

Vision and Autism

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Introduction

Look Me in the Eye is the title of a recent best-selling memoir of John Robison; the subtitle is: *My Life with Asperger's*. The book jacket illustration shows a small boy with his eyes squeezed tightly shut. The prologue begins: "Look me in the eye, young man," and the author proceeds to explain how his inability to do so was consistently interpreted to mean that he "was just no good". He then admits that to this day he "finds visual input to be distracting".

This article is designed to provide a description of this and other visual characteristics common in individuals on the autism spectrum and present methods of evaluation and treatment of these visual differences. In addition, I've included a list of professional, lay and fiction books for further reading.

What visual behaviors are seen in this population?

Avoidance of eye contact isn't the only common visual behavior among those on the autism spectrum. So are:

- seeking out visual input like flashing or rotating lights
- flicking hands to watch them
- looking at something, then looking away before picking it up
- peering out of the sides of the eyes
- using peripheral rather than central vision for many activities

A paper on Vision and Autism published by the College of Optometrists in Vision Development (10/97) (the organization which certifies optometrists who provide vision therapy) states it succinctly:

"Vision problems are very common in individuals with autism."

What is meant by the term "vision"?

This statement above leads us to a definition of the word "vision". My current favorite working definition is "the deriving of meaning and the directing of action stimulated by light". Mull over this definition and you'll see that determining whether or not a child can see 20/20 doesn't barely scratches the surface of exploring a child's experience of "vision". For this reason, although standard eye testing is important to treat or rule out diseases of the eye and the need for glasses to see clearly, it does not evaluate the ability of the child to use vision in learning and movement.

Who evaluates the deriving of meaning and directing of action, and what are the factors which are examined?

The field which is variously known as behavioral or developmental optometry is designed to evaluate the breadth of this visual spectrum. One way to explain some of the factors which are examined over and above the 20/20 criteria is use the mnemonic device of 7 F's:

- Following
- Fixation
- Focus
- Fusion
- Flexibility
- Field
- Fatigue

Let's go through the definitions of each of these important visual skills: following refers to actively moving both eyes in a smooth and coordinated movement to **follow** a moving object. When **following** is tested in the exam room it is called tracking or pursuits. There is another type of self-directed smooth eye movement which occurs when a child tries to navigate a maze, or connect the dots; this, too requires consistent, bilateral control of the eyes.

Fixation refers to the ability to hold both eyes centrally on an object. When reading, an individual must be able to fixate the word long enough to "derive meaning".

Focus is necessary to see something clearly; when it is blurry, we say it is out of focus; the brain doesn't like blur; it definitely limits our abilities to derive meaning and direct action.

Fusion is a technical term which means that both eyes are aimed at the same place in space, and that the two images are melded in the brain into one, hopefully 3-D object. If an individual has poor or no fusion, s/he may see two objects, or the world may appear flat and without contour.

Flexibility of the visual system allows one to quickly and easily look back and forth in space and see clearly and singly.

Field is a category that ensures that the person can see the full breadth of both eyes' limits: up, down, right and left. There are organic, usually permanent field losses, but there can also be attentional, variable loss of visual field. For instance, when we are frightened, we tend to attend only to what is right in front of us, limiting our field to a tunnel area. Using all of our visual field helps us to know where we are in space, and also where other people and objects are; it really helps us to direct our actions.

Fatigue is a factor that can limit visual performance in many areas; if an individual with autism is very concentrated in using peripheral vision, and ignoring the central area, which is the opposite of how most people use their visual system, s/he may tire very quickly, and not want to do central visual tasks.

Now we've defined vision and how to evaluate it; what about autism?

The visual system is usually the dominant form of learning and experience in the world. John Streff, an articulate behavioral optometrist once said: "When vision is working well, it guides and leads; when it is not, it interferes." Let's go back to the statement made by the COVD: "Vision problems are very common in individuals with autism". If this is the case, visual problems will interfere with a child's learning, sports, and daily life.

Many of the distinct visual symptoms referred to above occur for one of two reasons: either because "people with autism use visual information inefficiently" or due to the fact that they "have hyper-sensitive vision and react by being visually defensive" (think analogous to tactile defensiveness). (Rose & Torgerson, p. 270 JOVD, Volume 24, Winter 1994)

What causes the visual problems related to autism?

The visual symptoms of autism can be explained as poor integration between the separate but equally necessary visual processing pathways: **focal** and **ambient**.

The focal visual pathway gives information on what is being observed; the ambient one lets us know where we are, and where the object is. Although it is an oversimplification, you could say that the focal system is the lead player in the deriving of meaning, while the ambient system takes the lead in directing action. Those who work with individuals with autism, like Dr. Melvin Kaplan who wrote the book *Seeing Through New Eyes: Changing the Lives of Children with Autism, Asperger Syndrome and other Developmental Disabilities through Vision Therapy*, explain that the vision problems this population experiences

"stem from deficits in the ambient vision processes involved in peripheral vision." Autistic and other disabled children often have perfectly normal focal vision—the central vision that allows us to identify objects when we look straight at them.... The problem lies instead with ambient vision, which involves the entire field of vision and tells us about the location of objects in space.." (p.17 Kaplan)

He goes on to explain: "Children with autism tend to look at other people from the corners of their eyes, not because they are aloof, but because monocular vision makes more sense than trying to interpret data from the two eyes that aren't working together. In addition, they may find it impossible to look at other people while conversing, because they can't process visual and auditory information at the same time."

John Robison, the author of the book cited in the Introduction, and Temple Grandin, a well-known author and designer of animal facilities have both mentioned this fact in their books.

Dr. Kaplan relates balance problems, toe-walking and difficulty interpreting space and time to a disordered ambient visual system. He and Drs. Rose and Torgerson, who wrote an excellent comprehensive article entitled: "A Behavioral Approach to Vision and Autism", concur on the two tools to be used to re-educate an individual to organize space and gain a stable periphery:

1. the introduction of yoked prism glasses
2. participation in vision therapy

What are Yoked Prism Glasses and what do they do?

Yoked prisms are lenses which are used to move the world in one direction—up, down, right or left. The use of these lenses disrupts the ambient system and encourages reorganization and integration of ambient and focal vision. At times the lenses are prescribed for full or part-time wear outside of the office. Sometimes they are used as part of in-office vision therapy.

What is Vision Therapy?

Optometric Vision Therapy is an individualized treatment regimen prescribed for a patient in order to:

- Provide medically necessary treatment for diagnosed visual dysfunctions; Prevent the development of visual problems; or
- Enhance visual performance to meet defined needs of the patient.

Optometric Vision Therapy is appropriate treatment for visual conditions which include, but are not limited to:

- Strabismic and non-strabismic binocular dysfunctions;
- Ambylopia;
- Accommodative dysfunctions;
- Ocular motor dysfunctions;
- Visual motor disorders; and
- Visual perceptual (visual information processing) disorders.

The systematic use of lenses, prisms, filters, occlusion and other appropriate materials, modalities, equipment and procedures is integral to optometric Vision Therapy. The goals of the prescribed treatment regimen are to alleviate the signs and symptoms, achieve desired visual outcomes, meet the patient's needs and improve the patient's quality of life.

Approved by the American Optometric Association

Board of Trustees

November 1996

What kinds of vision therapy activities do you find that children with autism respond to best?

In working in the office with children on this spectrum, I endeavor to make the activities fun and interesting, and not invasive. As previously stated, lights and motion can be good attention-getters and can be used to direct focal involvement. But one tool which I've found to be fascinating and fun is the use of a mirror. I find it ironic considering the "mirror neuron theory" that doing activities while looking into a mirror is usually much more acceptable for a child than looking directly at an activity. The mirror allows one to see things at twice the distance, and puts the individual and the room into context. Procedures can be done while watching oneself perform in the mirror, or the mirror can be used as part of the activity—such as drawing glasses around your own eyes and a mustache under your nose using water-based markers right on the mirror surface. Looking at the surface of the mirror, and then into the mirror can also allow one to experience binocularity and fusion. This description can hardly begin to describe the possibilities of enhancing, stabilizing and expanding one's visual world.

Conclusion

This article is but a brief introduction to the ways in which a behavioral optometric evaluation can identify and treat some of the visual symptoms of autism. Eliminating or ameliorating some of the visual symptoms associated with autism can be a definitive step toward the stated vision therapy goal of "improving the patient's quality of life."

Bibliography and Books I've read and learned from:

Unwritten Rules of Social Relationships: Decoding Social Mysteries Through the Unique Perspectives of Autism by Temple Grandin and Sean Barron Future Horizons Arlington, TX, 2005

Literature from my profession:

"Autism Spectrum Disorders: A Primer for the Optometrist" by Marc Taub, O.D. and Robyn Russell, B.S. in *Review of Optometry*, May 15, 2007, p. 82-91

"A Behavioral Approach to Vision and Autism" by Marcy Rose, O.D., FCOVD and Nancy G. Torgerson, O.D., FCOVD *Journal of Optometric Vision Development*, Volume 25, Winter 1994 p. 269-275.

Seeing through new eyes: Changing the lives of children with Autism, Asperger Syndrome and other developmental disabilities through vision therapy Melvin Kaplan Jessica Kingsley Publishers, Philadelphia, Pa, 2006

Autism Spectrum Disorders and Cortical Visual Impairment: Two Worlds on Parallel Courses, Part I and II, *AER/Denver*, July 2000, (from the Internet)

Memoir: *Look Me in the Eye: My Life with Asperger's* by John Robison

My favorite fiction: *The Curious Incident of the Dog in the Night-time* by Mark Haddon and *Speed of Dark* by Elizabeth Moon

Lay Press Articles: "Growing Up with Autism" in *Newsweek* November 27, 2006

"Mirror Neurons and Autism" in *Scientific American* November, 2006.