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Young Brains on Drugs

THE DEBATES OVER LEGALIZATION, DECRIMINALIZATION, AND MEDICAL USES OF MARIJUANA IN THE United States are missing an essential piece of information: scientific evidence about the effects of marijuana on the adolescent brain. Much is known about the effects of recreational drugs on the mature adult brain, but there has been no serious investigation of the risks of marijuana use in younger users. In April 2014, a controversial study* suggested that “casual” use of marijuana is associated with structural abnormalities in the brains of young people (aged 18 to 25), particularly in regions vital to emotion, motivation, and decision-making. The fact that the findings are preliminary and disputed indicates that rigorous research is needed to inform discussions about the public health benefits and risks of legalized marijuana.

Although marijuana remains illegal for people under the age of 21 in the United States (including in the two states that have legalized it for adults), young people will almost certainly have greater exposure to, and likely more ways to access, the drug (as they already do with alcohol and tobacco), as new initiatives to change marijuana laws in many states come to fruition. Proponents of legalization argue that the medically harmful effects of marijuana are “no worse” than those of alcohol and tobacco. But even if that is true, it does not mean that the risks are the same. Over the decades, the United States has funded research to study the long-term health effects of alcohol and tobacco, but not marijuana. Yet many of the most worrisome brain pathologies from drug use are seen in mental health (as opposed to pulmonary disease and cancer with smoking, and gastric and liver disease with alcohol), where marijuana use is associated with, among other conditions, anxiety and psychotic disorders.† Research suggests that early marijuana use is linked to these problems, but their biological underpinnings are a mystery.

The National Survey on Drug Use and Health has repeatedly found that children who began alcohol or marijuana use before age 15 had a fivefold-increased prevalence of substance use disorders later in life.‡ This may be due to effects of early drug use on the trajectory of the brain’s subsequent development, but we don’t know for sure. What is needed are large longitudinal cohort studies to examine whether marijuana use causes changes in brain function and behavior in young people. The Framingham Heart Study, still ongoing after its initiation 65 years ago, revolutionized our understanding of what causes cardiovascular disease, producing completely unanticipated findings that have led to improved health care and public policy.

The U.S. National Institutes of Health should launch a similar long-term study of pre-adolescent children and follow them through adolescence into young adulthood, when their brains are most plastic, rapidly developing, reorganizing, and forming enduring neural connections and circuits. The rapid growth of brain science in the past two decades has generated new methods to measure the effects of drugs on brain structure and mental processes. With “big brain” research projects now under way in the United States and Europe, including the BRAIN Initiative announced by President Obama in 2013, to deduce how brain function is linked to behavior and disease, the time is right to rigorously pursue a long-term study of drug effects. Without more scientific evidence to inform policies, we are gambling with the health and safety of our youth in making decisions about psychoactive substances such as marijuana when their real risks are unknown.

– Robert L. DuPont and Jeffrey A. Lieberman

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*J. M. Gilman *et al.*, *J. Neurosci.* **34**, 5529 (2014). †M. Large *et al.*, *Arch. Gen. Psychiatry* **68**, 555 (2011); L. Degenhardt *et al.*, *Addiction* **108**, 124 (2013). ‡Substance Abuse and Mental Health Services Administration, *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings*, NSDUH Series H-46, HHS Publication No. (SMA) 13-4795 (Substance Abuse and Mental Health Services Administration, Rockville, MD, 2013).

