Medical Xpress

Poor recognition of 'self' found in high functioning people with autism

February 6 2008

Contrary to popular notions, people at the high end of the autism spectrum disorder continuum suffer most from an inability to model "self" rather than impaired ability to respond to others, said Baylor College of Medicine researchers in a report that appear in the journal *Neuron*.

This inability to model "self" can disrupt an individual's ability to understand the world as a whole, said Dr. P. Read Montague Jr., professor of neuroscience, and director of the Human Neuroimaging Lab and the Computational Psychiatry Unit at BCM. "It's an interesting disconnect."

Using a functional magnetic resonance imaging (fMRI) scanner, Montague and his colleagues scanned the brains of people considered "high functioning" autistics because they have normal or high normal intelligence quotients but many of the symptoms of people with autism. During this procedure, the researchers identified a pattern of activity or "signature" in the brain that identified those with autism. The level of activity correlates with the severity of the autistic symptoms. The less activity there is, the more serious the symptoms. The finding could lead to a test to speed diagnosis.

"We are very excited about the usefulness of the hyperscanning technology and economic games as new tools to probe autism. Our hope is that these same approaches can be used to probe a wide range of psychopathologies," said Dr. Pearl Chiu, first author on the study and an assistant professor in the departments of neuroscience and psychiatry and behavioral sciences at BCM.

To understand the behavioral patterns of people with autism spectrum disorder, Montague and his colleagues used a technique called hyperscanning, which enabled them to scan two brains simultaneously while the research subjects played a trust game. Hyperscanning was developed in Montague's laboratory.

In the trust game, one player receives an amount of money and then sends whatever amount he or she wants to the other player via computer message. The amount sent is tripled and the player at the other end then decides how much of the tripled amount to send back. The game has several rounds.

During this interaction, Montague and his colleagues evaluated the brains' response by watching bright spots in the brain that represent increased blood flow and thus brain activity. Prior work had shown that during the trust game, most of the activity occurs in an area called the cingulate cortex.

To hone their picture of the "self" response in that part of the brain, Montague and his colleagues had 81 athletes (football, baseball and soccer players as well as members of the Houston Ballet) take part in an imagining task. They watched clips of various athletic activities while in the scanner. They then imagined themselves performing those activities. The pattern of activity in the cingulate cortex during that "imagining" reflected the "self" response.

Later the scientists identified the same "self" response in the cingulate cortices of normal subjects when they decided how much money to send to the other person. The pattern contrasted with the "other" response seen when the actions of their partner in the trust game were revealed to them.

The researchers then brought in 18 adolescent males with high functioning autism to play the game. Montague and his colleagues determined that the subjects understood the game and helped them adjust to the scanning procedure.

“It was the first time an autistic kid had been scanned in a social exchange,” said Montague.

The adolescents did not play the game differently from their partners, who were taken from a population of similar teens who did not have autism. They made similar amounts of money overall and round by round.

However, when the researchers scanned the brains of the youngsters with autism during the trust game, they found that the youngsters’ “self” responses were dim compared to those of normal subjects. Not only that, but the more serious the subject’s autistic symptoms, the dimmer the response.

The response occurred in the cingulate cortex. In a normal “self” response there, the brightest area was in the middle of that area of the brain. That response was significantly less in the brains of the youngsters with autism.

“They cognitively understood the game,” said Montague. “It’s not that they don’t understand the game. It’s that there is a very low level of ‘self’ response. It’s impaired in them and the degree to which it is missing correlates with their symptom severity. The more you are missing the self response, the more autistic you are.”

“To have a good self concept, you have to be able to decide if the shared outcome is due to the other person or due to you," said Montague. "If people can't see themselves as a distinct entities at deeper levels, there is a disconnect."

He believes that the problem occurs at an unconscious level. He hopes to use the imagining technique in the future to scan the brains of people with autism whose intelligence is less than that of those in this first experiment.

"The genius of this study was to recognize the primary deficit with this spectrum of disorders," said Dr. Michael Friedlander, chair of neuroscience at BCM. "Then they took that information dealing with the deficit social cognition and invented a new kind of experiment and technology to probe it."

Source: Baylor College of Medicine