Detecting autism from brain activity

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Neuroscientists from Case Western Reserve University School of Medicine and the University of Toronto have developed an efficient and reliable method of analyzing brain activity to detect autism in children. Their findings appear today in the online journal *PLOS ONE*.

The researchers recorded and analyzed dynamic patterns of brain activity with magnetoencephalography (MEG) to determine the brain's functional connectivity – that is, its communication from one region to another. MEG measures magnetic fields generated by electrical currents in neurons of the brain.

Roberto Fernández Galán, PhD, an assistant professor of neurosciences at Case Western Reserve and an electrophysiologist seasoned in theoretical physics led the research team that detected autism spectrum disorder (ASD) with 94 percent accuracy. The new analytic method offers an efficient, quantitative way of confirming a clinical diagnosis of autism.

"We asked the question, 'Can you distinguish an autistic brain from a non-autistic brain simply by looking at the patterns of neural activity?' and indeed, you can," Galán said. "This discovery opens the door to quantitative tools that complement the existing diagnostic tools for autism based on behavioral tests."

In a study of 19 children—nine with ASD—141 sensors tracked the activity of each child's cortex. The sensors recorded how different regions interacted with each other while at rest, and compared the brain's interactions of the control group to those with ASD. Researchers found significantly stronger connections between rear and frontal areas of the brain in the ASD group; there was an asymmetrical flow of information to the frontal region, but not vice versa.

The new insight into the directionality of the connections may help identify anatomical abnormalities in ASD brains. Most current measures of functional connectivity do not indicate the interactions' directionality.

"It is not just who is connected to whom, but rather who is driving whom," Galán said.

Their approach also allows them to measure background noise, or the spontaneous input driving the brain's activity while at rest. A spatial map of these inputs demonstrated there was more complexity and structure in the control group than the ASD group, which had less variety and intricacy. This feature offered better discrimination between the two groups, providing an even stronger measure of criteria than functional connectivity alone, with 94 percent accuracy.

Case Western Reserve's Office of Technology Transfer has filed a provisional patent application for the analysis' algorithm, which investigates the brain's activity at rest. Galán and colleagues hope to collaborate with others in the autism field with emphasis on translational and clinical research.

Galán's collaborators and co-authors of this study are University of Toronto's associate researcher, Luis García Domínguez, PhD, and professor José Luis Pérez Velázquez, PhD.

Provided by Case Western Reserve University