Cognition and behavior: Brain changes tied to autism severity

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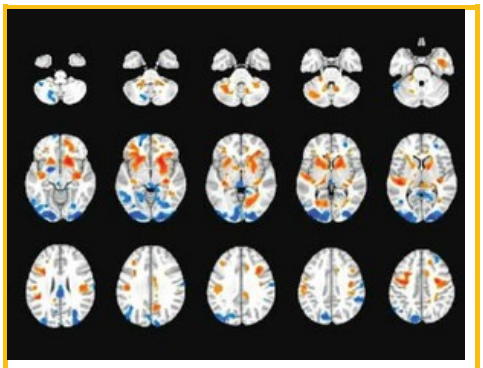

Brain map: Adults with more severe autism symptoms have more brain matter in some regions (orange) and less in others (blue) compared with those who have milder symptoms.

Adults with autism have regional differences in brain volume in areas that play a role in social behavior and communication compared with controls, according to a large study published in the February issue of *Archives of General Psychiatry*[1]. The differences correlate with the severity of autism symptoms, the study also shows.

Research has shown that some children with autism have abnormally large heads, or macrocephaly, which normalizes as they reach adulthood. Other studies describe regional differences in both gray and white matter — which contain the cell bodies and connecting processes of neurons, respectively — that persist into adulthood.

These reports are often conflicting, however, most likely because they are based on a small number of participants and as a whole include different age groups.

In the new study, researchers performed structural magnetic resonance imaging, or MRI, scans on 89 men with autism and 89 controls, who were recruited from one of three autism research centers in the U.K. The large number of participants allowed researchers to look for subtle brain alterations that persist into adulthood and could underlie autism symptoms in adults.

Consistent with previous results, there is no difference in overall brain size between men with autism and controls, the study found.

The researchers report several regional differences in brain volume between the two groups, however. Compared with controls, for example, men with autism have more gray matter in the anterior temporal lobe, which is involved in higher-order cognitive processes such as theory of mind — the ability to understand the intentions and beliefs of others. They also have more gray matter in the dorsolateral prefrontal cortex, which plays a role in motor functions, than do controls.

Men with more gray matter in the anterior temporal lobe also have more severe deficits based on the social measures in the Autism Diagnostic Interview-Revised (ADI-R), but not on measures of repetitive behavior and deficits in communication, the study found.

The brains of men with autism have less gray matter than those of controls in a large occipital and parietal region that plays a role in theory of mind and emotion processing. Less brain matter in this region is associated with more severe social and communications deficits.

Variations in the amount of gray matter in other brain regions — including the cerebellum, a motor-control area; the prefrontal cortex, which is involved in higher-order cognitive function; and the amygdala, which regulates emotion and fear — are also associated with the severity of autism symptoms as measured by the ADI-R, the study found.

Individuals with autism also have alterations in the amount of white matter — which contains the connective processes of neurons — compared with controls, suggesting deficits in the connections between brain regions, the researchers say. This provides support to a theory that short-range connections are enhanced and long-range connections are impaired in individuals with autism.

References:

1: Ecker C. *et al. Arch. Gen. Psychiatry* **69**, 195-209 (2012) PubMed

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