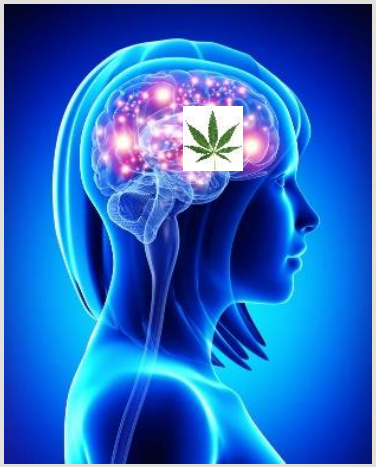
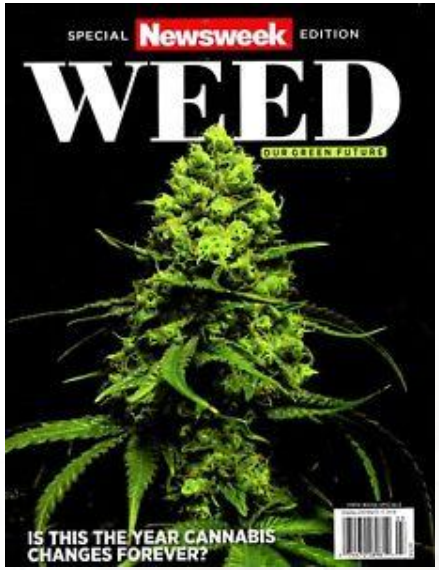


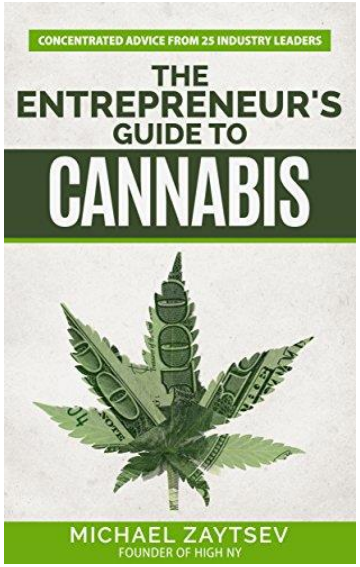
Cannabis and Your Kid's Brain

What You Need to Know

Andra Smith, Ph.D., May 12, 2018

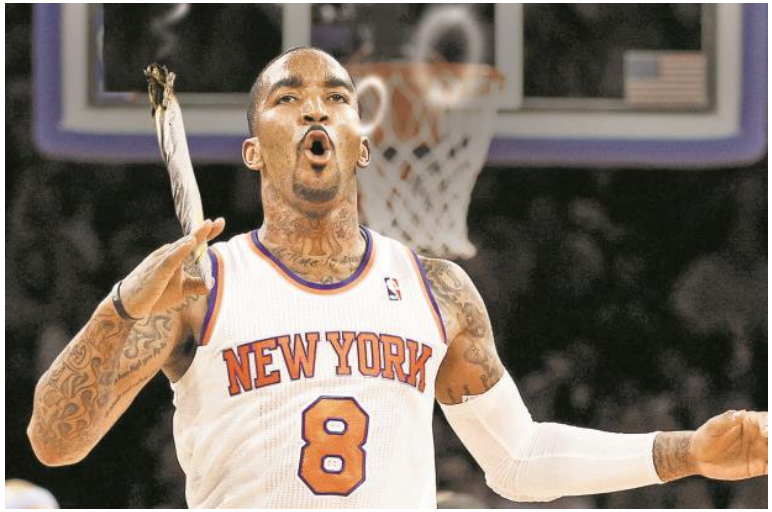

SPECIAL Newsweek EDITION
WEED
OUR GREEN FUTURE
IS THIS THE YEAR CANNABIS CHANGES FOREVER?

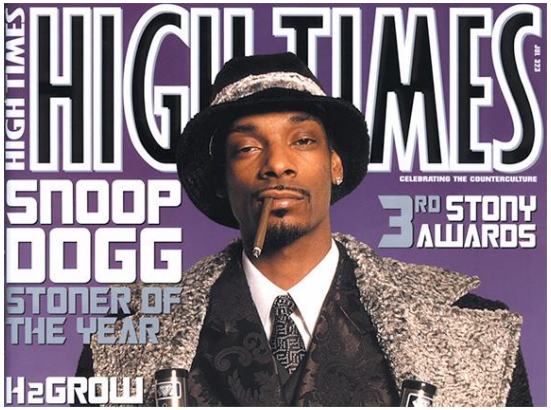

WEED WORLD
18+ ONLY
ISSUE 99
THE LOW DOWN
DIRT
ORGANIC SOIL GROWN VS. HYDRO CANNABIS
CANNABIS GOURMET
CANNA-LICIOUS!
MEL THOMAS
STARTING YOUR CROP
OUTDOOR GARDENING
THE PINNACLE OF GROWING
the best read for
MEDICINAL MARIJUANA
patients + growers


CONCENTRATED ADVICE FROM 25 INDUSTRY LEADERS
THE ENTREPRENEUR'S GUIDE TO
CANNABIS
MICHAEL ZAYTSEV
FOUNDER OF HIGH NY


Summer Indoor Grow
21 Hot Tips for Cool Growrooms
HIGH TIMES
99 Plants in 7 Days!
CLONING FOR HEAVY YIELDS
Plus!
Kentucky's Pot Mafia
Succeed with Seeds

uOttawa


NEW YORK
8


HIGH TIMES
HIGH TIMES
CELEBRATING THE COUNTERCULTURE
SNOOP DOGG
STONER OF THE YEAR
3RD STONY AWARDS
H2GROW

uOttawa

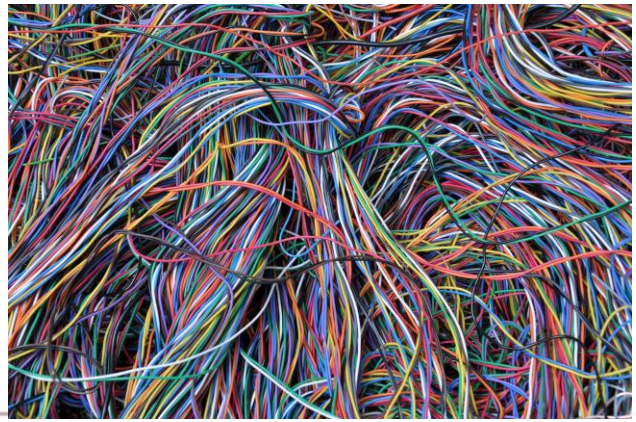
Objectives

- Discuss brain development
- Clarify some common misconceptions about cannabis
- Identify the impact of early and regular cannabis use on youth cognition and risk taking behaviour
- What can we do?

uOttawa

Brain Development

uOttawa



uOttawa

Brain Development

Prenatally – 7 stages

Stages 1-5 = Getting brain set up

Stage 6 = Pruning – streamline the 'good' connections

Stage 7 = Myelination – polishes off these connections, making them quick and efficient.

uOttawa

Brain Development

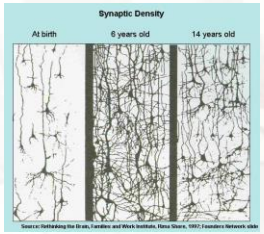
Teen Years

Two critical phases of brain development occur

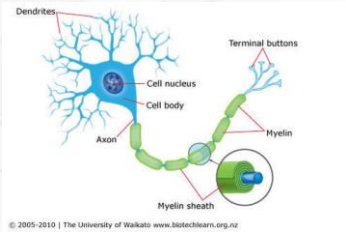
1) PRUNING - streamline the 'good' connections, making the brain more efficient.

2) MYELINATION - polishes off these connections, making them quick and efficient.

1)



2)

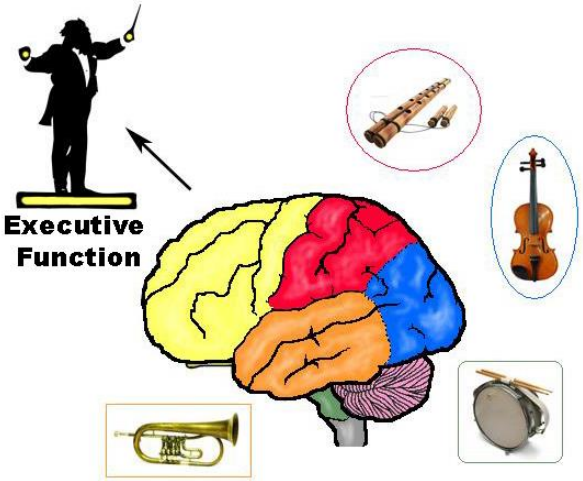


Development of the Prefrontal cortex is most dramatic.

uOttawa

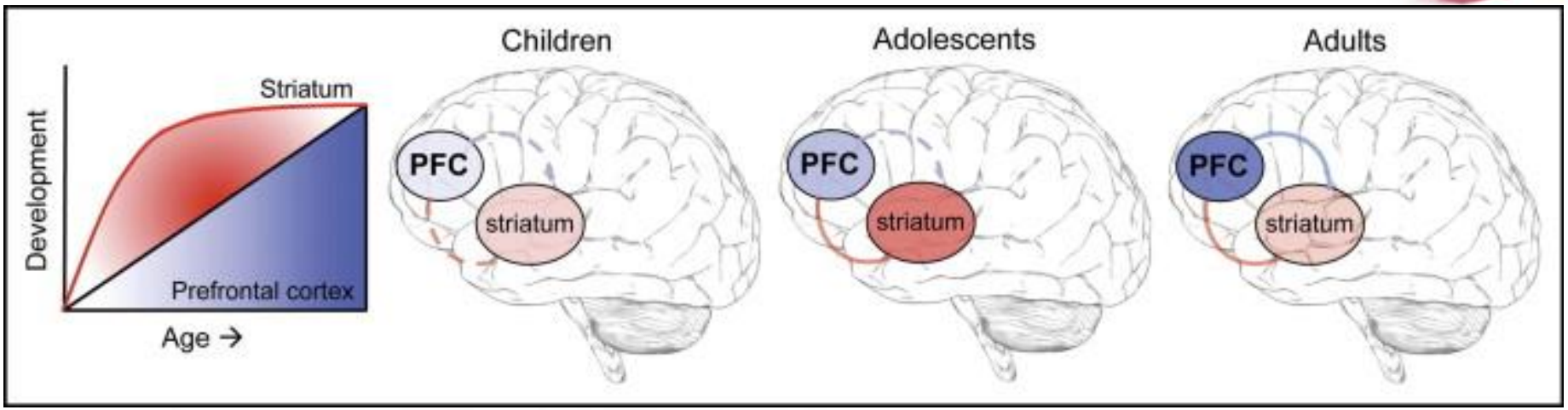
Executive Functioning

- The ultimate mental activity.
- Judgment, planning, decision making, social conduct, organization, anticipation, goal establishment, monitoring results and use of feedback.
- The PFC is the "dashboard" of the brain.



uOttawa

Brain Development



- Striatal – Limbic development – emotion and reward = curvilinear fashion
- Prefrontal development – cognitive control = linear over the course of adolescence
- Adolescence = Emotional reactivity outpaces cognitive control
- Teens = Prone to making high-risk choices, valuing immediate reward over long-term considerations (Casey & Jones, 2010)

uOttawa

Question

- What Contributes to Both Prenatal and Teen Brain Development?

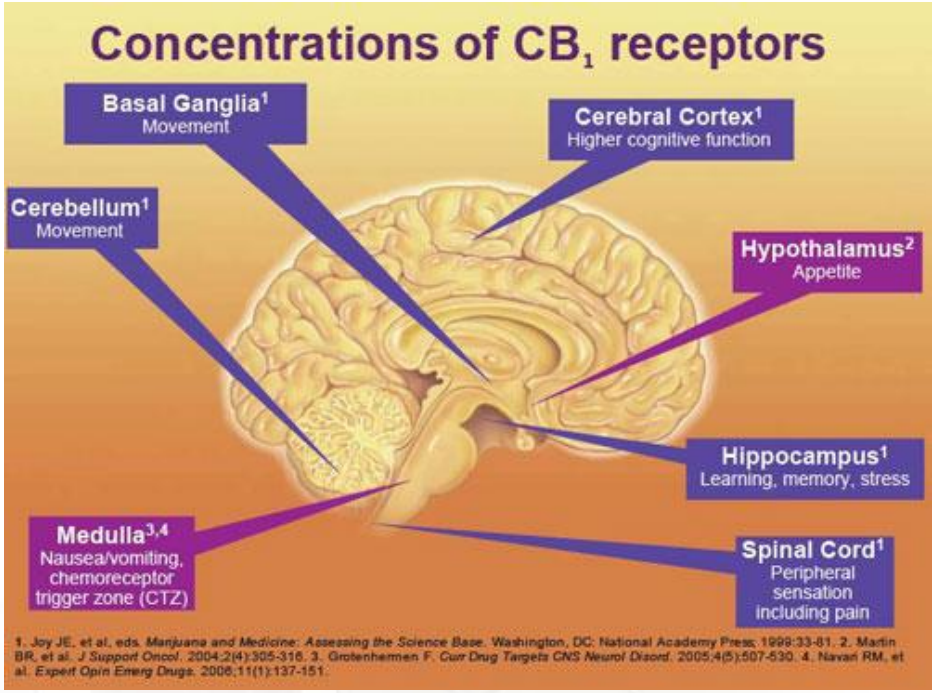
uOttawa

Answer: Endocannabinoid System

- Our internal cannabinoid system.

uOttawa

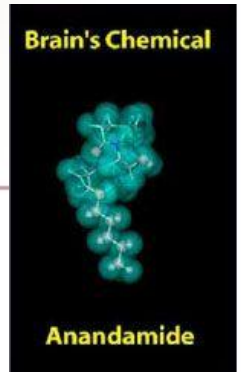
Endocannabinoid System



Helps to Regulate

- Sleep
- Appetite, digestion, hunger
- Mood
- Motor coordination
- Planning/ Starting a movement
- Immune Function
- Reproduction and fertility
- Pleasure and reward
- Pain
- Memory and Learning
- Emotion Regulation
- Temperature regulation

Balance



✓✓

x x

Flood

uOttawa

Impacted Behaviour

- Cognition
  - Processing speed, attention, memory, impulsivity = executive functioning
- Academic and Employment Successes
- Motivation, Reward (dopamine), Emotional Regulation
- Risk taking behaviour
  - Driving under the influence, unprotected sex, other drug use

Cannabis Impairs Driving Ability

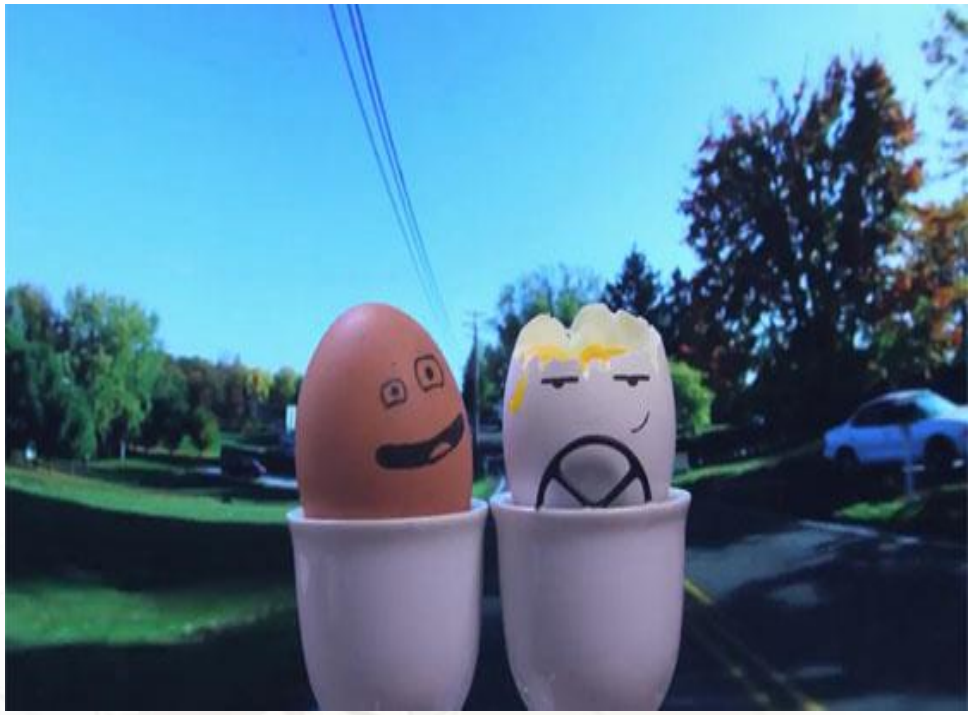


Image reproduced with permission from Arrive Alive – Ontario Student against Impaired Driving.
'Eggs on Weed'

- Cannabis was the most common illicit drug present among fatally injured drivers aged 15-24 in Canada (National Fatality Database)
- Attentional focus, information processing, motor coordination, reaction time
- Driving slower, reduced control with increased task complexity = lane weaving, slower reaction times, impaired divided attention, reduced critical tracking test performance.

uOttawa

Misconceptions

1. Our endogenous cannabinoid system was made for exogenous cannabis.
2. Cannabis is a natural plant so must be harmless.
3. Cannabis is better than alcohol or nicotine.*
4. Everyone is doing it.
5. It is not addictive.
6. Cannabis is medicine so I will feel better if I use it.
7. The research shows mixed evidence.

uOttawa

Is it?

Misconceptions

1. Our endogenous cannabinoid system was made for exogenous cannabis.
2. Cannabis is a natural plant so must be harmless.
3. Cannabis is better than alcohol or nicotine.
4. Everyone is doing it.
5. It is not addictive.*
6. Cannabis is medicine so I will feel better if I use it.
7. The research shows mixed evidence.

uOttawa

Cannabis **Can** Be Addictive

- Who could become addicted? Anyone.

- 9% of users overall,
- 17% of those who begin use in adolescence,
- 25-50% of those teens who are daily users.

- Cannabis use disorder develops faster than for alcohol or tobacco

- Withdrawal = irritability, anxiety, restlessness and sleep problems

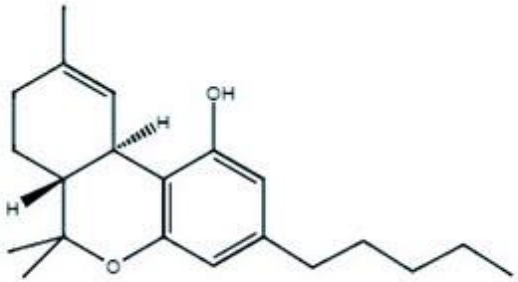
- Young adults with cannabis dependence report
  - ✓ persistent desire
  - ✓ unintentional use of cannabis
  - ✓ spending excessive time obtaining/using cannabis
  - ✓ continued use of cannabis despite experiencing health problems
  - ✓ experiencing tolerance (needing a greater amount of the drug to get the same effects)
  - ✓ experiencing negative social consequences.

uOttawa

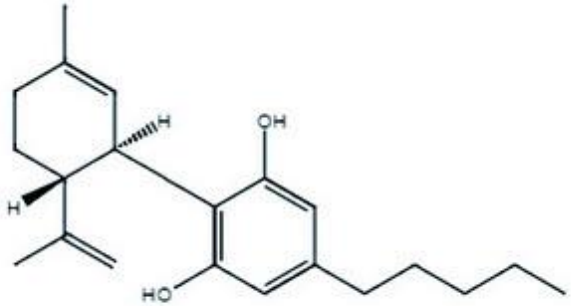
Misconceptions

1. Our endogenous cannabinoid system was made for exogenous cannabis.
2. Cannabis is a natural plant so must be harmless.
3. Cannabis is better than alcohol or nicotine.
4. Everyone is doing it.
5. It is not addictive.
6. Cannabis is medicine so I will feel better if I use it*
7. The research shows mixed evidence.

Chemical Make-up



delta-9-THC



CBD

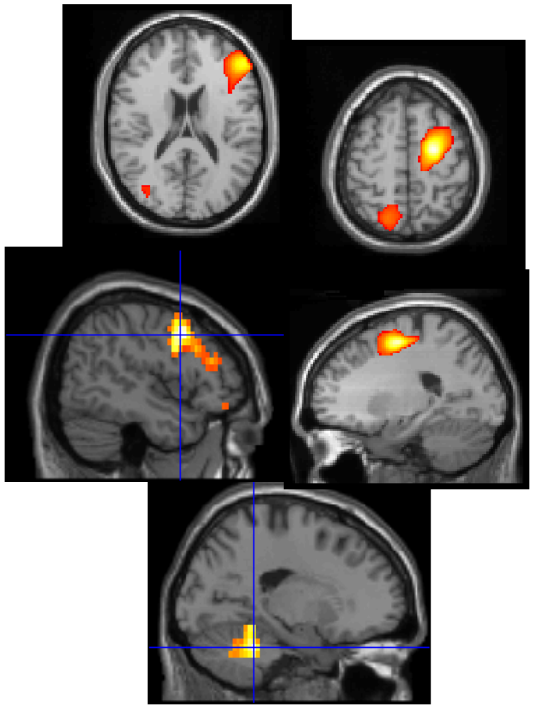
THC= tetrahydrocannabinol
CBD= cannabidiol

uOttawa

Misconceptions

1. Our endogenous cannabinoid system was made for exogenous cannabis.
2. Cannabis is a natural plant so must be harmless.
3. Cannabis is better than alcohol or nicotine.
4. Everyone is doing it.
5. It is not addictive.
6. Cannabis is medicine so I will feel better if I use it.
7. The research shows mixed evidence.*

Magnetic Resonance Imaging (MRI)



uOttawa

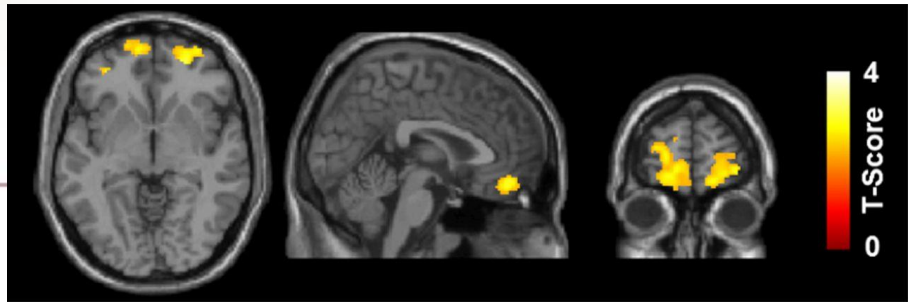
Neuroimaging Research

Long-term effects of marijuana use on the brain

Francesca M. Filbey[a,1], Sina Aslan[a,b], Vince D. Calhoun[c,d], Jeffrey S. Spence[a], Eswar Damaraju[c], Arvind Caprihan[c], and Judith Segall[c]

[a]Center for BrainHealth, University of Texas, Dallas, TX 75235; [b]Advance MRI, LLC, Frisco, TX 75034; [c]The Mind Research Network, Albuquerque, NM 87106; and [d]University of New Mexico, Albuquerque, NM 87131

- VOLUME – Orbitofrontal cortex (OFC) is smaller in users than non-users
- fMRI ACTIVITY - More activity in OFC of users compared to non-users during response inhibition and reward processing
- FUNCTIONAL CONNECTIVITY - increased in heavy smokers
- BUT….



uOttawa

Neuroimaging Research

ARCHIVAL REPORTS

Orbitofrontal Volumes in Early Adolescence Predict Initiation of Cannabis Use: A 4-Year Longitudinal and Prospective Study

Ali Cheetham, Nicholas B. Allen, Sarah Whittle, Julian G. Simmons, Murat Yücel, and Dan I. Lubman

- BUT….
- Orbitofrontal cortex size at age 12 predicted marijuana use at age 16
- Confounds to the literature
  - causality
  - premorbid characteristics
  - age of sample
  - strains
  - method of ingestion
  - And….correction for other drug use

uOttawa

Ottawa Prenatal Prospective Study (OPPS)

- Started 40 years ago in middle class population.

- Unique sample - premorbid assessments due to longitudinal nature - 4000 variables from in utero to adulthood.

- Subtle executive functioning deficits in offspring for
  - Sustained attention
  - Visuoperceptual/visuospatial functioning
  - Impulsivity
  - Working memory (immediate and delayed)

uOttawa

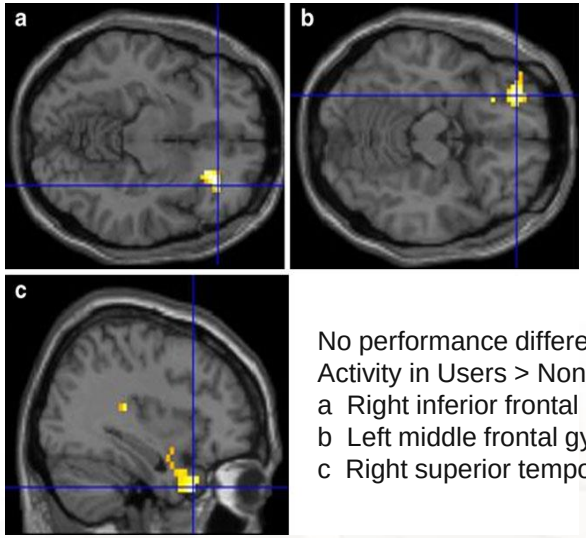
OPPS Offspring Use Results

- Imaged OPPS offspring at 19-21 years of age using functional MRI.

uOttawa

Visuospatial Working Memory

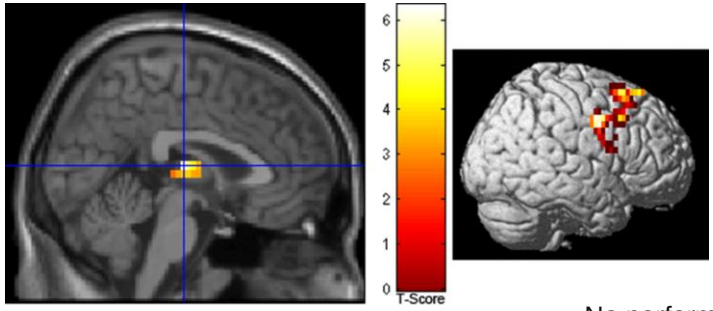
1.



No performance differences BUT
Activity in Users > Non-Users
a Right inferior frontal gyrus.
b Left middle frontal gyrus.
c Right superior temporal pole.

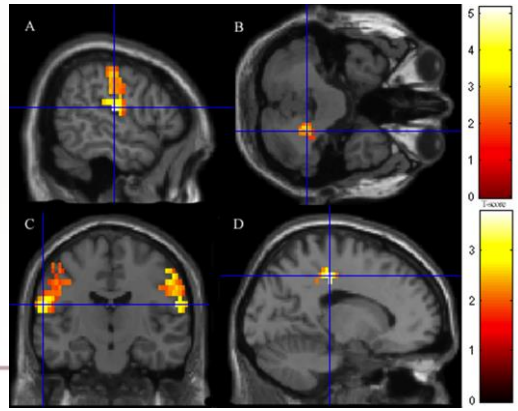
Response Inhibition and Attention

2.



No performance differences BUT
Activity in Users > Non-Users
a Thalamus.
b Right middle frontal gyrus.
c Right premotor cortex.

3.



uOttawa

Summary of OPPS Findings

- Teen use affects brain functioning and structure in brain regions necessary for learning, decision making, memory, impulse control and emotion regulation.

uOttawa

Misconceptions

1. Our endogenous cannabinoid system was made for exogenous cannabis.
2. Cannabis is a natural plant so must be harmless.
3. Cannabis is better than alcohol or nicotine.
4. Everyone is doing it.
5. It is not addictive.
6. Cannabis is medicine so I will feel better if I use it.
7. The research shows mixed evidence.*

What We **Know** About Cannabis and the Brain

- Most consistently alterations exist in the hippocampus, cerebellum, amygdala, striatum, prefrontal cortex = regions high in cannabinoid receptors

- Executive Functioning and Emotion Regulation are negatively impacted

- Younger initiation > older initiation

- More frequent use > less frequent use

- Higher THC dose > lower THC dose

uOttawa

Reasons for Use

- To relax
- To have fun
- To alter their perspective
- To fit in – socially sanctioned
- To experiment – curious to try something new
- To numb the Physical Pain, Anxiety, Depression
- To feel good – dopamine (short-term)
- To sleep faster – sometimes that works but the sleep isn't as restorative because it reduces REM sleep
- Risk perception is low – better than …

- STRESS

uOttawa

How Can We Tell? – Changes!

- Glassy, red eyes
- Eating habits – increase or decrease
- Loud talking and inappropriate laughter followed by sleepiness
- Loss of interest and motivation
- Anger or irritability
- Sleeping habits
- Declining school work and grades
- Changes in friends
- Deteriorating relations with family
- Less openness and honesty

uOttawa

What Can We Do If Already Using?

- There is hope…
- The brain is a dynamic, malleable, social organ that is sculpted by experience, making new connections throughout life.
- Strengthening the good connections is always the goal.

- If you take away the drug you have to replace it with something to help them feel good and fill their time.

- E.g. – meditations, music, exercise, playing instrument, getting together with healthy friends, baking with grandma, volunteering, gratitude

uOttawa

What Can We Do to Prevent Use?

- Healthy brains – Healthy kids – Happy families
- Listen – non-judgmental and non-reactive goes a long way
- Natural rewards - music, exercise, playing instrument, getting together with healthy friends, baking with grandma, volunteering, gratitude.
- Mindfulness – your children and yourself

uOttawa

Mindfulness

- Being aware of the present moment, accepting and acknowledging it, without getting lost in the thoughts or emotional reactions of that moment.

- Helps to reduce our tendency to react emotionally and ruminate on negativity.

uOttawa

Key Messages

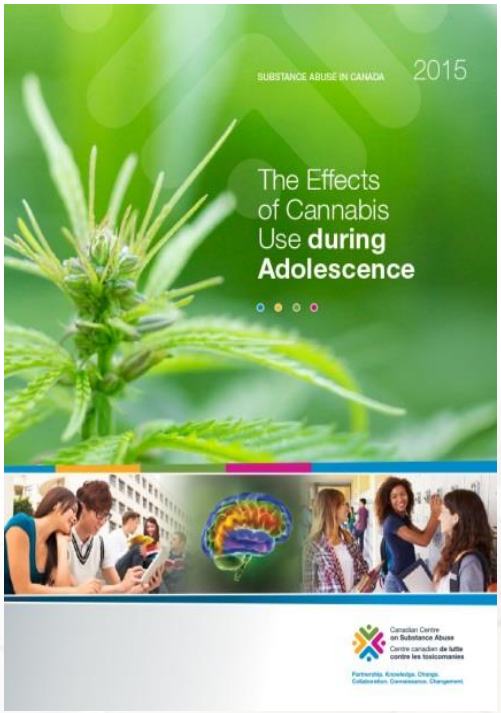
- Talk to youth about myths and evidence
  - Delay initiation of use to protect the brain – worth the wait
  - Cannabis use can influence cognition, including driving
  - Cannabis can be addictive
- Talk to your kids about what they know and don't know
- Build their confidence to be happy with themselves so they don't need THC to feel good
- Keep them busy with things that make them happy
- Increase awareness
- Increase prevention
- Increase resilience
- And remember BIOLOGY doesn't distinguish between legal and non-legal drugs.

- Healthy brain – happy children – happy family.

uOttawa

Resources

- www.ccsa.ca
- www.drugclass.ca
- www.ottawapublic health.ca



asmith@uottawa.ca

uOttawa


INSIDE EACH OF US ARE TWO WOLVES
ONE IS EVIL
IT IS ANGER
ENVY SORROW
REGRET GREED
ARROGANCE
SELF PITY
GUILT
RESENTMENT
INFERIORITY
LIES
FALSE PRIDE
SUPERIORITY
AND EGO
© Blu222
ONE IS GOOD
IT IS JOY
PEACE LOVE
HOPE
SERENITY
HUMILITY
KINDNESS
BENEVOLENCE
EMPATHY
GENEROSITY
TRUTH
COMPASSION
AND FAITH
WHICH WOLF WINS? THE ONE YOU FEED MOST

uOttawa