consequences?
marijuana and the teen brain
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in this talk

- what is marijuana?
- the brain on marijuana
- is the teen brain special?
- current research
what is marijuana?

- cannabis sativa plant
- leaves, stems flowers
- delta-9-tetrahydrocannabinol = Δ⁹-THC
- main psychoactive ingredient
Δ⁹-THC is the main psychoactive ingredient

Δ⁹-THC activates cannabinoid₁ (CB₁) receptor in the brain.

CB₁ is expressed at high levels in many brain areas.

Two endogenous brain lipids have been identified as CB₁ ligands.
endocannabinoids – ligands for CB$_1$

- N-arachidonylethanolamine
- anandamide (AEA)
- arachidonate-derived neuroactive lipids
- 2-arachidonoylglycerol
- 2-AG
what areas of the brain process marijuana?
motor controlled planning

initiation of actions

termination of actions

habit pathway

- hypothalamus
- basal ganglia
- ventral striatum
- amygdala
- brainstem
- cortex
- hippocampus
- cerebellum
prediction
reward
addiction?
anxiety
emotion
fear

brainstem
cerebellum
cortex
hippocampus
ventral striatum
basal ganglia
amygdala
hypothalamus
vomiting reflex

pain sensation

sympathetic nervous system reactions
The brain contains various regions that contribute to different cognitive functions:

- **higher cognitive functions**
- **sensation perception**
- **judgment and pleasure**
Memory formation involves the hippocampus, which is associated with learning sequences and places. Other brain regions such as the hypothalamus, basal ganglia, ventral striatum, amygdala, cortex, hippocampus, and cerebellum also play crucial roles in various cognitive functions.
motor control
coordination
motor learning
doubles risk of car accident - DUI
Explicit memory or declarative memory: objects, places, facts, people, and events.

1. Short term explicit memory
2. Converted to long term memories
3. Stored in parts of the cortex that correspond to the senses involved – the same areas that originally processed the information.
Implicit memory or procedural memory: skills, habits, and conditioning.

Implicit memories of skills, habits, and conditioning are stored in the cerebellum, striatum, and amygdala.
learning

influence

memory

perceptual information
How do endocannabinoids affect synaptic transmission?

- Voltage-dependent Ca++ channels open & Ca++ enters the terminal.
- Xmtr is released from synaptic vesicle.
- Xmtr binds to receptor and the channel opens.
- Post-synaptic depolarization opens voltage-dependent Ca++ channels → which activates endocannabinoid synthesis.

Xmtr binds to receptor and the channel opens.