

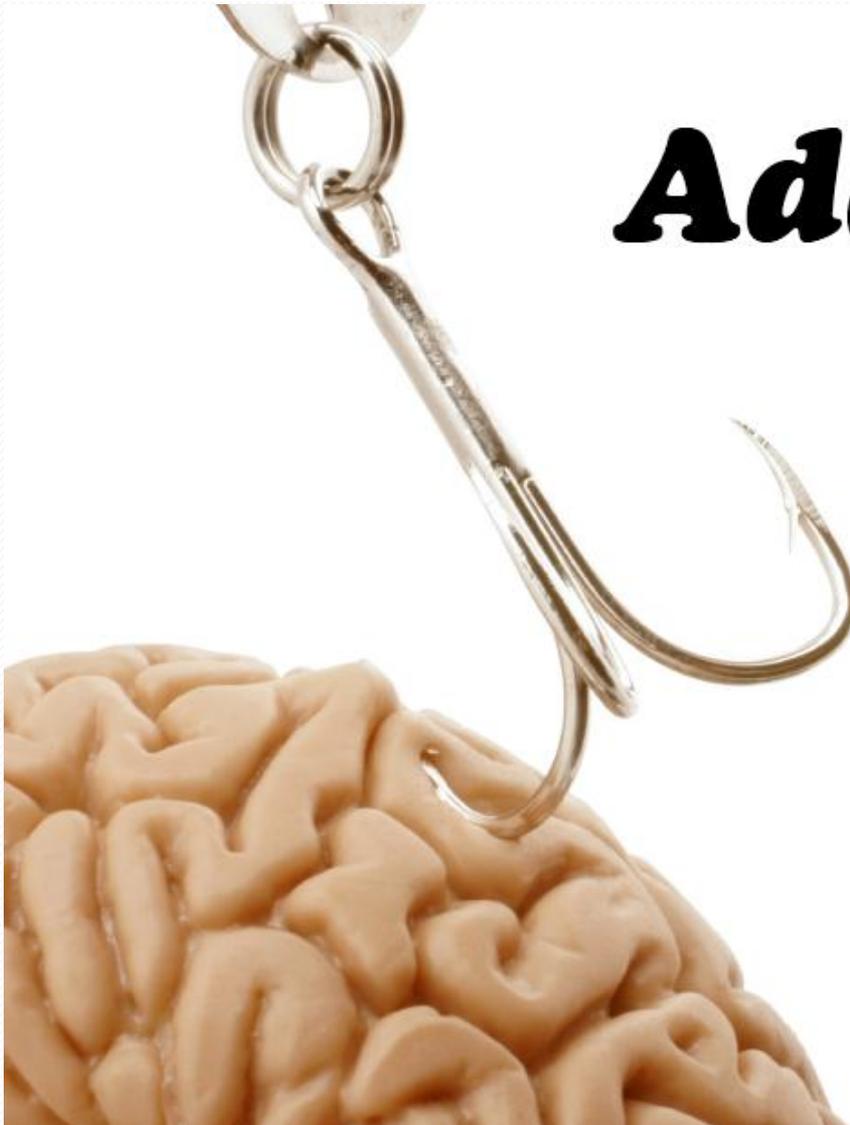
The Addicted Brain

Prevention & Recovery Conference

November 28, 29 & 30

Norman, Ok

Addicted Brain





Drug Addiction: A Brain Disorder

- Loss of control of drug-taking behavior
 - ◆ Overwhelming compulsion to take drugs
 - ◆ Craving when drugs not available
- Addicts are:
 - ◆ Tolerant
 - ◆ physically dependent
 - ◆ psychologically dependent
- Addiction is a chronic, relapsing disorder
 - ◆ Relapse can occur long after drugs are gone from the body



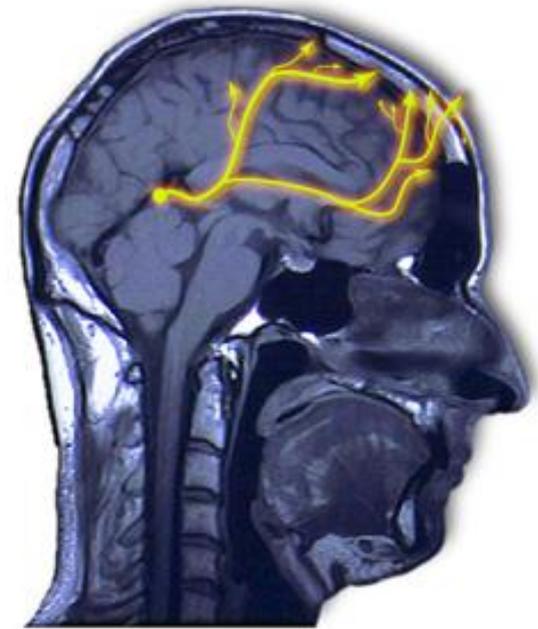
What is Addiction?

The American Society of Addiction Medicine (ASAM) released on August 15, 2011 their latest definition of addiction:

- Addiction is a chronic brain disorder and not simply a behavioral problem involving too much alcohol, drugs, gambling or sex.
- This is the first time that ASAM has taken an official position that addiction is not solely related to problematic substance abuse.
- Outward behaviors are actually manifestations of an underlying disease that involves various areas of the brain
- Addiction, at its core, is not just a social problem or a problem of morals.
- Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry.
- www.asam.org/DefinitionofAddiction-LongVersion.html

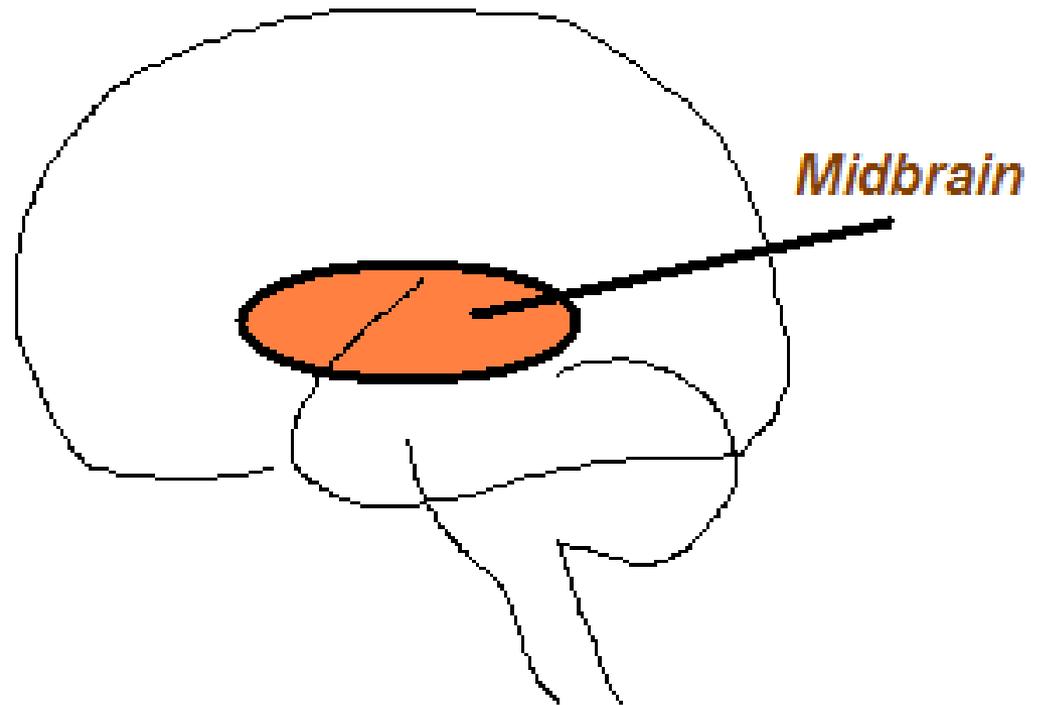
REWARD PASSWAY

- The reward pathway reinforces behavior by creating an affect on memory which using then can be trigger by eye sight, and smell
- The brain is divided into several distinct regions that are each responsible for performing functions. In the center of the brain sits the reward pathway, which is responsible for driving our feelings of motivation, reward and behavior.
- Neurons are the cells responsible for passing chemical and electrical signals along the pathway of the brain. They come in many shapes and sizes enabling them to conduct specialized functions such as storing memories or controlling our muscles.



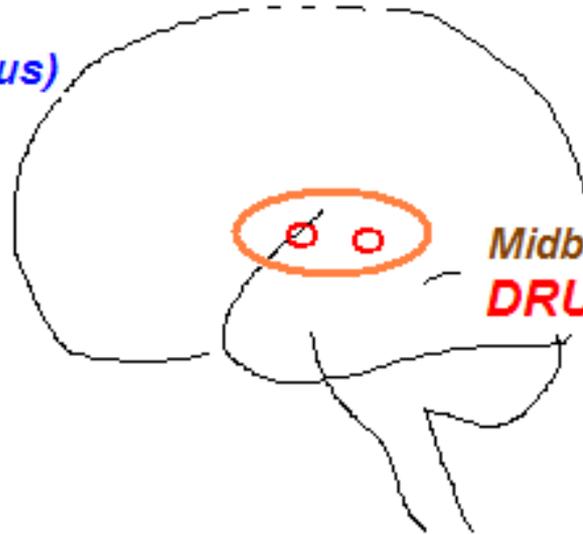
The Midbrain is the **SURVIVAL** Brain

- Not conscious
- Acts immediately, no future planning or assessment of long-term consequences
- A life-or-death processing station for arriving sensory information



In addiction, the drug is equated with survival at the level of the unconscious (i.e. the drug IS survival)

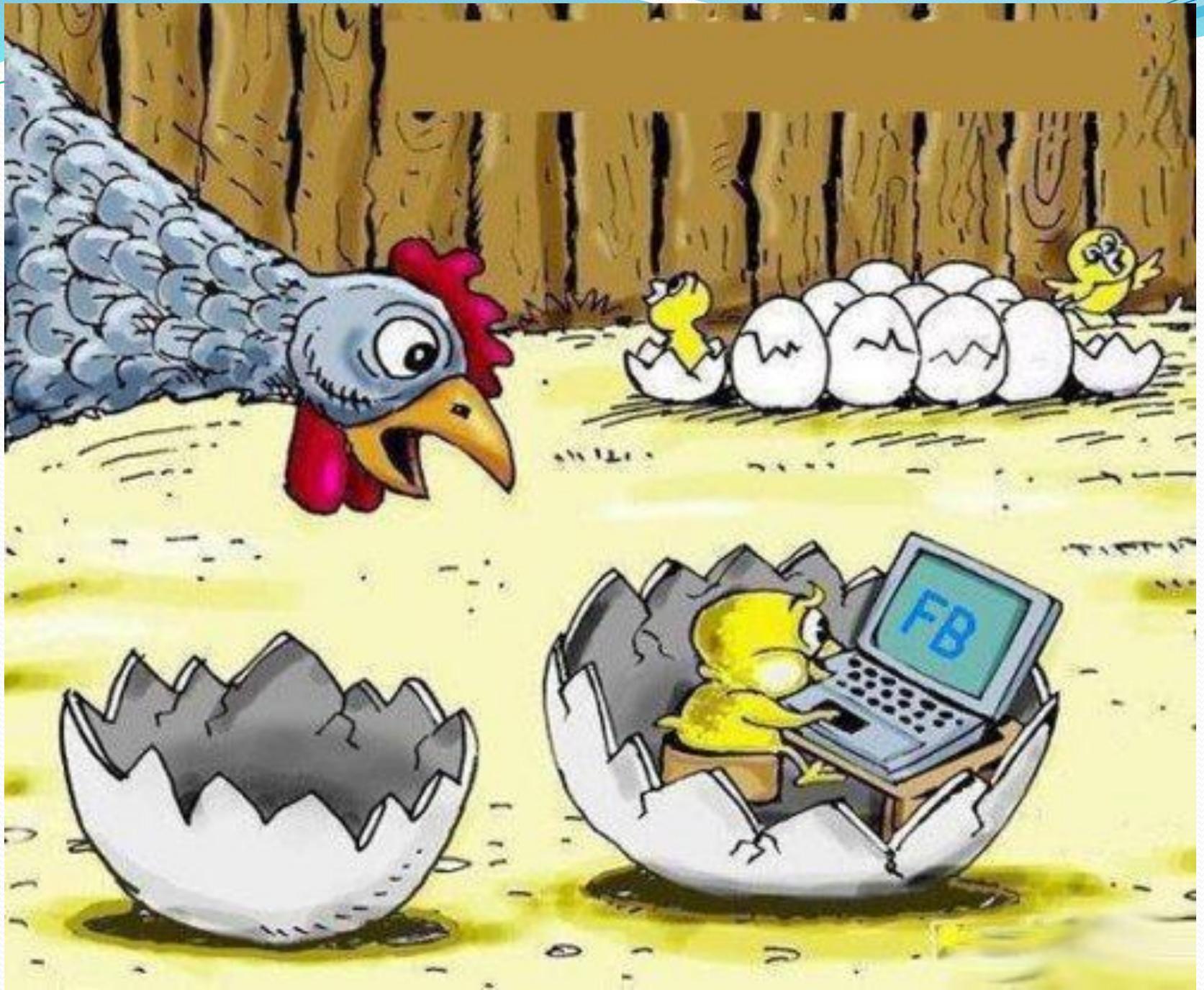
Cortex
(conscious)

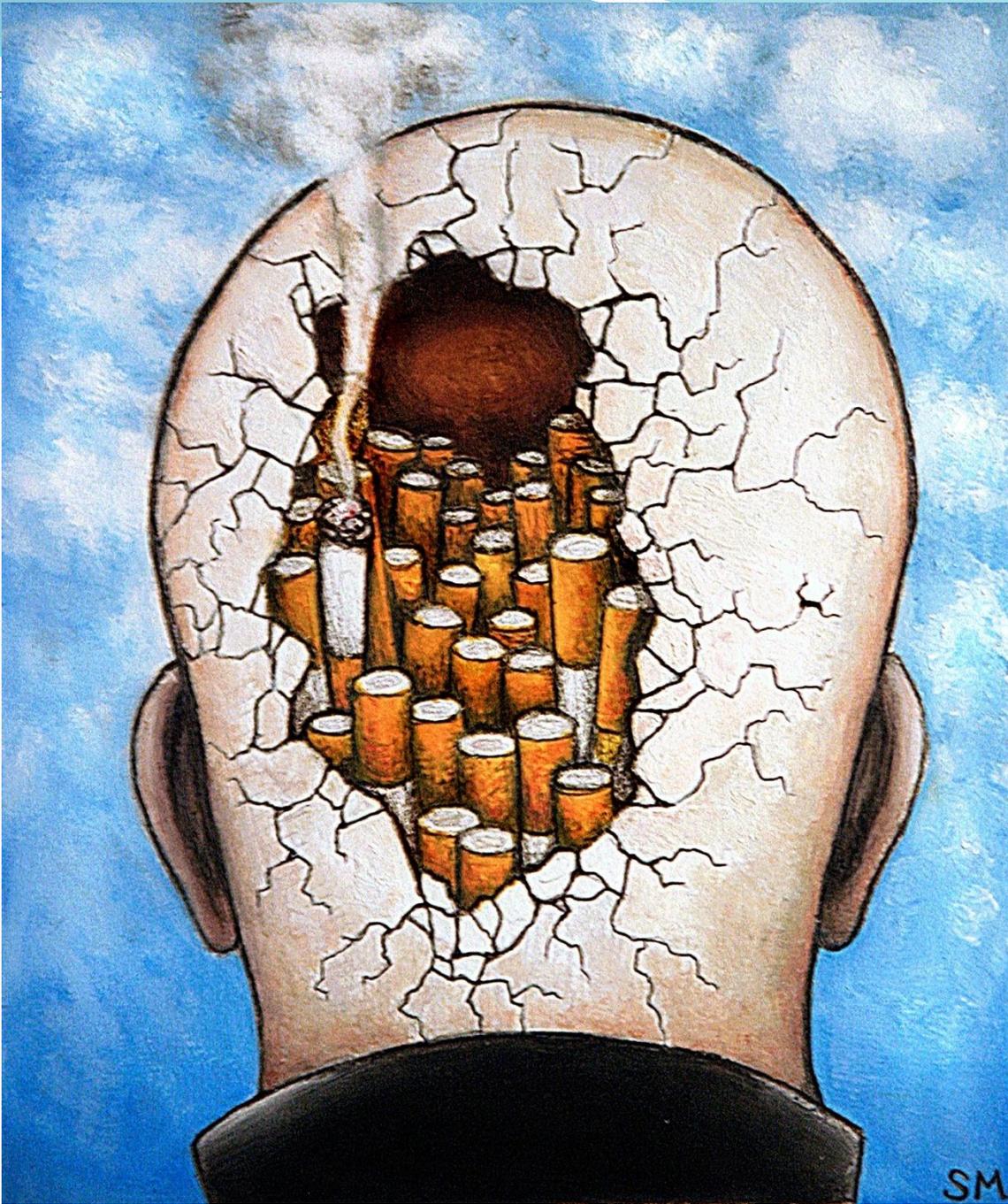


Midbrain (unconscious)
DRUG = SURVIVAL

Are you an Internet Addict?







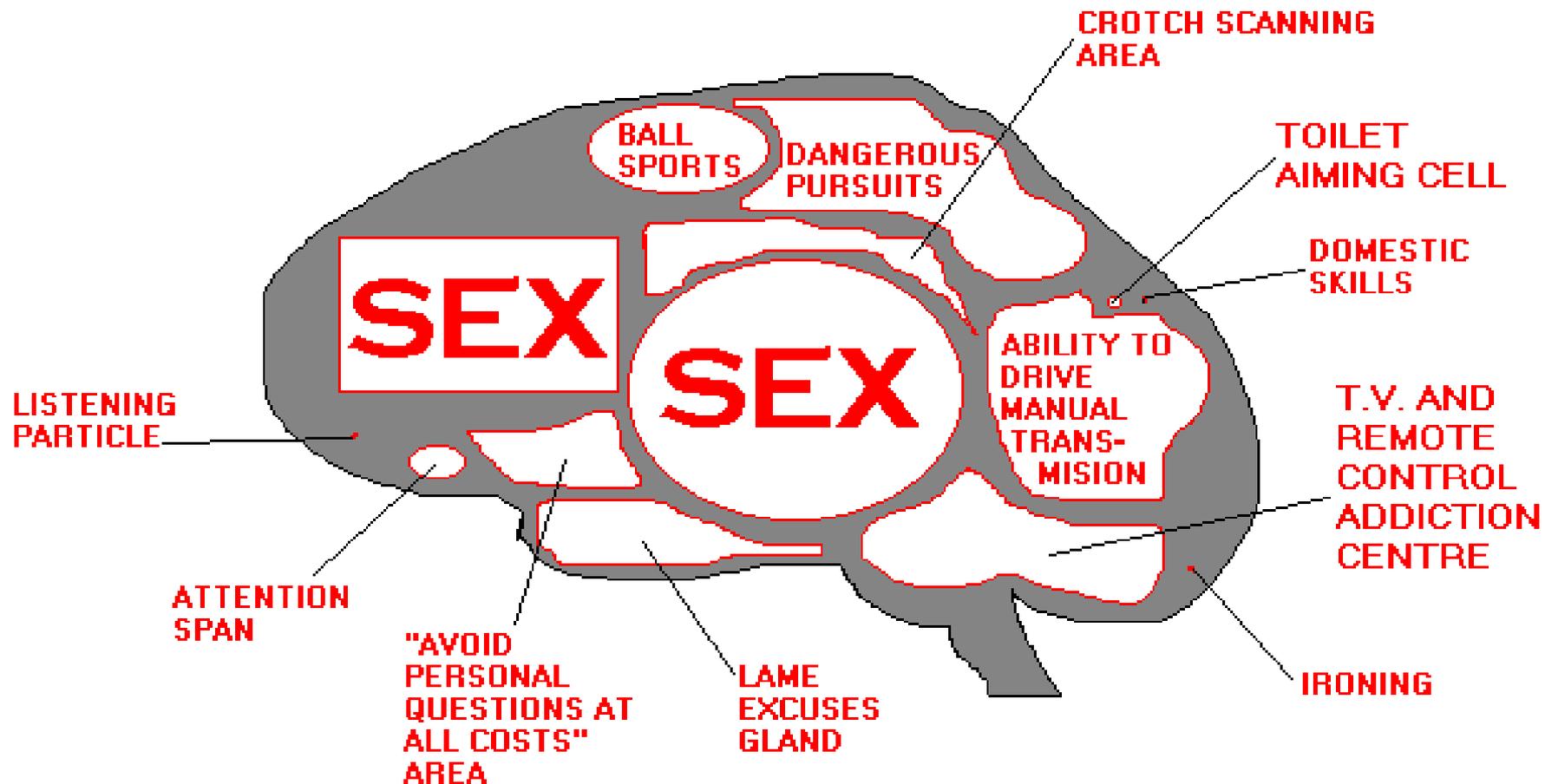


**MORE
MORE
MORE**





THE MALE BRAIN



FOOTNOTE: the "Listening to children cry in the middle of the night" gland is not shown due to it's small and underdeveloped nature. Best viewed under a microscope.



~ ADDICTION ~

When "because you can" becomes "because you can't ... stop".

**GIVE ME THE
CHOCOLATE
AND NOBODY
GETS HURT**

Addictive Brain Response

If Alcohol Or Other Drugs Makes You Feel Really Good
You're At High Risk Of Addiction.



- Floods The Brain With Pleasure Chemicals
- Deprives The brain Of Warning Chemicals
- Creates Intense Euphoria
- Inhibits Anxiety and Fear Even When In Real Threat
- Impairs Judgment and Impulse Control

The Two Part Brain

- The Cortex: Higher brain
- The Limbic System (lower brain): 85 % to 90 % of our behaviors are driven from the subconscious limbic region of the brain
- Our brains are made up of tiny chemicals called neurotransmitters. These tiny chemicals drive our emotions, feelings and behaviors
- The physical/chemical brain has a tremendous capacity to gain control of the mind. It can subject it and trap it. In other words it can take over the human will and influence how a person thinks, feels and acts. This state is known as addiction. This control over the human mind is called addiction



*Science Has Generated Much
Evidence Showing That...*

**Prolonged Drug Use Changes
the Brain In Fundamental
and Long-Lasting Ways**

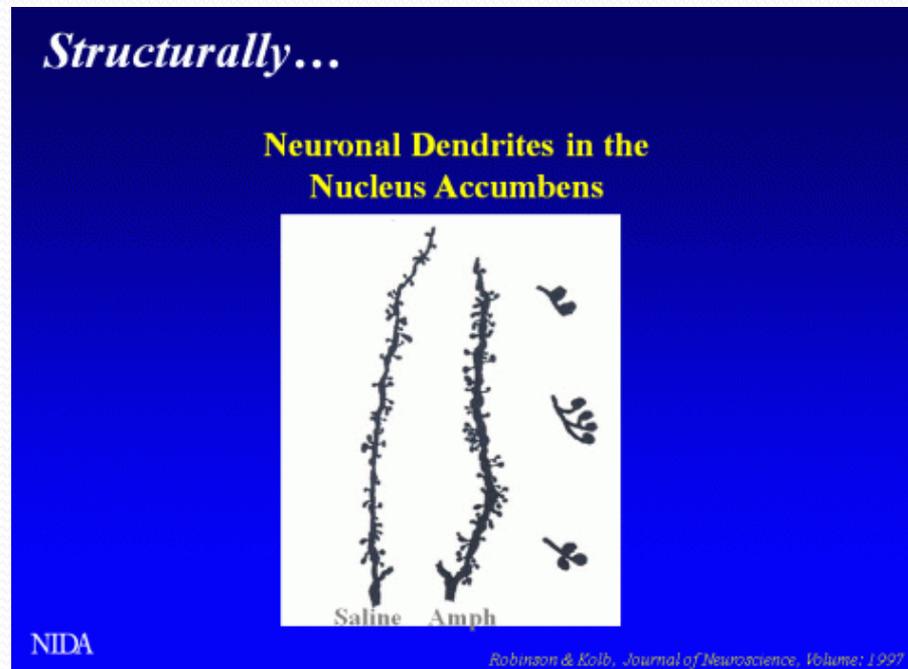
AND...

**We Have Evidence That
These Changes Can Be Both
*Structural and Functional***

Structural Damages

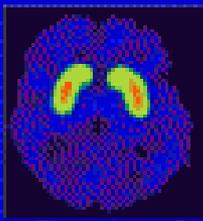
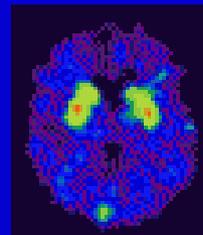
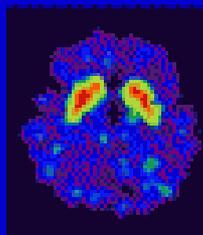
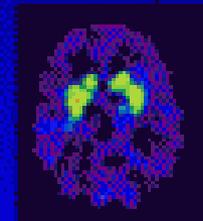
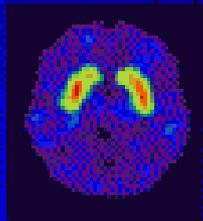
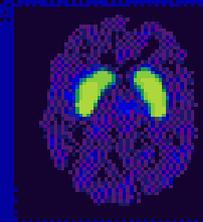
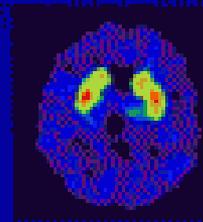
- Stimulants like amphetamines can alter the structure of neurons.

In this case, the dendrites of dopamine neurons in the nucleus accumbens—a part of the reward pathway—have more dendritic spines or connections in the amphetamine exposed animal compared to one treated only with saline.



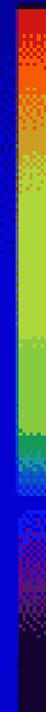
Functionally...

Dopamine D2 Receptors are Decreased by Addiction



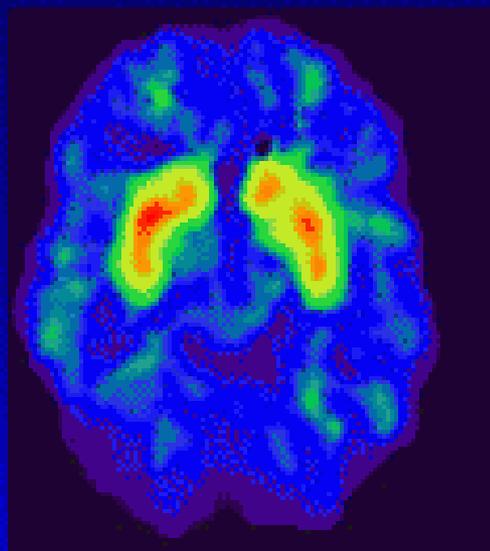
Control

Addicted

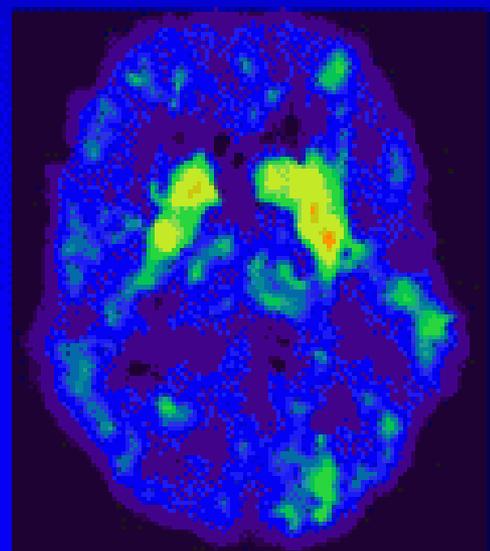


DA D2 Receptor Availability

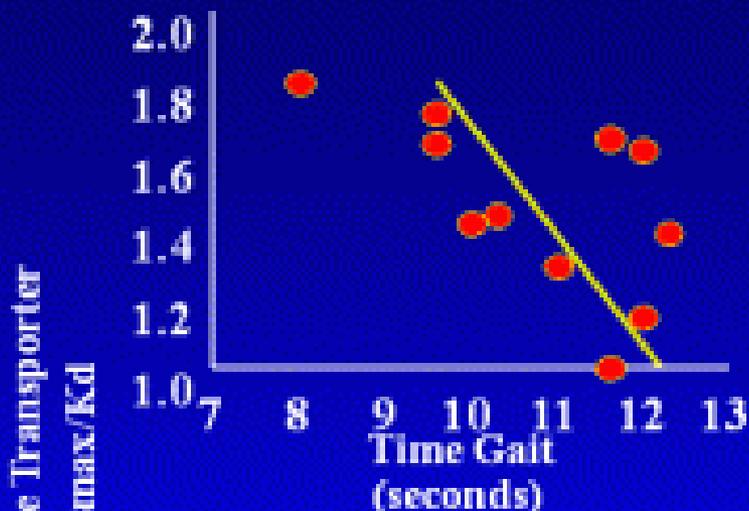
Dopamine Transporters in Methamphetamine Abusers



Normal Control

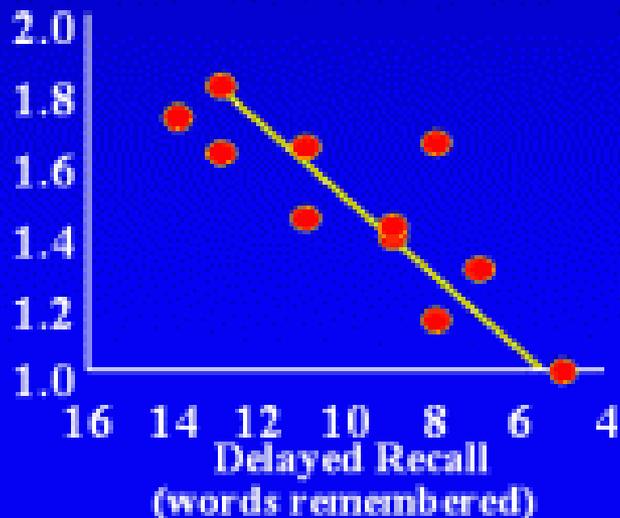


Methamphetamine Abuser



Motor Task

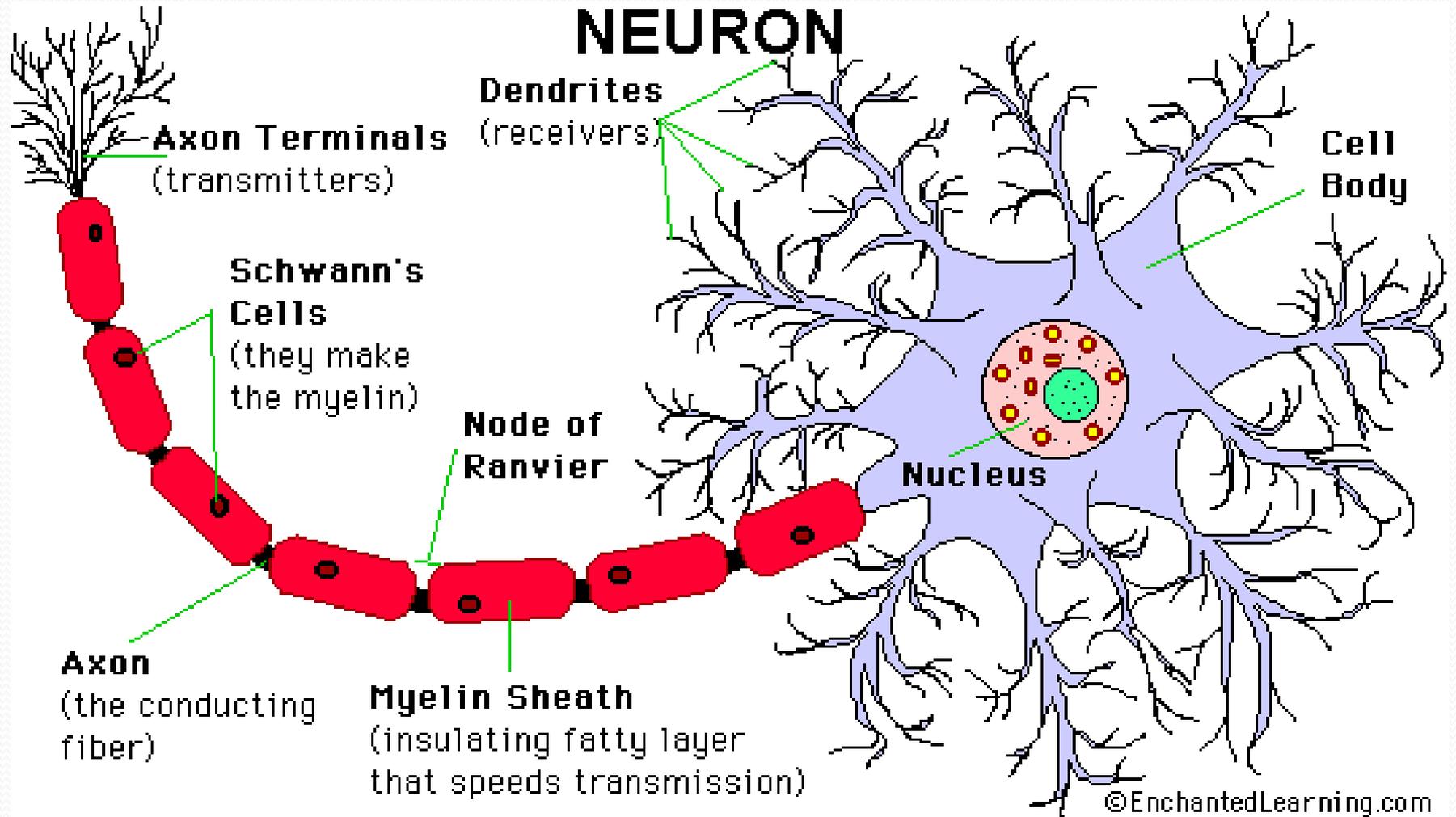
Loss of dopamine transporters in methamphetamine abusers may result in slowing of motor reactions.

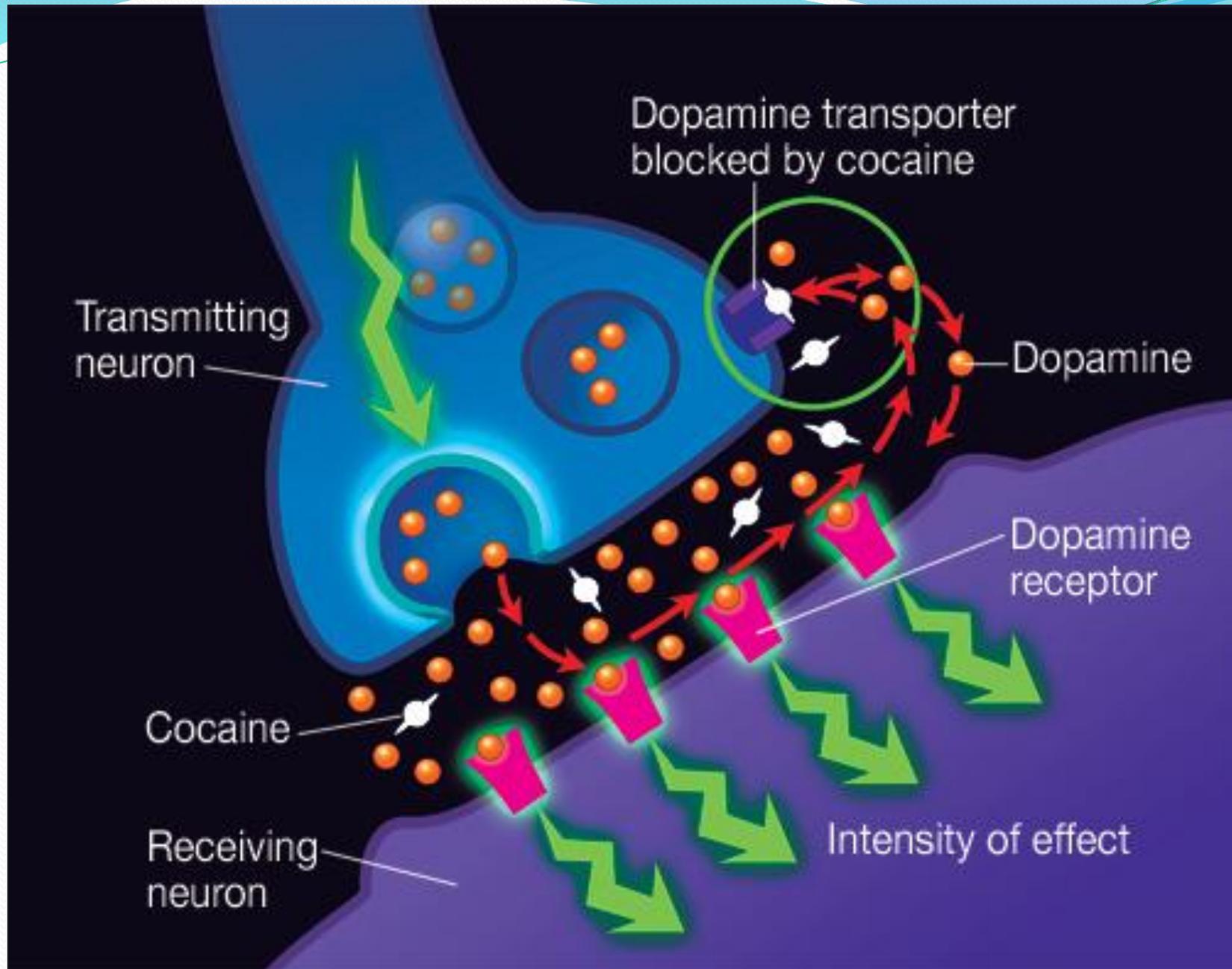


Memory Task

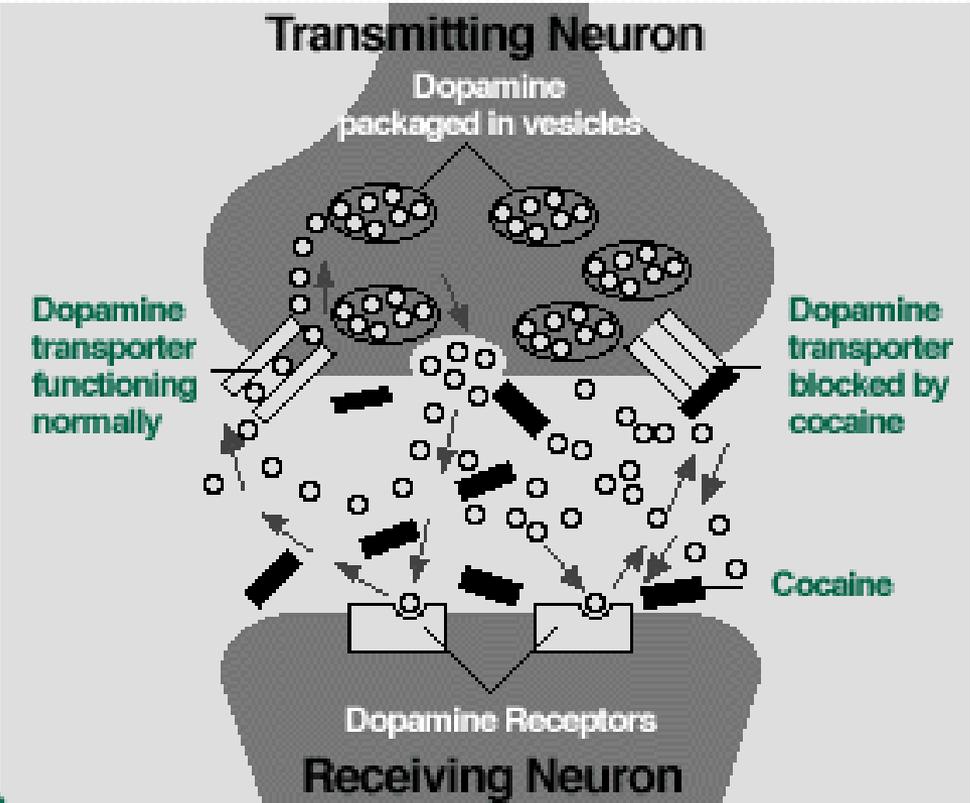
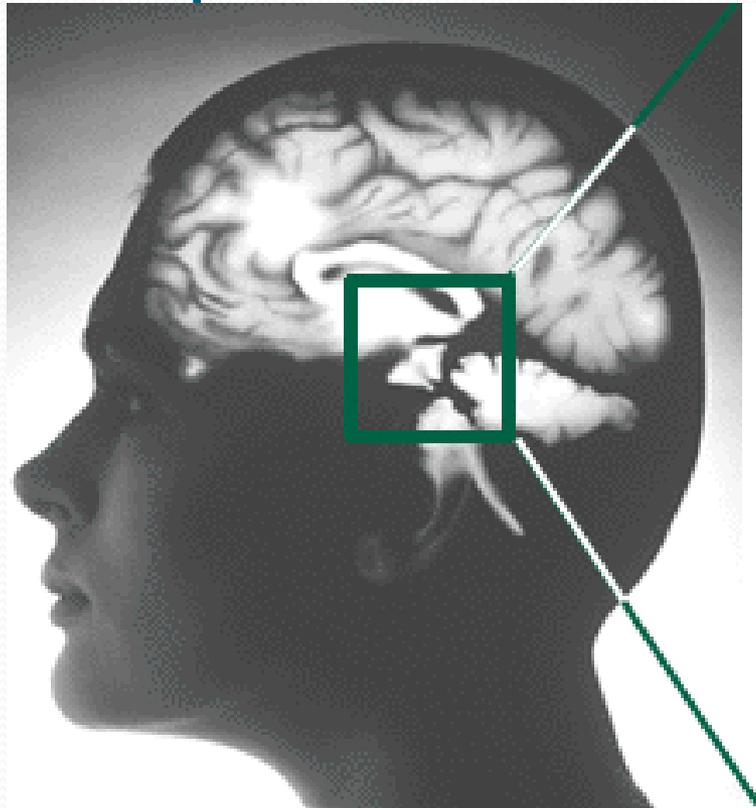
Loss of dopamine transporters in methamphetamine abusers may result in memory impairment.

NEURON





Re-uptake Blocked



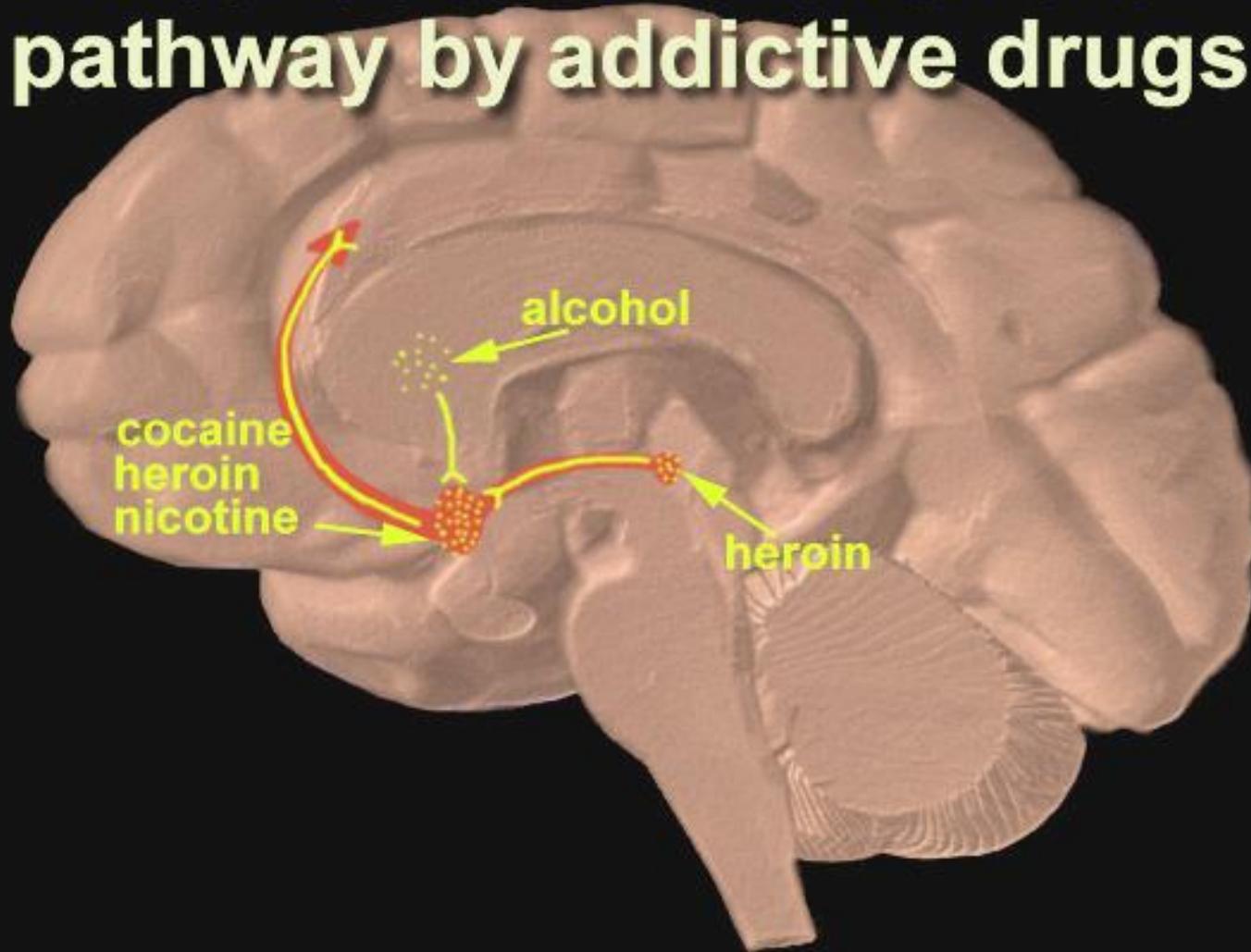
DOPAMINE (DA)

- All drugs of abuse and potential compulsive behaviors INCREASE DA
- Reward salience
- “this is important!”
- “I really want this!”
- Rostral (toward the nose) projections:
 - PFC < Nucleus Accumbens < Ventral Tegmental Area

GLUTAMATE (Glu)

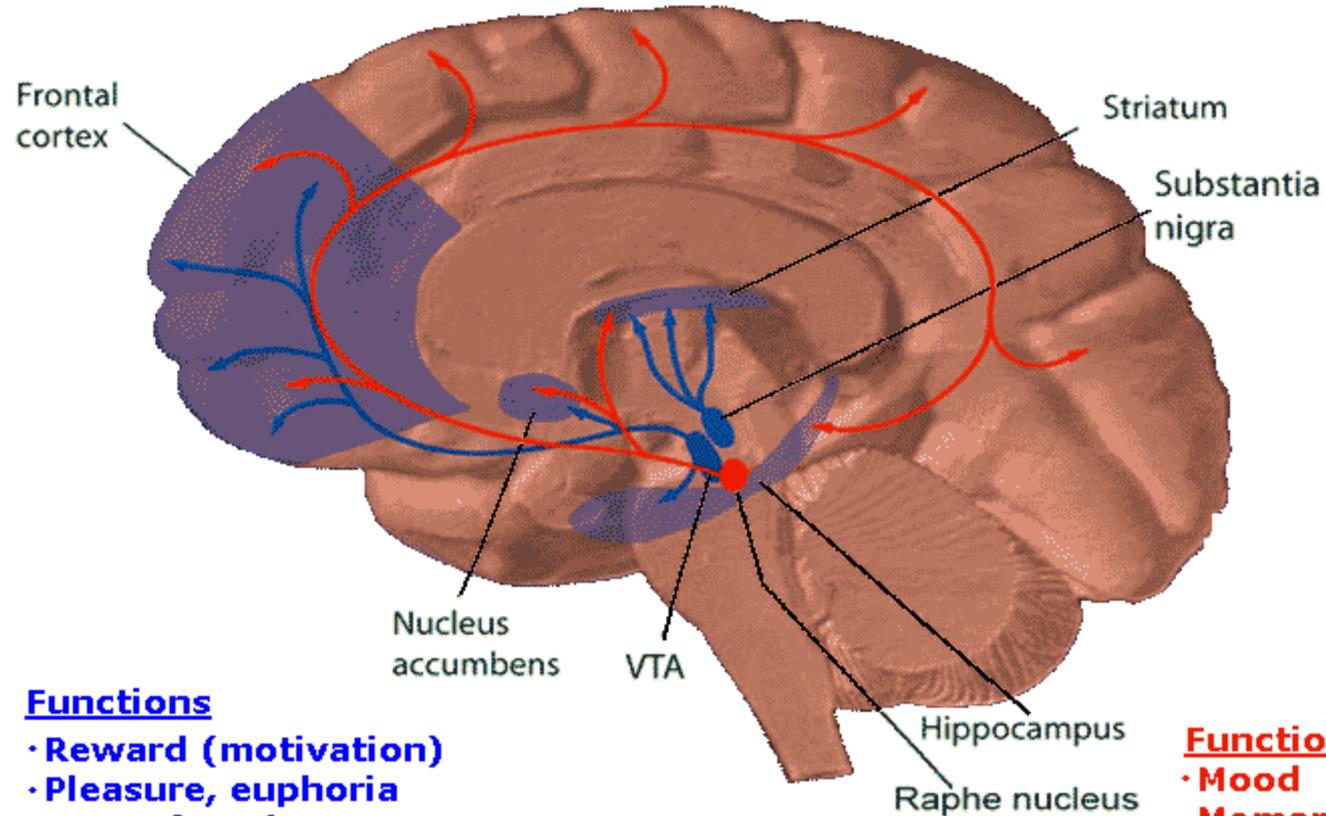
- All drugs of abuse and potential compulsive behaviors EFFECT Glu
- Drug memories
- Drug seeking
- “OK, I’ll remember”
- “Fine, go and get it”
- Caudal (toward the tail) projections:
 - PFC > NA

Activation of the reward pathway by addictive drugs



Dopamine Pathways

Serotonin Pathways



Functions

- Reward (motivation)
- Pleasure, euphoria
- Motor function (fine tuning)
- Compulsion
- Perseveration

Functions

- Mood
- Memory processing
- Sleep
- Cognition

Addiction Neurochemical

Glutamate:

- The most abundant neurochemical in the brain
- Critical in memory formation & consolidation
- All drugs of abuse and many addicting behaviors effect Glutamate which preserves drug memories and creates drug cues
- And ... glutamate is the neurochemical of “motivation” (it initiates drug seeking)

Hijacked Brain

SOBER PERSON

Frontal Cortex Does the Thinking

Free Will Exists

Responsibility

Can stop

Punishment & Coercion DO work

ADDICT

Limbic System In Control

No Free Will

No Responsibility

Can't Stop

Punishment & Coercion DON'T work

Executive Function

- Abstract thinking
- Motivation for goal-directed activity
- Planning and problem-solving
- Attention to tasks
- Inhibition of impulsive responses
- Weighing consequences of future actions
- Flexibility of responses (rule shifting)
- Reflective decision-making

Gives us the capacity to use past experience and knowledge to make sense of our current behavior

DSM-IV Criteria for Substance Abuse

- **RECURRENT SUBSTANCE USE** leading to failure to fulfill major role obligations (work, school, home)
- **RECURRENT SUBSTANCE USE** in physically hazardous situations (impaired driving, operating machinery, in the work place)
- **RECURRENT SUBSTANCE USE** with related legal problems
- **CONTINUED SUBSTANCE USE** despite social/interpersonal conflict
- Person has never before met the criteria for Substance Dependence

DSM-IV Criteria for Substance Dependence (I'M A TOWN DRUNK)

- INABILITY (to cut down)
- MORE DRUG USED (than intended)
- A LOT OF TIME (spent obtaining, using & recovering from using the drug)
- TOLERANCE
- QLD ACTIVITIES, FRIENDS & FAMILY MEMBERS (given up in favor of the drug)
- WITHDRAWAL
- NEGATIVE CONSEQUENCES (have no effect on the pattern of drug use)