms (such as social, emotional, and communication deficits). Due to sensory processing disorder not being listed in the DSM-5, children with sensory processing deficits who do not meet the criteria for autism spectrum disorder are still widely understudied. The atypical reactions previously listed that are found in those with sensory processing disorder who fall under the autism diagnosis can vary among each individual person's behavioral response to their environment. These responses can make those with sensory processing disorder appear incapable of sitting still or listening, constantly complaining about the feeling of clothing, or not be able to hold a conversation or maintain a single train of thought in a restaurant due to background noise that they are unable to tune out. Without proper therapy for those not on the autism spectrum exhibiting sensory processing symptoms, common every day sensory stimuli may create discomfort in their environment and impede learning.

Results

Through my work, I have found a small amount of current published studies that have indicated that there is biologically significant evidence to support sensory processing disorder becoming a diagnosable neurological disorder. In 2013, the University of California San Francisco (UCSF) published a study that was "the first to find that boys affected with sensory processing disorder have quantifiable regional differences in brain structure when compared to typically developing boys".² Then in 2016, UCSF followed up this study and included females, stating that

² Leigh, S. (2016, January 26). *Brain's wiring connected to sensory processing disorder*. Retrieved from <https://www.ucsf.edu/news/2016/01/401461/brains-wiring-connected-sensory-processing-disorder>

³ Ibid

⁴ Arnett, A. B., Chang, Y., Harris, J., Hill, S. S., Marco, E. J., Mukherjee, P., & Owen, J. P. (2014, July 13). *Autism and sensory processing disorders: shared white matter disruption in sensory*

they "have found that boys and girls with sensory processing disorder (SPD) have altered pathways for brain connectivity when compared to typically developing children, and the difference predicts challenges with auditory and tactile processing."³ This research establishes that there is a biological basis for the disease and it has posed the question of how these differences compare to those associated with other neurodevelopmental disorders. In a study conducted by researchers at the University of Minnesota, children who exhibit atypical sensory behaviors to the same or greater degree as children with autism show impairment in "white matter microstructure, and that this white matter micro structural pathology correlates with atypical sensory behavior."⁴ This study uses diffusion tensor imaging (DTI) fiber tractography to show connectivity of specific white matter tracts in boys with autism and boys with sensory processing issues, relative to typically developing children. This research is significant because it includes studying the white matter microstructure (the area of the brain that affects learning, various brain functions, and what deals with the coordination and relay between different brain areas) and it indicates variations between the children with sensory processing and autism, supporting the theory that sensory processing disorder can be found among those without another formal neurodevelopment disorder diagnosis.

Translational impact

Practical applications of diagnosing and treating sensory processing disorder can be taken from Occupational Therapists who currently treat those under the diagnosis of the autism spectrum. The current standard is to provide a sensory integration diet, as outlined by sensory integration therapy. This is a series of activities that are specifically tailored to an individual's needs, which occurs by exposing them to various sensory stimuli in a repetitious, structured environment. The goal is to have the sensory system adapt to whatever stimuli are impeding their ability to appropriately respond.⁵ In addition, a functional behavior analysis can potentially be conducted by a Board-Certified Behavior Analyst, to find the purpose of the behaviors that are related to the sensory response.

pathways but divergent connectivity in social-emotional pathways. Retrieved from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103038>

⁵ Kelly, K. "*Sensory Diet*" *Treatment: What You Need to Know*. Retrieved from <https://www.understood.org/en/learning-attention-issues/treatments-approaches/therapies/sensory-diet-treatment-what-you-need-to-know>

Individuals with sensory processing disorder can also be given an opportunity to attend social skills classes if they have extreme atypical reactions that cause them to avoid social interaction due to the environment. Diagnostic criteria can also be formed from the current outlined criteria provided within the umbrella of the autism diagnosis, as well as additions that mean to satisfy all the variations in sensory response. The diagnostic criteria could potentially be outlined as:

- hyper- or hypo-reactivity to sensory input, the lack of sensory discrimination, or an unusual interest in sensory aspects of the environment
- can be described by three main variations: over responsive, under responsive, or sensory seeking
- all three can be displayed at one point of another or together depending on the stimuli, as well as lack sensory discrimination
- symptoms must be present in the early developmental period

Future research

During the summer of 2018, I will conduct a research experiment to find further support for the biological basis of sensory processing disorder. This experiment attempts to establish a paradigm that will assist in defining the differences between autism spectrum disorder and sensory processing disorder and determine the characteristics of sensory processing disorder behaviors while examining biological data. As it stands currently, we are attempting to receive data from an open field test regarding the social interaction and sensory response for a set of lab mice. These mice will then become space irradiated and we will be provided the dissected brains. Examination of any anatomical and physiological changes in various lobes or sections of the brain that are known to be related to autism and sensory processing disorder will be

discussed and recorded. A qPCR lab experiment will then be conducted to measure and record variations in chosen proteins. Other potential discussions will include sex, age, body weight, and long-term effects. Further research can hope to address whether those with sensory processing disorder avoid social interaction and certain forms of communication due to sensory stress.

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