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Patterns in Adolescent Brains Could Predict Heavy Alcohol Use

Heavy drinking is known to affect an adolescents' developing brain, but certain patterns of brain activity may also help predict which teens are at risk of becoming problem drinkers, according to a study by researchers in the University of California, San Diego School of Medicine and VA San Diego Healthcare System. Their results will be published in the September issue of the *Journal of Studies on Alcohol and Drugs*, online August 8.

This study focused on 12 to 16-year-olds whose brains were scanned using special functional magnetic resonance imaging (fMRI) prior to the onset of drinking, and then again three years later. About half of this group transitioned into heavy drinking over the 3-year period. However, when imaged before they began drinking, this cohort already showed less fMRI response in regions of the brain previously linked to heavy drinking.

"Interestingly, this study showed that teens who initially showed less activation in certain brain areas were at greater risk for becoming heavy drinkers over the next three years," said principal investigator Susan Tapert, PhD, professor of psychiatry at UC San Diego School of Medicine and VA San Diego Healthcare System.

Over time, adolescents who initiated heavy drinking exhibited less efficient processing of information.

"That's the opposite of what you'd expect, because their brains should be getting more efficient as they get older," said lead researcher Lindsay M. Squeglia, PhD of UC San Diego Department of Psychiatry.

Once this group began drinking heavily – defined by episodes of consuming four or more drinks on an occasion for females, and five or more drinks for males – their brains already started showing the patterns previously seen in heavy drinkers: more activity in certain areas of the brain as they tried to perform a memory test. These brain areas included the parietal lobe (which helps process spatial information), and frontal lobe (the portion of the brain involved in, among other things, short-term memory tasks, planning, and organization).

“At the point these teens began drinking heavily, the fMRI data revealed greater parietal and frontal activity during a spatial working memory task in heavy drinkers versus light drinkers, despite equivalent performance on the tasks and after considering their brain activation patterns before drinking started,” said Squeglia.

The study’s findings add to evidence that heavy episodic drinking during adolescence may be followed by subtle alterations in brain functioning. But the research also points to neural response patterns that could indicate a risk factor for future substance use.

“Our results suggest there could be a pre-existing vulnerability, and could provide clues to the biological origins of problem drinking,” said Squeglia.

Additional contributors to the study include Reagan R. Wetherill, PhD, UC San Diego; and Carmen Pulido, PhD, Joanna Jacobus, PhD, and Gregory G. Brown, PhD, UC San Diego and VA San Diego Healthcare.

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