Marijuana Legalization and Young Brains: Time for Serious Study

Psychiatric News Online
From the American Psychiatric Association

From the President
April 18, 2014


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While we debate and differ on the risks and benefits of legalization, decriminalization, and medical uses of marijuana, all will agree (or say they do) that marijuana should remain illegal for young people. However, we should not deceive ourselves; just like with alcohol and tobacco, young people will almost certainly have ready access to pot with the liberalization of our laws and the commercialization of marijuana. What we are missing in fully understanding the ramifications of this new legislation, which can have broad effects on our country and culture, is firsthand knowledge of how marijuana affects the brain, particularly the young brain. Without more scientific evidence, we are gambling with the health and safety of our young people based on speculation and wishful thinking. Moreover, our national wager will increase as more states move to legalize marijuana.

The irony is that we currently have the capacity to determine whether there are harmful effects of marijuana on the developing brain. The rapid growth of brain science in the last two decades has provided the capacity to measure the effects of drugs on behavior and mental functions and to identify brain changes in structure and function—something not previously possible. Substantial evidence from animal models and several human studies has shown that drug use produces a sensitization of brain circuits that leads to sustained drug use and to progression to additional damaging drug use and to perpetuation and relapse during abstinence. The tragic death of Philip Seymour Hoffman is a prime example of these enduring effects. After a period of extensive drug use in his youth, he was drug-free for 20 years, only to fall victim to a common prescription for a pain medicine that triggered a fatal relapse into addiction at age 46.

The National Institute on Drug Abuse (NIDA) has funded groundbreaking research to understand specifically how drugs change the brain in a way that impairs mental functions and leads to
addiction. This research has revealed how otherwise dissimilar drugs act through common neural pathways of reward to cause addiction. These fundamental pathways are hijacked by drugs that stimulate them far more intensely than do natural rewards like food and sex, which affect the same brain-reward system. That is why food and sex pathologies have so much in common with addiction to tobacco, alcohol, and other drugs, including marijuana.

This capacity for drug-induced alterations in the brain is greatly enhanced during childhood and adolescence, when the brain is developing. In recent years, the National Survey on Drug Use and Health has annually reported that children who initiated alcohol or marijuana use at age 14 or younger report a fivefold increased prevalence of a substance use disorder later in life. These results suggest that drugs affect the trajectory of the developing adolescent brain. What we don’t know is how this differs from what would have been the drug-unexposed trajectory and what is the end result.

Missing is the scientific evidence to enable us to appreciate the specific impact of marijuana on the developing brain. Proponents of legalization argue that pot is “no worse” than alcohol and tobacco in terms of their potential for medically harmful effects. While this may be true (to some extent), many of the potential deleterious effects and long-term brain pathologies from adolescent drug use are seen in mental health where marijuana use can trigger serious and persisting anxiety and psychotic disorders. And no one is talking about the possible effects of adolescent marijuana use on more subtle brain effects, including information processing, academic achievement, and motivation.

Research has already shown that early marijuana use is linked to these problems. We need data to show whether those changes have enduring biological underpinnings. Answers to this and other questions are essential to guide future drug policy and legislation.

There are many things that can and should be done to address the problem of substance abuse in our population. The major barrier has been the limited resources available to fund this research. However, given this new wave of legislation and its potential impact on the youth of our nation, it should be an urgent priority to determine the effects of marijuana use on the developing brain. Now is the time to launch a long-term study of a large, carefully selected, national cohort of 10-year-olds to be followed continuously for at least 15 years. It should begin before adolescence when the brain is rapidly developing, reorganizing, and undergoing final formation of major connections, the time when enduring brain biology can be established or changed. Uniquely among signaling systems, adolescence is the period when the wiring of the brain dopamine system is completed, the same dopamine involved with brain reward, learning and memory, psychosis, and sexual response. It is also the time before and during youthful initiation and novelty seeking.

Only with such a study, a veritable Framingham Study, of the effects of drug use on youth, with the support of the National Institutes of Health (NIH), will it be possible to advance our understanding of the brain impact of marijuana and other drug use on youth. However, support for this study must come from new funds and cannot cannibalize the meager existing budgets of the NIH institutes, which are already stretched by the lingering effects of the Great Recession and sequestration.
With the recent state laws making marijuana more acceptable and more widely available, we are already behind schedule. A national investment in science must be made now to answer the essential questions about the impact of drug use, especially marijuana use, on the adolescent brain. Imagine if our country a century ago had the knowledge we have today about the negative health effects of tobacco. We cannot afford to wait any longer to learn the truth about the possible adverse brain effects of marijuana use.