Medical Xpress

Weaker brain 'sync' may be early sign of autism

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In a novel imaging study of sleeping toddlers, scientists at the University of California, San Diego Autism Center of Excellence report that a diminished ability of a young brain's hemispheres to "sync" with one another could be a powerful, new biological marker of autism, one that might enable an autism diagnosis at a very young age.

Writing in the June 23 issue of the journal *Neuron,* Eric Courchesne, PhD, professor of neurosciences at the UC San Diego School of Medicine, and colleagues in Israel and Pittsburgh report that language areas located in the right and left sides of the brain are less synchronized in toddlers with autism than in toddlers displaying either language delay problems or typical development. The strength of synchronization was associated with individual language and communication abilities: the weaker the synchronization, the more severe the communication difficulties exhibited by the autistic child.

"Neural synchronization refers to the coordinated timing of neural activity across distinct brain areas," said Ilan Dinstein, PhD, a neurobiologist at the Weizmann Institute of Science in Rehovot, Israel, a member of the UCSD Autism Center of Excellence, and first author of the study.

"In a normal brain, neurons in separate areas belonging to a system with a particular function, such as vision or language, always stay in sync, even during sleep. Our study shows that in most brains of toddlers with autism this 'sync' is significantly weaker in brain areas that are

responsible for language and communication abilities. Many things need to be set up right during brain development to enable normal sync between different brain areas. The wiring between the brain areas needs to be right and the neurons within each brain area need to send and receive their messages properly."

The findings, if corroborated by further research, could have significant impact, Dinstein said.

"It would be a biological rather than a behavioral measure that could be used to diagnose autism at a very young age – around one year. The functional magnetic resonance image (fMRI) scan would not identify all of the individuals with autism, but it would be helpful in revealing the majority of individuals. The results also tell us that significant differences in the biology of language areas are apparent during very early stages of autism development. It will help focus further research into the brain differences that underlie autism."

Though the exact cause of autism remains unknown, it is hypothesized that the neurological disorder – which is marked by impaired social and communications skills, usually manifesting itself in the first few years of life – arises from the development of abnormal neural networks with irregular connectivity and synchronization.

Autism is a developmental disorder that progresses with time. It is currently impossible to identify autism at birth and diagnoses, which are entirely based upon observed behavioral symptoms, are typically performed only after the age of 3. These facts help make the study of how autism develops particularly challenging. Affected toddlers are prone to incessant movement and random, uncontrolled behaviors, both of which can disrupt efforts to measure brain function and structure using different imaging techniques.

To sidestep these difficulties, the UCSD scientists studied toddlers' brains at night while they were sleeping. This novel approach meant toddlers with severe autism, who are often left out of studies due to their challenging behaviors, could be included, thus permitting scientists to successfully test the strength of brain synchronization in children with different levels of development and identify the brain areas that exhibited weak synchronization in those with autism.

"We hope that this work will be one of several enlightening steps leading to a fuller understanding of the underlying biology of autism during early development," said Dinstein. "Such an understanding is critical for developing the necessary diagnostic and therapeutical tools that are so needed for successful early intervention."

Provided by University of California - San Diego