



Brain Structure And Substance Use: Disentangling Risk, Exposure, and Drug-Specific Effects

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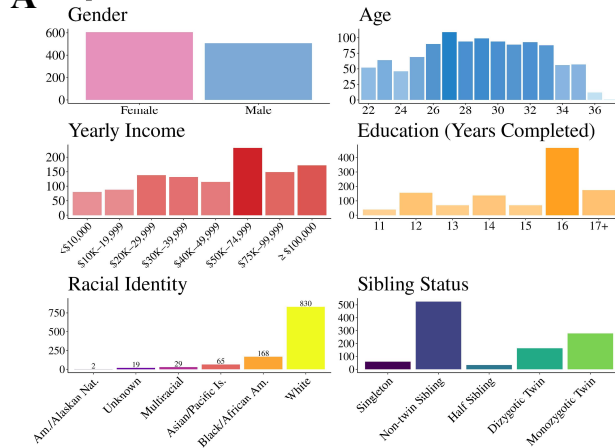


What is the effect of substance use on brain structure?

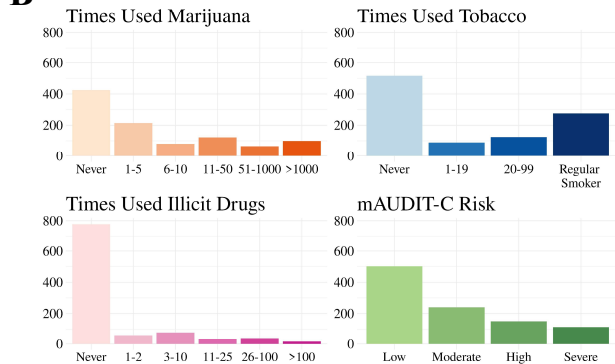
Findings indicate a bidirectional relationship between substance use and brain structure, with a combination of risk and exposure effects.

- The current project utilizes data from relatives, allowing the identification of risk and exposure effects.
- The Human Connectome Project (HCP) is a family-based study (2-4 siblings per family, most including a twin pair) of 1,206 healthy young adult participants. Data were collected from 2012-2015 at Washington University in St. Louis, including a large variety of neuroimaging, cognition, and mental health measures. Data are openly available.

A Sample Characteristics



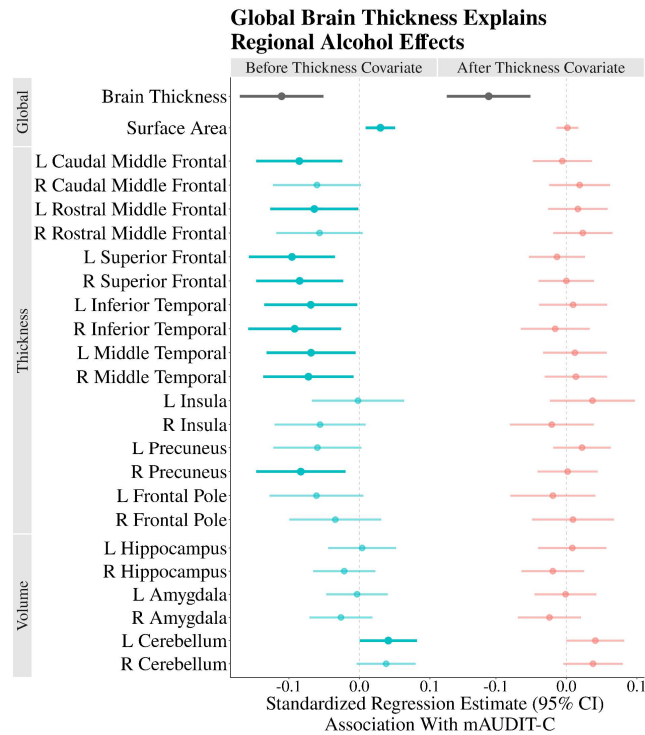
B Substance Use Endorsement



B) The mAUDIT-C, a modified version of the AUDIT-C, was selected to reflect recent history of alcohol use. Of the four substances, alcohol had the highest prevalence of recent use (100% of the sample), followed by marijuana, tobacco, and illicit drugs, respectively.

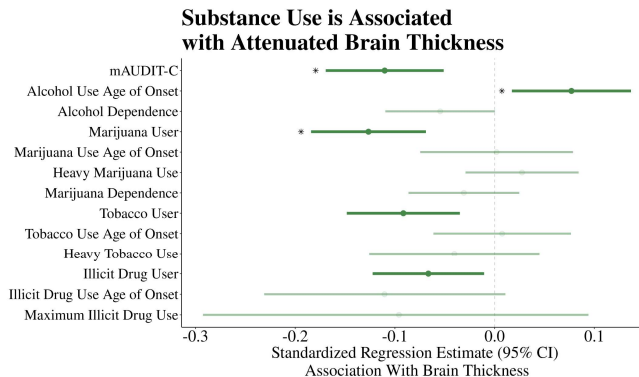
Which brain regions are affected by substance use endorsement?

C



C) Initial analyses suggested that mAUDIT-C predicted several brain structure estimates. However, these associations were accounted for by controlling for mean global thickness, indicating that mAUDIT-C is a predictor of global, rather than regional, brain measures.

D

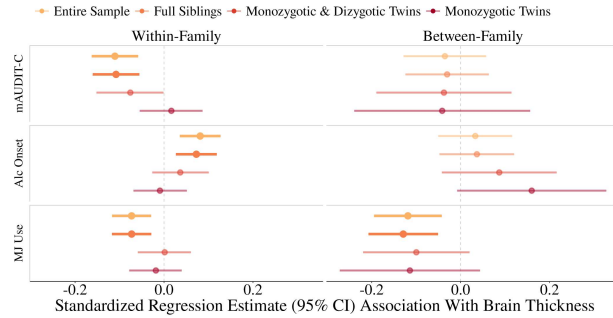


D) *Denotes unique variance above other significant substance use variables. Linear mixed-effects models indicated that substance use endorsement (i.e., tobacco, marijuana, illicit drug, and alcohol use) predicted significantly attenuated brain thickness. However, only the mAUDIT-C, alcohol use age of onset, and marijuana use variables evidenced drug-specific effects.

Are these brain changes due to environmental or genetic effects?

E

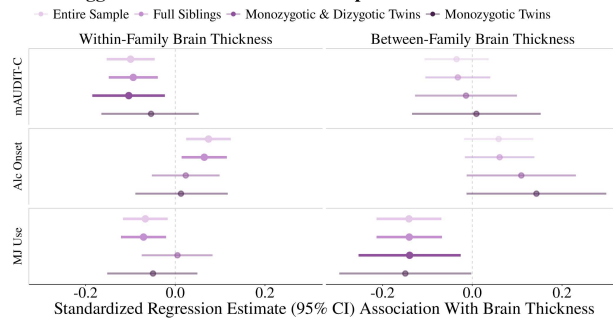
Drug Use Associations Reflect a Combination of Exposure and Risk on Brain Thickness



E) MJ Use = Marijuana Use. Alc Onset = Alcohol use age of onset. Between- and within-family substance use analyses were utilized to assess predispositional and casual effects on brain thickness. A causal effect was present for alcohol use age of onset and the mAUDIT-C. Marijuana presented with both effects.

F

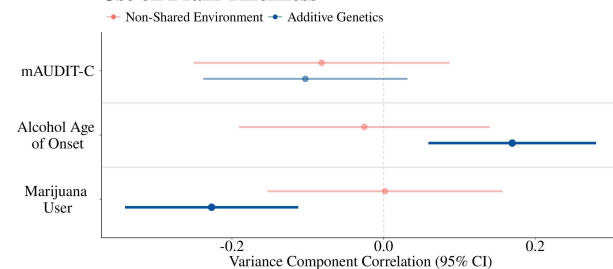
Associations Between Brain Thickness and Substance Use Suggest a Bidirectional Relationship



F) MJ Use = Marijuana Use. Alc Onset = Alcohol use age of onset. Between- and within-family brain thickness analyses were employed to explore a potential bidirectional relationship between substance use and brain thickness. Indeed, a genetic effect of brain thickness on substance use was observed for all variables. Only marijuana evidenced a predispositional effect.

G

Significant Genetic Risk Effects of Substance Use on Brain Thickness



G) The SOLAR-Eclipse Genetics software was employed to assess the environmental and genetic effects of substance use on brain thickness. The latter effect was present for alcohol age of onset and marijuana. There were no observed effects present for AUDIT-C.