NEWS

Interpreting gray matter studies not black and white

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Gray matter, that mysterious brain substance, is thought to control everything from motor function to mental acuity. In recent years several studies have suggested that an excess of gray matter during childhood is to blame for the symptoms of autism.

But critics balk at what they see as too simplistic an explanation, saying it's dicey to interpret structural differences in the brain without functional links to support the observations.

Postmortem studies in the late 1990s suggested that individuals ? especially children ? with autism have enlarged brains. Subsequent imaging studies, including a 2001 study in *Neurology*[1], hinted that these enlarged brains contain extra gray matter, which is composed primarily of nerve cell bodies, and sometimes also extra white matter, which connects neurons together.

On 28 November, researchers from the Children's Hospital of Philadelphia announced that the brains of children with autism have more gray matter than average, specifically in the so-called mirror neuron system within the parietal lobe. The researchers **presented their unpublished data** at the **Radiological Society of North America meeting in Chicago**.

Their observations were based on comparing the brains of 13 boys with high-functioning autism or autism spectrum disorders with those of 12 healthy boys. In the healthy boys, more gray matter in the parietal lobe correlates with a higher IQ but in those with autism, higher gray matter volume appears to be associated with lower IQ scores, the researchers say.

"The enlarged gray matter that's there is not actually functioning," says lead investigator **Manzar Ashtari**.

Mirror, mirror in the brain

Ashtari says the excess gray matter interferes with mirror neurons, believed to play a role in

executing actions, experiencing emotions and witnessing actions or emotions in others. "Basically, these things are what really lack in autistic kids," she says.

Another small study published on 6 November in the *Proceedings of the National Academy of Sciences* reported that children with autism have altered mirror neuron activity, based on electromyographic recordings[2].

The Ashtari study was widely reported in the mainstream press, but many researchers urge caution in interpreting observations from a single structural imaging study.

"This study is another piece of evidence suggesting that there seem to be larger gray matter volumes in regions of the brain," says **Stewart Mostofsky**, a pediatric neurologist at the Kennedy Krieger Institute in Baltimore. But given the small sample size and the fact that the data haven't yet been peer reviewed, Mostofsky says he's surprised the study has received so much attention.

Structural studies of autistic brains have often shown confounding results. For instance, some studies suggest that children with autism have a higher brain volume overall[3], but others have found no difference[4]. In fact, some studies have found that the brains of children with autism spectrum disorders have less gray matter in certain brain regions, not more.

There may also be differences in brain structure depending on the age, gender and the precise type of autism. "I honestly do not believe that there's going to be a single view that will explain all of autism," says **Erin Bigler**, a clinical neuropsychologist at Brigham Young University.

Age appears to be a key variable. Some researchers say autistic kids probably go through rapid, premature brain growth at a young age, leading to enlarged brains compared with other children. But the brain connections and material laid down in this initial growth period do not function effectively.

In the meantime, typically developing kids exhibit slower, but more sustained, brain growth that continues through adolescence, so that by adolescence and adulthood the overall brain size is similar in both those with autism and in typical controls.

Still, given the widespread ? and often subtle ? variability, differences in any particular region of the brain are just one piece of a large puzzle, says Mostofsky. "There's this tendency of scientists, or of every human being, to try to identify specific reasons for this," Mostofsky says. But identifying structural differences is only useful, he says, "when you look at the functional correlates."

References:

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