The Autistic Child – More Than Meets the Eye

Sensory Processing Issues and Autism

Until recently, the sensory integration issues that plague many individuals on the autism spectrum have taken a back seat to the more commonly identified social and communication issues traditionally used to diagnose the disorder. In fact, the current Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association (DSM-IV-TR) states that the main areas of impairment in people with autism are communication, social interaction, repetitive motion, and restricted interests. Among other proposed changes to the definition of autism, the new edition of the DSM (DSM-V) due out in 2013, proposes to include sensory integration issues as part of the criteria for diagnosis, officially acknowledging the difficulties these individuals have processing information from the five senses. For individuals with autism who experience sensory integration issues, information is incorrectly processed by the brain, often causing distress, discomfort, and confusion. These sensory processing difficulties can be an underlying cause for some of the more commonly recognized behaviors often associated with autism, including avoiding eye contact and stimming behavior. When it comes specifically to perception and what the individual with autism sees, these issues can be a result of both ophthalmological and perceptual processing disorders.

How Many Are Affected?

In a study published in the Journal of Autism Developmental Disorders in 2012, the authors reported finding ophthalmologic pathology in 40% of patients with autism, leading them to conclude that “children with autism or a related disorder will frequently have an ophthalmologic abnormality.” However, this is not the whole story when it comes to what the individual with autism spectrum disorder (ASD) sees. While we take in visual information through the eyes, this information is broken down into millions of signals that have to be processed separately by independent pathways in the brain before being put back together again into the image we ultimately see.

Conservative estimates suggest that as many as 33% of individuals with ASD have brains that do not correctly process the visual information they receive. A survey conducted in 1994 by the Geneva Centre for Autism in Toronto, Canada, suggests these difficulties may be more common, finding that 81% of those on the autism spectrum reported distorted perception. The most common problems were difficulties with depth perception; distorted perception of size, shape,
and motion; seeing only small details and not the whole; and visual overstimulation. However, visual-perceptual processing difficulties are not unique to the autism community. They are experienced by as many as 50% of individuals with reading difficulties or dyslexia and can also plague individuals who have suffered traumatic brain injury, concussion and whiplash. Even a portion of the general population (many estimates suggesting 12-14%) is affected.

**What Does the World Look Like?**

Well-known adults on the autism spectrum such as Temple Grandin and Donna Williams have described what the world can look like for someone with autism who experiences visual-perceptual processing difficulties. In her book, *Nobody Nowhere*, Donna Williams says, “Colors and things and people would fly, doors would get kicked in and sometimes faces would, too. But it was never whole people, only their pieces.” This is a glimpse into the often fragmented and frightening world in which many with ASD live.

**What Causes the Problem?**

In the visual cortex of the brain, information about shape, movement and color is determined by magnocellular, parvocellular, and koniocellular neurons in the lateral geniculate nucleus. This information is then sent to the primary visual cortex. Theories to explain visual processing difficulties come out of the literature on reading disabilities. There are presently two theories to explain visual processing difficulties: the transient visual subsystem deficit and the cortical hyperexcitability theories. The first suggests that there are issues with the magnocellular pathway that brings information to the primary visual cortex, conveying information about motion. The second proposes that there is a lack of inhibition in the orientation columns in the visual cortex, and this lack of inhibition causes excitation to spread throughout the visual system resulting in difficulty in processing visual information. In either case, it is suggested that color can improve perceptual processing for individuals experiencing difficulties. In 2012, both *ISRN Neurology* and *Autism Science Digest: The Journal of AutismOne* published articles discussing the positive benefits of color (in either the form of colored lenses or colored overlays) to improve the difficulties associated with perceptual processing difficulties many individuals with autism experience.

**How Does Color Help?**

The colored lenses modify the speed at which visual information reaches the brain and allows the brain to correctly process the information. For individuals with autism, this often means transforming a fragmented environment into a cohesive whole. For some, it can take once distorted and scary faces and make them clear, cohesive and friendly. This change in the way faces look can have a dramatic impact on the individual with autism’s willingness to make eye-contact. And because behaviors such as stimming are often performed in an effort to create calm in a chaotic environment, when the visual environment calms down, these behaviors can calm down as well. In her book, *Like Color to the Blind*, Donna Williams describes the difference that colored lenses made in how her world looked, “Before I saw cracked children, cracked steps, print and writing…However, the person, I did not see whole. I saw hair, I saw, eyes, nose, mouth, child…not a face. Now I see the whole face, the whole person…I could now perceive for
the first time as a whole…I finally could do more than struggle to image an un-fragmented whole.”

Individuals with autism who also suffer from perceptual processing difficulties that may be helped by colored lenses may have difficulties with any of the following:

1) **Sensory Overload** caused by bright lights, fluorescent lights, and sunlight. Lighting is stressful; and this results in behaviors to filter out the light, poor eye contact, and physical symptoms such as anxiety or headaches.

2) **Environmental Distortions** where the individual sees the world in a distorted fashion. Objects are blurry, moving, changing, and can disappear. People may look frightening, stairs may look like a slide without steps, and walls and floors may swing and sway. Misperceptions can cause difficulties with sustained attention, eye contact, gross and small motor coordination, ability to interpret facial expressions, and poor social skills.

3) **Print Distortions** make learning or reading difficult. The individual may have good or even advanced reading skills but has trouble with reading comprehension or experiences strain and fatigue when reading or doing other activities. Tracking or building breaks into reading may be a problem.

**References**


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Sandra Tosta, PhD, holds a Bachelor of Science in Human Development from Cornell University and a PhD in Educational Psychology from the University of California, Los Angeles. She has expertise in both quantitative and qualitative primary research in both corporate and academic settings. As a senior researcher at the Hypothesis Group for nearly a decade, she focused on research related to children and education. She has authored a variety of papers on related topics and contributed a chapter on parenting in a multimedia society in Marc Bornstein’s *Handbook of Parenting: Volume 5*. She currently serves as head of research for the Perceptual Development Corporation at the [Irlen Institute International Headquarters](http://www.irlen.com).