Marijuana Exposure and Cognitive Performance

Cannabis exposure is not causally associated with either significant or residual detrimental effects on cognitive performance

“Data on substance use as well as neurocognitive measures were assessed in 804 adolescents (441 females, 363 males) at age 14 and 19. … Our data suggests that decision-making is not impaired when cannabis is used in moderation and onset of use occurs after the age of 15. In addition, we find no evidence to support the presumption that cannabis consumption leads to a decline in neurocognitive ability.”

Residual effects of cannabis-use on neuropsychological functioning, Cognitive Development, 2021

“It is unclear whether cannabis use causes cognitive decline; several studies show an association between cannabis use and cognitive decline, but quasi-experimental twin studies have found little support for a causal effect. Here, we evaluate the association of cannabis use with general cognitive ability and executive functions (EFs) while controlling for genetic and shared environmental confounds in a longitudinal twin study. … We tested the concurrent association between the cannabis use variables and cognitive abilities in late adolescence and young adulthood and the longitudinal association between cannabis use variables during adolescence and young adulthood cognitive abilities. … We found little support for a potential causal effect of cannabis use on cognition, consistent with previous twin studies. Results suggest that cannabis use may not cause decline in cognitive ability among a normative sample of cannabis users.”

Investigating the causal effect of cannabis use on cognitive function with a quasi-experimental co-twin design, Drug and Alcohol Dependence, 2019

Cannabis exposure, even among young people, is not independently associated with significant, long-term changes in brain morphology

“A systematic review following PRISMA guidelines and subsequent effect-size seed-based d mapping (SDM) meta-analyses were conducted to investigate relationships between age (across the 12-to-21-year-old developmental window), sex, and gray matter volume (GMV) differences between cannabis using (CU) and typically developing (TD) youth. … Meta-analysis of whole-brain VBM [voxel-based morphometry] studies identified no regions showing significant GMV difference between CU and TD youth. … These findings suggest that GMV [gray matter volume] differences between CU [cannabis using] and [typically developing] TD youth, if present, are subtle, and may vary as a function of age, cumulative cannabis exposure, and sex in young people. Whether age- and sex-related GMV differences are attributable to common predispositional factors, cannabis-induced neuroadaptive changes, or both warrant further investigation.”

Age- and sex-related cortical gray matter volume differences in adolescent cannabis users: A systematic review and meta-analysis of voxel-based morphometry studies, Frontiers in Psychiatry, 2021

“In a population-based sample of 436 twins aged 24 years, dimensional measures of alcohol and cannabis use (e.g., frequency, density, quantity, intoxications) across emerging adulthood were assessed. Cortical thickness of control/salience network areas were assessed using magnetic resonance imaging and defined by a fine-grained cortical atlas. … Greater alcohol, but not cannabis, misuse was associated with reduced thickness of prefrontal (e.g., dorso/ventrolateral, right frontal operculum) and frontal medial cortices, as well as temporal lobe, intraparietal sulcus, insula, parietal operculum, precuneus, and parietal
medial areas. Effects were predominately (pre)frontal and right lateralized. … This study provides novel evidence that alcohol-related reductions in cortical thickness of control/salience brain networks likely represent the effects of alcohol exposure and premorbid characteristics of the genetic predisposition to misuse alcohol. The dual effects of these two alcohol-related causal influences have important and complementary implications regarding public health and prevention efforts to curb youth drinking.”

The effects of alcohol and cannabis use on the cortical thickness of cognitive control and salience brain networks in emerging adulthood: A co-twin control study, Biological Psychiatry, 2021

“The goal of this diffusion tensor imaging (DTI) study was to compare whole-brain white matter microstructure between 39 near daily cannabis users and 28 controls closely matched on age, sex, alcohol use, cigarette use and mental health. Within the group of cannabis users, associations between white matter microstructure and recent cannabis use, dependence severity, and age of onset and duration of weekly use were investigated. White matter microstructure did not differ between cannabis users and controls and did not covary with recent cannabis use, dependence severity, or duration of use. … These findings suggest that long-term near-daily cannabis use does not necessarily affect white matter microstructure.”

The relation between cannabis use, dependence severity and white matter microstructure: A diffusion tensor imaging study, Addiction Biology, 2021

After adjusting for potential confounders, the cumulative use of cannabis — even among young people — is not associated with either a significant or long-term adverse impact on intelligence quotient

“In the largest longitudinal examination of marijuana use and IQ change, … we find little evidence to suggest that adolescent marijuana use has a direct effect on intellectual decline. … [T]he lack of a dose-response relationship, and an absence of meaningful differences between discordant siblings lead us to conclude that the deficits observed in marijuana users are attributable to confounding factors that influence both substance initiation and IQ rather than a neurotoxic effect of marijuana.”

Impact of adolescent marijuana use on intelligence: Results from two longitudinal twin studies, Proceedings of the National Academies of Sciences, 2016

“We … test[ed] for associations between marijuana use and changes in intelligence scores from adolescence (ages 12-21) to adulthood (ages 18-26) using data drawn from the National Longitudinal Study of Adolescent to Adult Health. … [O]ur findings did not reveal a significant association between cumulative marijuana use and changes in intelligence scores.”

Examining the influence of adolescent marijuana use on adult intelligence: Further evidence in the causation versus spuriousness debate, Drug and Alcohol Dependence, 2017