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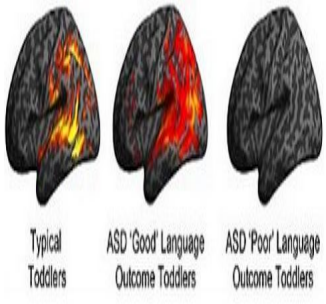
Brain Imaging Predicts Language Ability in ASD Toddlers



Functional magnetic resonance imaging (fMRI) may be useful in determining future language development outcomes in toddlers with autistic spectrum disorder (ASD), even before they have been formally diagnosed with the condition. The findings, reported in the journal *Neuron*, are from a study conducted by University of California, San Diego School of Medicine researchers.

In the *Neuron* paper, the researchers describe the first effort to create a process capable of detecting different brain subtypes within ASD that underlie and help explain varying development language trajectories and outcomes. “We wanted to see if patterns of brain activity in response to language can explain and predict how well language skills would develop in a toddler with ASD before that toddler actually began talking,” says senior author Eric Courchesne, PhD, professor of neurosciences and co-director of the Autism Center of Excellence at UC San Diego.

For this study, Prof. Courchesne and colleagues combined prospective fMRI measurements of neural systems’ response to speech in children at the earliest ages at which risk of ASD can be clinically detected in a general paediatric population (around ages 1-2 years) with comprehensive longitudinal diagnostic and clinical assessments of language skills at 3-4 years of age.

Based on the results, pre-diagnosis fMRI response to speech in ASD toddlers with relatively good language outcomes was very similar to non-ASD comparison groups with robust responses to language in superior temporal cortices, a region of the brain responsible for processing sounds so that they can be understood as language. In contrast, ASD toddlers with poor language outcomes had superior temporal cortices that showed diminished or abnormal inactivity to speech.

In addition, fMRI imaging showed that the brains of ASD toddlers with poor language development processed speech differently, including how neural regions governing emotion, memory and motor skills were involved.

In sum, the study found entirely different neural substrates at initial clinical detection that precede and underlie later good versus poor language outcome in autism. These findings, the UC San Diego team notes, will open new avenues of progress towards identifying the causes and best treatment for these two very different types of autism.

ASD affects 1 in 68 children, mostly boys, in the United States. A major challenge of ASD diagnosis and treatment is that the neurological condition is considerably heterogeneous. Early symptoms differ between each ASD toddler, as does progression of the condition. No uniform clinical phenotype exists, in part because the underlying causes for different subtypes of autism are diverse and not well-understood.

“There is no better example than early language development,” says Prof. Courchesne. In some children with ASD language improves substantially with age, but in some it may progress too slowly or even diminish. "The neurodevelopmental bases for this variability are unknown," he adds. Differences in treatment quantity do not fully account for it, although many studies have shown that early, accurate diagnoses of ASD can improve treatment benefits in many affected children.

“Our work represents one of the first attempts using fMRI to define a neurofunctional biomarker of a subtype in very young ASD toddlers,” explains co-author Karen Pierce, PhD, associate professor of neurosciences and co-director of the Autism Center of Excellence. “Such subtypes help us understand the differences between persons with ASD. More importantly, they can help us determine how and why treatments are effective for some, but not all, on the autism spectrum.”

Source: University of California, San Diego Health Sciences
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