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Novel imaging technique shows gray matter increase in brains of autistic children

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Using a novel imaging technique to study autistic children, researchers have found increased gray matter in the brain areas that govern social processing and learning by observation. Results of the study conducted at the Fay J. Lindner Center for Autism, North Shore-Long Island Jewish Health System in Bethpage, N.Y., were presented today at the annual meeting of the Radiological Society of North America (RSNA).

“Our findings suggest that the inability of autistic children to relate to people and life situations in an ordinary way may be the result of an abnormally functioning mirror neuron system,” said lead author Manzar Ashtari, Ph.D., from the Children’s Hospital of Philadelphia in Pennsylvania.

Mirror neurons are brain cells that are active both when an individual is performing an action and experiencing an emotion or sensation, and when that individual witnesses the same actions, emotions and sensations in others. First observed in the macaque monkey, researchers have found evidence of a similar system in humans that facilitates such functions as learning by seeing as well as doing, along with empathizing and understanding the intentions of others. Dr. Ashtari’s study found the autistic children had increased gray matter in brain regions of the parietal lobes implicated in the mirror neuron system.

The study included 13 male patients diagnosed with high-functioning autism or Asperger syndrome and an IQ greater than 70 and 12 healthy control adolescents. Average age of the participants was about 11 years.

Each of the patients underwent diffusion tensor imaging (DTI), a technique that tracks the movement of water molecules in the brain.

DTI is traditionally used to study the brain's white matter, as well as the brain fibers. However, Dr. Ashtari's team applied it to the assessment of gray matter by employing apparent diffusion coefficient based morphometry (ABM), a new method that highlights brain regions with potential gray matter volume changes. By adding ABM to DTI, the researchers can detect subtle regional or localized changes in the gray matter.

In addition to the gray matter abnormalities linked to the mirror neuron system, the results of this study revealed that the amount of gray matter in the left parietal area correlated with higher IQs in the control group, but not in the autistic children.

"In the normal brain, larger amounts of gray matter are associated with higher IQs," Dr. Ashtari said. "But in the autistic brain, increased gray matter does not correspond to IQ, because this gray matter is not functioning properly."

The autistic children also evidenced a significant decrease of gray matter in the right amygdala region that correlated with severity of social impairment. Children with lower gray matter volumes in this area of the brain had lower scores on reciprocity and social interaction measures.

"Impairments in these areas are the hallmark of autism spectrum disorders, and this finding may lead to greater understanding of the neurobiological underpinnings of the core features of autism," said study co-author Joel Bregman, M.D., medical director of the Fay J. Lindner Center for Autism.

Autism is the fastest growing developmental disability in the United

States and typically appears during the first three years of life. Children with autism are hindered in the areas of social interaction and communication skills. According to the Centers for Disease Control and Prevention, as many as 1.5 million Americans have autism.

Source: Radiological Society of North America