When your brain won't hang up: Sustained connections associated with symptoms of autism

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For decades, scientists have examined how regions of the brain communicate to understand autism. Researchers at University of Utah

Health believe the symptoms of autism may result from sustained connections between regions of the brain. The details of their study are available November 16 in the journal *JAMA Network Open*.

"People with autism do not like unexpected stimuli, and it may be because brains are not as efficient at rapidly shifting between ideas or thoughts," said Jeff Anderson, M.D., Ph.D., professor in Radiology at U of U Health and senior author on the study. "We wondered if we could see how local circuits in the brain react in patients with autism."

To explore the duration of connections, Anderson and his team used a new fMRI technique (multiband, multi-echo resting-state functional MRI), to take pictures of the brain faster than once per second to examine where activity synchronizes across more than 300 regions of the brain. The approach measures how long, on average, functional connectivity persists between brain regions.

"We don't have good methods for looking at the brain on these time scales," Anderson said. "It's been a blind spot because it falls in between typical MRI and EEG studies."

Their work shows that patients with autism experience prolonged connection compared to typically developed individuals. The researchers believe the enduring connection may be an explanation for the symptoms of autism, because the brain does not shift from one activity to another easily.

"Now that we are looking at finer timescales, we've found a consistent story," said Jace King, Ph.D., a postdoctoral research associate in the Brain Network Lab and first author on the paper. "It provides us with new tools to figure out the mechanisms that may underlie autism."

The study was conducted in two parts. The initial study consisted of

fMRI scans performed on 90 male participants (52 with autism between 19 to 34 years of age and 38 controls between 20 to 34 years of age). Patients with autism were matched to controls by age but not IQ. Anderson and his team compared the findings from his study to the findings from 1,400 participants (579 autism patients (80 female and 499 male) and 823 controls (211 female and 612 male)) in the ABIDE (Autism Brain Imaging Data Exchange) study.

The results from ABIDE support the initial study, which showed sustained brain connectivity in patients with autism. According to Anderson, brain connection fades out more quickly for patients without autism, but it remains synchronized for up to 20 seconds for individuals with autism. The team also found that the severity of autism symptoms increased with the duration of synchronization.

"Individuals with autism who have greater social dysfunction have an increase in synched activity in their scans," said King.

While the results offers a new perspective in how autism works in the brain, the initial portion of the study was limited to only male subjects within a narrow age range. Despite the limitations, Anderson believes they are on an exciting path of discovery.

"We want to compare the results from this analysis to more traditional methods," said Anderson. "This is a whole new perspective into how autism works in the brain, and can help us develop strategies for treatment and finding medications that might be more effective to ease the symptoms of the disorder."

Provided by University of Utah

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