# Attention Loss: ADHD may lower volume of brain
## Bruce Bower

Youngsters diagnosed with attention-deficit hyperactivity disorder (ADHD) lack concentration, patience, and organizational skills. A new study reveals that the brains of these children are slightly smaller than those of their peers who are free of psychiatric disorders.

This disparity is most pronounced for the children and teenagers with ADHD who have never taken a stimulant medication, such as Ritalin, say psychiatrist F. Xavier Castellanos of New York University and his colleagues.

Overall, kids with ADHD had total brain volumes about 3 percent less than those of unaffected youngsters. Brain development followed parallel paths for participants with and without ADHD, but the 3 percent disparity in brain volume stayed constant.

Never-medicated children with ADHD also exhibited smaller white-matter volume in the brain than did both those taking stimulants and those free of mental ailments. White matter, which grows thicker as a child matures, consists of fibers that establish long-distance neural connections.

"It's possible that stimulant medication promotes brain maturation," Castellanos says.

Although there are valid concerns about the risks of long-term stimulant use, choosing not to use medication may present its own risk, adds study coauthor Jay N. Giedd, a psychiatrist at the National Institute of Mental Health in Bethesda, Md. "The new findings make treatment decisions even tougher," he says.

The scientists present their findings in the Oct. 9 Journal of the American Medical Association.

The team used magnetic resonance imaging (MRI) devices to measure brain volumes in 89 boys and 63 girls with ADHD of whom, 103 were on medication and 83 boys and 56 girls without any psychiatric conditions. Participants ranged in age from 5 to 18 years at the start of the study. Over the next decade, a majority of them underwent at least one, and as many as three, more MRI scans.

The data reveal that several discrete brain areas were smaller in children with the most severe forms of ADHD symptoms, which include inattention, hyperactivity, and impulsiveness, than in kids displaying milder versions. These areas consisted of parts of the frontal and temporal lobes, the inner-brain region known as the caudate nucleus, and the cerebellum. Earlier, smaller MRI studies had primarily implicated the frontal lobe in ADHD.

ADHD appears to stem from genetic variation in brain size rather than a brain defect, Giedd proposes. Any of several biological processes occurring in a slightly undersized brain may contribute to impulsiveness and hyperactivity, which often play out most dramatically at school, he theorizes.

"This study provides a new look at the developing brain in ADHD," remarks psychologist Carl M. Anderson of McLean Hospital in Belmont, Mass. Of particular interest is the possible role of the cerebellum in ADHD, he says. Research now suggests that this rear-brain structure, which is usually associated with coordinating motion and balance, aids in coordinating thoughts and emotions, according to Anderson.

While rating the new work on ADHD as the most rigorous to date, psychologist Alan A. Baumeister of Louisiana State University in Baton Rouge says the findings need to be replicated in independent studies. It remains unclear, he says, whether a discrepancy in brain size specifically underlies ADHD or also characterizes childhood depression and other mental disorders.

**References:**
Castellanos, F.X., et al. 2002. Developmental trajectories of brain volume abnormalities in children and adolescents with attention-deficit/hyperactivity disorder. Journal of the American Medical Association 288(Oct. 9):1740-1748. Abstract available at http://jama.ama-assn.org/issues/current/abs/joc20194.html.

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