

# **Problem Gambling and the Brain:** *Implications for Treatment and Treatment Providers*

**23<sup>rd</sup> Annual  
RGANM Conference**  
August 8, 2019



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Transformation Education Institute

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# Important Notice!

**I am not a  
problem  
gambling  
expert...**



# Today's Itinerary

1. The Addictive Response and Childhood Trauma
2. Identification, Treatment and Prevention Implications



# Today's Agenda

## 1. The Addictive Response and Childhood Trauma



# The 4 “Whats” of Addiction

1. **What’s** the Brain Got to Do With It?
2. **What** Happens in the Brain When Someone is “Getting High?”
3. **What** is Addiction in the Brain?
4. **So What?**



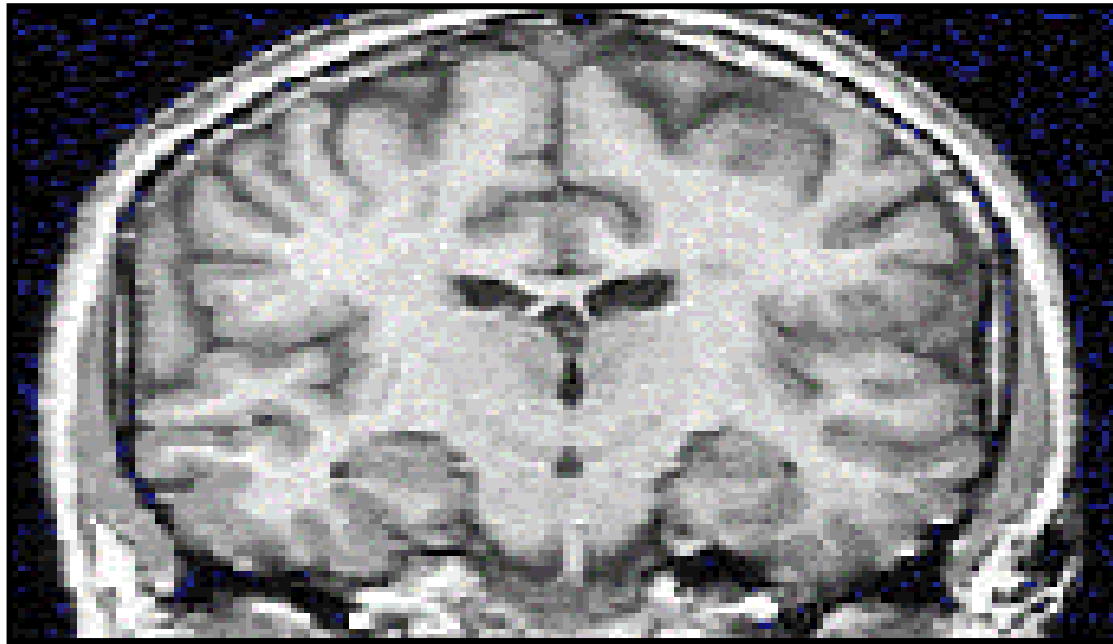
# The Addictive Response to Childhood Trauma

## 1. What's the Brain Got to Do With It?



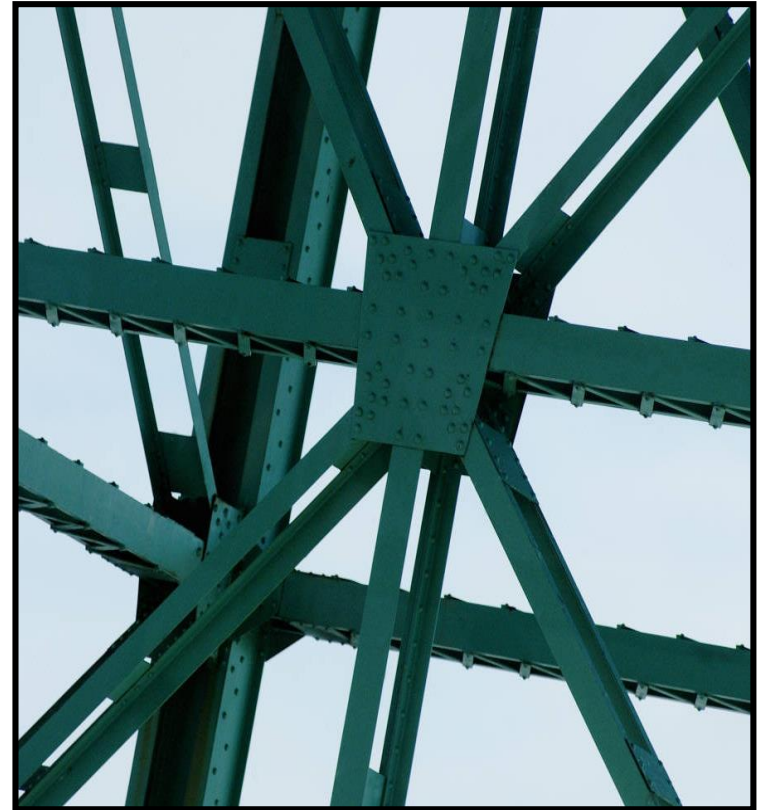
# Why the Brain? Reason #1

Because the brain is involved in  
**EVERYTHING** humans do!



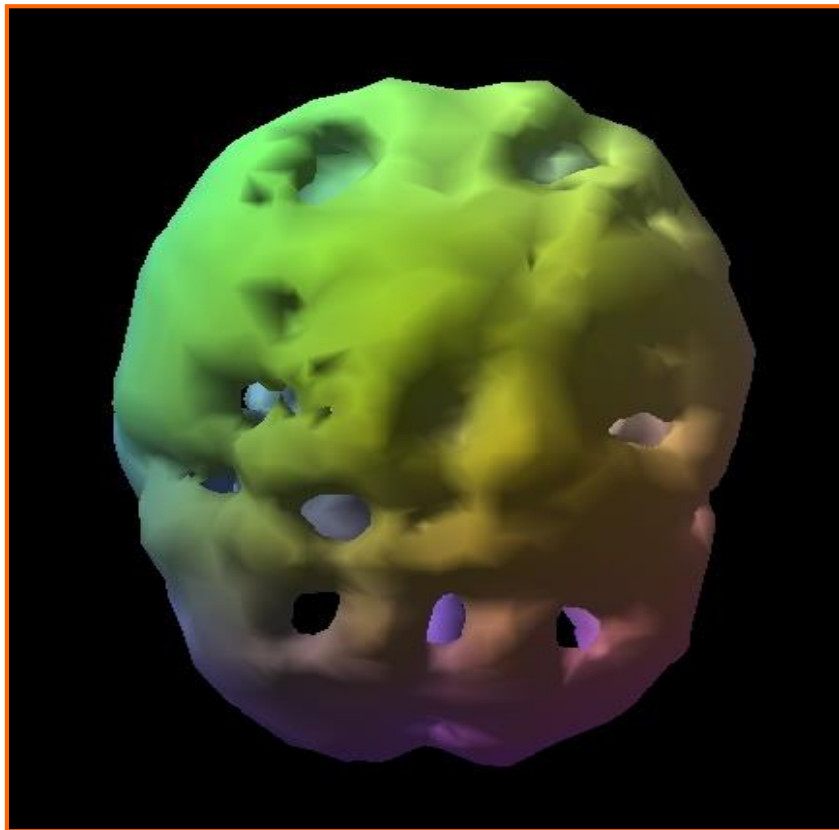
# Brain Science Can (and Has)...

- Provided a new, researched-based perspective on chronic human problems.
- **Reinforced** the reasons many traditional practices work.

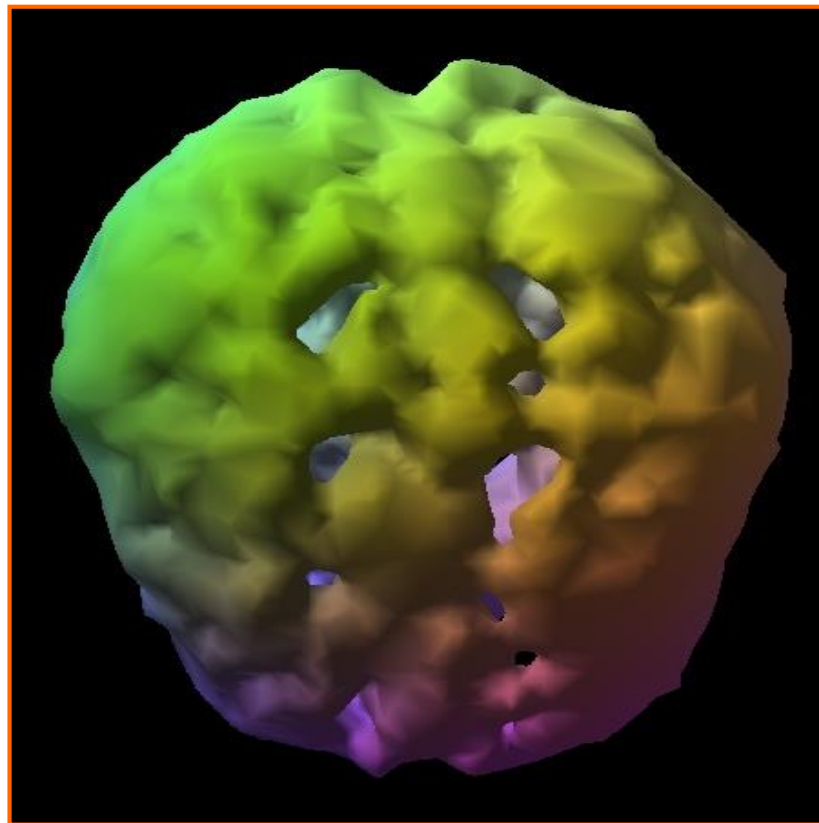




# A New View of Drug Abuse

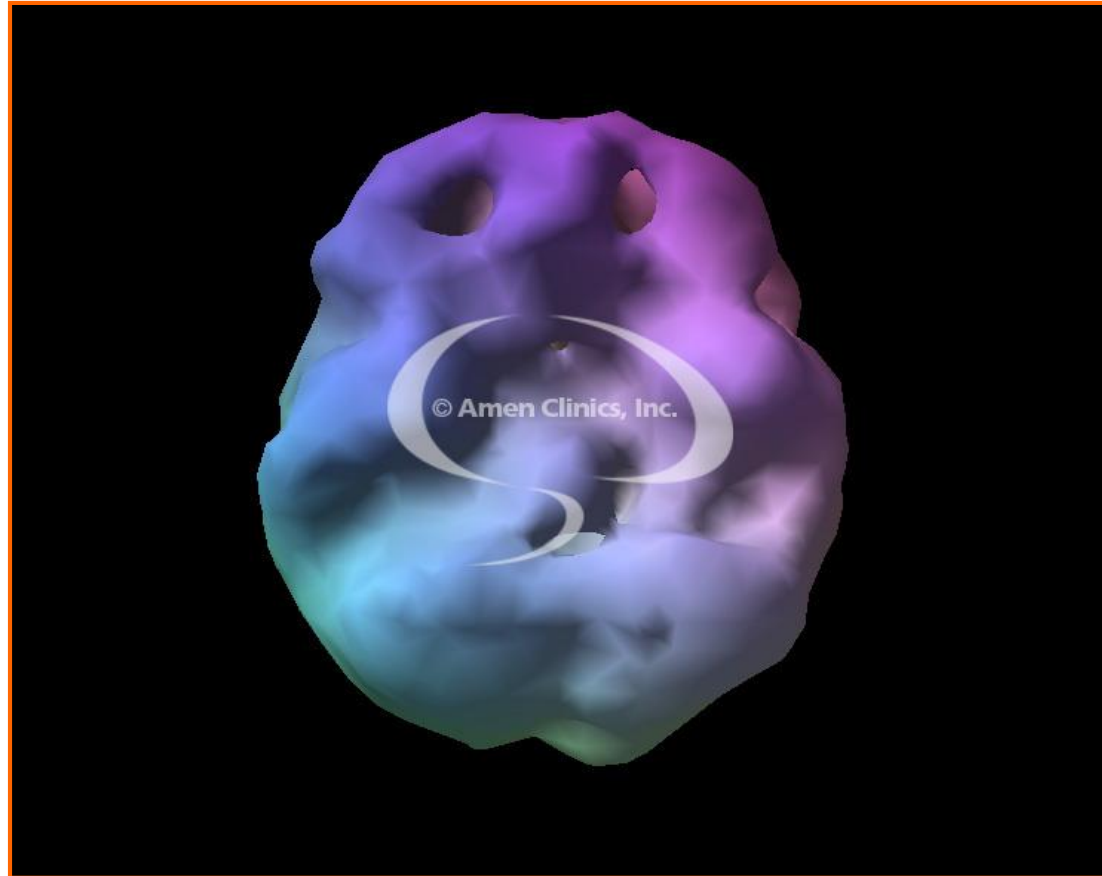


**Cocaine**

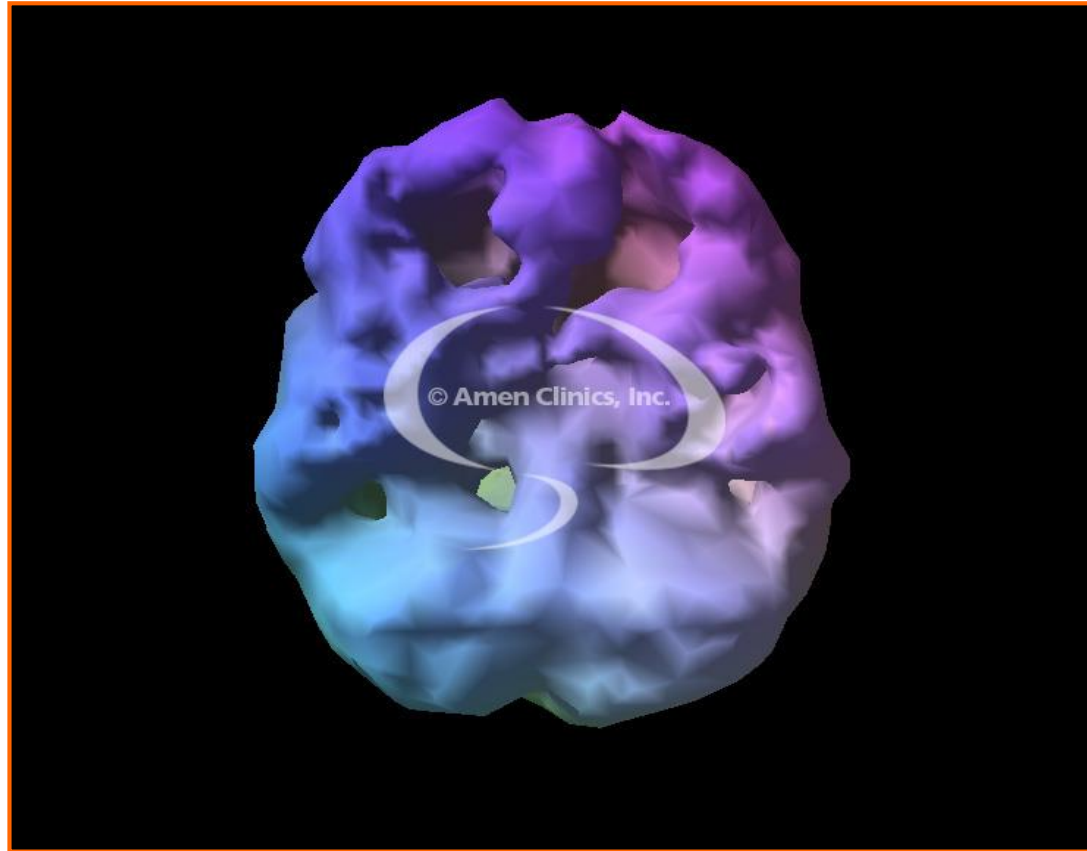


**Methamphetamine**

# ADHD Brain at Rest



# ADHD Brain: Concentration Under Stress/Threat

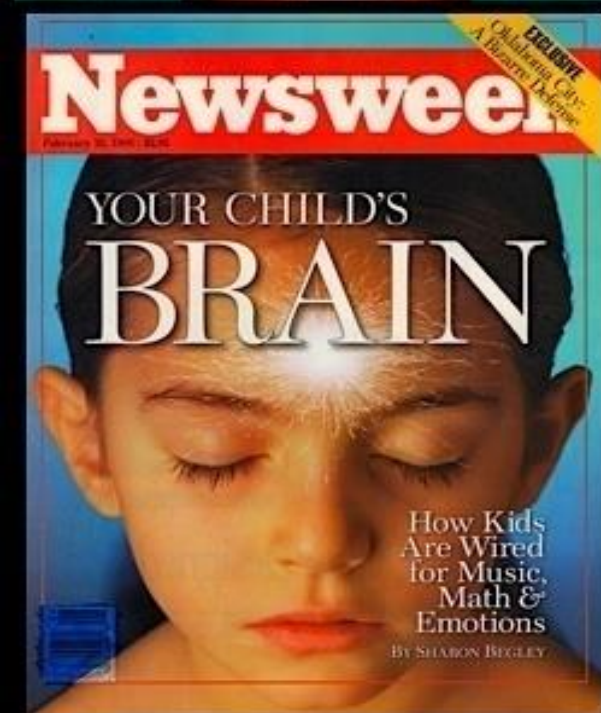
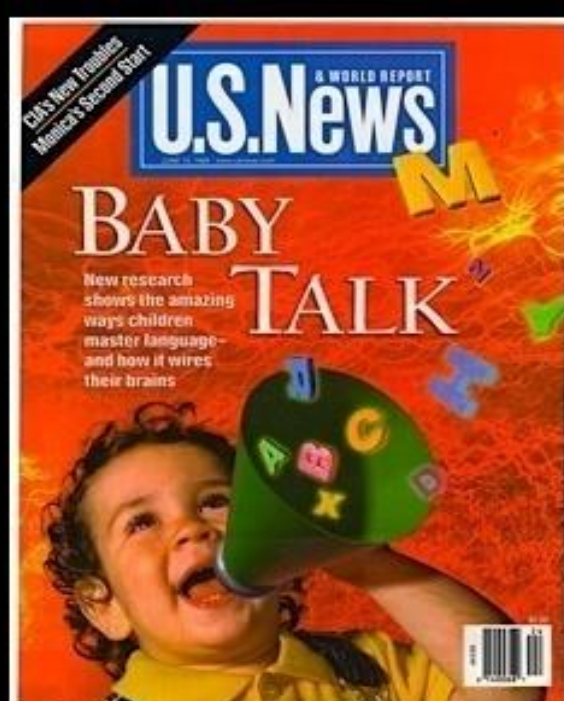
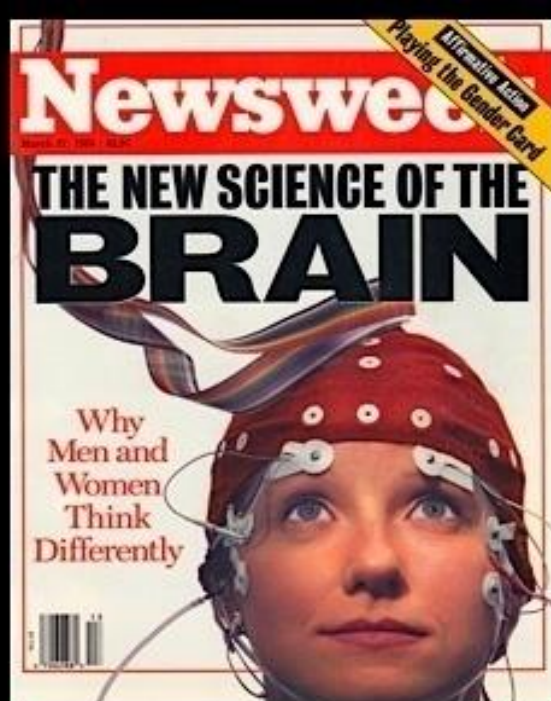
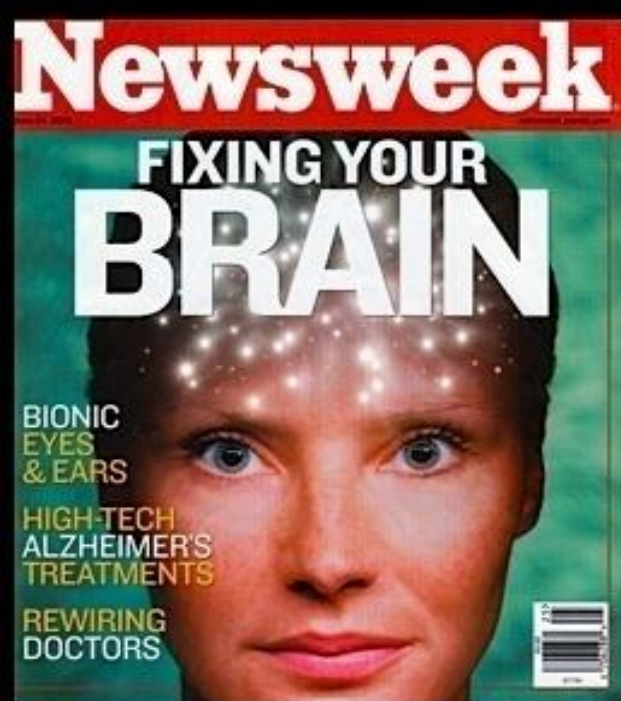


# Why the Brain? Reason #2

Because  
knowledge about  
the brain is  
**EVERYWHERE**  
these days...







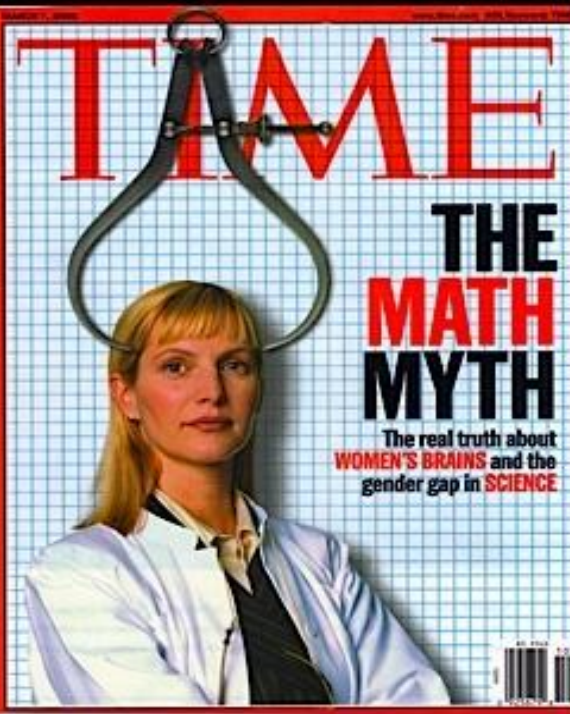
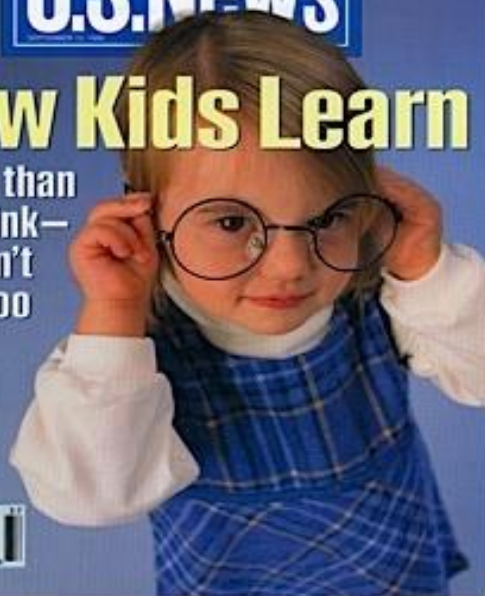


KILLER TRUCKS: THE DANGER TO MOTORISTS

A WORLD REPORT  
**U.S. News**

# How Kids Learn

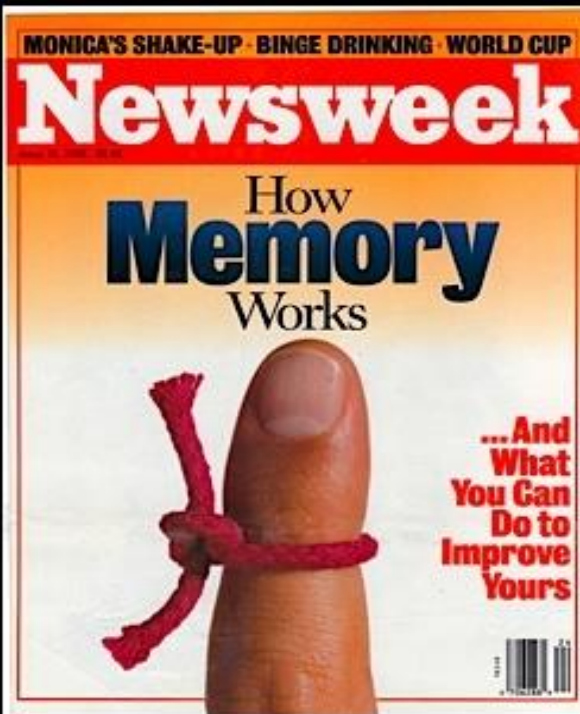
Faster than  
you think—  
but don't  
push too  
hard



# TIME

## THE MATH MYTH

The real truth about  
**WOMEN'S BRAINS** and the  
gender gap in **SCIENCE**

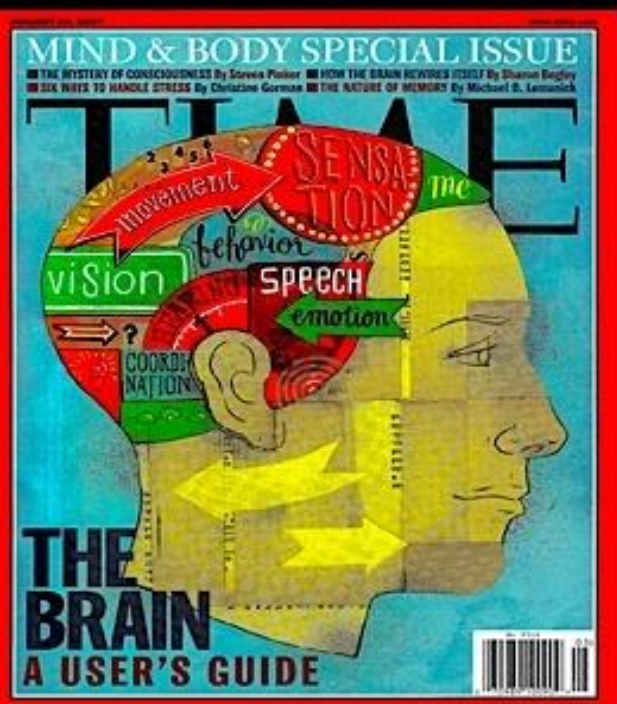


MONICA'S SHAKE-UP • BINGE DRINKING • WORLD CUP

# Newsweek

## How Memory Works

...And  
What  
You Can  
Do to  
Improve  
Yours

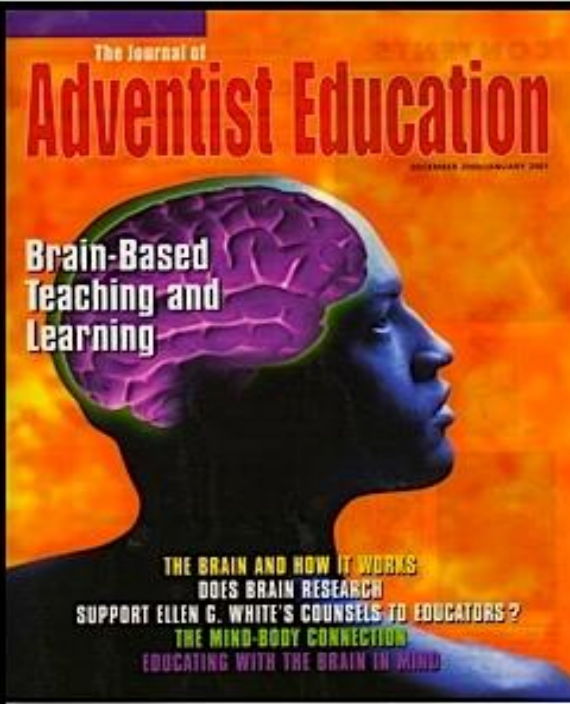


MIND & BODY SPECIAL ISSUE

THE MYSTERY OF CONSCIOUSNESS By Steven Pinker • HOW THE BRAIN REWIRES ITSELF By Sharon Begley  
DO SIX HOURS TO HANDLE STRESS By Christine Gorman • THE NATURE OF MEMORY By Michael S. Gazzaniga

## THE BRAIN

A USER'S GUIDE



The Journal of

# Adventist Education

DECEMBER 2001/JANUARY 2002

## Brain-Based Teaching and Learning

THE BRAIN AND HOW IT WORKS  
DOES BRAIN RESEARCH  
SUPPORT ELLEN G. WHITE'S COUNSELS TO EDUCATORS?  
THE MIND-BODY CONNECTION  
EDUCATING WITH THE BRAIN IN MIND



WWII'S FORGOTTEN FRONT • THE STONES OPEN UP

# Newsweek

## Your Baby's Brain

NEW RESEARCH

From Jealousy  
To Joy: How  
Science Is  
Unlocking the  
Inner Lives  
Of Infants

Eight months old  
Scottish-born baby  
is described as  
the world's first  
social network  
phenomenon





# One of My Favorites...









Killer Girls / Gandhi on the Gaza / Rent Sweet Rent

# Newsweek

08.22.2014



HOW WASHINGTON  
OPENED THE  
FLOODGATES TO  
ONLINE GAMBLING.  
OK, WHO'S IN?

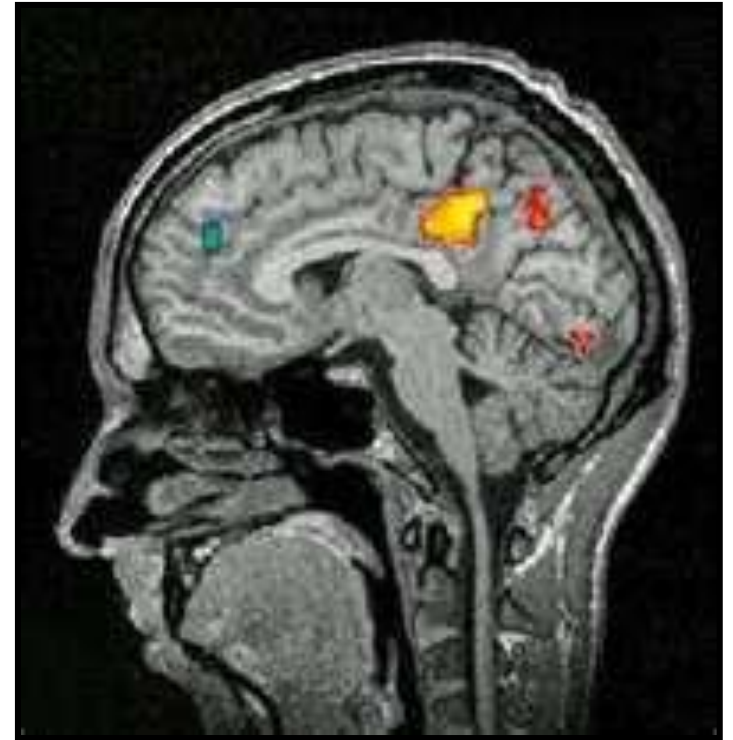
# POKER FACE



TranZed  
**Transformation Education**  
**INSTITUTE** POWERED BY THE  
CHILDREN'S GUILD

# Knowledge About the Brain

- **Knowledge** impacts our **Thinking** (Our beliefs about how things work)
- **Thinking** determines our **Behavior**
- ***We Each Become What We Think About***



# Knowledge About the Brain

- Knowledge about the brain can impact how we think about the brains we serve and, directly and indirectly, how we behave toward them.
- Our focus today: **How and Why Addiction Happens in the Brain.**



# Why the Brain? Reason #3

Because the brain is where addiction does its insidious work...







***Both the “High” and the  
“Addiction Response”  
Happen Here!***

# Why the Brain?

1. It is *where* addiction works its potent power.
2. If you know what happens in the brain, then you will understand why addiction makes you/them *feel and behave* the way you/they do.
3. You can judge whether you/they are in *control* or whether the addiction is in control.
4. If you know the physiological actions of addiction, you can *strategize how to fight back* when your/their brain craves more, even when you/they want less.



# **The Addictive Response to Childhood Trauma**

## **2. What Happens in the Brain When Someone is Getting High?**






# Natural Highs




**Voluntary behavior in animals  
(including humans) is motivated  
by the avoidance of pain and the  
*pursuit of pleasure.***

*Higgins, E. and George, M., The Neuroscience of Clinical  
Psychiatry (2007) Lippincott, Williams & Wilkins,  
Philadelphia*

# The Pursuit of Pleasure



The motivation to pursue a beneficial act to enhance survival is driven in part the brain giving a brief squirt of *euphoria* — the reward system.



# The Pursuit of Pleasure

This euphoric feeling is caused by the secretion of endorphins in the brain. The most important of which is the neurotransmitter *dopamine*.

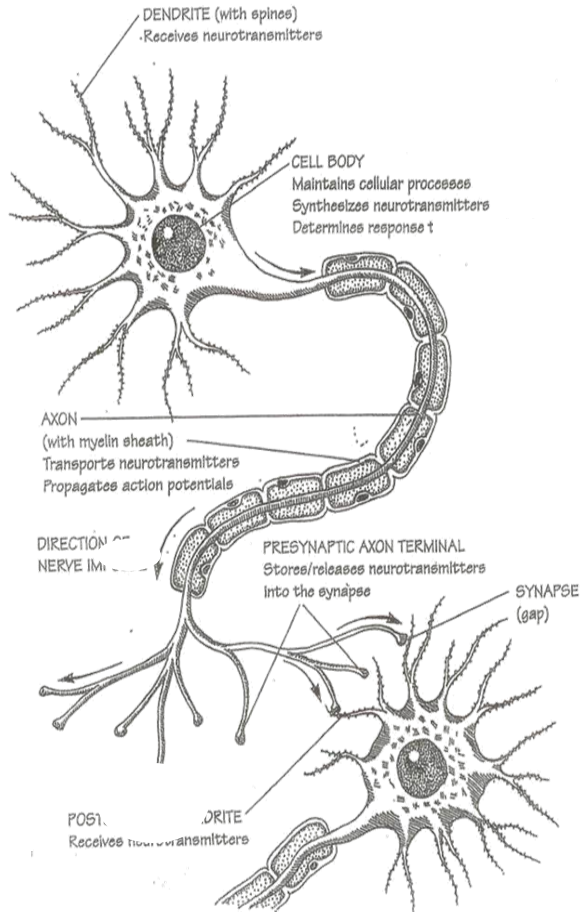


# The Pursuit of Pleasure

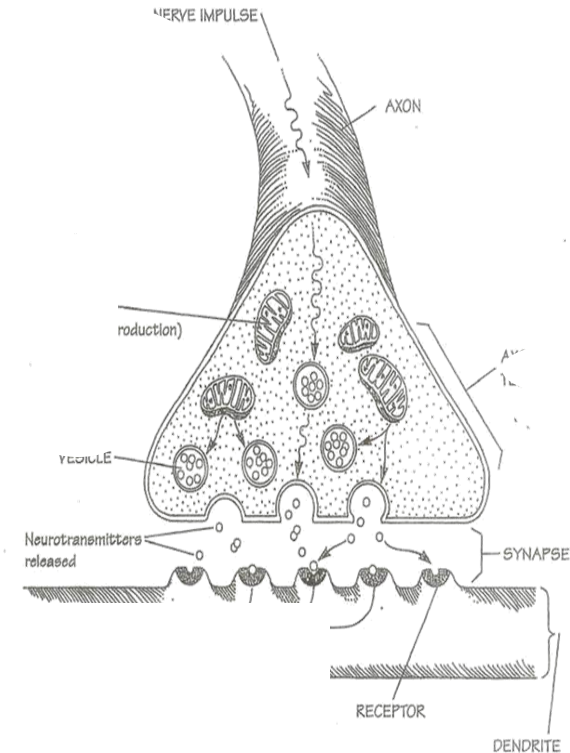


This reward system has evolved over thousands of years to enable the brain to sort through the variety of stimuli that bombard the senses and choose the ones that enhance survival (i.e., eating, sex, social interaction). ***When these stimuli are encountered, the brain secretes dopamine.***

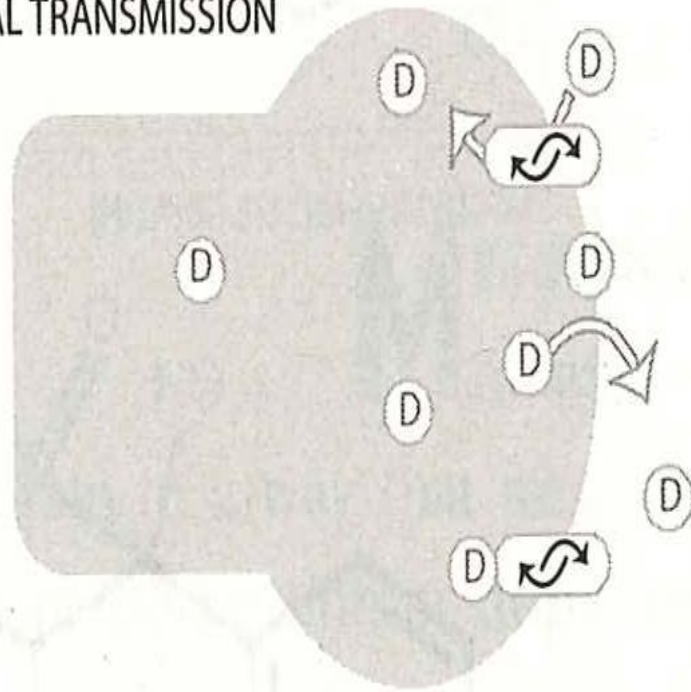
## Functional Model of a Neuron



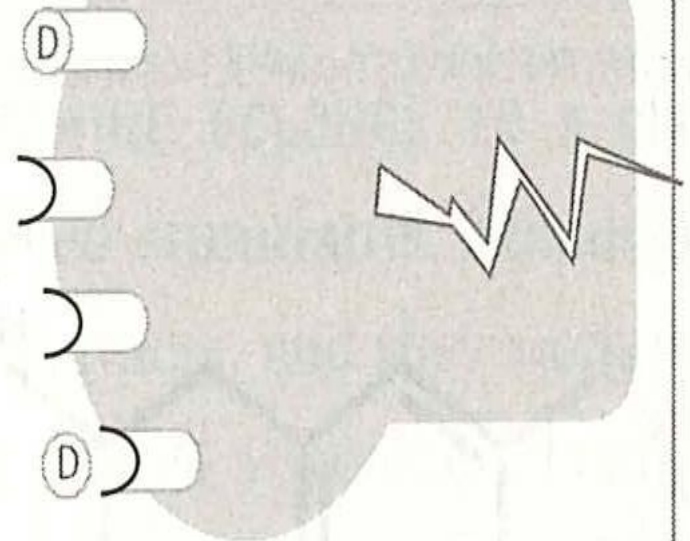
## Synaptic Area



## NORMAL SIGNAL TRANSMISSION



## NORMAL NERVE SIGNAL



D DOPAMINE

POSTSYNAPTIC DOPAMINE RECEPTOR

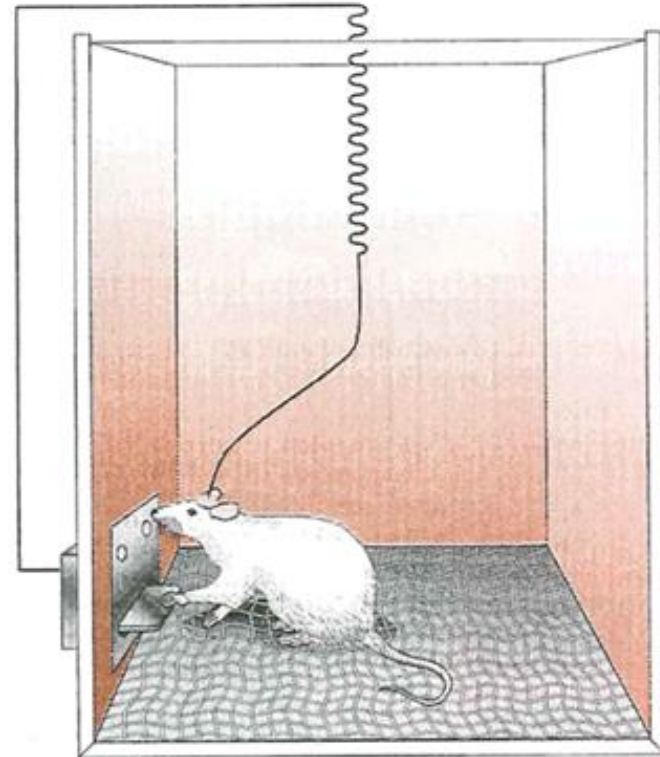
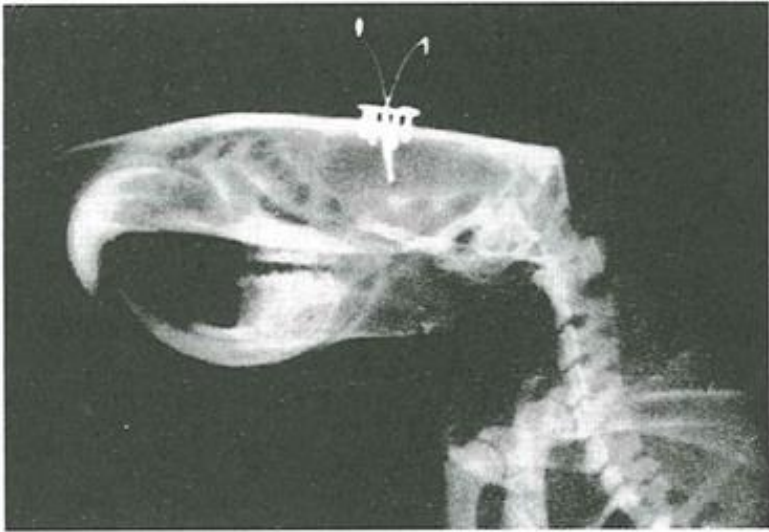
DOPAMINE REUPTAKE TRANSPORTER

# The Power of Reward

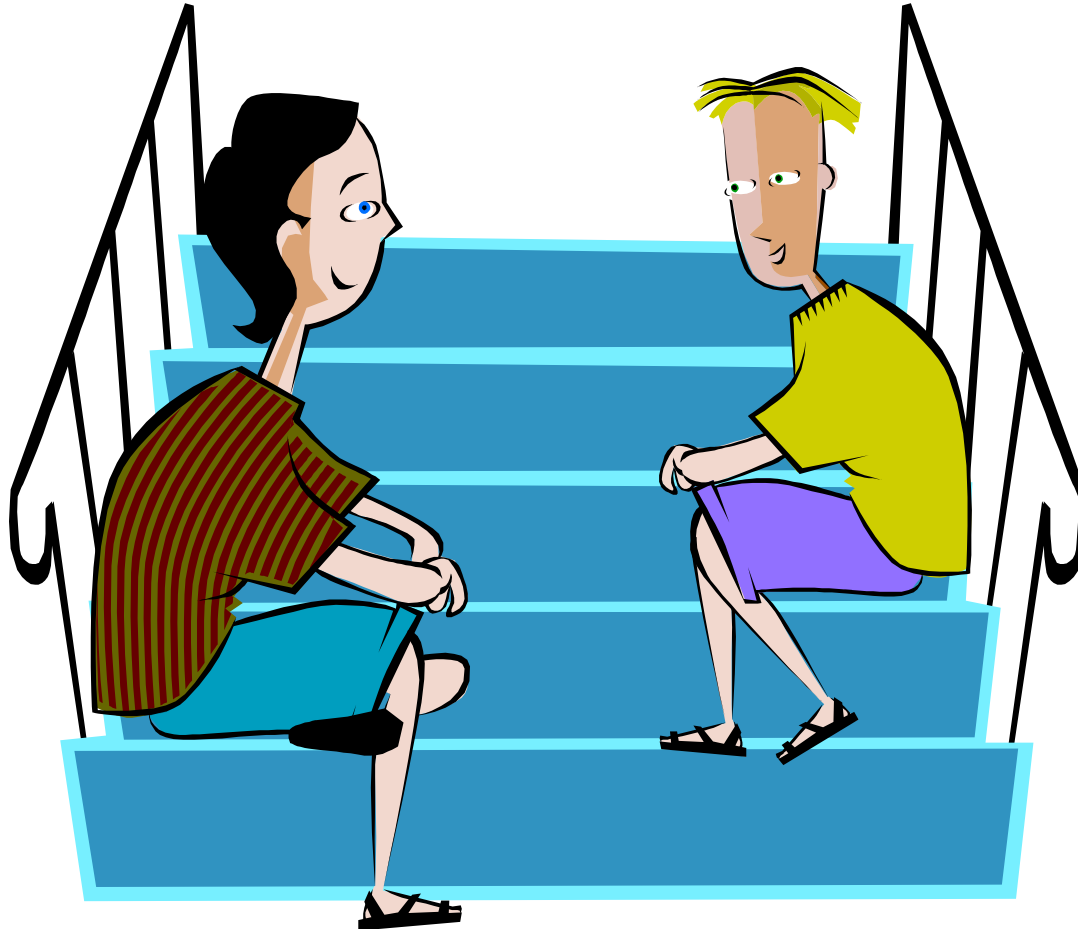
- The first clues about the power of pleasure were discovered by accident in the 1950's.
- In an experiment on surgical techniques, an electrode placed in rat's brain provided pleasurable stimulus when rat pressed a lever. ***In other words, the rat could get a secretion of dopamine whenever it wanted it.***



# The Power of Reward

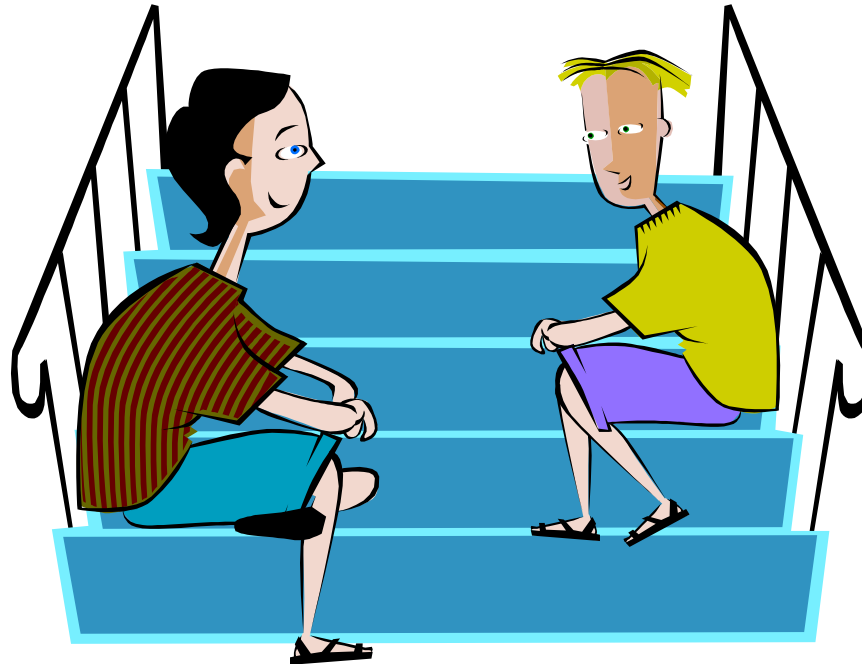


# Nudge a Neighbor Time!



# Nudge a Neighbor Time!

- 1. How many times did the rat hit the lever?*
- 2. What made it stop?*



# The Power of Reward

## Results –

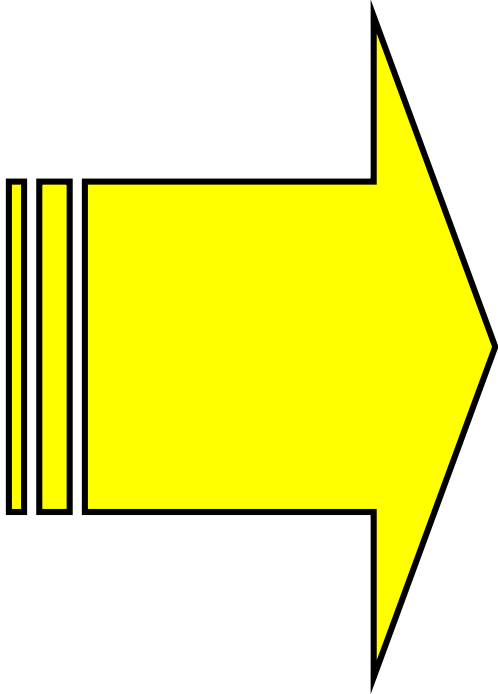
Rat would:

- Press the lever up to 5,000 an hour.
- Choose dopamine experience over food (even when starving).
- Cross an electrified grid (painful!) for a chance to press the lever.

Olds, J.; Pleasure Centers in the Brain. Sci Am. 1956; 195: 105-112.

**Only *death*  
stopped the  
rat from  
pressing the  
lever.**





**What activities  
result in enhanced  
dopamine levels in  
our society?**

# What activities result in enhanced dopamine levels in our society?

- Romantic Love
- Sexual Orgasm
- Music
- Humor

 **Expectation of \$**

- Inflicting punishment on a known enemy
- Looking at beautiful faces
- Social cooperation

*\* Obviously, a partial list!*

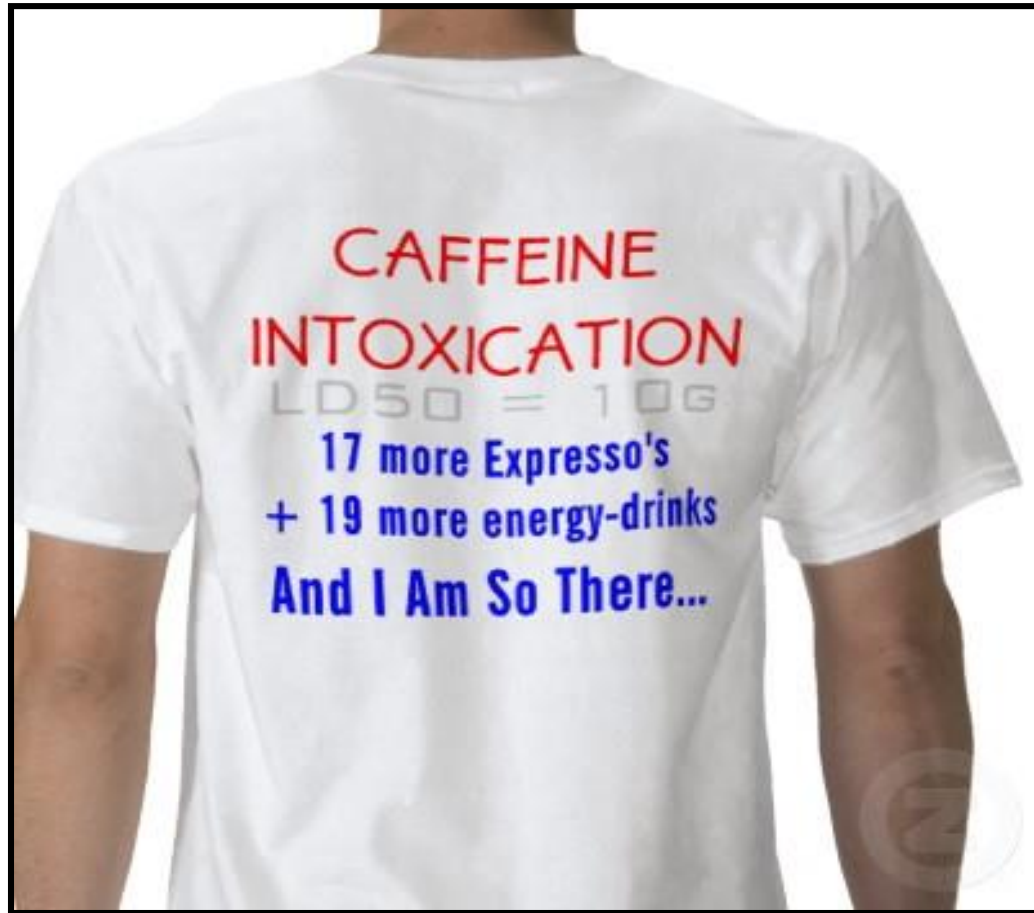
# Take Home Message



- *Dopamine feels good! (It is supposed to feel good).*
- *This is the brain's normal system of reward.*
- *The brain is stingy with dopamine because the euphoria is a powerful motivator.*
- *Many activities naturally give us dopamine.*



# Chemically-Induced Highs



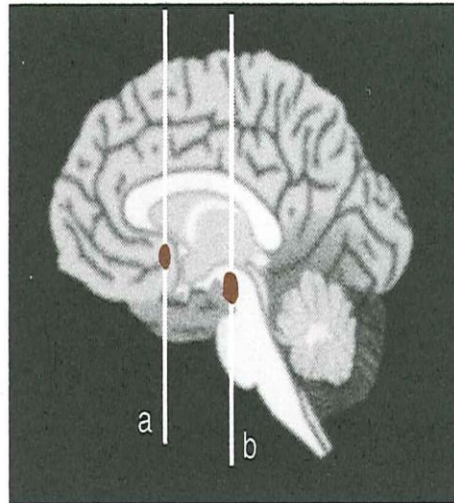
# What *chemicals* result in enhanced dopamine levels in our society?

- Chocolate
- Cocaine
- Alcohol
- Amphetamines
- Nicotine
- Methylphenidate



## Drugs

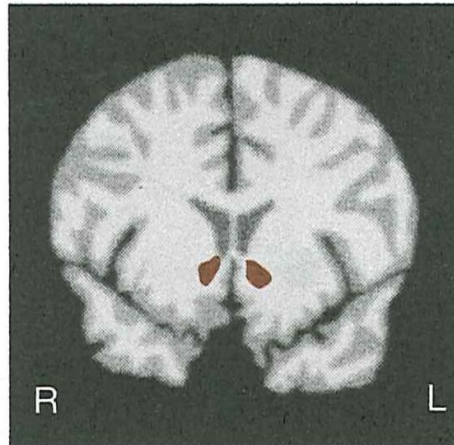
1. Cocaine
2. Alcohol
3. Amphetamines
4. Methylphenidate
5. Nicotine



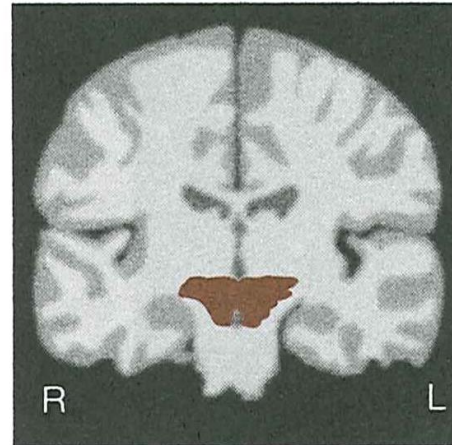
## Feelings

6. Romantic love
7. Listening to music
8. Humor
9. Expectation of \$\$\$
10. Inflicting punishment
11. Looking at beautiful faces
12. Social co-operation
13. Eating chocolate

a. Nucleus accumbens



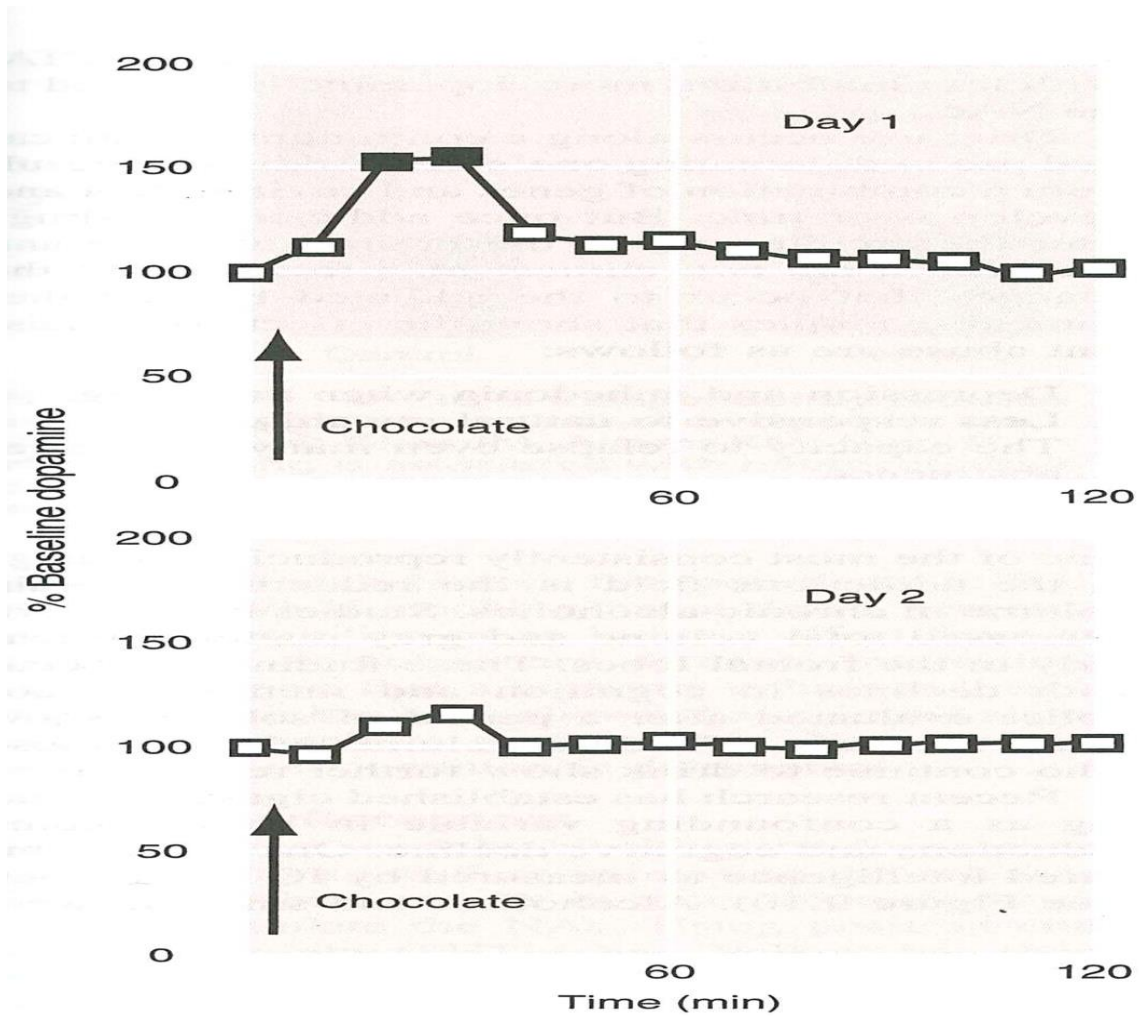
b. Ventral tegmental area



# Boosting Dopamine Levels



- Chocolate
  - 150% boost in dopamine levels at MAc over baseline of first administration.
  - On second administration, boost in dopamine level is no longer significant.



# Boosting Dopamine Levels

- Cocaine
  - 400% boost in dopamine levels over baseline at first administration.





# Boosting the Messenger

- METH
  - 1500% boost in dopamine levels at NAc over baseline at first administration.





# The Addictive Response to Childhood Trauma

## 3. What is Addiction in the Brain?



# Addictions Change the Brain

For much of human history, most of the pleasurable activities that we are wired to pursue occur in nature in limited supply, making it hard to overindulge.



# Addictions Change the Brain

But modern life provides a smorgasbord of temptations that activate the reward system.



# Addictions Change the Brain

Drugs of abuse, in particular, overwhelm and fundamentally alter the neurons that were never intended to experience such supra-physiological levels of neurotransmitters (dopamine).



# Addictions Change the Brain

Some drugs have direct effects on the dopamine pathways while others work indirectly.





# Addictions Change the Brain

**Stimulants and Nicotine and METH  
Dramatically increase dopamine levels  
— DIRECT IMPACT!**

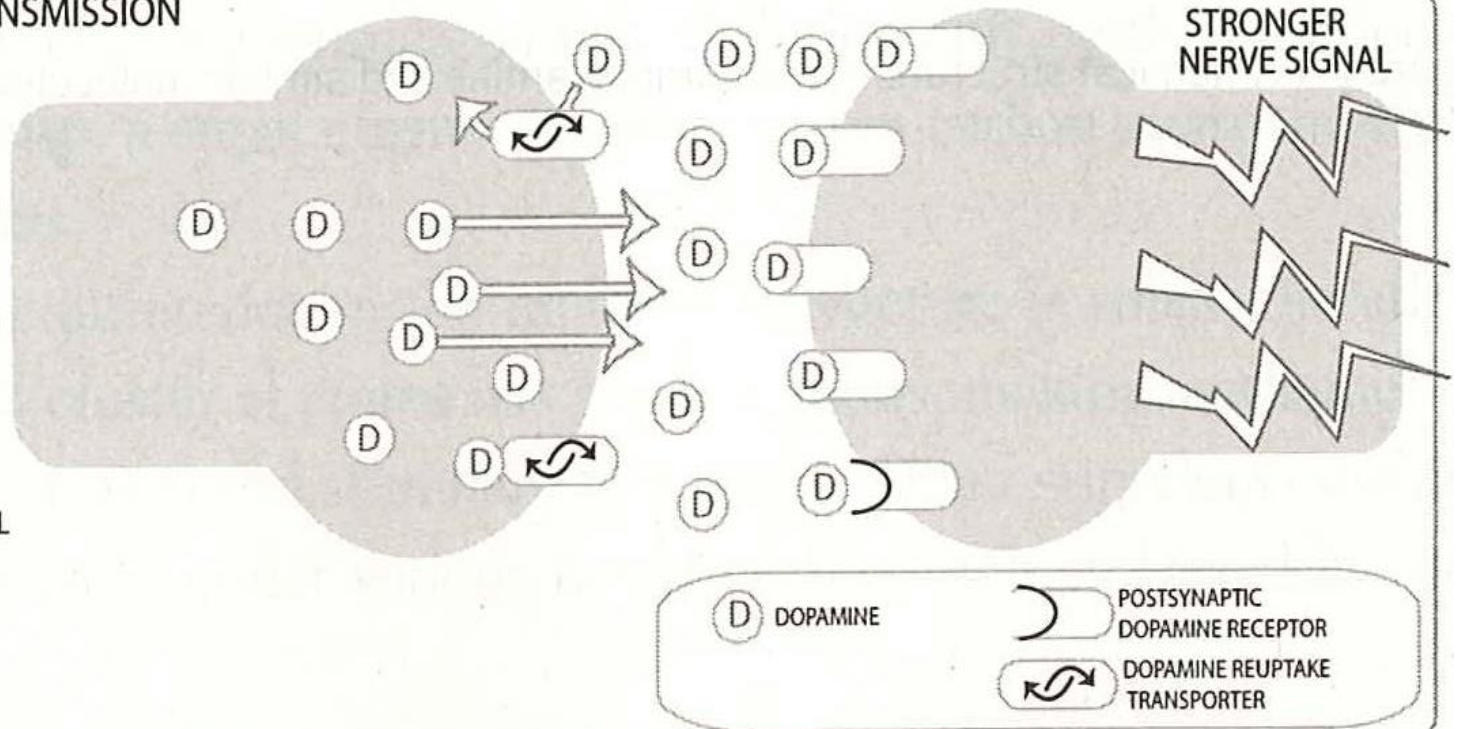


## ENHANCED TRANSMISSION

1. DOPAMINE  
VESICLES RELEASED

2. MORE DOPAMINE  
IN THE SPACE

3. STRONGER SIGNAL  
TRANSMISSION



# Addictions Change the Brain

**Opioids, Alcohol and METH**  
suppress the inhibitory neurons that  
modulate (limit the amount of dopamine  
metabolized). With less inhibition, more  
dopamine is available —  
**INDIRECT IMPACT!**

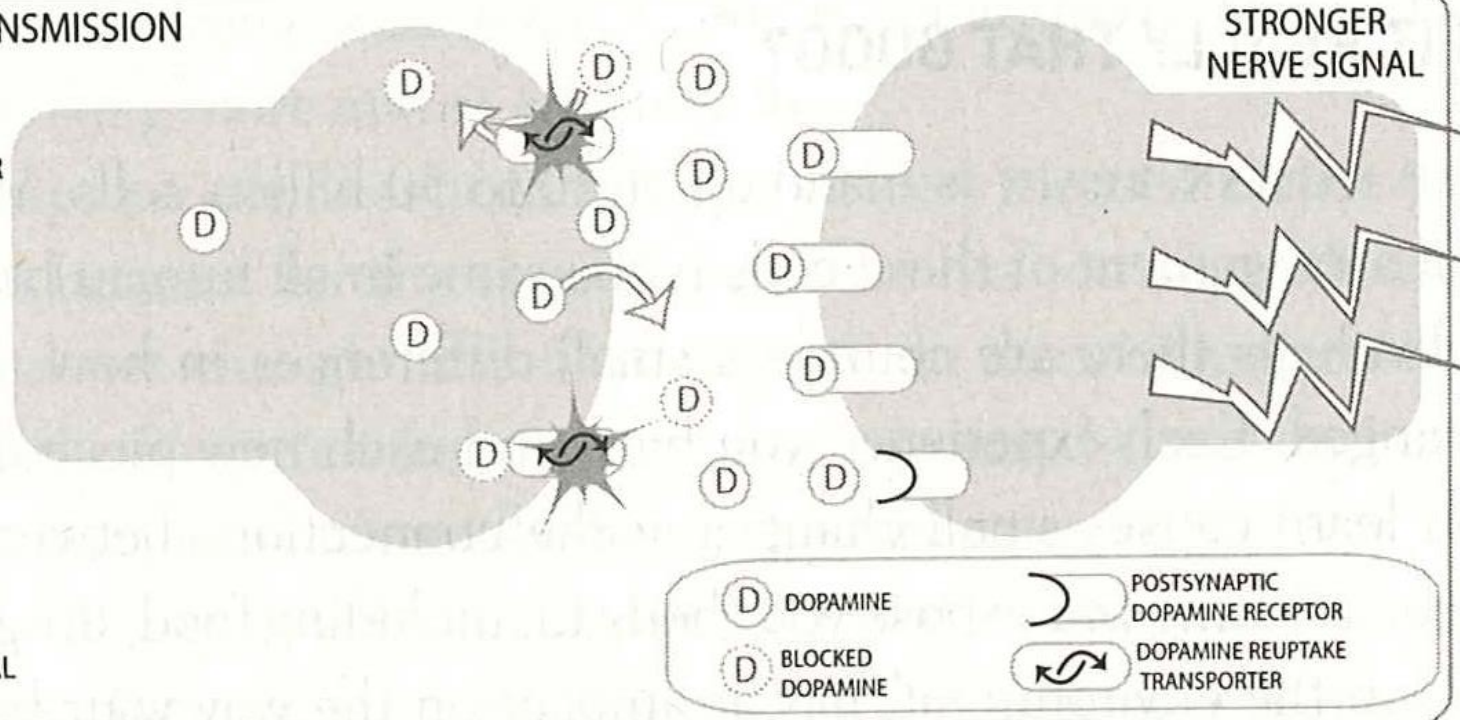
## ENHANCED TRANSMISSION

1. BLOCKED  
DOPAMINE REUPTAKE  
RECEPTORS

2. BLOCKED  
DOPAMINE  
RECYCLING

3. INCREASED  
DOPAMINE  
IN THE SPACE

4. INCREASED SIGNAL  
TRANSMISSION



# Addictions Change the Brain

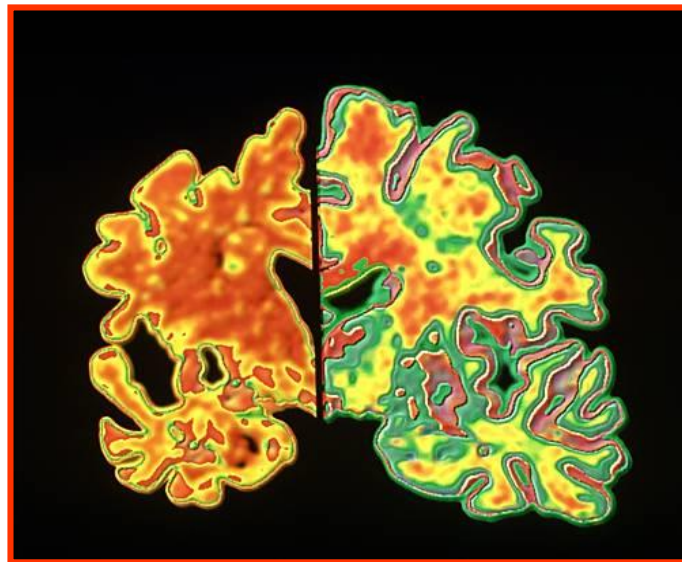
METH presents a “double-whammy” to the natural reward system. The amount of dopamine secreted is increased AND the dopamine modulators are prevented from working. **This could be the most explosively powerful reward response that currently exists.**



# Addiction Changes the Brain

## Damage to Dopamine Receptors

Excessive use of hedonic substances results in a decrease (shut down) of dopamine receptors.



# Addiction Changes the Brain

## Damage to Dopamine Receptors

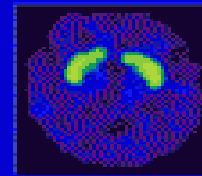
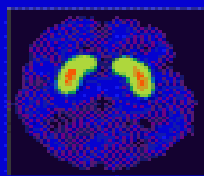
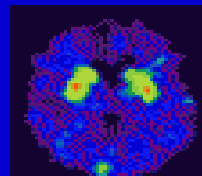
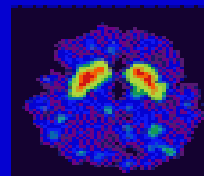
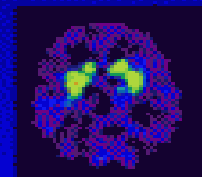
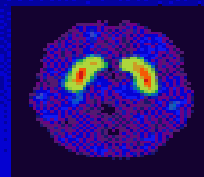
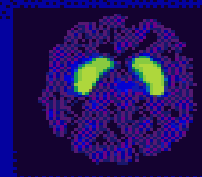
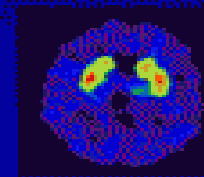
With fewer dopamine receptors, the addicted brain:

1. Will develop **tolerance** and the need to take more;
2. Will have difficulty experiencing **pleasure** with natural reinforcers.

# Tolerance

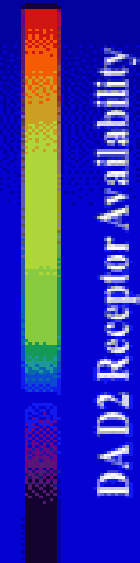
*Functionally...*

**Dopamine D2 Receptors are Decreased by Addiction**



**Control**

**Addicted**



# Addiction Changes the Brain

## Genetic Protection

Genetic expression is also stimulated to produce substances (gaba) and activate glial cells (remove glutamate) that further dampen the reward circuitry and induce tolerance. ***Drug addiction changes genes!***



# “Life of the Party”

vs.

# “The Wet Blanket”

- **Glutamate =**  
Neurotransmitter that creates cellular excitement! “The Life of the Party.”  
When glutamate is present, cells pay attention!
- **Gaba =**  
Neurotransmitter that dampens cellular excitement and moderates cell excitement. A real wet blanket!



# Take Home Messages



- Never underestimate the high.
- Addiction is the brain's physiological response to too much dopamine.
- Dopamine receptors close and genes crank-up to dampen the reward system.
- If the abuse continues, permanent damage can occur.

# Today's Agenda

## 2. Identification, Treatment and Prevention Implications



# Hope for the Future

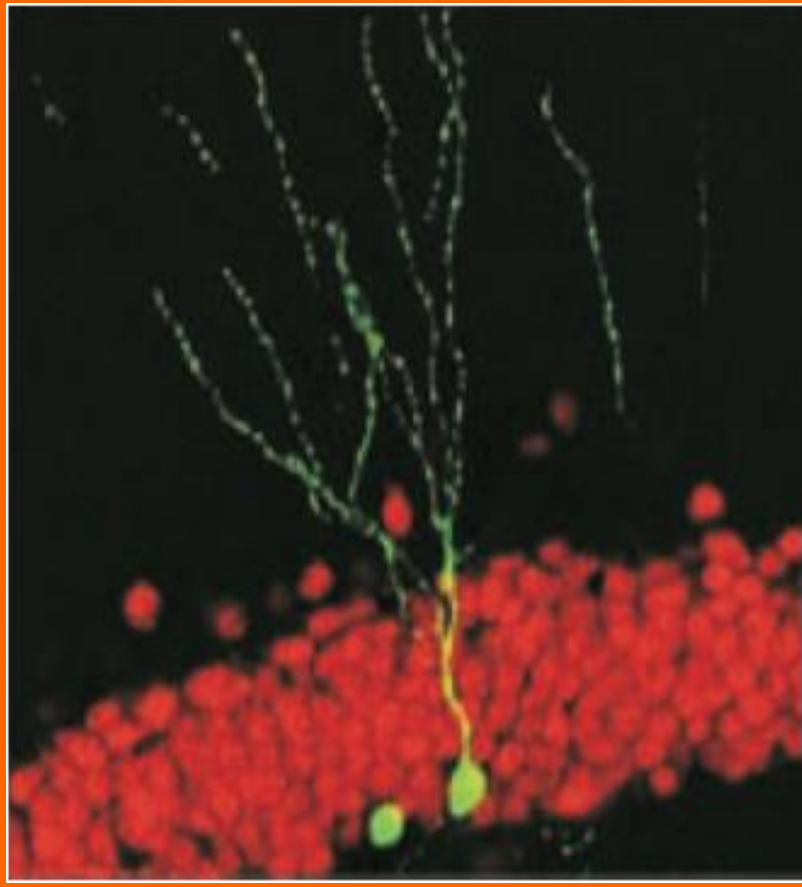


**GOOD NEWS!**

**Brains can  
change for the  
better!**

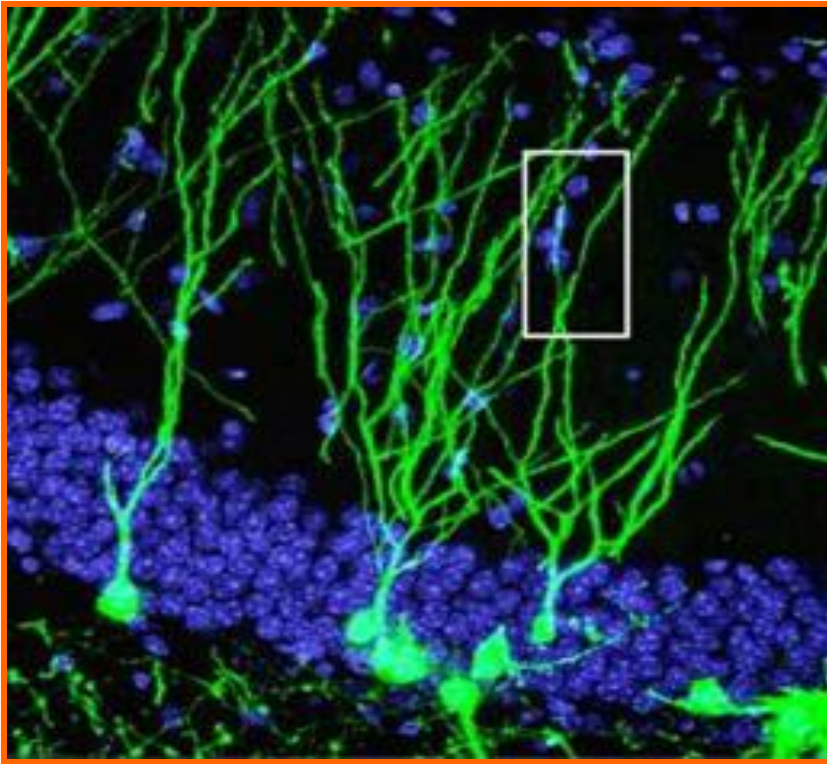
**But the right  
environment  
**MUST** be  
created...**

# The Promise of Neurogenesis!



By exposing children to specific school environments, adults can stimulate the growth of new neurons in a child's brain to repair and eventually expand learning capacity. ***The Hippocampus can be healed!***

# Neurogenesis (The Birth of New Brain Cells)



- New cell staining techniques allowed researchers at The Salk Institute to confirm the birth of newly-generated neurons.
- Subsequent studies showed that many of these new neurons survived and became functional!

# Sparking Neurogenesis

Neurogenesis is known to positively regulate and impact learning, mood, memory and overall health.



*“When your brain does well, you do well.”*



# **7 Power Tools (or... How to Stimulate Neurogenesis)**

**These aren't the only tools  
but they are foundational.  
Other efforts will fail if these  
essentials are not in place  
because the brain will  
remain in distress.**



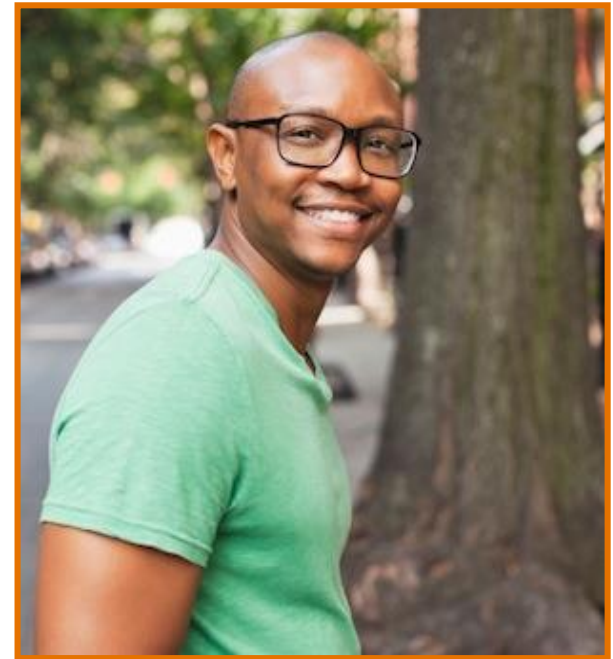
# **BUT: Neurogenesis Can Be Cut-Off**

## **STOPPED by:**

- Distress
- Physical Inactivity
  - Boredom
  - Depression
- Poor Nutrition

# Neurogenesis is Your Goal!

1. Vigorous Physical Play (Regular Physical Activity)
2. Meaningful New Learning
3. Enriched Experiences
4. Managed Stress Levels
5. Positive Nutrition
6. Social Support
7. Sufficient Time



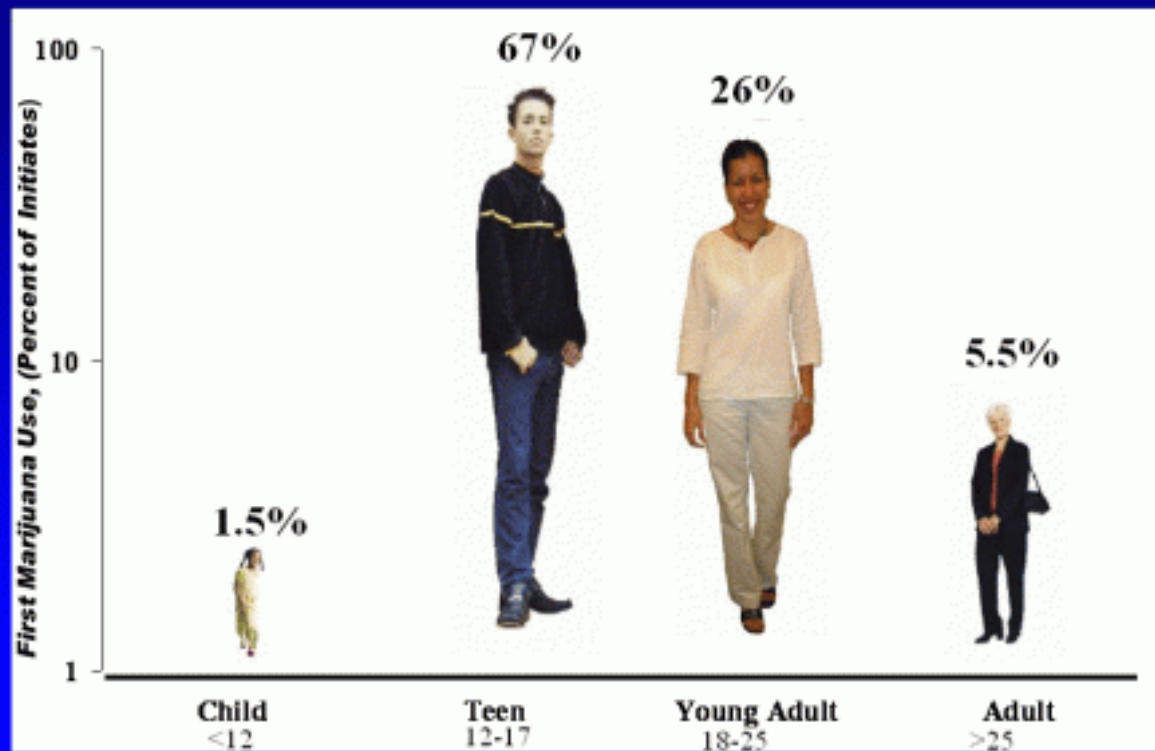
(Jensen, E., Enriching the Brain, Jossey-Bass, San Francisco, CA 2006)

# Addiction Treatment Implications

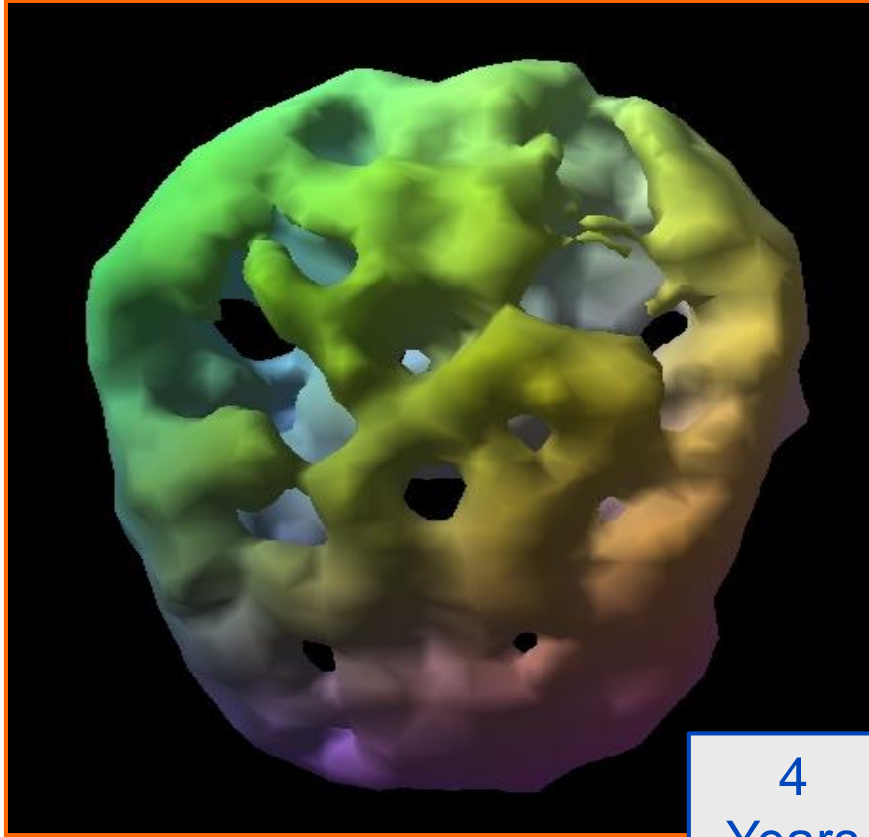
1. Delayed Experimentation (Montana Meth Project).
2. Early Intervention. Damage happens faster in younger brains.
3. Abstinence (w/motivation) will heal many brains.
4. Medications are the future. (Ironic, isn't it?)
- 5. Identify and reinforce healthy activities that stimulate the reward system.**

# Delayed Experimentation

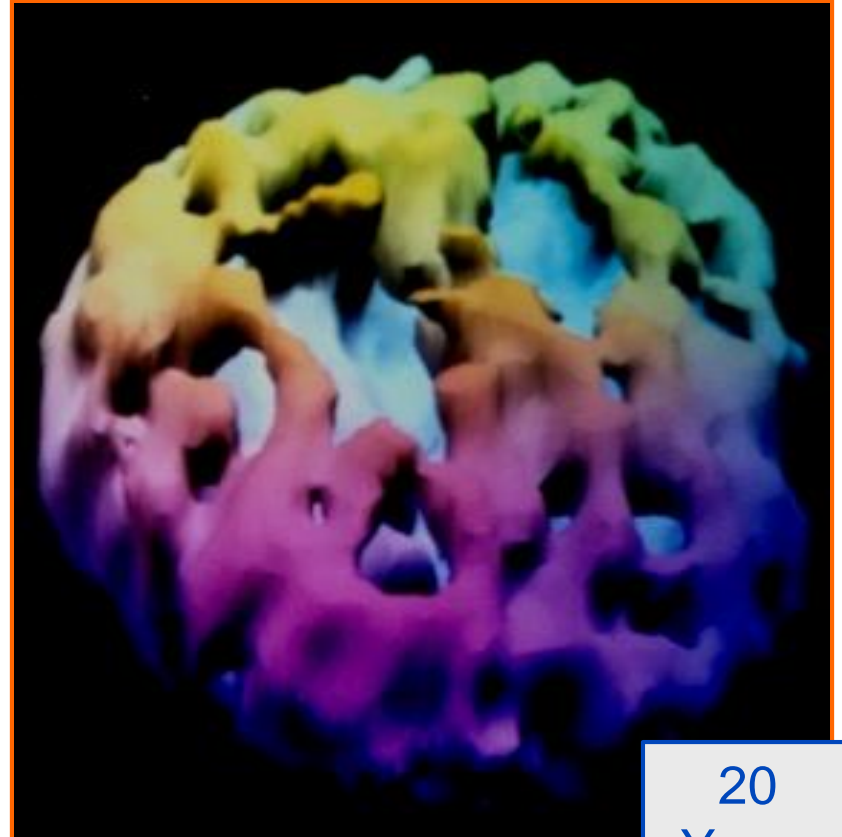
*Addiction is a Developmental Disease:  
It Starts Early*



# Alcohol Abuse



4  
Years



20  
Years



# Take Home Messages



*Help everyone  
you know find  
healthy ways  
to produce  
dopamine!*

# Healthy Dopamine Squirts

- Positive Relationships
- Vigorous Physical Play
- Goal Achievement
- The Arts
- Helping Others



# The Addictive Response

## Gambling, Addiction and the Brain



# Gambling and the Brain

“Understanding that addiction is, at its core, a consequence of fundamental changes in brain function means that a major goal of treatment must be either to reverse or to compensate for those brain changes.”

- Dr. Alan Leshner, National Institute on Drug Abuse

# Gambling and the Brain

“People diagnosed with pathological gambling experience negative biological consequences similar to those of substance abusers, namely tolerance and withdrawal.”

- Dr. Jon Grant

# 9 Ways Gambling Addiction and Substance Addiction are Similar

1. Repetitive/feeling while compulsive behavior despite *negative* consequences.
2. *Diminished* control over the problematic behavior.
3. A state of anticipated *pleasure* prior to engaging in the problematic behavior.
4. A *positive*, satisfying feeling while engaging in the problematic behavior.



# 9 Ways Gambling Addiction and Substance Addiction are Similar

5. *Tolerance* toward the activity increases over time.
6. Occurrence of *withdrawal* symptoms.
7. Attempts to cut-back or stop are often repetitive and *unsuccessful*.
8. *Higher* usage rates during adolescence and young adulthood.

# 9 Ways Gambling Addiction and Substance Addiction are Similar

9. *Rapid* rate of progression to problematic behavior in women compared to men.



# Gambling and the Brain

“A complex system of neurotransmitters, such as serotonin, dopamine, endogenous opioids and hormones, are responsible for what we feel, how we think and what we do. Imbalances within this system have been shown to influence both behavioral and substance addictions.”

- Grant, J.E., et al., (2006). “The neurobiology of substance and behavioral addictions,” CNS Spectrums, 11(12), 924-930

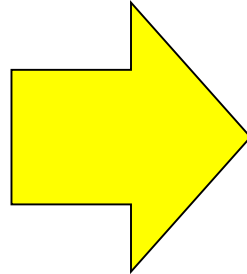
# Neurotransmitter Imbalance

1. Serotonin = *“Ahhh”*
2. Dopamine = *“Yahoo!”*
3. Endogenous Opioids = *Naturally occurring opiate-like substances*
4. Cortisol = *“Uh-oh” impairs thinking*



# 1. Short on Serotonin

- Impacts mood, emotion, cognition (thinking) and impulse control
- Common in pathological gamblers
- Increased motivation to satisfy urges, lessened ability to inhibit behavior, impairment in reward/risk processing

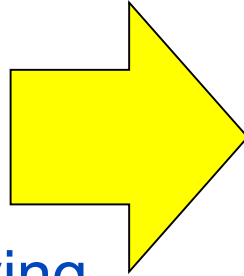


## Serotonin Boosters:

- *Physical Activity*
- *Meditation*
- *Martial Arts*
- *Stress Management Skills/Outlets*
- *SSRIs*

## 2. Bad Dopamine Sources

- Alterations within the dopaminergic pathways result in the pursuit of activities (gambling) that trigger dopamine release.
- “Reward Deficiency Syndrome” causes a craving for environmental stimuli to compensate for the dopamine imbalance—regardless of the consequences.



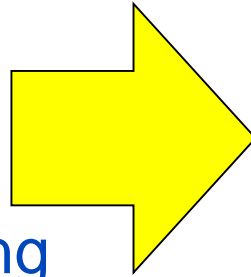
### Alternative Dopamine Sources:

- *Physical Activity*
- *Relationships*
- *Achievement*
- *Adventure*
- *Arts*
- *Sex*



# 3. Endogenous Opioids

- Altered opiodergic systems result in difficulty controlling desires to continue an addictive behavior due to intense euphoric feelings experiences when engaging in that behavior.
- This euphoric experience is “on top of” or in addition to the “Yahoo!” of dopamine.



## Drugs vs. Drugs:

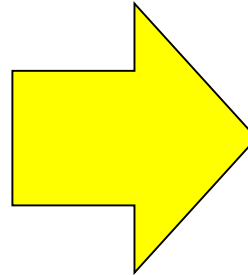
*Clinical studies have demonstrated treatment success with opioid antagonists Naltrexone and nalmefene.*

*Grant, et al., (2006)*

***Priming Reminders  
Don't Help!***

# 4. Teaching Better Thinking

- In pathological gamblers, there is decreased activation in the frontal lobes, the “thinking” part of our brains.
- The frontal lobes play a critical role in the processing of risk and decision making.
- This lower activity is found in both behavior addictions and substance addictions. (Potenza, 2006)



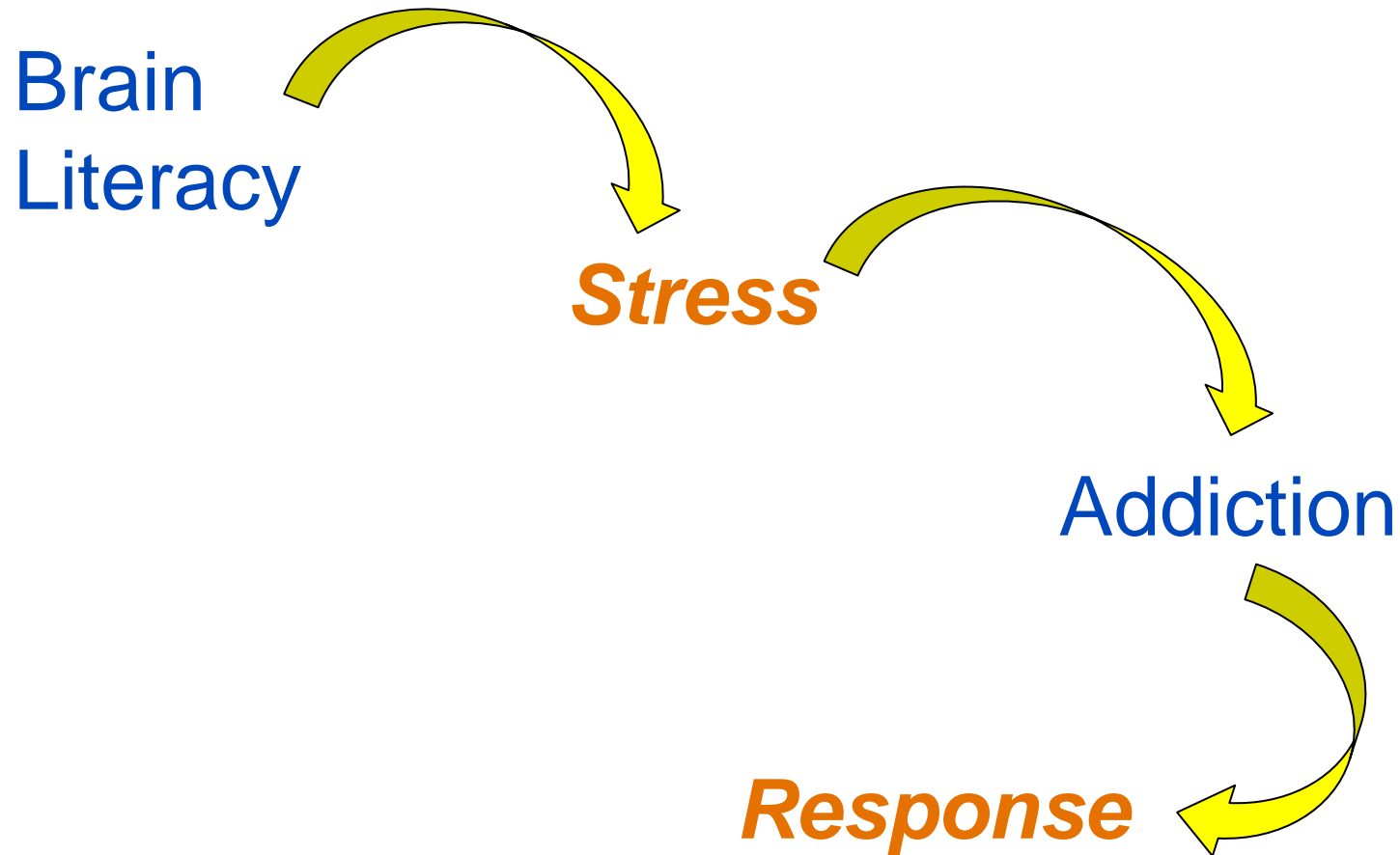
## Let's Talk:

*Therapies with evidence-based support:*

- *Cognitive Behavioral Therapy*
- *Motivational Interviewing*
- *Relapse Prevention*  
*Shah, et al., (2004)*

## **Computer Talk?**

# Let's Connect!



# What Do You Think?

*1. Is it possible for a client engaged in problem gambling to provide informed consent if the client's underlying drive to gamble is to relieve the chronic stress arising from childhood trauma?*



# What Do You Think?

***2. Is the treatment provider's use of a valid trauma screen for problem gambling clients ethically required?***

# What Do You Think?

***3. Is the treatment provider ethically required to consult a trauma treatment specialist if her/his problem gambling client has a trauma history?***



# Thanks for inviting me!



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