Guest Editorial: Melvin Kaplan, O.D.

Visual management: A physiological approach to rehabilitating autism spectrum disorders

One of the most common questions I'm asked is: "What does vision have to do with autism?"

It's a good question, because most autistic children seem to see perfectly well. However, we see not just with our eyes, but with our brains—and children with autism spectrum disorders frequently have neurological problems that prevent them from correctly interpreting what their eyes are seeing. As a result, even children with 20/20 eyesight may view the world in a distorted and confusing way. Because 80 percent of the information we receive from our environment is visual, this can result in severe disability.

How can a child with perfect eyesight be visually impaired? The answer lies in the fact that we have two types of vision:

• ***Focal vision***, which involves the central visual field, is largely a conscious process. Focal vision, which works independently from other sensory systems, allows us to answer the question, "What is it?" This is the visual system that traditional optometrists and opthalmologists address with eyeglasses or surgery.

• ***Ambient vision***, which involves the entire visual field, is more dynamic and largely non-conscious, and integrates with other sensory systems. This is the visual system that answers the questions, "Where am I?" and "Where is it?"

Most autistic children have a preference for focal vision, which is why many display a fetish for numbers, letters, and objects. Their lack of attention to ambient vision—which has neural feedback loops to other sensory modalities—limits their ability to process information in areas involving posture, movement, speech, and thought.

Ambient vision allows us to see in three dimensions, and to accurately judge movement and distance. The brains of many autistic children, however, do not process information from the ambient visual system correctly. In patients with autism or related disabilities, we typically see two types of altered vision. One is "tunnel vision" or compressed vision, in which the field of vision is constricted to a relatively small circle. People with tunnel vision view the world in two dimensions, and cannot accurately judge distance or motion. The other is "alternating" vision (hypoconvergence or visual disparity), in which the eyes see two different images with no overlap. In these cases, the person is basically seeing two dissimilar and competing views of the world

The effect of ambient visual problems, not surprisingly, can be catastrophic. We use our ambient vision to tell how far away objects or people are, how fast they're moving, what other people's body language means, and even where our bodies end and the outside world begins. Disrupt this vision, and the world becomes a bizarre and frightening place. Autistic author Donna Williams, for instance, writes about how the walls would ripple when she looked them. My verbal patients say that they experience "white-outs," "black-outs," or a feeling as though they're looking through a bowl of jello.

We use our ambient vision to tell how far away objects or people are, how fast they're moving, what people's body language means, and even where our bodies end and the outside world begins. When this visual process is disrupted, as it is for many autistic children, the world becomes a bizarre and frightening place.

While the scientific literature on vision problems in autism is sparse—largely because few professionals are aware of the issue—research confirms an astonishing rate of visual impairment. A 1997 study by Denis et al. found that 60% of autistic children exhibited strabismus (an inability to fuse the images from both eyes into a coherent image), while a 1999 study in which I participated put the rate of strabismus at 50%. Scharre and Creedon studied 34 autistic children in 1992, and reported that 21% were strabismic at far distances and 18% at near distances; that only 14.7% of the children exhibited normal voluntary eye pursuit movements; and that 31 of the 34 children did not exhibit a normal nystagmus response (side-to-side oscillation of the eyes while spinning, riding in a car, etc.). In 2004, Landry and Bryson reported that children with autism have extreme difficulty in disengaging their attention from one visual stimulus in order to focus on another; the children's responses, the researchers noted, were comparable to those of two-month-olds. All of these findings are consistent with severe disruption of ambient visual processes.

The good news is that ambient vision is largely learned, and we can correct it by retraining the brain. This task starts by identifying the clues that autistic children give us about their visual deficits. While many doctors see rocking, hand-flapping, toe-walking, poor eye contact, and odd postures as problems, I see them as *solutions* to problems, because they reveal the adaptations that children make in order to compensate for their visual disabilities. Hand-flapping and front-to-back rocking, for instance, can be a child's way of achieving depth perception in a world that appears two-dimensional. Viewing people sideways rather than face-on also is a survival instinct, because it limits vision to one eye—a smart solution, when the brain can't coordinate the input from both eyes. And toe-walking, which I can often correct instantly with the right intervention, usually stems from tunnel vision.

Once we identify children's visual problems through careful observation, we can intervene with yoked prism lenses and vision training. The yoked prism lenses I use in my practice alter the visual field, stimulating an unconscious, active reorganization of a child's visual processing. Often, the effect is instantaneous. One little nonverbal autistic girl, for instance, did not respond to puzzles, the TV, or any other activities until I placed a pair of yoked prism lenses on her face. Instantly, she stood up, began exploring the room, and then stopped in front of a mirror and danced. When I tried to remove the lenses, she held them tightly on her face and cried, "My eyes! My eyes!"

Such responses are remarkable, but it takes months of training to transform temporary changes into permanent neural alteration. These transformations lead not just to better vision, but also to better physical, emotional, and cognitive ability. The amount of improvement each patient experiences depends, of course, on the individual's innate ability to change, as well as the degree of motivation. I find it interesting that patients with autism or other severe disabilities are often far more motivated, once they recognize the effects of prism lenses and therapy, than are patients with only minor disabilities. Even nonverbal and withdrawn autistic patients often react dramatically to prism lenses,work hard at therapy, and make remarkable progress. One small patient of mine was so pleased at her new visual skills that she actually kissed her glasses goodnight at bedtime each evening!

The successes brought about by vision training can be quite impressive. I've seen nonverbal children begin to speak, withdrawn children begin to reach out to others, and learning-disabled children begin to read and spell easily. However, vision training isn't a cure. Rather, it's just one part of a comprehensive treatment program, including educational and biomedical interventions. As the Defeat Autism Now! (DAN!) approach is proving, autism is a multi-faceted condition, and only by addressing each aspect of the problem—including vision impairments and other sensory issues—can we successfully battle it.

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