

Children of alcoholics: different brain regions affect who may or may not develop alcohol problems

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Although children of alcoholics (COAs) have a greater risk of developing alcohol-use disorders (AUDs), not all COAs *will* develop AUDs. This study used functional magnetic resonance imaging (fMRI) to examine brain responses to emotional stimuli in adolescent COAs considered “vulnerable” or “resilient” to AUDs. Findings indicate that resilient COAs have greater control over their emotional responses, while vulnerable COAs seem to have difficulties processing emotional stimuli.

Results are published in the March issue of *Alcoholism: Clinical & Experimental Research*.

“COAs are between four and ten times more likely than non-COAs to develop AUDs,” said Mary Heitzeg, research investigator in the psychiatry department at the University of Michigan, and lead author for the study. “It is widely believed that this is due to a combination of genes that are passed on and the environment these children are raised in. Both of these factors – genetics and environment – can influence the developing brain. Therefore, our research focuses on what brain responses can tell us about how risk is passed on to COAs.”

Heitzeg and her colleagues recruited 28 adolescent participants (15 males, 13 females), 16 to 20 years of age, from a community study of alcoholic and matched “control” families. Of these, 22 were COAs: 11

were considered vulnerable for later alcoholism since they were already showing signs of problem drinking, and 11 were considered resilient, based on low levels of problem drinking during the course of their adolescence. The remaining six adolescents were considered low-risk “controls.” All of the participants were given a task of passively viewing positive, negative and neutral words during fMRI, and their neural activation was then compared. Behavior problems were assessed with the Youth Self-Report.

“The really interesting part of our results is that we found separate brain regions that contribute to resilience versus vulnerability,” said Heitzeg, “as opposed to finding that the groups were simply performing at different levels along the same scale. The resilient group had greater responses in two brain regions – the orbitofrontal cortex, which monitors emotional stimuli and evaluates it so that the right response can be made to it; and the insula, which also has an emotional monitoring function but one that is directed more toward the internal emotional state. In contrast, the vulnerable group showed no difference from the control group in those two regions.”

“The authors speculate that this may indicate that resilient COAs have enhanced awareness of their emotional responses, particularly effective emotional processing,” said Duncan Clark, associate professor of psychiatry at the University of Pittsburgh Medical Center. “This enhanced processing may lead to their being less likely to react to emotions in an impulsive fashion.”

“Conversely, the vulnerable group showed an increased response in an area of the prefrontal cortex believed to be involved in conscious regulation of emotional responses, and a corresponding decrease in the amygdala and ventral striatum, which are areas of the brain that are involved in unconscious emotion processing,” said Heitzeg.

“A pattern suggesting less subcortical activation in response to negative emotional stimuli,” said Clark, “means that vulnerable COAs may have more difficulty with negative emotional stimuli due to less effective processing.”

“One of the hallmarks of alcoholism is a difficulty inhibiting automatic responses to alcohol-related stimuli,” explained Heitzeg. “For example, being in a bar may lead a recovering alcoholic to have a drink even though they know they should not drink because of the negative consequences. Some of this weakness in controlling automatic behavior may be caused by alcohol consumption, but some is believed to be a pre-existing behavioral trait that predisposes a person to alcoholism. Therefore the enhanced monitoring and consequent flexibility in responding that may distinguish the resilient COAs could translate specifically into a protective factor from alcoholism by allowing better control over behavior.”

On the other hand, she added, the suppression of emotion observed in the vulnerable COAs suggests an excess tendency to shut down emotional arousal. “These youth may not fully process emotional information, leaving them unable to engage normally with emotional events in their lives,” Heitzeg explained. “Therefore, this group’s risk mechanism may involve a tendency toward inappropriate behavior because of a poorer processing of relevant emotional cues.”

Both Heitzeg and Clark were intrigued by the possibilities of using fMRI to relate brain-activation patterns in response to emotional stimuli among COAs to their risk of developing AUDs, but both of them also noted the preliminary nature of this study. “This work is an important first step in understanding the differences between COAs who develop AUDs and those who do not,” said Heitzeg.

She and her colleagues will continue to follow the adolescents from this

study. “We expect to see quite a few members from the vulnerable group and few, if any, members from the resilient group move into AUD diagnosis,” she said. “We are also looking at younger COAs – those between the ages of seven and 11 years - to give us an earlier view of how they control their emotions and behavior. We plan to look at their brain responses every two years through adolescence, and also track their drinking behavior and behavior problems. This will give us a more complete understanding of early brain functioning in vulnerable and resilient COAs.”

Source: University of Pittsburgh

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