Visual Abilities and Sensory Differences in a Person with Autism

Temple Grandin

I read the two articles on the visual abilities of individuals with autism with great interest. I have autism, and this research might explain why I am still able to easily read magazines, books, and newspapers without glasses at the age of 61. The only time I need glasses is to read tiny telephone book print. I use a hand magnifier for telephone books and tiny business card print and seldom bother to put on my reading glasses that I purchased during my 50s. They are cheap, simple magnifiers that I purchased without a prescription. I occasionally wear them for reading when lighting is poor. My distance vision is still excellent, and I have never worn glasses for driving.

My father also had excellent vision, and he got his first pair of reading glasses in his 60s and never wore glasses for distance vision. If my father were alive today, he would probably be diagnosed with Asperger's. My vision is also still excellent at night. Many times I forget to turn on my car headlights, because I can see well enough without them. This is most likely to happen in towns and cities that have streetlights.

Interested in Visual Detail

As a child my favorite repetitive behavior was dribbling sand through my hands over and over. The reason I liked to do this was my fascination with the shapes and reflections off of every tiny grain. Each little grain looked like a tiny rock, and I was like a scientist putting it under a microscope. At the age of 61, I can still see the variations in the weave patterns of hotel meeting room carpets when I am sitting on a chair in a normal position. At a boring meeting, I often look at the carpet and study variations and imperfections on the repetitive woven pattern.

Several years ago I took a test where the person has to identify large letters that are composed of many smaller letters. I was then asked to identify either the big letter or the little letters it was composed of. I was faster at identifying the little letters.

In my work on cattle behavior, the first thing I studied was how the animals reacted to visual distractions as they moved through a cattle handling facility to be vaccinated. In the 1970s when I started my research, I was one of the first people to observe that cattle often stopped and refused to walk over shadows, or they stopped when they saw a jacket hung on a fence. Most ranchers never noticed how these visual details affected cattle behavior. It is interesting that my animal behavior work involved identifying visual details in the environment (1,2).

Visual stimuli have always been fascinating to me. In high school, I became obsessed with the Ames distorted room optical illusion and the trapezoidal window. I spent months building them (3). In college, I loved light shows at rock concerts. Automatic sliding doors were another obsession. I enjoyed watching the rapid movement.

I Think in Pictures

In my work with livestock design, I use my visual thinking skills to "build" equipment in my mind. When I design a system, I can imagine walking through it like a virtual reality computer. I had a virtual reality computer system in my head long before these systems were invented. I describe my visual thinking skills in Grandin (4). In 2006, I had a brain scan with tensor brain imaging that showed large white fiber tracts done by Dr. Nancy Minshew and her colleagues at the University of Pittsburgh. In my brain there is a huge fiber tract that runs from my frontal cortex to deep into my occipital cortex. It is almost twice as big as the tract in a gender- and age-matched control subject. The slice was made at the level of my eyes.

Sensory Differences

Some people with autism have pain, fear, and discomfort from the same visual stimuli that I love. There are some people on the autism spectrum who have described that certain visual stimuli cause great discomfort (5,6). Many parents have told me that their child screams when supermarket doors open quickly. I enjoyed the movement of automatic doors, but other autistic individuals avoid them. Over the years I have observed that sensory sensitivities in autism are highly variable. One child will love to play with running water, and another autistic child will run away and scream when a toilet flushes. Many individuals with autism cannot tolerate fluorescent lights. They can see the 60-cycle flicker. This is especially a problem with older fluorescents. Fluorescent lights might increase repetitive behavior in some children with autism (7). Fluorescent lights do not bother me, but they make a room look like a pulsating strobe disco light show for some people. I had a dyslexic student who said she had difficulty thinking if she was stuck in a windowless room that had fluorescent lights. Sensory sensitivities can be very debilitating. Some individuals with autism or Asperger's cannot tolerate a noisy restaurant. There is a huge need for more research. Due to the variability of sensory sensitivities, subjects will need to be assigned to studies on the basis of their specific problems. For example, some individuals with autism cannot tolerate large supermarkets with fluorescent lights. Many parents have reported that their child with autism has oversensitivity to fluorescent lights, and they will often have a tantrum in a large store within 5 minutes. Other individuals can tolerate florescent lights. If sensitivity to fluorescent lights is going to be studied, subjects should be assigned to studies on the basis of their reactions to florescent lights. It is also important to document the type of florescent lights. The worst ones have a 50- to 60-cycle flicker rate. Sixty cycles is used in the United States, and 50 cycles is used in Europe. Newer fluorescent lights might have special electronic circuits that will increase the flicker rate and might create fewer problems for people with autism. An individual who might not be able to tolerate old fashioned 50 or 60 fluorescents might be able to tolerate fluorescents with a faster flicker rate. In all studies, the electrical characteristics of the fluorescent light circuit must be specified in the Methods sections.

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Brain Research

Research by Manual Cassanova *et al.* (8) might provide a possible explanation for enhanced visual processing. They found that both individuals on the autism spectrum and famous neuroscientists have more mini columns in their brains. Mini columns are the brain's basic units of neural circuitry. Cassanova *et al.* (9) suggest that they might be the smallest unit that can process information. Research by Eric Courchesne *et al.* (10,11) in San Diego has shown that there is early abnormal overgrowth in the brain. The back portion of the brain where the visual circuits are located has more normal development than the frontal cortex. I would have liked to have delved much more deeply into brain research, but I could not do this because I was given a short time to write this commentary. In conclusion, research on sensory over sensitivity should be a high priority, because it is extremely debilitating for some individuals on the autism spectrum.

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