

Adolescent binge drinking may compromise the brain's white matter, necessary for information relay

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Researchers know that the integrity of the brain's white matter is compromised in adult alcoholics, but it is unclear when during the course of drinking white matter abnormalities become apparent. A study of adolescent binge drinkers has found that even relatively infrequent exposure to large doses of alcohol during youth may compromise white matter fiber coherence.

Results will be published in the July issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"Because the brain is still developing during adolescence, there has been concern that it may be more vulnerable to the effects of neurotoxins, such as high doses of alcohol," said Susan F. Tapert, associate professor of psychiatry at the University of California, San Diego and director of Substance Abuse/Mental Illness in the VA San Diego Healthcare System. In fact, added the study's corresponding author, animal studies have suggested this is accurate.

"White matter" refers to brain areas that appear light in color due to being primarily lipids," added Duncan Clark, associate professor of psychiatry at the University of Pittsburgh Medical Center. "White matter is composed of bundles of myelinated axons connecting grey matter areas of the brain, and has been shown to continue to develop throughout adolescence. These systematic changes in white matter organization reflect not only maturation of interconnections but continued maturation of the brain as a whole."

"White matter, and its integrity, are essential to the efficient relay of information within the brain," said Tapert. "Indicators of white matter integrity are linked to performance on a range of cognitive tests, including measures of reading, copying

complex figures, and speeded coding of information. Abnormalities in white matter health could relate to compromised ability to consider multiple sources of information when making decisions, and to emotional functioning."

Tapert and her colleagues used diffusion tensor imaging - an MRI technique sensitive to the random movement of water in cells of a target tissue - to examine fractional anisotropy, a measure of directional coherence of white matter tracts, among 28 teens. Of the 28, 14 (12 males, 2 females) had and 14 (12 males, 2 females) did not have histories of [binge drinking](#). No participants had a history of an alcohol use disorder; drinkers were matched to non-drinkers on age, gender and education.

"This study showed that adolescents with histories of binge drinking episodes have lower coherence of white matter fibers, suggesting poorer [white matter](#) health, in a variety of brain regions," said Tapert. "Frankly, I was surprised we found this, because the drinkers did not meet criteria for alcohol abuse or dependence."

"These findings add to a growing literature indicating that adolescent alcohol involvement is associated with specific brain characteristics," said Clark. "One of the advantages of this study was that the adolescents with binge drinking did not have major mental disorders. Adolescents with alcohol-use disorders often have other problems. This suggests that the observed brain characteristics may be associated with alcohol involvement specifically rather than other complications."

"These findings, although cross-sectional, make me feel inclined to discourage adolescents from engaging in any binge drinking, that is, four or more drinks on an occasion for females, and five or more

drinks on an occasion for males," said Tapert. "Drinking to the point of being drunk or experiencing hangover symptoms may be detrimental to the adolescent brain. However, long-term studies following adolescents over time are essential to clarify the extent to which alcohol causes these brain abnormalities."

Clark agreed: "These findings indicate that adolescents who engage in binge drinking show low levels of brain organization," he said. "This characteristic could be a risk factor for accelerated alcohol use or an effect of alcohol. We need to know more about how [alcohol](#) influences [adolescent](#) brain development, [given] that [alcohol](#) may disrupt [brain](#) development."

Source: Alcoholism: Clinical & Experimental Research

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