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Associations of Neural and Genetic Characteristics with Substance Use Risk in the Adolescent Brain Cognitive Development Study

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Significant advancements in non-invasive brain imaging approaches and genome-wide association efforts have enabled the identification of genetic loci associated with brain morphology and substance use among adults. However, less is known about neural and genetic characteristics that underpin substance use involvement among preadolescents. Using data drawn from the Adolescent Brain Cognitive Development Study, we examined whether polygenic scores (PGS) for substance use (i.e., alcohol, tobacco, and cannabis use) predicted variation in brain structure prior to substance use (at ages 9-10), and investigated whether these PGS were associated with early substance use involvement (at ages 12-13). An early substance use involvement factor was created based on perceived substance use risk, harms, availability, and substance use. PGS for substance use were created based on genome-wide association studies conducted by Liu et al. (2019) and Pasman et al. (2018). A “common factor” substance use PGS was also created to assess genetic risk for using multiple substances. Significant negative correlations were observed between (1) alcoholic drinks per week and average cortical thickness, and (2) intracranial volume with age of smoking initiation. Positive correlations were observed between the (1) insula surface area and lifetime cannabis use, and (2) the common substance use PGS and pericalcarine surface area. Subsequent analyses will investigate associations of these PGS with early substance use involvement. Preliminary findings indicate a shared genetic etiology between cortical brain morphology and substance use and suggest that the genetic architecture of substance use is linked to heterogeneity in brain structure among preadolescents.