MedicalXpress

# Early brain responses to words predict developmental outcomes in children with autism

May 29 2013

A 2-year-old in the study sits on his mother's lap playing with toys while having his brain responses to words recorded. Credit: Institute for Learning & Brain Sciences, University of Washington.

The pattern of brain responses to words in 2-year-old children with autism spectrum disorder predicted the youngsters' linguistic, cognitive and adaptive skills at ages 4 and 6, according to a new study.

The findings, to be published May 29 in *PLOS ONE*, are among the first to demonstrate that a brain marker can predict future abilities in children with autism.

"We've shown that the brain's indicator of word learning in 2-year-olds already diagnosed with autism predicts their eventual skills on a broad set of cognitive and linguistic abilities and adaptive behaviors," said lead author Patricia Kuhl, co-director of the University of Washington's Institute for Learning & Brain Sciences.

"This is true four years after the initial test, and regardless of the type of autism treatment the children received," she said.

In the study, 2-year-olds – 24 with autism and 20 without – listened to a mix of familiar and unfamiliar words while wearing an elastic cap that held sensors in place. The sensors measured brain responses to hearing words, known as event-related potentials.

The research team then divided the children with autism into two groups based on the severity of their social impairments and took a closer look at the brain responses. Youngsters with less severe symptoms had brain responses that were similar to the typically developing children, in that both groups exhibited a strong response to known words in a language area located in the temporal parietal region on the left side of the brain.

This suggests that the brains of children with less severe symptoms can process words in ways that are similar to children without the disorder.

In contrast, children with more severe social impairments showed brain responses more broadly over the right hemisphere, which is not seen in typically developing children of any age.

"We think this measure signals that the 2-year-old's brain has

reorganized itself to process words. This reorganization depends on the child's ability to learn from social experiences," Kuhl said. She cautioned that identifying a neural marker that predicts future autism diagnoses with assurance is still a ways off.

The researchers also tested the children's language skills, cognitive abilities, and social and emotional development, beginning at age 2, then again at ages 4 and 6.

The children with autism received intensive treatment and, as a group, they improved on the behavioral tests over time. But the outcome for individual children varied widely and the more their brain responses to words at age 2 were like those of typically developing children, the more improvement in skills they showed by age 6.

In other studies, Kuhl has found that social interactions accelerate language learning in babies. Infants use social cues, such as tracking adults' eye movements to learn the names of things, and must be interested in people to learn in this way. Paying attention to people is a way for babies to sort through all that is happening around them and serves as a gate to know what is important.

But with autism, social impairments impede children's interest in, and ability to pick up on, social cues. They find themselves paying attention to many other things, especially objects as opposed to people.

"Social learning is what most humans are about," Kuhl said. "If your brain can learn from other people in a social context you have the capability to learn just about anything."

She hopes that the new findings will lead to brain measures that can be used much earlier in development – at 12 months or younger – to help identify children at risk for autism.

"This line of work may lead to new interventions applied early in development, when the brain shows its highest level of neural plasticity," Kuhl said.

**More information:** dx.plos.org/10.1371/journal.pone.0064967

Provided by University of Washington