

# Carpe Diem – Seize the Day Blog

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There are many comorbid conditions that accompany epilepsy. Autism is one of those comorbid conditions with epilepsy. People with epilepsy are also more likely than others to have autism. Here is another fact about autism that you may not have known. Did you know that there is a difference between the brains of boys and girls with autism? The brain organization differs between boys and girls with autism, according to a new study from the Stanford University School of Medicine.

The differences, identified by analyzing hundreds of brain scans with artificial intelligence techniques, were unique to autism and not found in typically developing boys and girls. The research helps explain why autism symptoms differ between the sexes and may pave the way for better diagnostics for girls, according to the scientists.

Autism is a developmental disorder with a spectrum of severity. Affected children have social and communication deficits, show restricted interests, and display repetitive behaviors. The original description of autism, published in 1943 by Leo Kanner, MD, was biased toward male patients. The disorder is diagnosed in four times as many boys as girls, and most autism research has focused on males.

"When a condition is described in a biased way, the diagnostic methods are biased," said the study's lead author, Kaustubh Supekar, PhD, a clinical assistant professor of psychiatry and behavioral sciences. "This study suggests we need to think differently."

"We detected significant differences between the brains of boys and girls with autism, and obtained individualized predictions of clinical symptoms in girls," said the study's senior author, Vinod Menon, PhD, a professor of psychiatry and behavioral sciences and the Rachael L. and Walter F. Nichols, MD, Professor. "We know that camouflaging of symptoms is a major challenge in the diagnosis of autism in girls, resulting in diagnostic and treatment delays."

Girls with autism generally have fewer overt repetitive behaviors than boys, which may contribute to diagnostic delays, the researchers said.

"Knowing that males and females don't present the same way, both behaviorally and neurologically, is very compelling," said Lawrence Fung, MD, PhD, assistant professor of psychiatry and behavioral sciences, who was not an author of the study.

Fung treats people with autism at Stanford Children's Health, including girls and women with delayed diagnoses. Many autism treatments work best during the preschool years when the brain's motor and language centers are developing, he noted.

"If the treatments can be done at the right time, it makes a big, significant difference: For instance, children on the autism spectrum receiving early language intervention will have a better chance of developing language like everyone else and won't have to keep playing catch-up as they grow up," Fung said. "If a child cannot articulate themselves well, they fall behind in many different areas. The consequences are really serious if they are not getting diagnoses early."

### **New statistical methods unlock differences**

The study analyzed functional magnetic resonance imaging brain scans from 773 children with autism—637 boys and 136 girls. Amassing enough data to include a sizeable number of girls in the study was challenging, Supekar said, noting that the small number of girls historically included in autism research has been a barrier to learning more about them. The research team relied on data collected at Stanford and on public databases containing brain scans from research sites around the world.

The preponderance of boys in the brain-scan databases also set up a mathematical challenge: Standard statistical methods used to find differences between groups require that the groups be roughly equal in size. These methods, which underlie machine-learning techniques in which algorithms can be trained to find patterns in exceptionally large and complex datasets, cannot accommodate a real-world situation in which one group is four times as large as the other.

***Editor's Note: The Carpe Diem – Seize the Day Blog will be distributed and posted weekly.***  
Always remember – **CARPE DIEM – SEIZE THE DAY!**

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