Autism and the Limbic System

Written by Stephen M. Edelson, Ph.D.
Center for the Study of Autism, Salem, Oregon

Over the past 10 years, high-tech research methods have begun to reveal neurological damage in some autistic individuals. One of the most important findings indicates specific damage in the limbic system, particularly in the amygdala and hippocampus. Much of this research has been conducted by Dr. Margaret Bauman, (Dept. of Neurology, Harvard Medical School), and Dr. Thomas Kemper, (Depts. of Neurology, Anatomy, and Pathology, Boston University School of Medicine). They report densely packed neurons in the amygdala and hippocampus of persons with autism. Additionally, they note that these neurons are smaller than in normal persons. At this time, we do not know what causes neurological damage in these areas; however, the damage appears to occur during the prenatal stage of development.

Can damage in the amygdala and hippocampus explain some of the behaviors exhibited by autistic children and adults? We can only speculate at present, but it is interesting to theorize about the possible connections between damage in the limbic system and the characteristic traits of many autistic people. Much of what we know of the behaviors associated with the amygdala and hippocampus are based on animal research. In these studies, researchers either surgically damage or remove a specific area in the brain and then observe any changes in the animal's behavior.

The amygdala, (which means "almond-shaped"), controls our aggression and emotions. Many autistic individuals are aggressive towards themselves or others, or conversely, extremely passive. Furthermore, autistic children and adults often appear emotionless or 'flat' (even though they obviously do have emotions). Experimenters have also shown that when the amygdala is removed or damaged, animals exhibit behaviors similar to autistic individuals, such as social withdrawal, compulsive behaviors, failure to learn about dangerous situations, difficulty retrieving information from memory, and difficulty adjusting to novel events or situations. In addition, the amygdala is responsive to a variety of sensory stimuli, such as sounds, sights, and smells; as well as emotionally or fear-related stimuli. We know that autistic individuals often have problems with each of these senses. Interestingly, Georgie, whose childhood was described in her mother's book, The Sound of a Miracle, often mentioned being afraid of many sounds prior to receiving auditory integration training from Dr. Guy Berard.

The hippocampus, (shaped like a "sea horse") appears to be primarily responsible for learning and memory. Damage or removal of the hippocampus will lead to an inability to store new information into memory. This sounds similar to Dr. Bernard Rimland's cognitive theory of autism. In his 1964 award-winning book Infantile Autism, Dr. Rimland theorized that autistic children had difficulty relating new information to previously stored information. In addition, when the hippocampus is damaged or removed, animals will display stereotypic, self-stimulatory behaviors and hyperactivity.

Although one can easily speculate about a relationship between the limbic system and autistic behaviors, we should be conservative, because much of what we know comes from animal models in which the parts of the limbic system are damaged artificially. We need to be cautious in extrapolating these findings to autistic individuals. However, the correspondence between behaviors seen in autism and what we know of the limbic system is compelling.

Further Reading: *The neurobiology of autism.* Edited by Drs. Margaret L. Bauman and Thomas L. Kemper (1994). Baltimore: The Johns Hopkins University Press.

The Autism Research Institute distributes an information packet on MRI and related brain research.

Click here to learn how to obtain this packet.

Return