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Substance use in adolescence and risk for aggression

Effects of alcohol and cannabis on aggression-linked brain circuitry

Philadelphia, February 16, 2021 – Alcohol and cannabis use during adolescence is a well-known risk factor for alcohol use disorder (AUD) and cannabis use disorder (CUD) during adulthood. Whether early drug use plays a causative role in predisposing teens to AUD and CUD is unknown, but researchers are investigating the possibility that it may have an impact on neural development. Evidence suggests that an increased propensity for aggression may underlie the risk.

Now, [a study](#) in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, published by Elsevier, shows that teens with more severe AUD or CUD displayed stronger retaliatory behaviors, but only those with AUD – and not CUD – had altered brain activity in aggression circuits.

One clue about substance use and risk for future AUD or CUD has emerged from the strong association between AUD and CUD and conduct disorder (CD), which includes increased aggressive behaviors. CD in young children can predict later substance use, suggesting that activity in neural networks involved in aggression may be a predisposing factor for substance use and abuse. In the current study, the authors hypothesized that, if heightened threat processing were a factor in AUD / CUD risk, then AUD / CUD severity would correlate with increased recruitment – or decreased regulation – of neural aggression circuitry.

R. James Blair, PhD, lead author of the study, and based at the Center for Neurobehavioral Research, Boys Town National Research Hospital, Boys Town, NE, USA said, “The findings indicated that, in adolescents, AUD severity in particular was associated with an exaggerated recruitment of regions implicated in retaliation, and that this relates to an increased risk for reactive aggression.”

The study included 112 youths, aged 13 to 18 years of age, with substance use disorders or other mental health concerns. To assess neural processing associated with threat, the researchers used functional magnetic resonance imaging (fMRI) to evaluate brain activity in subjects during a retaliation task. For the task, participants were presented with a \$20 USD pot to be split with a partner either “fairly,” with each receiving \$10, or “unfairly,” in which the participant received \$2, \$4, or \$6 while the partner received the larger balance. As part of the game, participants could accept or reject the offer, and could spend “punishment dollars,” each of which caused their partner to lose \$7. Participants were then graded on their propensity to retaliate in the task.

The investigators compared participants’ AUD or CUD severity with their likelihood to retaliate during the task. In general, the teens retaliated more strongly as the offers became less fair. But those with more severe CUD were more likely to retaliate at lower levels of unfairness.

Surprisingly, AUD severity was not associated with higher retaliation behavior. AUD severity, however, was associated with disordered neural activity in key brain areas linked to aggression and retaliation.

Cameron Carter, MD, Editor of *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, commented that “this work shows how noninvasive brain imaging can be used to provide new information about the differential effects of alcohol and cannabis use on brain function in young people with conduct disorder.”

The study could not differentiate between the possibility that alcohol use affected the brain activity or whether the fMRI findings represented existing risk factors for AUD. In any case, the results suggest that alcohol and cannabis may affect brain circuitry differently and have different mechanisms for imparting future risk for abuse.

Notes for editors

The article is "Alcohol use disorder and cannabis use disorder symptomatology in adolescents and aggression: associations with recruitment of neural regions implicated in retaliation," by R. James Blair, Sahil Bajaj, Noah Sherer, Johannah Bashford-Largo, Ru Zhang, Joseph Aloï, Chris Hammond, Jennie Lukoff, Amanda Schwartz, Jaimie Elowsky, Patrick Tyler, Francesca Filbey, Matthew Dobbertin, Karina Blair (<https://doi.org/10.1016/j.bpsc.2020.11.016>). It appears as an Article in Press in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, published by [Elsevier](#).

Copies of this paper are available to credentialed journalists upon request; please contact Rhiannon Bugno at BPCNNI@sobp.org or +1 254 522 9700. Journalists wishing to interview the authors may contact R. James Blair at james.blair@boystown.org or +1 (531) 355-1217.

The authors' affiliations and disclosures of financial and conflicts of interests are available in the article.

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