

Marijuana and the Teen Brain



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Topics



- Teen brain development
- Teen MJ use
- Interactions between MJ and the teen brain
- Effects of MJ on:
 - Brain structure and function
 - Cognitive abilities
 - Sleep
 - Behaviors, performance, health
- Prevention strategies

Teen Brain Development



- Adolescence a period of rapid developments driving transition from childhood to adulthood
- Involves complex biological, psychological, and social changes
- Progressions and interactions of these factors define short-term and long-term adolescent outcomes

Brain Changes during Adolescence



- Increased efficiency and specialization of brain functions
- Regions that mature last are those responsible for *impulse control, judgment, and planning ahead*
- Cortical gray matter does not resemble the adult brain until the early 20s
- Teens vulnerable both to substance use and its effects

Teen MJ Use



- Adolescents and young adults have a higher prevalence of MJ use than any other age group and it is increasing
- ~ 15% of 8th graders have used MJ
- ~ 50% of 12th graders have used MJ
 - 20% past month
 - 7% daily
- ~ 1 in 4 teens who use MJ develop abuse or dependence



Interactions between MJ and the Teen Brain



- Adolescent brain is actively developing
 - Exposure to MJ during a critical period of neural development may interrupt maturational processes
 - Negative effects on the brain could have major implications for academic, occupational and social achievement
- Interactions have been studied with sophisticated neurocognitive testing, MRI, and functional MRI

Effects of MJ



- Brain structure and function
- Cognitive abilities
- Sleep
- Behaviors, performance, health



Marijuana's Effects on the Brain

HYPOTHALAMUS

Controls appetite, hormonal levels and sexual behavior

BASAL GANGLIA

Involved in motor control and planning, as well as the initiation and termination of action

VENTRAL STRIATUM

Involved in the prediction and feeling of reward

AMYGDALA

Responsible for anxiety, emotion and fear

BRAIN STEM AND SPINAL CORD

Important in the vomiting reflex and the sensation of pain

NEOCORTEX

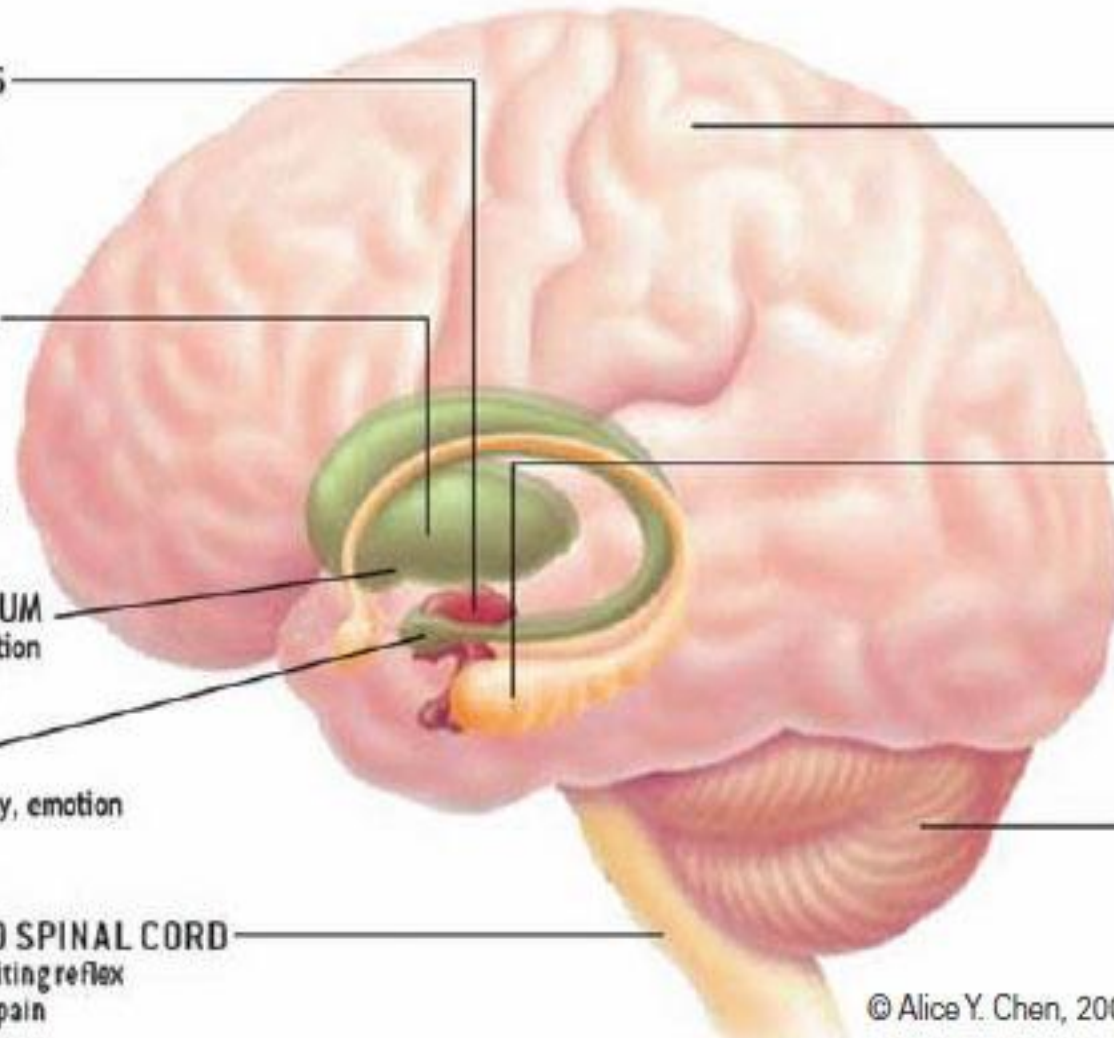
Responsible for higher cognitive functions and the integration of sensory information

HIPPOCAMPUS

Important for memory and the learning of facts, sequences and places

CEREBELLUM

Center for motor control and coordination

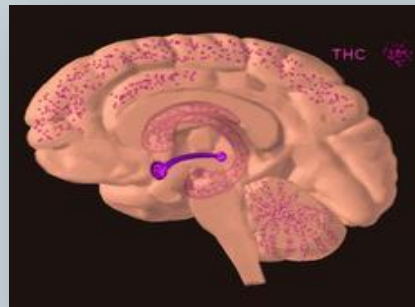


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Effects on Adolescent Brain Structure and Function



- Psychoactive compound in MJ is tetrahydrocannabinol (THC)
 - Similar to endocannabinoids that body produces naturally
 - Interacts with brain through cannabinoid receptors on surface of nerve cells
- Certain parts of the brain have high concentrations of cannabinoid receptors
 - Hippocampus, cerebellum, basal ganglia, cerebral cortex
 - Functions of these areas are ones most affected by MJ



Effects on Adolescent Brain Structure and Function



- Those who use MJ have different brain structure and function from those who do not
- Effects on brain structure and function persist for weeks (possibly years), even during periods of abstinence

Effects on Cognitive Abilities



MJ use in adolescents linked to impairments in:

- Coordination
- Short-term and sustained attention
- Learning, especially verbal learning ability
- Working memory
 - Ability to remember and process information in the moment, and to transfer it to long-term memory when needed
- Processing skills
 - Information processing, sequencing, visuospatial skills
- Executive functions
 - Planning, judgment, decision-making
- IQ

Effects on Adolescent Sleep



- Sleep deficits linked to mood, behavior, and substance use problems in adolescents
- MJ disrupts sleep – including REM and slow wave sleep – also disrupts sleep during periods of abstinence
- MJ use also worsens the adverse effects of sleep deficits
- Sleep loss and poor sleep quality during adolescence may lead to negative effects on important brain, metabolic, and physical maturational processes

Effects on Adolescent Behaviors, Performance and Health



- **Motor vehicle accidents** due to impaired judgment, poor motor coordination/balance, and slowed reaction time, *especially* when combined with alcohol use
- **Poor decision-making** due to compromised judgment (e.g. around sexual behaviors, riding in car with impaired driver)
- **Poor outcomes** including educational performance/grades, truancy, dropout, future unemployment, lower income

Effects on Adolescent Behaviors, Performance and Health



- Chronic cough and bronchitis
- Depression and anxiety (some evidence)
- Acute (immediate) psychosis and panic
- Schizophrenia in vulnerable individuals
- Addiction to MJ and other drugs

Vast majority of adults who use MJ heavily believe that use had negative effects on their cognition, memory, career, social life, physical health, mental health, and/or quality of life

Can MJ Lead to Addiction, Dependence, and Withdrawal?

YES

- **Addiction:** compulsive use of a substance, despite its negative or dangerous effects
 - 1 in 6 teens
- **Dependence:** person needs a drug to function normally
 - 1 in 5 teens
 - Accounts for 4.5 of the 7.1 million Americans dependent on or abusing illicit drugs
 - Primary drug of abuse in 61% of those < 15 years entering drug abuse treatment programs
- **Withdrawal syndrome:** irritability, sleeping difficulties, craving, anxiety, aggression



Difficult to treat MJ abuse and
dependence →
Prevention is critically
important

Prevention Strategies



- Talk to your kids about MJ and dispel myths
 - MJ is not safe
 - ✦ Contains ~ 400 chemicals
 - ✦ When you smoke, you have no idea what you are inhaling
 - e.g. dealers can use sand or glass beads to make their products heavier
 - ✦ Toxic to the brain and lungs
 - ✦ Addictive
 - ✦ Effects can persist even after abstaining for days to weeks
 - Driving after using MJ is not safe
 - MJ use is illegal (at least in Ohio) and legalization of MJ for adults in some states doesn't mean it's safe

Prevention



- Promote engagement
 - Family, peers, school, faith-based organizations, extracurriculars
- Express a no-use attitude
 - Be specific about your family expectations about drug use
 - Provide consistent, negative consequences for not meeting rules
- Start educating your kids early – 4th/5th grade
 - “What do you know about marijuana? Do you know that marijuana can hurt your health? Marijuana use is against the law.”
- Teach and practice skills to refuse drug offers

Prevention



- Monitor your child
 - Monitor behavior, be involved in his/her life, get to know his/her friends, network with other parents
- Keep lines of communication open: do things together and communicate the way they do (FB, twitter)
- Monitor your own behavior – be a role model
- Address depression and anxiety and help your teen to develop healthy coping skills so that they don't need to self-medicate with substances

More Information



National Institute on Drug Abuse

<http://www.drugabuse.gov>

NIDA for Teens

<http://teens.drugabuse.gov/drug-facts/marijuana>

Coalition for a Drug-Free Greater Cincinnati

<http://www.drugfreecincinnati.org/>

Search: “NIDA Marijuana Facts for Teens”

National Institute on Drug Abuse
National Institutes of Health

Most teenagers do not use marijuana.



II. Want to Know More? Some FAQs About Marijuana

What is marijuana? Are there different kinds?

Marijuana is a green, brown, or gray mixture of dried, shredded leaves, stems, seeds, and flowers of the hemp, or cannabis, plant. It goes by many different names—pot, herb, weed, grass—and stronger forms include sinsemilla (sin-seh-me-yah), hashish (“hash” for short), and hash oil.

How does marijuana work?

All forms of marijuana are mind-altering (psychoactive). In other words, they change how the brain works. Marijuana contains more than 400 chemicals, including THC (delta-9-tetrahydrocannabinol). Since THC is the main active chemical in marijuana, the amount of THC in marijuana determines its strength or potency and therefore its effects. The THC content of marijuana has been increasing since the 1980s.

Marijuana
Facts
for **Teens**