

Brain abnormality found in boys with attention deficit hyperactivity disorder

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Researchers trying to uncover the mechanisms that cause attention deficit hyperactivity disorder and conduct disorder have found an abnormality in the brains of adolescent boys suffering from the conditions, but not where they expected to find it.

Boys with either or both of these disorders exhibited a different pattern of [brain](#) activity than normally developing [boys](#) when they played a simple game that sometimes gave them a monetary reward for correct answers, according to a new study by a University of Washington research team.

The research focused on two [brain areas](#), the striatum and anterior cingulate cortex. The striatal region is a network of structures in the mid brain that motivates people to engage in pleasurable or rewarding behavior. The anterior cingulate is higher in the brain and normally activates when an expected reward stops. However, this process, called extinction, doesn't occur, at least as quickly, in boys with [attention deficit hyperactivity](#) or conduct disorders. Instead, the striatal region continues to be activated, said Theodore Beauchaine, a UW associate professor of psychology and senior author of the paper.

"When children engage in impulsive behavior they are looking to stimulate themselves and have fun. Children with attention deficit [hyperactivity disorder](#) are always looking to have fun and that is what gets them in trouble," he said. "A behavior should stop when the reward stops. When you stop the reward for children with these disorders, they

continue to focus on the reward long afterward and the anterior cingulate does not appear to become activated."

Attention deficit hyperactivity disorder is one of the most common mental disorders among children, affecting between 3 and 5 percent of school-age youngsters, or an estimated 2 million.

The researchers used [functional magnetic resonance imaging](#) to compare brain activity in 19 boys with either or both disorders and 11 normally developing boys. The adolescents ranged in age from 12 to 16.

Their brains were scanned while they played the game. The boys looked at a screen and there was a button under each of their thumbs. When a light flashed on the left or right side of the screen they were instructed to press the button on that side. The screen lit up very fast, up to 100 times a minute. The boys received five cents for each correct response and could win up to \$50. They were not penalized for wrong answers and their accumulated winnings showed up on the screen.

Each boy had four five-minute blocks of trials. The first and third trials involved opportunities to earn money. The second and fourth trials did not involve winning money, but the boys were told to keep playing the game because the game would change at some point.

Beauchaine said there was no difference in the accuracy or speed - the behavioral response - between the two groups. But there was a difference in brain activation. When the non-reward blocks came up the anterior cingulate lit up for normally developing boys, but those with either of the disorders, which frequently co-occur, continued to only show activation in the striatum.

"This shows there is an abnormality, but not in the place we expected to find it. We expected to find a difference in the way the striatum

functions, but instead found it in anterior cingulate functioning," said Beauchaine.

More information: The study appears in the current issue of *The Journal of Abnormal Psychology*.

Source: University of Washington ([news](#) : [web](#))

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