ADDRESSING THE CHALLENGES OF MARIJUANA USE AMONG TEENS

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Challenges Created By Legalization of Marijuana Use

1) Wide spread perception that "legal means harmless."

2) Increased use in the general population and among high school and college students.

3) Daily use is considered the new "norm" among young users:

* Unprecedented number of daily marijuana users among U.S. college students.

Challenges Created By Legalization of Marijuana Use (Cont'd.)

4) Increased tolerance for and acceptance of use among teens.

5) Unprecedented increase in potency and changes in routes of ingestion.

6) Lack of accurate information with teens and adults who work with them.

7) Drastic increases in cognitive impairment, mental and physical health crisis due to increased potency, frequency, and vaping. (Route of ingestion.)

Challenges Created By Legalization of Marijuana Use (Cont'd.)

8) Accepting marijuana as treatment options which have not been researched or regulated in regards to effectiveness, dosing, potency, warning of side effects. Utilizing the term "medical marijuana" implies rigorous levels of scientific research and scrutiny regarding benefits and risk. With medications the FDA oversees safe and effective dosing, quality, control of amount and delivery, and accuracy of product labeling and marketing. This is not true with medical marijuana. (Self-medicating)

9) Overwhelming lack of resources to address marijuana use and addiction.

10) Inaccurate perception with young people that driving under the influence of marijuana is safe.

Challenges Created By Legalization of Marijuana Use (Cont'd.)

11) Cannabis use is an intricate part of, most if not all, youth cultures. It is considered normative behavior.

12) Research in 2012 indicated significant increase in adolescent use of marijuana based on belief that it was safe because it was "medically approved."

Marijuana: a Very Complex Plant:
We do Not Respect This Plant

* It consists of hundreds to thousands of biologically active compounds

* Concentration levels are in influenced growing techniques, and time in storage, and processing

* Single plant contains 480 biologically active chemicals
  -66 are phytocannabinoids produced by plant

* More than 100 psycho-active metabolites are produced as the body attempts to break it down and eliminate it

* Smoking creates 2000 chemicals from the combustion process which effect brain and body

* Rodenticides, insecticides, pesticides, fungi bacteria, residual solvents have been found in street and legal marijuana

Potency:

1960's - 1 – 2%

1980's - 4 – 6%

Current – Average 10%

Colorado samples – 19 – 30% THC

New Challenges: High Potency Cannabis (HPC)

DABS: (Butane, Honey Oil, Wax)

Extracting and concentrating THC using butane, alcohol, water, or another solvent contains 80-95% THC

Side Effects of High Potency THC:

* Long lasting psychological and traumatic effects
* Heart attacks
* Severe long term psychosis
* Deaths from cannabis hyperemesis
* Increased anxiety
* Increased mood swings and Bi-Polar symptomology

High Potency Cannabis

* Not only is it not your parents weed – It's not weed, it is high potency THC.
* Cannabis of choice is High Potency THC known as Dabs, Wax, Vape cartridges and edibles.
* High Potency Hash Oil Extracts 35 – 99% THC

Cannabis Resin and Hash Oils are extracted via 2 methods:

* Most frequent method uses high heat butane oil to extract the resin.
* The less commonly used method uses ice and water to separate and filter the high potency part of the plant.

- Both methods result in an oil which is then inhaled through a Dab pen, vape cartridge or placed in edibles.

Safety Concerns:

* Oils are toxic to the lungs.
* We have no long term research to determine. physical, cognitive, psychiatric consequences of HPC.
* We do know that as tolerance develops the preoccupation with using more is very strong.
* Using vapes, cartridges and dab pins makes it easy to use without being detected. There is an increase use at work, in class, in homes.
* THC is vaped at extremely high temperatures causing significant stress on the lungs and respiratory system.

Psychosis and HPC Use

What does the research tell us about high potency use? Bear in mind that research considers HPC as 9-12% THC.

* **30 years of research confirms that THC use at a young age(15-18) increase risk of developing psychosis.**
* **Risk is directly correlated to frequency, dose, potency.**
* **Individuals who switched from regular marijuana to medical marijuana experienced higher levels of neuro toxins.**

Psychosis and HPC Use Cont'd

* In 2009 adults hospitalized for first episode of psychosis were more likely to use HPC.
* Daily use of HPC associated with 12 fold increase in risk of psychosis.
* HPC use associated with early onset of first episode (average of 6 years).
* Following first episode patients at greatest risk for relapse (defined by hospital re-admission) were self reported daily users of HPC.
* Relapse risks were lowest among those who discontinued use after first episode of psychosis.
* HPC has significantly lower levels of CBD. CBD reduces brains risk of psychosis.

What I see:

* Increased numbers of young adult males (18-23) who are diagnosed with Bipolar and first episodes of psychosis. All of them report recent, frequent use of "Dabs."
* Teens who are highly emotionally reactive, overwhelmed, and have no frustration tolerance and an inability to problem solve.
* Increased car accidents
* Debilitating anxiety and avoidance behavior

Cognitive Impairment and HPC (looking at potency of 12%)

* **Research clearly supports presence of cognitive impairment related to frequency, duration, and age of onset**
  - **Problems with motor control**
  - **Executive functioning**
  - **Brain structure changes**
  - **Reduced Volume in the hippocampus memory**
  - **Temporal cortex (sensory information from ears is processed into speech and words)**
  - **Limbic related issues – produces emotionally relevant context for sensory experiences)**
  - **Orbitofrontal cortex (emotion and memory)**
  - **White matters and structural changes that create cognitive impairment**

Cannabis Hyperemesis Syndrome (CHS)

Symptoms:

- Recurrent nausea
- Severe nausea (20 times a day)
- Abdominal pain
- Compulsive hot baths or showers for symptom relief
- (14 a day) - Relief is rapid but transient
- Symptoms worse with food
- Results in weight loss and dehydration
- Daily cannabis users (16-51)
- Heavy use for at least three months

Cannabis Hyperemesis Syndrome (CHS) Cont'd.

* Has been considered rare but is on upswing as potency increases
* Largely unrecognized and under reported
* Often misdiagnosed as Cyclic Vomiting Syndrome. However, 50% of the people diagnosed with Cyclic Vomiting Syndrome report daily cannabis use
* Treatments with anti-nausea medication are ineffective

CHE Cycle

Prodromal:

* 1-2 weeks of morning nausea, food aversion, weight loss, occasional vomiting
* Acute – Severe nausea, frequent vomiting, abdominal pain
* Recovery – symptom improvement related to cessation of cannabis use

CHE Cycle

* Only treatment proven effective is cessation of use. Improvement might take 12 hours to 30 days
* Individuals typically increase use believing it will help
* THC has been helpful as an antiemetic with chemo therapy patients. However, accumulation of toxic levels of THC in fatty tissues results in paradoxical effects.
* Recent death of 16 year old reported

THC Medical Uses

1) Nausea related to chemo therapy

2) Appetite stimulator for anorexia with HIV patients

3) Some indication for pain management
   - neuropathy pain
   - Arthritis, Fibromyalgia
   - (7 – 9% THC) Participants reported cognitive impairment

THC is contra-indicator for:

* Anxiety
* Mood management
* Learning and focus
* Social anxiety
* OCD
* Sleep
* Psychosis
* Tourette's
* Psychiatric diagnosis

EFFECTS

ON THE

EMOTIONAL

REGULATION

SYSTEM

Anandamide is an endogenous cannabinoid which is very fragile (unlike THC) which breaks down quickly in the body

It is synthesized enzymatically in areas of the brain that are critical to memory, higher order thought processes, movement control, learning, pleasure, concentration sensory and time

Endocannabinoid System Functions

* The neuron's "volume control": dampens down neuron activity when too strong
* Regulates levels of important neurotransmitters affecting pleasure, mood, pain, appetite, motivation, memory, etc. (dopamine, serotonin, endorphins)
* Helps keep neuron activity in balance, not underactive or overactive

THC vs. Anandamide

- **Both dial down neuron activity to change neurotransmitter release**
- **THC has a MUCH STRONGER, LONGER effect than anandamide on brain cells**
- **THC interferes with anandamide function, so it can't do its job to protect and balance cell activity**

How does THC Compare to Anandamide, the Chemical which our own brain makes?

Both THC and anandamide dial down neuron activity, thereby changing the amount of neurotransmitters released.

However, when THC binds to our cannabinoid receptors, it has a MUCH STRONGER, LONGER effect on brail cell activity than anandamide.

THC's effect is like a sledgehammer compared to the precision scalpel of anandamide.

When THC occupies the cannabinoid receptor, THC interferes with anandamide's ability to protect and balance cell activity.

MARIJUANA IMPACTS

THE

PSYCHOLOGICAL AND EMOTIONAL

HEALTH OF THE

BRAIN.

Regular marijuana use during adolescence found to increase risk 2 to 5 times of developing psychosis, schizophrenia, anxiety, and depression in adulthood.

Source: DT et al Adolescent cannabis use and psychosis epidemiology and neurodevelopmental models. Brt J. Parmacol. 2010; 160:511-522

Adolescent Marijuana Use

* A four year longitudinal study (1995-1998) of 2236 Columbian teens between the ages of 12 and 17 indicated that marijuana use in early adolescents was significantly connected to anxiety, aggression, and decreased functioning in later adolescence and early adulthood.

* A ten year longitudinal study of marijuana use among teens in the Netherlands indicated a significant increase in young adult onset of mood disorders, anxiety problems, psychosis, schizophrenia among teens that used marijuana.

* Marijuana use is one of the primary risk factors in adolescent suicide.

Adolescent Marijuana Use Cont'd.

- Creates an imbalance in Dopamine system by creating exasperated release of Dopamine followed by depletion of Dopamine.

- Brain shuts down receptor as it down regulates. Requires more frequent use and more and potent substance.

MARIJUANA JEOPARDIZES

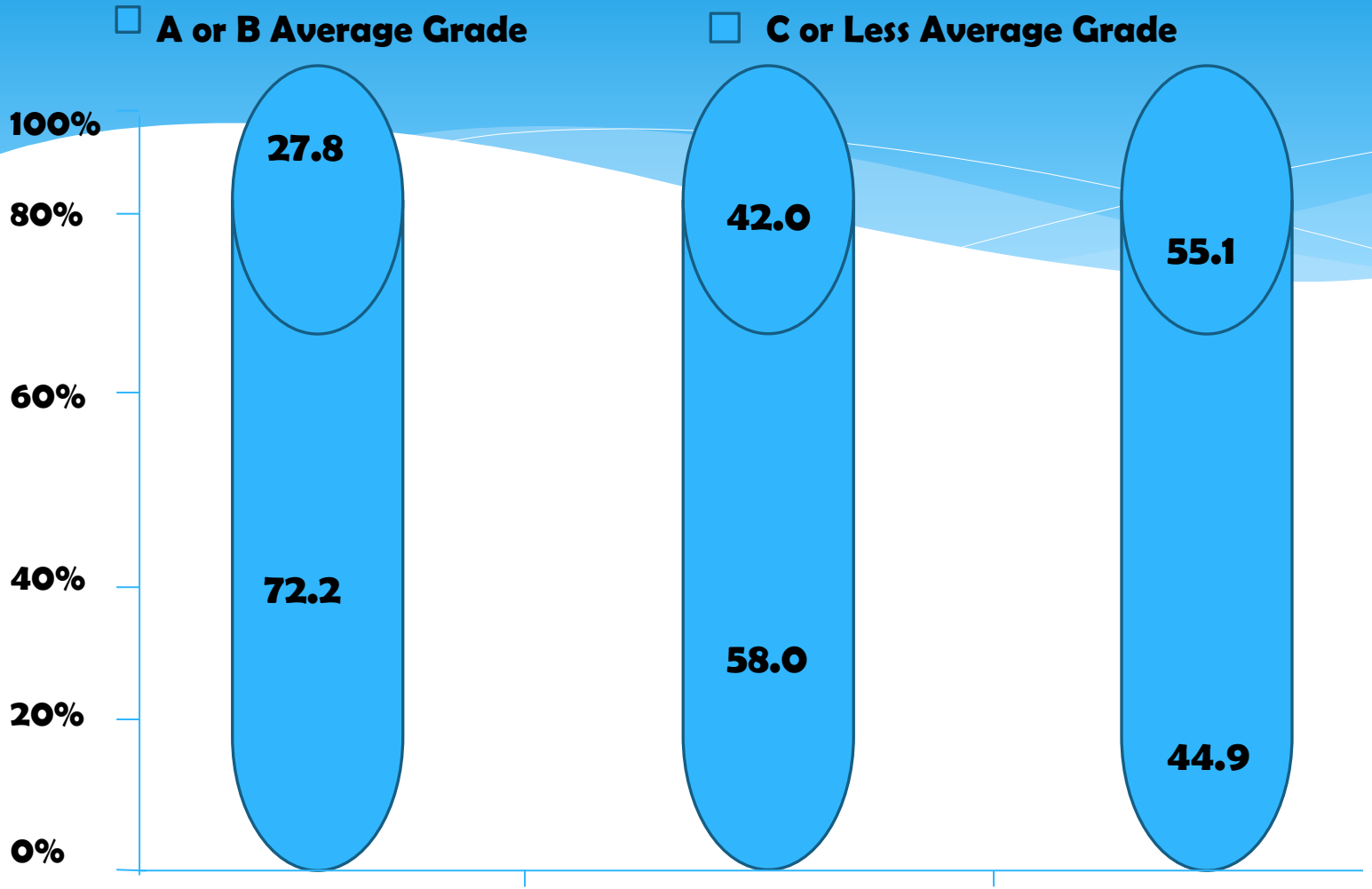
LEARNING

AND

SCHOOL SUCCESS

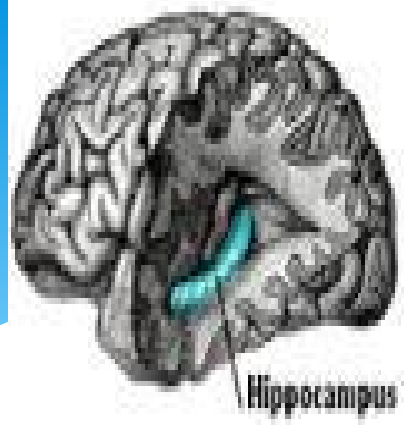
Marijuana Use On Academic Performance

Source: SAMHSA, 2002, 2003, and 2004 NSDUH Survey of Households



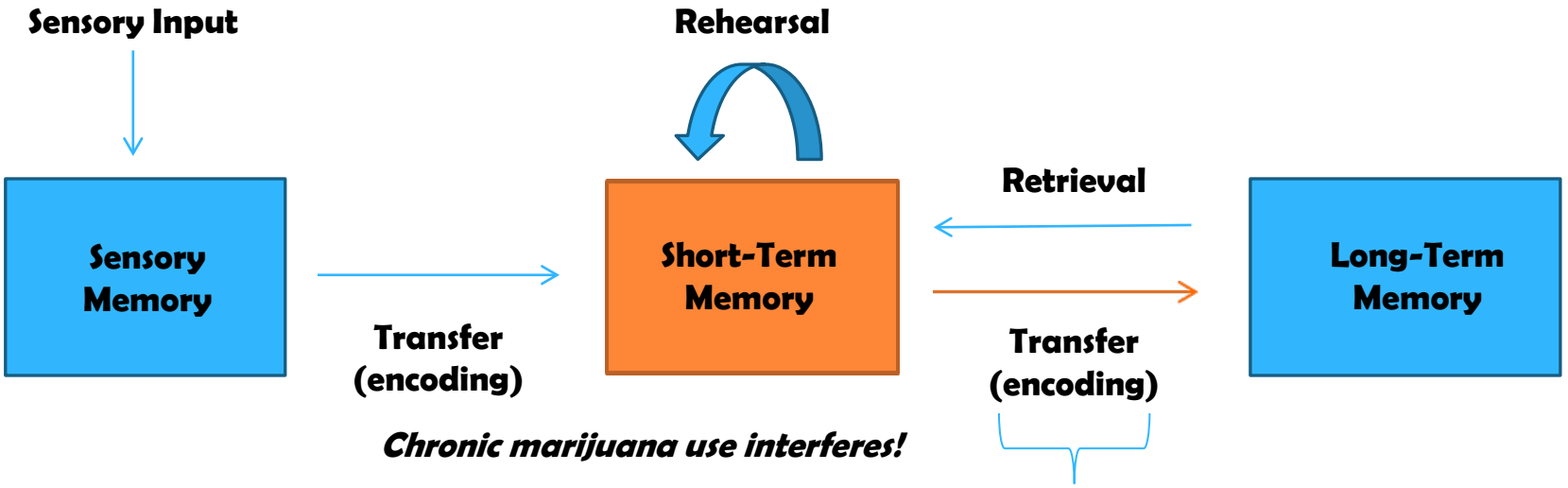
17,000 Students Nationally

This means that 10% of students with mostly A's used marijuana and 48% of the students with mostly D's and F's currently used marijuana.



Let's Make a Memory
Introducing the Hippocampus

Aaron M. White Ph.D. 2004



MAHMOOD, JACOBUS, BAVA, SCARLETT, and TAPERT (2010)

THC and Memory

* THC reduces hippocampal neuron activation, below the level needed to trigger memory formation.
* With chronic THC exposure, neuron connections involved in memory are gradually lost due to continual suppression.
* Brain imaging studies show regular THC users have a smaller hippocampus, and have poorer memory.

Source: Iversen L. How cannabis works in the brain. In Marijuana and Madness. Ed. Castle & Murray, 2004. Oxford University Press

THC and Memory
(Cont'd.)

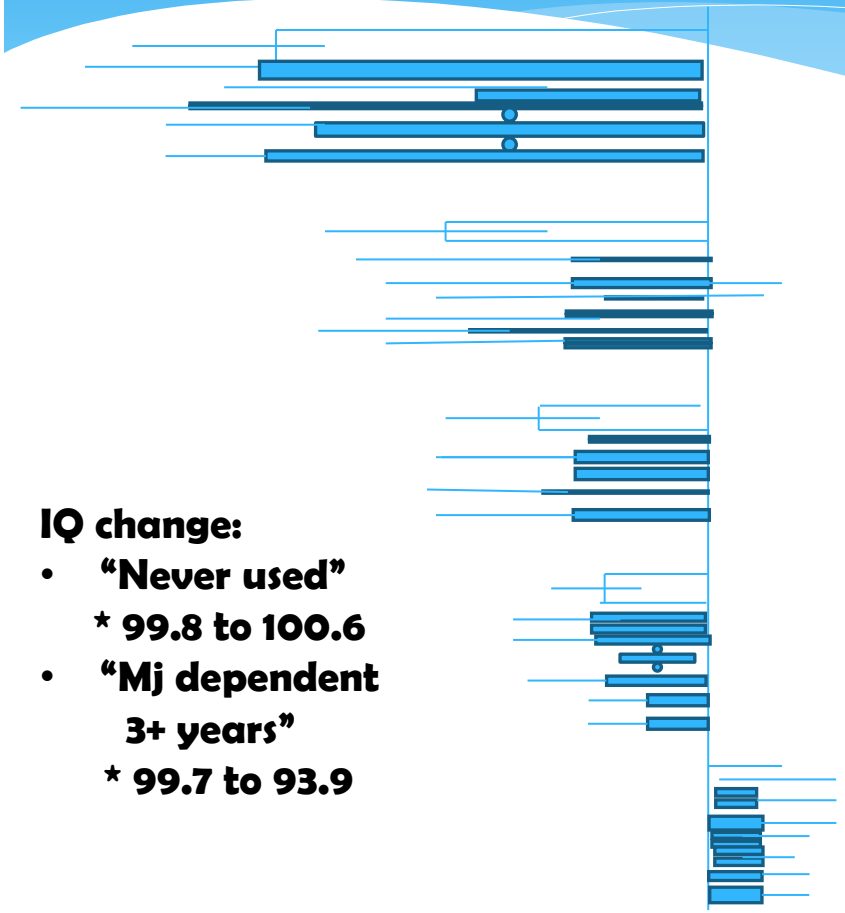
* Significantly impacts the ability to process and learn new information, especially higher level concepts.
* Research with college students whose brains were scanned while asked to complete a "location tasks" research subjects were not under influence while completing the task. Simple tasks took a disproportionate amount of frontal lobe energy to complete. As task becomes more complex, subjects just "give up."
* Pre-frontal lobe alterations were noted in females which increases emotional reactivity and impairs planning, focus, and decision making.

THC and Memory
(Cont'd.)

Research indicates that the younger teens are when they begin using the more negative impact they experience in frontal lobe development.

Change in IQ from 13-38 yrs old

Persistent cannabis users show neuropsychological decline from adolescents to midlife.



MJ dependent 3+ years

MJ dependent 2 years

MJ dependent 1 year

Used, never diagnosed

Never used

IQ change:

- "Never used"
  * 99.8 to 100.6
- "Mj dependent 3+ years"
  * 99.7 to 93.9

Negative Impact

Table I. Adverse Effects of Long-Term or Heavy Use of Marijuana.

Volkow, N.D., Baler, R.D., Compton, W.N., and Weiss, S.R.B. (2014). Adverse health effects of marijuana use. *New England Journal of Medicine,* (370) (23), 2219-2227.

Effects of long-term or heavy use

1. Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)* (Addiction rate increases with HPC)
2. Altered brain development*
3. Poor educational outcome, with increased likelihood of dropping out of school*

Negative Impact (Cont'd.)

4. Cognitive impairment, with lower IQ among those who were frequent users during adolescence*

5. Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)*

6. 2012 research indicates an increase in conduct disorder symptoms, specifically linked to teens using medication marijuana (i.e., HPC)

Negative Impact (Cont'd.)

7. Symptoms of chronic bronchitis

8. Increased risk of chronic psychosis disorders (including schizophrenia) in persons with a predisposition to such disorders

* This effect is strongly associated with initial marijuana use early in adolescence

Negative Impact (Cont'd.)

Table 1. Adverse Effects of the Short-Term Use of Marijuana

Volokow, N. D., Baler, R. D., Compton, W. N., and Weiss, S. R. B. (2014) Adverse health effects of marijuana use. ***New England Journal of Medicine,*** **(370) (23), 2219-2227.**

Effects of short-term use

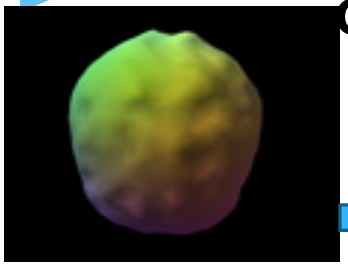
1. **Impaired short-term memory, making it difficult to learn and to retain information;**
2. **Impaired motor coordination, interfering with driving skills and increasing the risk of injuries;**
3. **Altered judgment, increasing the risk of (doing stupid things) sexual behaviors that facilitate the transmission of diseases;**
4. **In high doses, paranoia and psychosis;**

(Review of over 100 studies)

Impact of Marijuana Use on Orbitofrontal Brain Functioning: Executive of Social-Emotional Processing

Amen (1998) High Resolution Brain SPECT Imaging in Marijuana Smokers. Journal of Psychoactive Drugs. (30(2), 1-13.

SPECT imaging uses an injected gamma-emitting tracer to be taken up by brain tissue in a manner proportional to brain blood flow.



Orbitofrontal cortex (OFC) seems to be involved in:

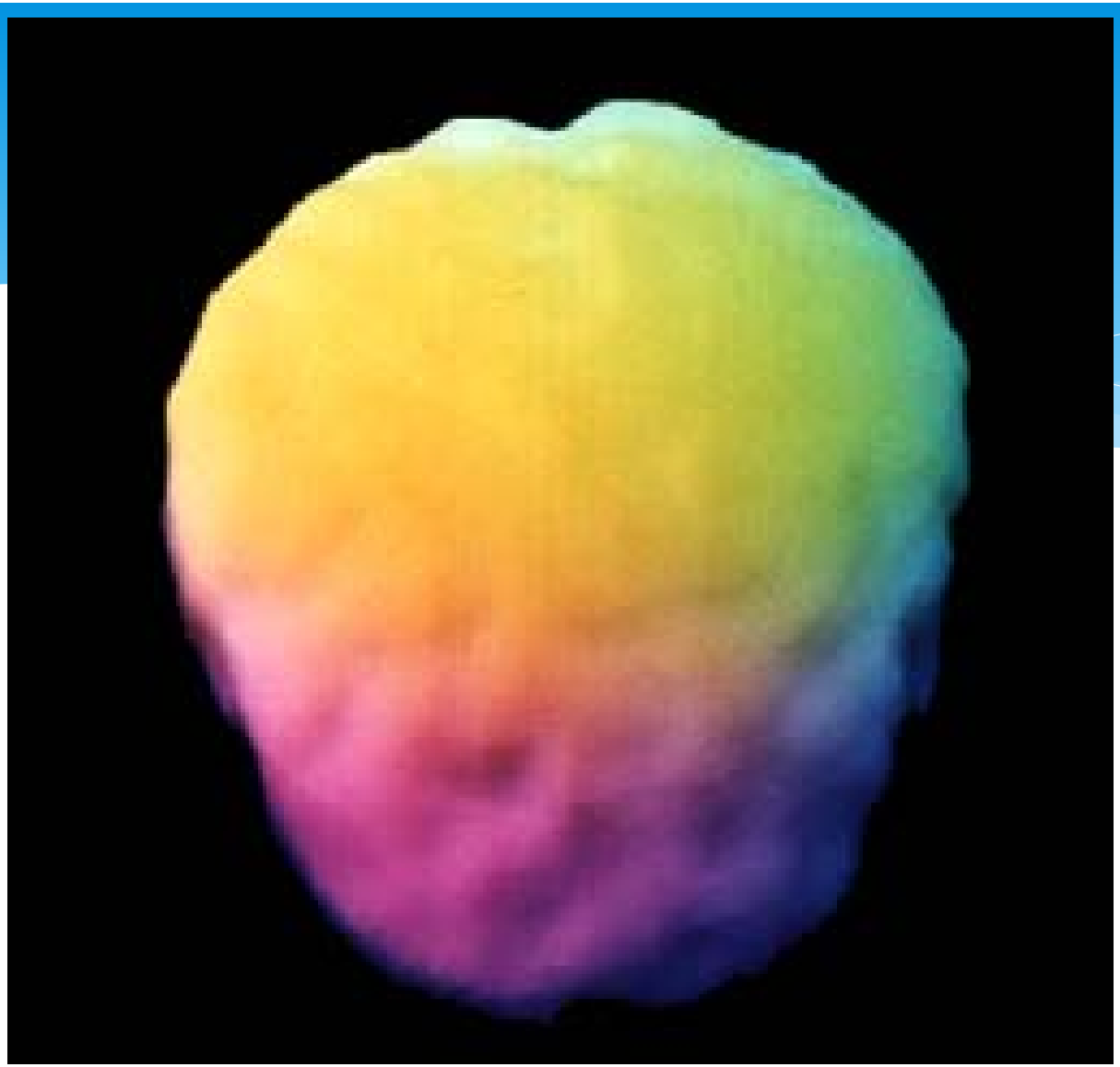
* reward value
* Expectation i.e., expected reward (medial) or punishment (lateral)
* organizing, monitoring, learning i.e., rule making
* decision making in regard to reward or punishment
* regulates planning sensitive to reward & punishment

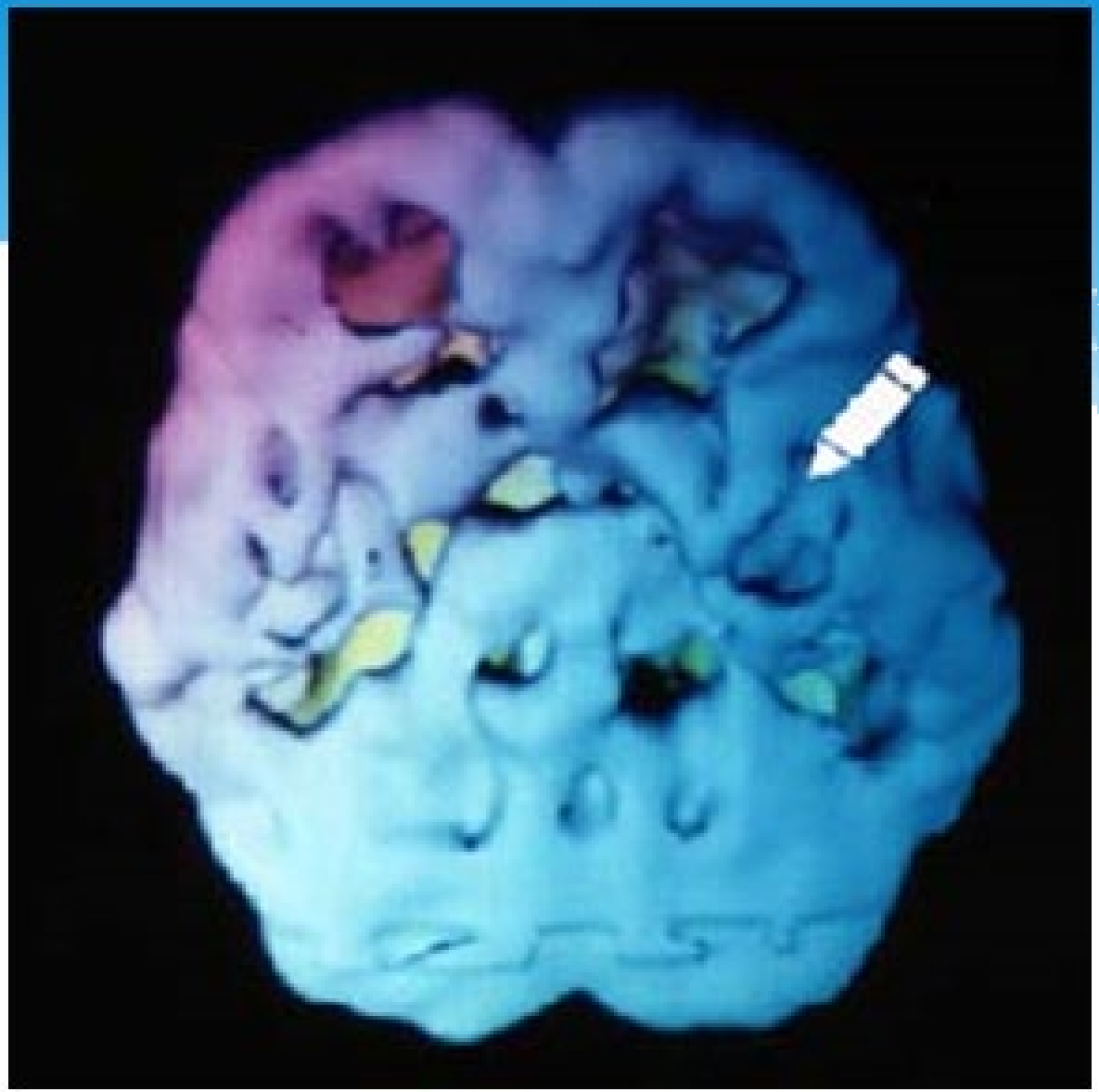
NORMAL PRESENTATION SUPERIOR (Top Down) Surface View
full, symmetrical activity

Poor OFC Functioning and Everyday Activities

* higher tendency toward disinhibited behavior
* swearing excessively
* Hyper-sexuality
* Poor social interaction
* Poorer empathizing
* Excessive smoking and risk taking behavior

18 y/o – 3 year history of X 4 week use – *Inferior (sunder-side) surface view - DECREASED PFC & TEMPORAL LOBE ACTIVITY*





Negative Impact (Cont'd.)

Driving Impairment

- Cannabis Impairs driving ability
  - Reaction times
    - Motor performance
    - Attention
    - Visual processing

  Increases driving errors

After weeks of abstinence

previous daily users have cognitive processing and driving related impairments

Following legalization

several states report an increase in number of fatally injured drivers testing positive for THC

Negative Impact (Cont'd.)

Blood THC

Concentration levels of 7.5 Nano gram increase crashes

Courts

have found prescribing physician negligent especially if driving risk WERE NOT EXPLAINED TO PATIENTS

Physical Addiction and Withdrawal

Yes, marijuana is physically addicting as evidenced by the existence of marijuana withdrawal.

Cannabis Withdrawal

DSM-5 Diagnostic Code 292.0

- **Onset of withdrawal begins within 24 to 72 hours of last use.**
- **Marijuana has long half life.**
- **Peaks within first week.**
- **Symptoms strongly noticeable during first two weeks.**
- **Some symptoms including sleep disturbance lasts up to 42 days**

Physical Addiction and Withdrawal (Cont'd.)

Criteria: At least 2 psychological and 1 physiological symptom after stopping daily or almost daily use for past several months.

Psychological Symptoms:

* Irritability
* Restlessness
* Anxiety
* Insomnia/fatigue
* depressed mood
* reduced appetite

Physical Addiction and Withdrawal (Cont'd.)

Physical Symptoms:

* Abdominal pain
* Sweating
* Fever
* Chills
* Headaches

Many cannabis users relapse in order to treat withdrawal symptoms.

(Medina, J. (2015) Cannabis withdrawal, Phys. Central.

Assisting Clients with Withdrawal:

* Melatonin for sleep
* Gabapentin – reduce cravings
* NAC – N-acetylcistine
* Relaxation/Breathing
* Tylenol, Aleve, Advil for general discomfort

Assisting Clients with Withdrawal: (Cont'd.)

N-Acetyl-L-Cystein (NAC) in treating Marijuana Use Disorder (Dose 1200-2400 mg/daily)

NAC is a supplement form of cysteine

- Semi-essential amino acid (the body produces it from other forms of amino acids)
- Potent antioxidant: increases glutathione
- Assists kidneys and liver in detox process
- Repeated use of substances results in excessive glutamate in nucleus accumbus (motivation and learning)
- Excessive glutamate paired with glutathione depletion can damage brain possibly contributing to Bipolar, Schizophrenia, OCD and addictive behavior
- Is neuro-protective and helps heal brain related adaptations of substance use
- Correcting glutamate dsy-regulation promotes abstinence and prevents relapse (stimulants, alcohol, nicotine, cannabis)
- Self report reductions in marijuana use and cravings by teens

Niacin: AB vitamin that is a powerful anti-oxidant. It cleans THC out of the brain.

CLINICAL INTERVENTIONS

Community Response to Challenges

* Adolescents, young adults, and everyone who comes in contact with them needs accurate, up to date information about marijuana
* Every school health class needs to present quality THC education to students
* Communities need to become actively involved in policy issues
* Media needs assistance on how to present accurate specific information

Clinical Response

* Marijuana specific treatment for marijuana users as well as poly-substance users
* All clinical professionals need accurate information about comorbidity of marijuana and psychiatric diagnosis
* Harm reduction strategies

Treatment Challenge

I. Adolescent marijuana users need to be in groups that specifically address their drug of choice.

II. Need to be asked difficult and personal questions about their use.

III. Need accurate info – they don't have it.

IV. Need to understand overlap between marijuana and mental health.

V. Programming that focuses heavily on subtle and personal consequences of use.

VI. Clients need to understand what motivates their use of marijuana.

My Marijuana Story

Format:

* This is a discussion with client
* Develop its own flow with element of spontaneity
* Facilitator needs to be flexible
* Follow client's pace
* Although, there is certain questions to ask and info to gather the process in conversational vs. structured interview

Goal:

* To provide client with an opportunity to assess and self-evaluate their relationship with Marijuana, its' meaning to them, and its' impact on their lives

Time:

* It is important to have adequate time

  -Most cases take most of an hour

HOW DO TEENS

PROMOTE BRAIN RECOVERY

AND PROTECT FROM

FUTURE DAMAGE

VITAMINS AND NEURO-PROTECTANTS

IMPROVE BRAIN

RECOVERY

(Decrease psychiatric symptoms)

B-1 At risk:–Effects the Brain's ability to oxidize glucose to energy

B-2 Marginal levels more prevalent in depressed patients. Insufficient amounts found in 95% adolescent females; heavy alcohol users

B-6 Higher levels associated with lower prevalence of depression in adolescents

<u>BIG B's:</u> B6, B12, Folic Acid

B-9 (Folic Acid) Requisite in synthesis of serotonin, norepinephrine, dopamine, and DNA. Common among patients with mood disorders. Low levels in patients experiencing first episode of psychosis.

Folate can enhance antidepressant treatment

Found in 50% of depressed patients

Deficiency found in heavy alcohol use,

19% adolescent females

B-12 Needed to produce monoamine neurotransmitters and maintain myelin. Deficiency found in up to a third of depressed patients, and compromises response to antidepressants. Higher levels of B-12 are associated to better treatment out comes. Deficiency can cause depression, irritability, agitation, psychosis, obsessiveness, increase risk of cognitive decline, and 5-fold increase in brain atrophy, increase risk of psychiatric disorders.

Deficiency found in smokers

<u>Vitamin C:</u> Vital for synthesis of serotonin and norepinephrine. It is antioxidant in the brain. Patients with poor diets as a result of drug and alcohol use and eating disorders are at risk.

Vitamin D: Important role in brain function and development. Neuronal cells have vitamin D receptors in hippocampus, prefrontal cortex, hypothalamus, thalamus. These areas are linked to pathophysiology of depression. Important in biosynthesis of dopamine, norepinephrine, epinephrine provides resistance to neurotoxins.

Low vitamin D levels linked to schizophrenia, psychotic symptoms, impairment in memory, orientation, executive functions. Is a neuro-protectant.

Magnesium – converts glutamates into GABA which is precursor to seratonin

Preservision Multi Vitamin

(Source: Vitamin D deficiency and Psychiatric Issues, Current Psychiatry Vol. 12 No. 4)

Diet

Your brain needs every amino acid, every vitamin, and every mineral to create every neurotransmitter

Your brains health and recovery is completely dependent on what nutrients you put in your body

Neuro Protection and Recovery

Supplements

OMEGA – 3 Fatty Acids:

Anti-oxidant, anti-inflammatory, anti-apoptotic activates cell signaling pathways, prevents and restores synaptic loss as well as neuronal glial death.

N-acetylcysteine (NAC):

Powerful anti-oxidant that increases glutathione, protective of brain. Helpful with marijuana use, reduced episodes of use in methamphetamines. Positive effect on relapse prevention in alcohol, marijuana, cocaine by reducing cravings.

Melatonin:

Improves sleep which is neuro-protective in itself. Prevents triggers of neuron-inflammation and oxidation stress. Protect mitochondrial integrity, modulates immune system, assists with metabolic syndrome, antioxidant

Caffeine:

Prevents stress related mood and memory dysfunction, reverses synaptic dysfunction

Henry A. Nasrallah, M.D.,

Current Psychiatry, Dec. 2016

Are You Neuro-protecting Your Patients?

Cognitive Building Activities –

To improve visual problem solving and visual spatial problems

- Jigsaw puzzles
- Tana grams
- Lego's
- Knex
- Building Models
- Reading
- Painting
- Drawing
- Dance
- Word searches

Working Memory:

Working memory deficits play a significant role in decision making with addicts

Improving working memory reduces relapse rates, reduces urges, encourages frontal lobe activation, improves functional balance between cognitive systems

Many things improve working memory – Chess, Checkers, Backgammon, Sudoku, Crossword Puzzles, table top board games, word searches

The following is a partial list of free memory apps and sites with free worksheets:

Sharpbrains.com

Education.com/worksheets/memory

Icebreakers.com

Neurodevelopment.com

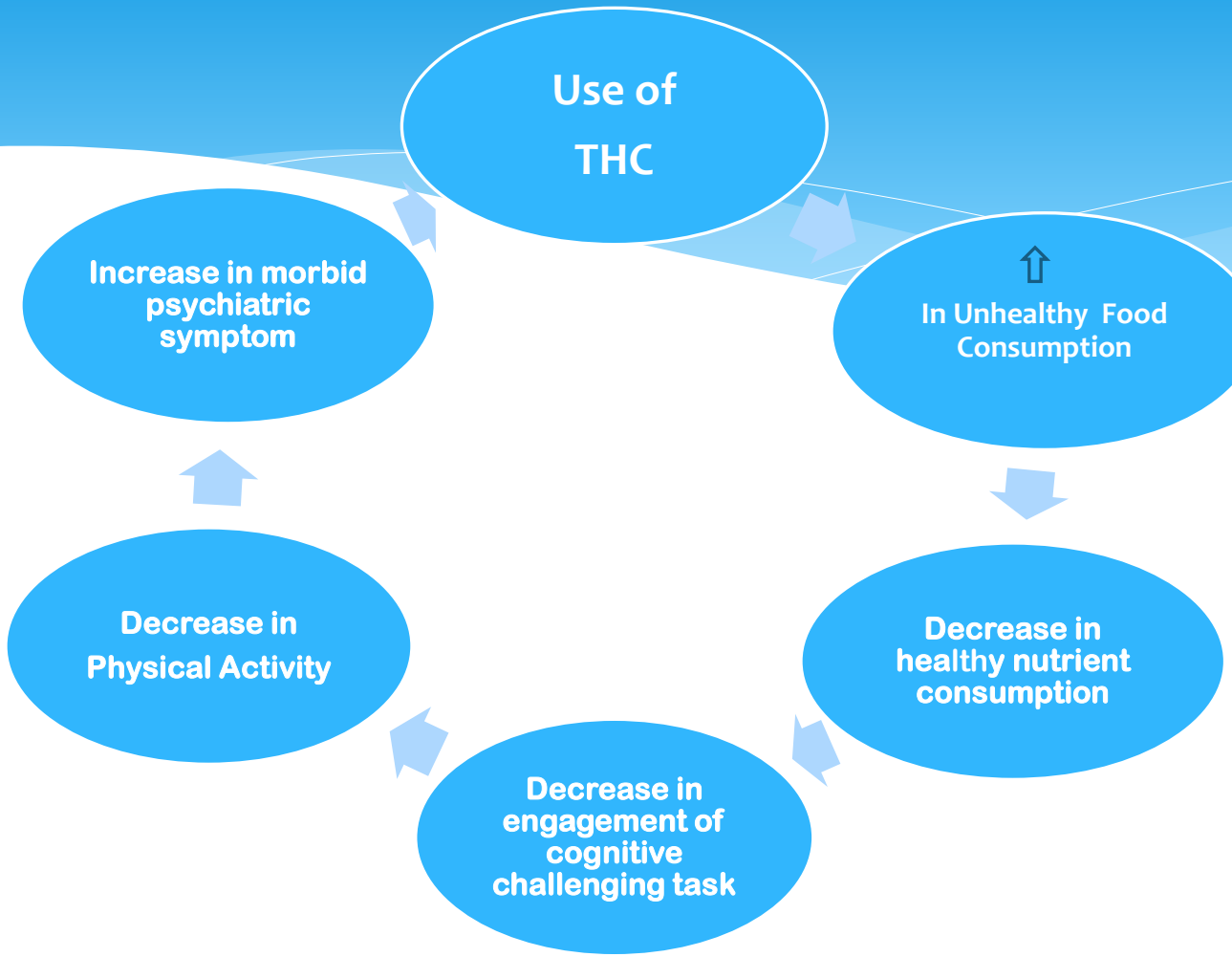
Exercise is Critical in Neuro Protection and Neuro Healing

- Positively effects executive functioning
- Improves inhibitory control
- Positive impact on neuro biological mechanisms
- Improves cerebral blood flow
- Neural plasticity
- Levels of synaptic protein
- Improved dopamine and norepinephrine
- Improve task related activities
- Most significant benefits occurring in the frontal lobe
- Enhances cognitive performance
- Improves brain structure

- Greater response accuracy on tasks
- Information processing
- Improve cooperation
- Reduced anxiety and depression
- Improved response time
- Sustained attention
- Grows new brain cells
- Grows new neurons

Harm Reduction

Use of THC prompts lifestyle behaviors that cause and contribute to additional cognitive, physical and emotional damage----



Harm reduction involves intervening at all points within this cycle

Harm Reduction

- The goal for adolescents using THC is abstinence
- The road to abstinence starts with individuals assessing the need for change
- Assessment often results in changing patterns of use
- Changing patterns of use allows us to encourage less risky and harmful behavior

Discontinue use of HPC

* Use less frequently
* Use smaller amounts

- Changing patterns provide opportunity to encourage teens to participate in activities that help protect their brain from damaging impact of THC
    * Exercise
    * Cognitive activity
    * Vitamins/Diet/Nutrients
    * Cognitive re-engagement
- Success in harm reduction can promote further assessment and further movement towards abstinence
- Unsuccessful attempts at harm reduction often encourage re-assessment and motivates teens toward goal of abstinence

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