Understanding Substance Use Disorders

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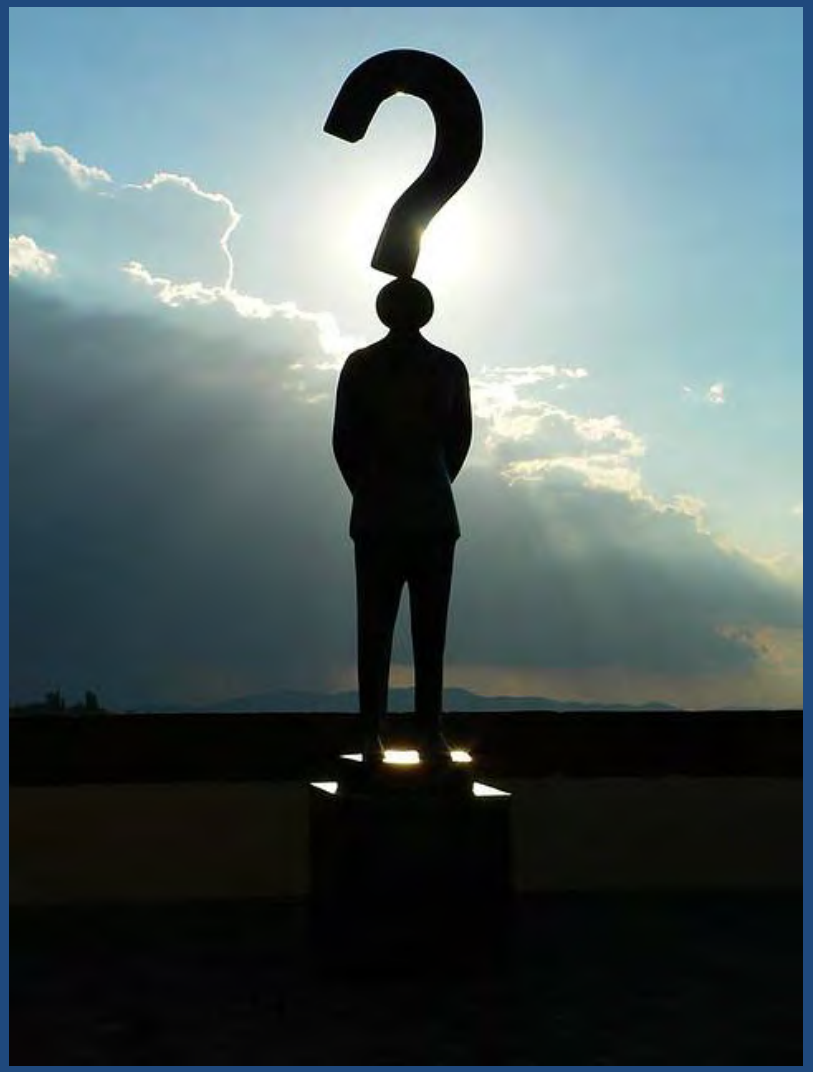
Program Objectives

Our objectives in this session are to enhance your ability to:

- Understand the biological, sociological, and psychological components of substance use disorders.
- Know the evidence-based practices for substance use disorders.

It’s difficult to understand why people start using or trying drugs



It’s difficult to understand why they continue to use drugs regardless of negative consequences

Drugs Work!

- Cocaine/crack/meth/ice – improves confidence, euphoric mood
- Opioids – reduces both physical and emotional pain
- Tranquilizers – calms you down
- Cannabis – euphoria, relaxation, heightened sensory perception
- PCP/Special K – anesthesia, dissociation
- Alcohol – anesthesia, calms, confidence

What are the causes?

- Lacking moral principles?
- Lacking willpower?
- Poor choices?

Neuroscience Supports Substance Use Disorder = Brain Disease

What's all the fuss about Neuroscience?

Neuroscience – definition from dictionary.com - the field of study encompassing the various scientific disciplines dealing with the structure, development, function, chemistry, pharmacology, and pathology of the nervous system that effect the brain.

- Every thought, sensation, emotion, physical movement is accounted for in terms of brain structures and chemistry.

- In other words… nothing happens in human behavior except by the mechanisms of the brain.

Substance Use Disorder

- Illness of the brain.
- Chronic condition that requires life-long management.
- Compared to:
  - Type 2 Diabetes, Chronic hypertensive disease, Asthma, Obesity
  - All have a complex of physiological and behavioral health components
- No one treatment episode will resolve illness.
- Course of dependency is multiple episodes of treatment, recovery activities, relapse periods.

https://newsinhealth.nih.gov/2015/10/biology-addiction

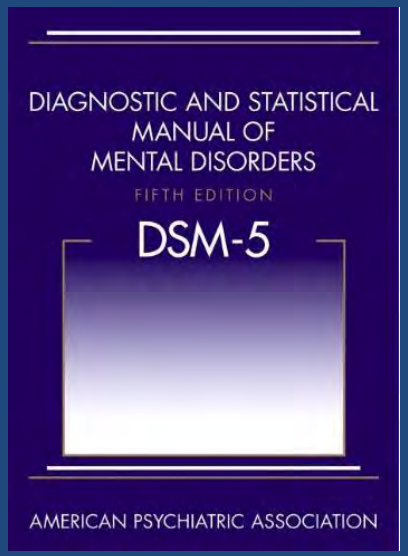
DSM 5 Substance Use Disorder

DSM IV Addiction Diagnosis definition was uncertain and promoted stigma

- 10 Classes of drugs plus gambling
- Impairments of health, disability, and failure to meet responsibilities
- Criteria includes craving
- Severity is mild, moderate, or severe

DSM 5 – 10 Classes of Drugs

- Alcohol
- Caffeine
- Cannabis
- Hallucinogens
- Inhalants
- Opioids
- Sedatives
- Stimulants
- Tobacco
- Other Substances



Abuse vs. Substance Use Disorder
Carlton Erickson, Ph.D. University of Texas 2009

- Abuse is a problem caused by bad choices, self-anesthetization, celebration, or just wanting to get high
  - Reduced through treatment such as education, positive reinforcement of alternate behaviors, coercion, environmental change, maturation, pressure to stop, life events

- Substance Use Disorder is a brain disease caused by genetic vulnerability, drug use, and environmental influence
  - Reduced through “treatment” to positively affect abnormal brain function to reduce need for drug – Evidence-Based Practices

Substance Use Disorder is a complex health condition and quitting takes more than a strong will.

Substance Use Disorder is…

- Chronic, relapsing brain disease
- Use and abuse continue regardless of harmful consequences

Therefore…

Understanding how the brain functions during and after drug use, encourages practitioners to use appropriate strategies according to the stage of recovery and consequently impact on program retention.

Drug Exposure

Estimated lifetime prevalence of risk…

- Nicotine – 32%
- Heroin - 23%
- Crack - 20%
- Cocaine - 17%
- Alcohol – 15%
- Stimulants other than cocaine – 11%
- Cannabis – 9%
- Sedatives – 9%
- Analgesic opioids – 9%
- Psychedelics – 5%
- Inhalants – 4%

US Epidemiological Estimates, 1992-98
Anthony et al,. 1994
Chen & Anthony, 2004
Hughes et al,. 2006

Three key components in dependency…

- Drug use or exposure to a drug
- Genetic influence or vulnerability
- Environmental influences

Genetic Vulnerability for Dependence

- Genetic Factors 40-60%
  - Problems in the pleasure pathway
  - Impaired control over drug use
- Dependent drugs seem to “match” the need in the chemical system that is not normal
- Onset time is variable
- Mild to severe range

Environmental Factors

- Utah Addiction Center at the University of Utah, Dr. Kelly Lundberg, 2012

- Community Domain
- Peer Domain
- Family Domain
- School/Work Domain

Rhesus Monkeys

- Have an important history with humans and have aided a great deal to medical and scientific research.
- Rhesus antigens found in their blood enabled doctors to identify the different human blood groups.
- They are second only to chimps with comparable human DNA
- They also preceded humans into space starting in 1949.

Rhesus Monkey Experiment

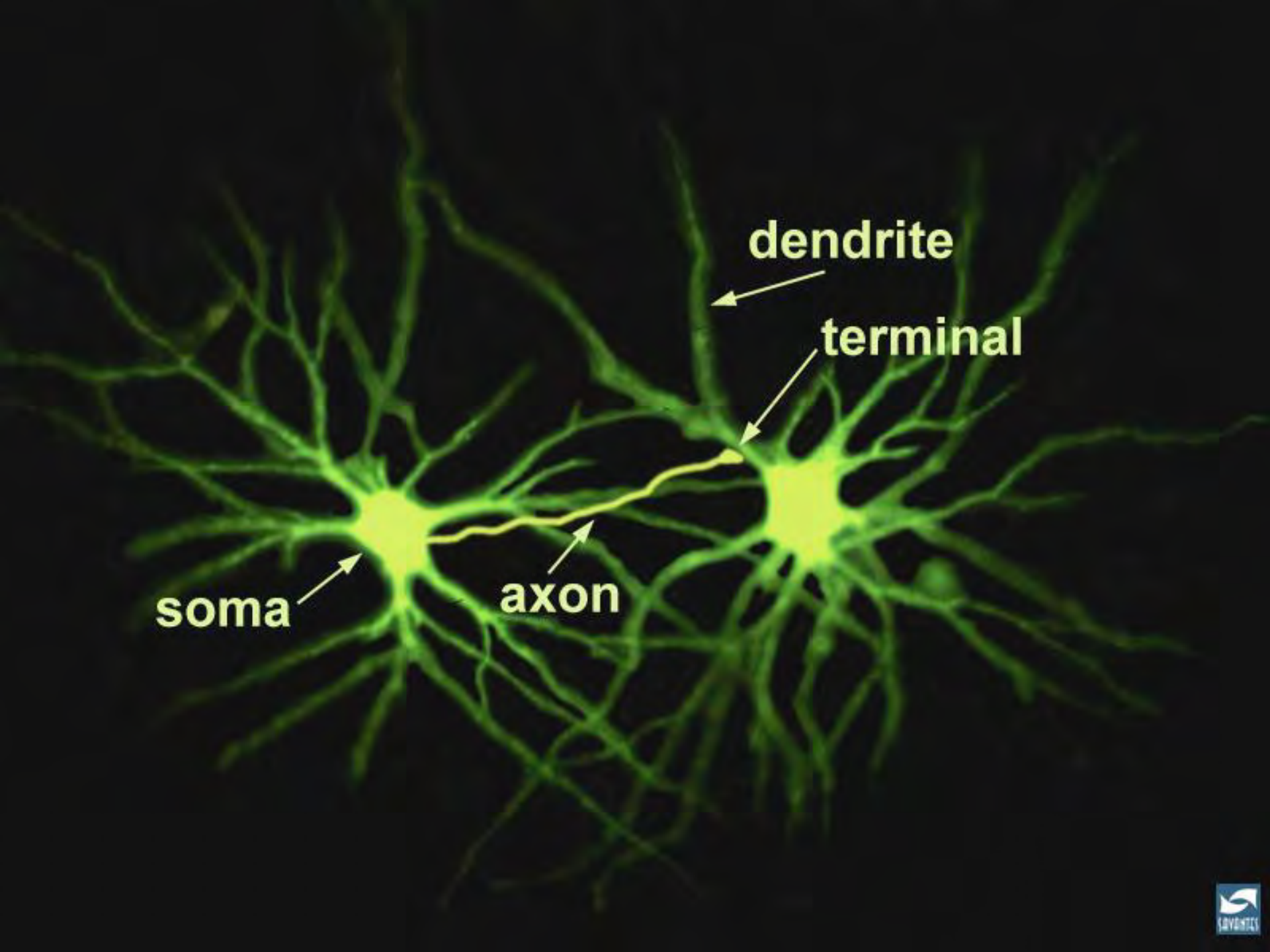
- Isolated
  - Low dopamine
  - Stressed
  - Subordinate
  - Preferred cocaine

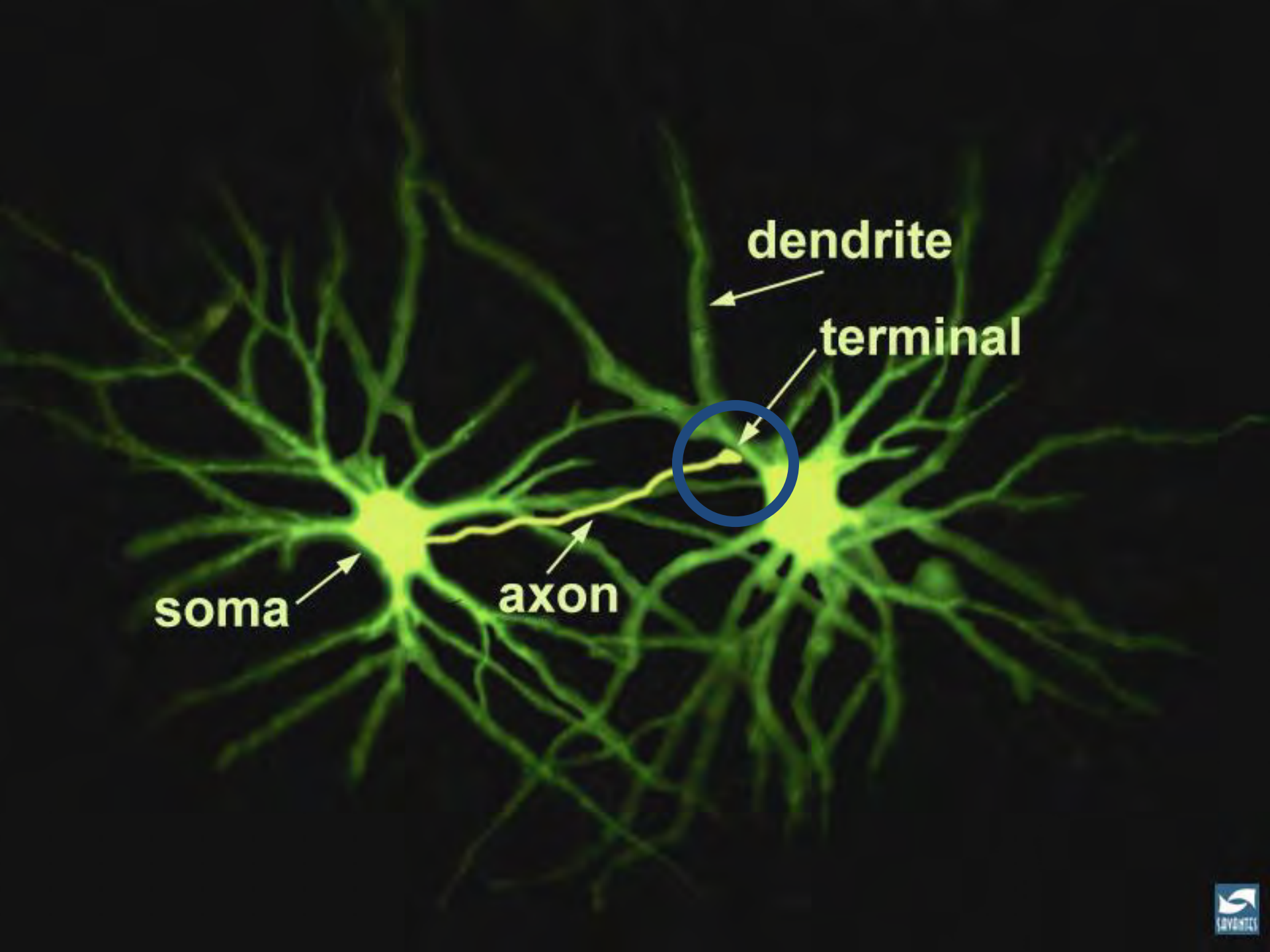
- Grouped
  - High dopamine
  - Non-Stressed
  - Did not prefer cocaine

The Brain

The Players of the Brain

- Neurons - the cells of the brain
  - 100 billion
  - Dendrites, Axons, Cell body with Nucleus
- Neurotransmitters - chemicals that communicate information throughout our brain and body
  - More than 60 in the brain
- Synapse
  - The space between the axon terminal and the receptor dendrite where neurotransmitters flow…
  - 10,000 per neuron


dendrite
terminal
soma
axon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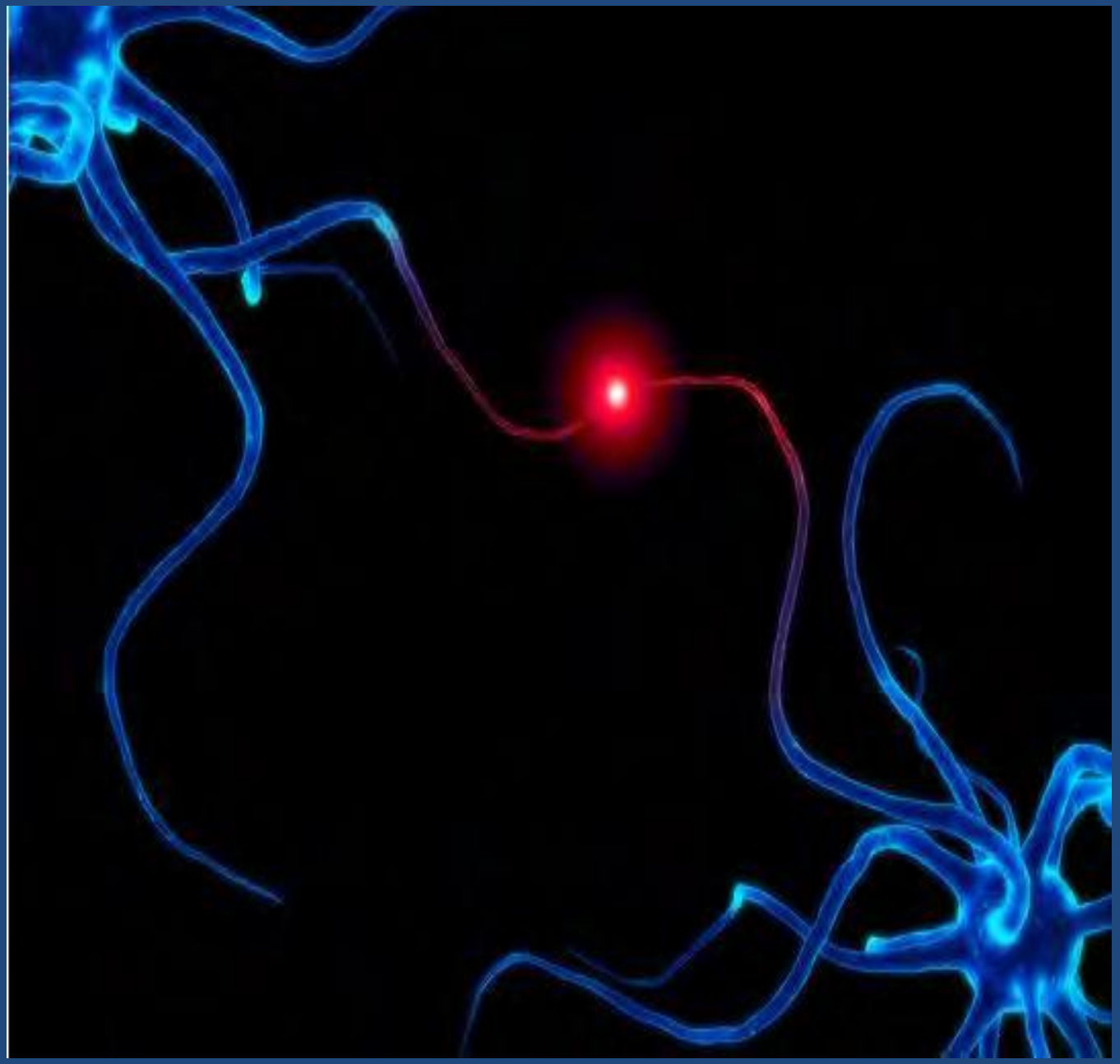

Behavior… (including substance use disorder) is related to…

- Characteristics of brain regions
- The functions of neurons, including their connectivity into pathways or circuits
- The neurochemistry that exists between neurons that allows them to interact
- External stimuli

Key parts of the brain – Reward Centers

- Pre-frontal Cortex
  - Voluntary control of skeletal muscle
  - Personality
  - Higher intellectual processes (prefrontal cortex takes up the majority of the frontal lobe – executive suite)
    - Concentration, planning, decision making
  - "On second thought… "
  - Matures last (ages 25-26 for full maturity)
  - Modulated by Dopamine…

Why are adolescents more vulnerable?

- Frontal cortex is not developed
- Decisions are made in the amygdala
- Amygdala controls
  - Emotions
  - Motivation
  - Memory
  - Fear – flight, fight, freeze

Neurotransmitters

NEUROHORMONES

Glycine

ATP

GABA

Serotonin

Dopamine

TRH

Glutamate

GTP

Histamine

Norepinephrine

Substance P

Acetylcholine

Neurotransmitters

NEUROHORMONES

Glycine

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Dopamine

TRH

Glutamate

GTP

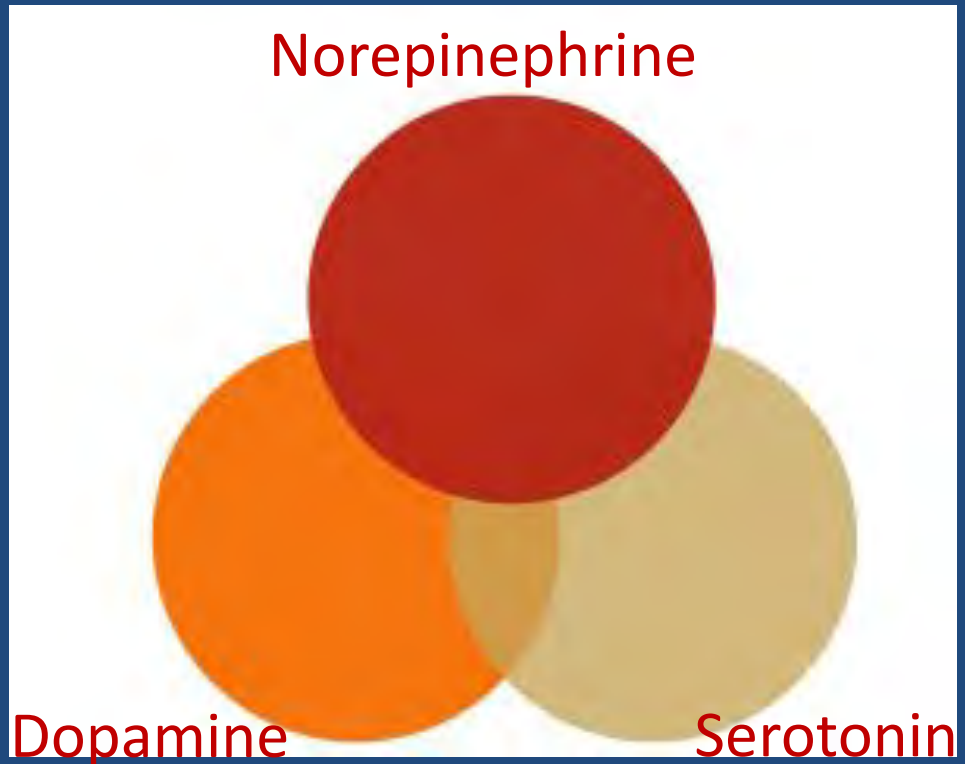
Histamine

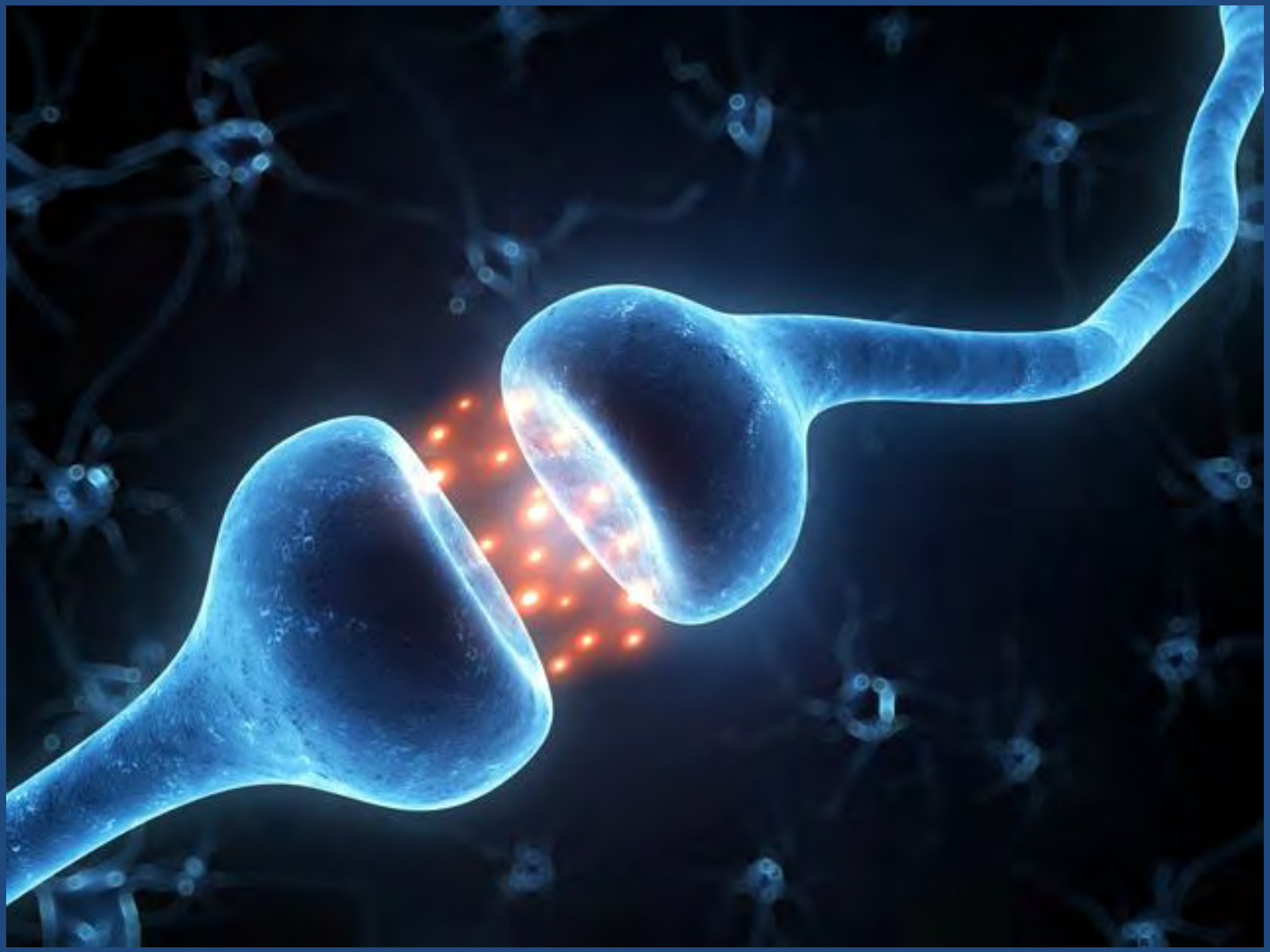
Norepinephrine

Substance P

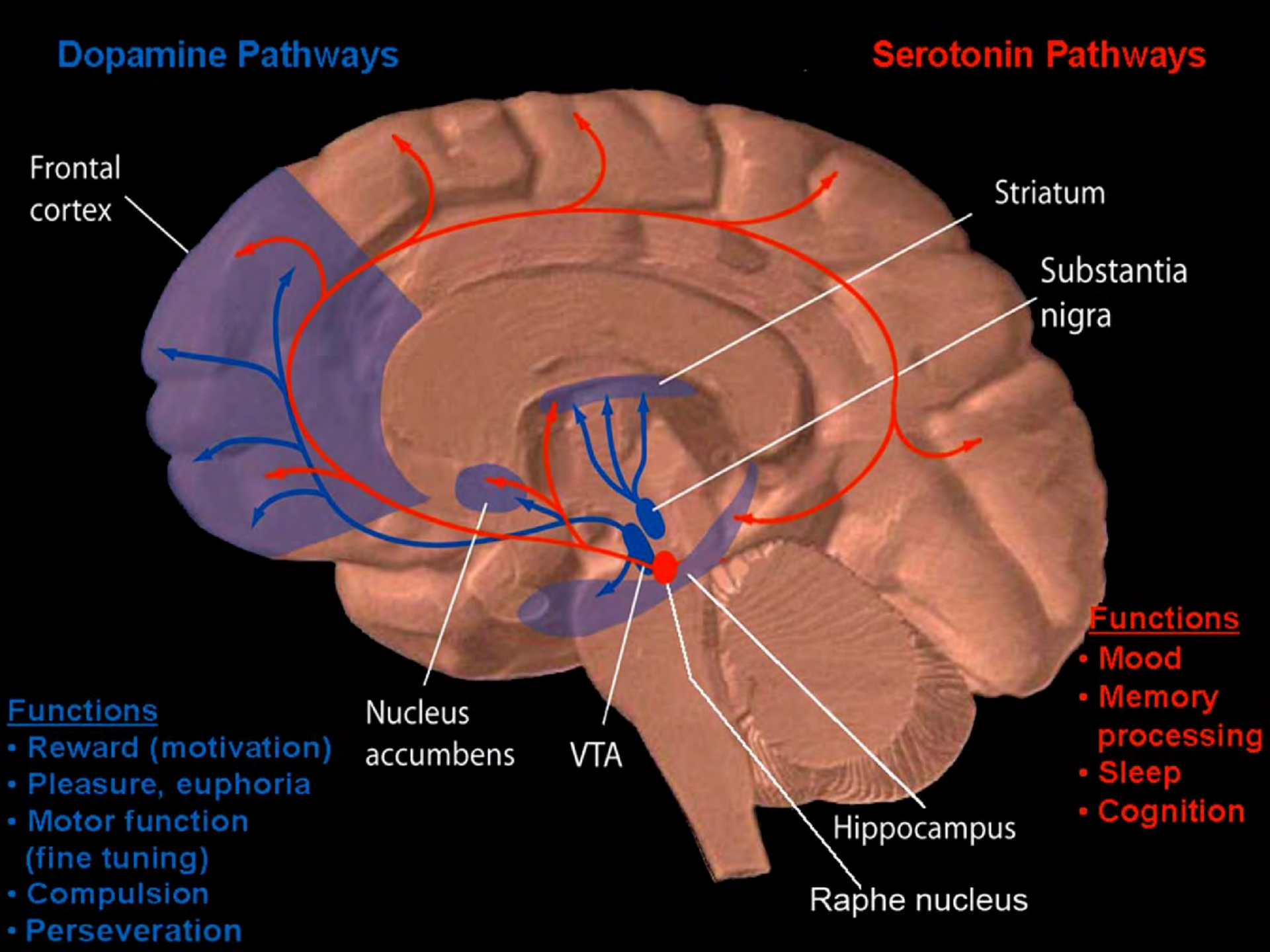
Acetylcholine

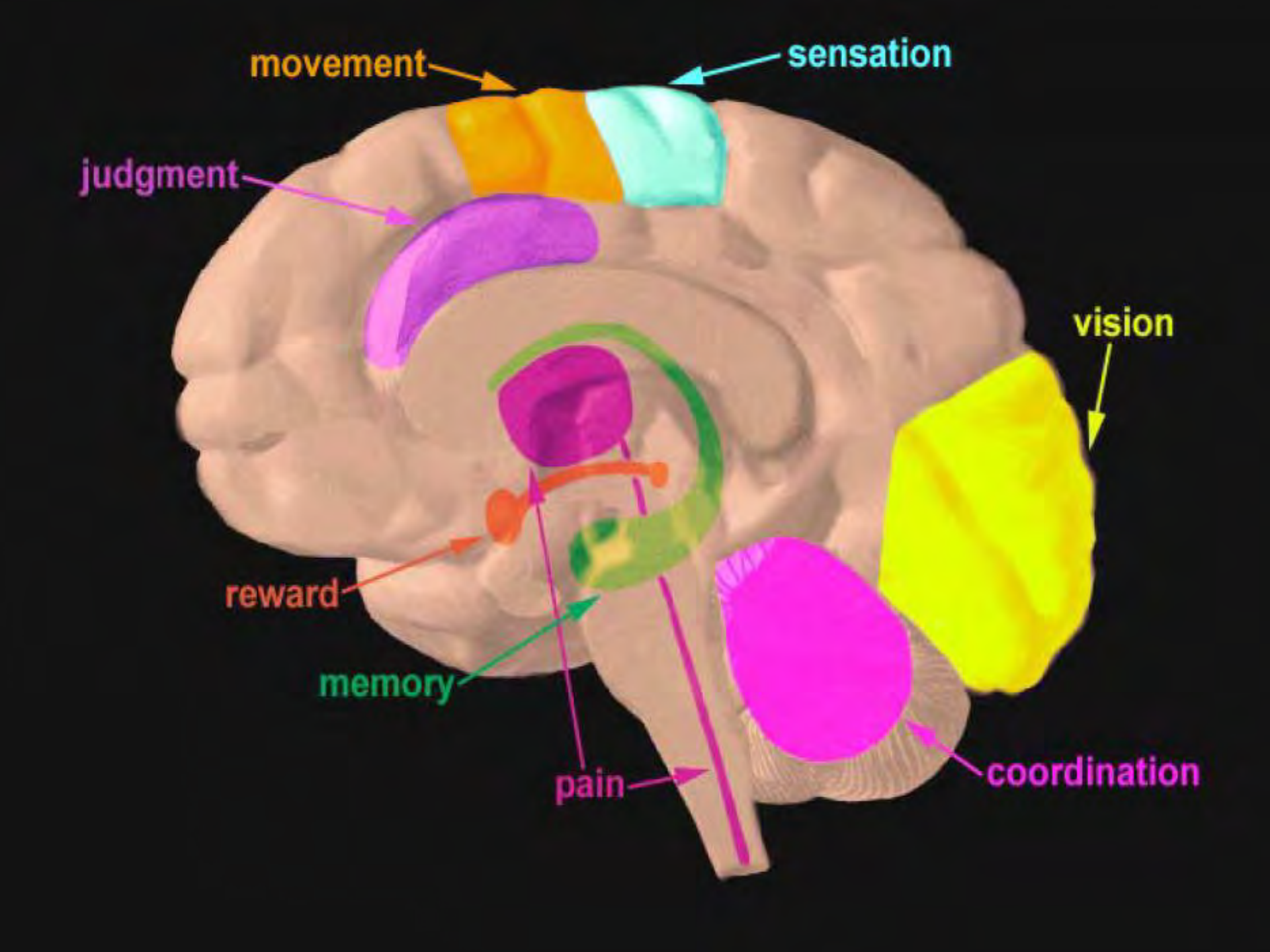
The Monoamines





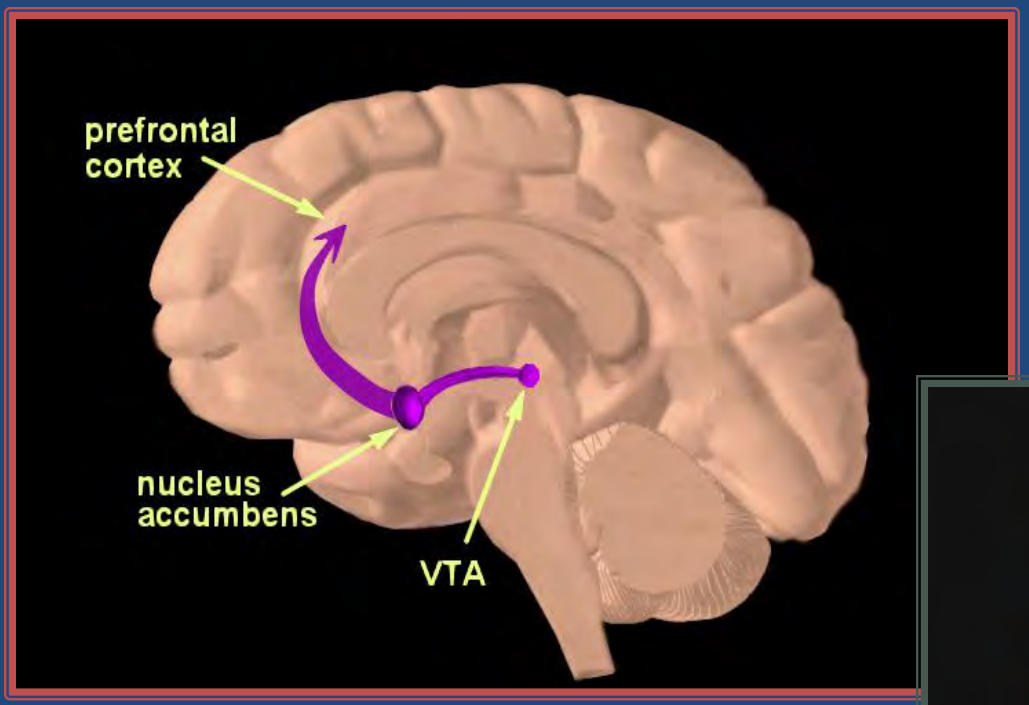
The monoamines control our psychological and substance use disorder destiny.


Dopamine Pathways
Serotonin Pathways
Frontal cortex
Striatum
Substantia nigra
Nucleus accumbens
VTA
Hippocampus
Raphe nucleus
Functions
• Reward (motivation)
• Pleasure, euphoria
• Motor function (fine tuning)
• Compulsion
• Perseveration
Functions
• Mood
• Memory processing
• Sleep
• Cognition

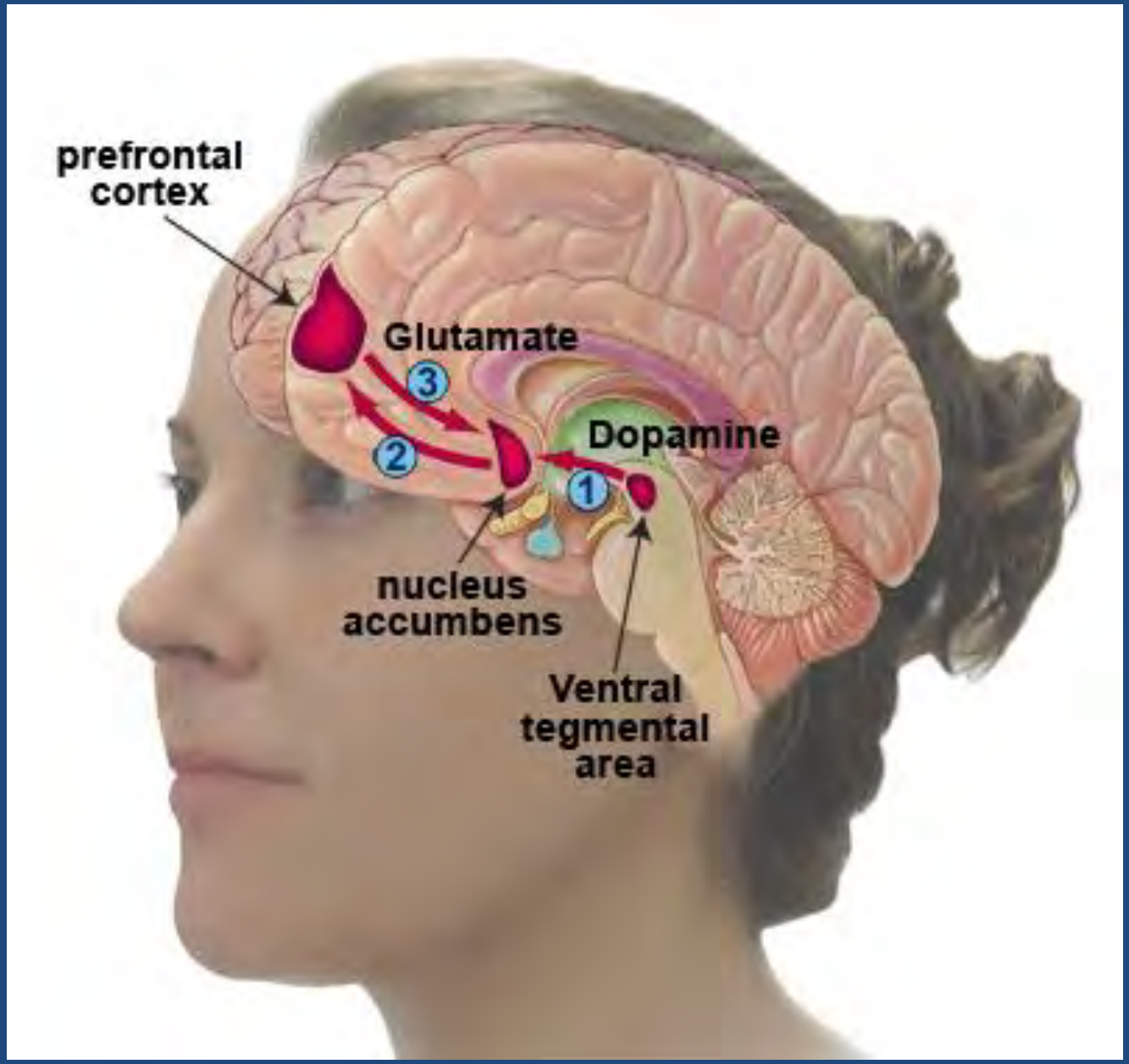

movement
sensation
judgment
vision
reward
memory
pain
coordination

How do dependent substances affect the reward pathway?

Pathway for Understanding Chemical Dependence Effects of Drugs on the Brain & Behavior



Reward Pathway


prefrontal cortex
Glutamate
3
2
Dopamine
1
nucleus accumbens
Ventral tegmental area

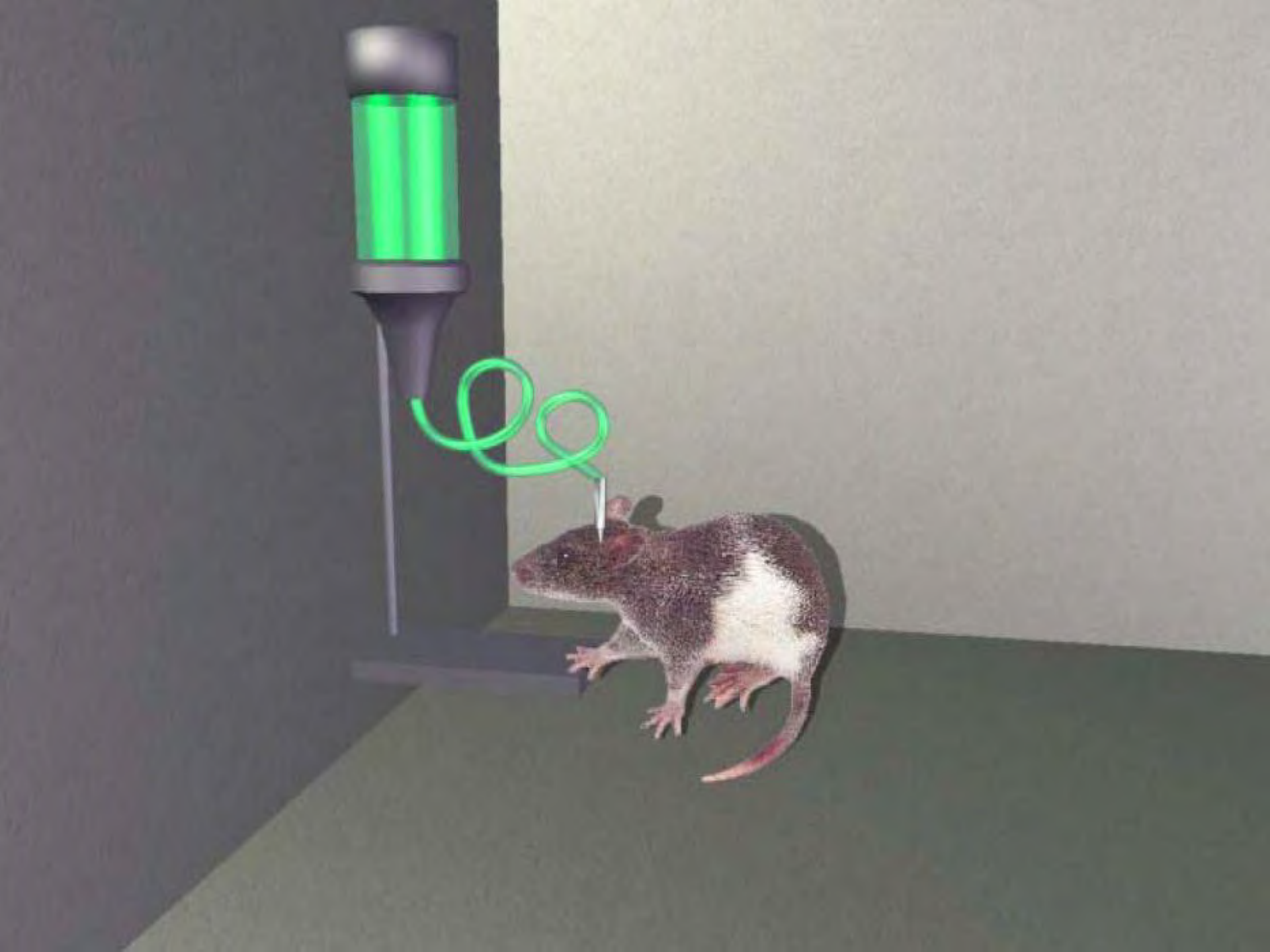
Drugs Cause Chemical Disruption in the Brain

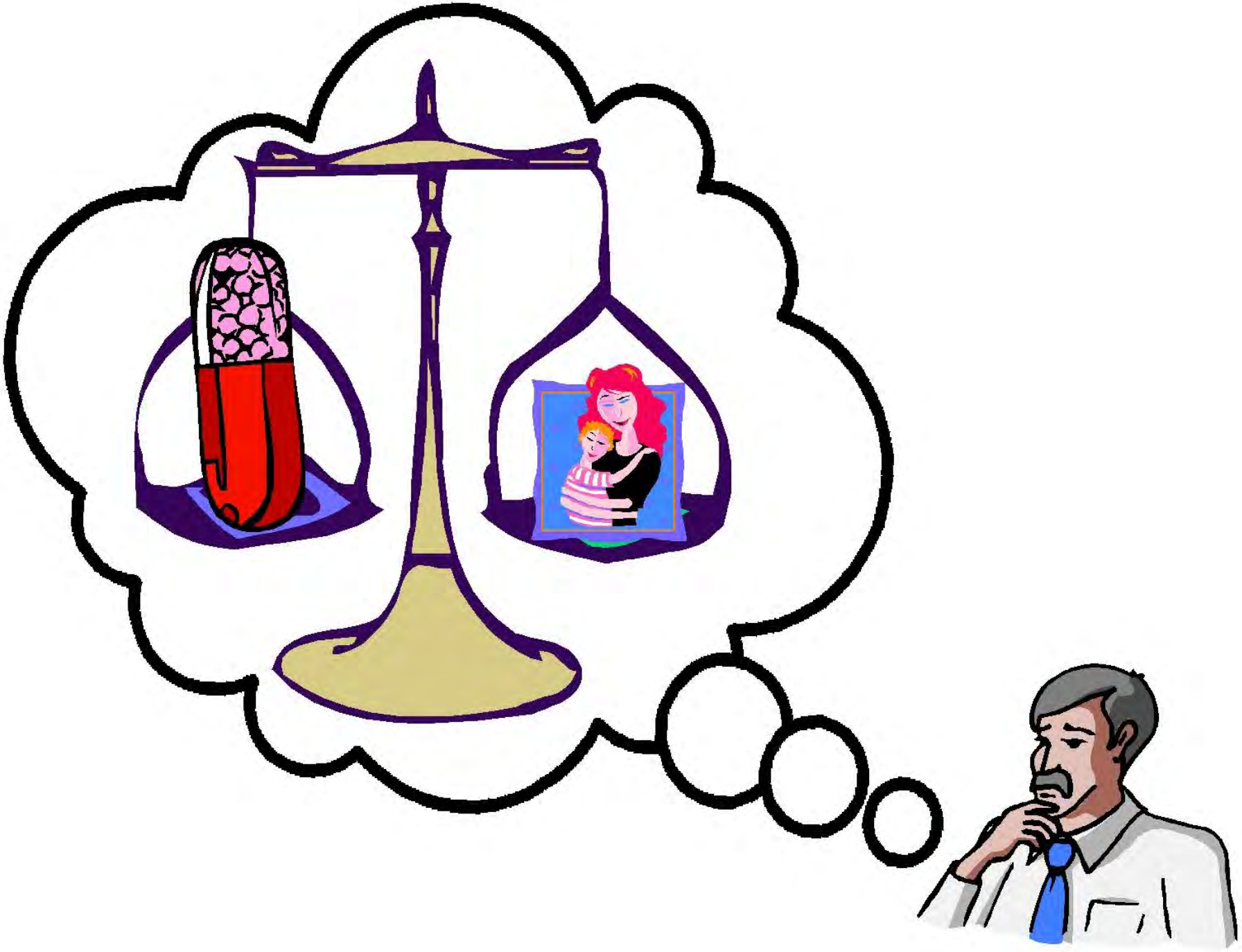
- Imitate the brain's chemistry
  - Cannabis and heroin can "fool" the brain's receptors sending abnormal messages

- Over-stimulating the reward circuit
  - Cocaine and meth cause nerve cells to release abnormal amounts of neurotransmitters (dopamine)

Dopamine Overstimulates the Reward System

- Produces a euphoric effect
- Reinforces a pattern that “teaches” people to repeat the behavior of using drugs
- Brain stops making dopamine or reduces the number of receptors
- The person uses more (tolerance)



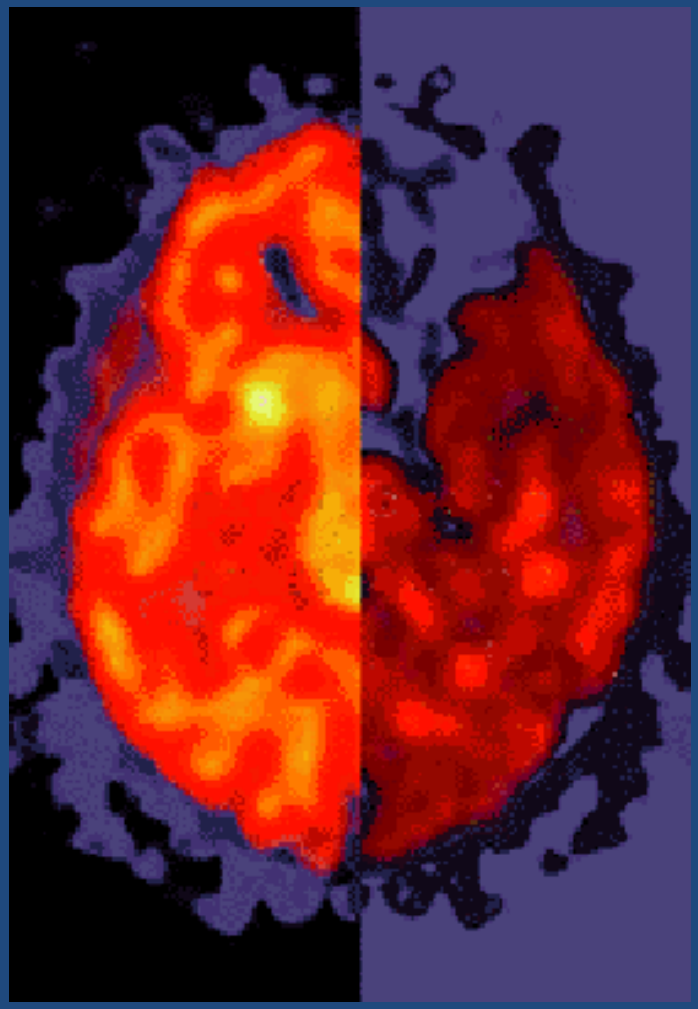



Activation of the reward pathway by addictive drugs
alcohol
cocaine
heroin
nicotine
heroin
Reward Center

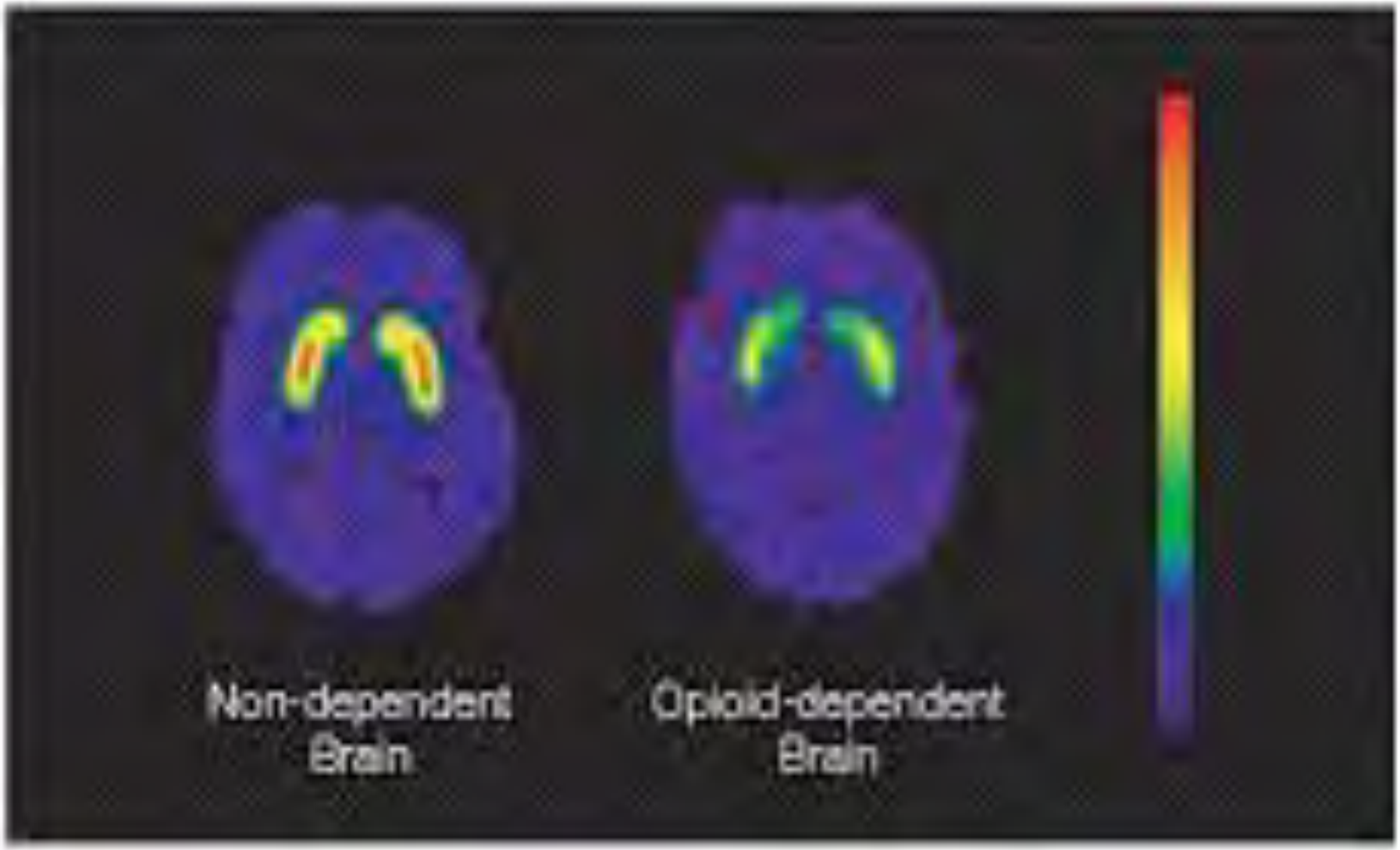
Brain changed in PET Scans

- Drug users have far less dopamine activity (right), as is indicated by the depletion (dark red shows disruption), compared to the controls (left)

  Studies show that this difference contributes to dependence and a diseased brain




normal subject
cocaine addict
metabolism


Non-dependent
Brain
Opioid-dependent
Brain

Drugs like cocaine mute visual and auditory centers required for normal social functioning. All brain resources are redirected to acquiring the drug.


What we say to dogs
Okay, Ginger! I've had it! You stay out of the garbage! Understand, Ginger? Stay out of the garbage, or else!
What they hear
blah blah GINGER blah blah blah blah blah blah GINGER blah blah blah blah blah...
Larson

If I see you smoking crack, I'll arrest you!

Blah, blah blah
CRACK blah,
blah blah

Gray Matter

The brain tissue that serves to process information

Gray Matter Loss in These Three Areas Occurs With

- Schizophrenia
- Bipolar Disorder
- Major Depression
- Obsessive Compulsive Disorder
- Anxiety Disorder
- Substance Use Disorder

https://jamanetwork.com/journals/jamapsychiatry/fullarticle/2108651

All these disorders share common brain architecture.

Behavioral Responses

- Loss of control
- Continued compulsive use despite harmful consequences
- Multiple relapses preceding stable recovery

Risk Factors

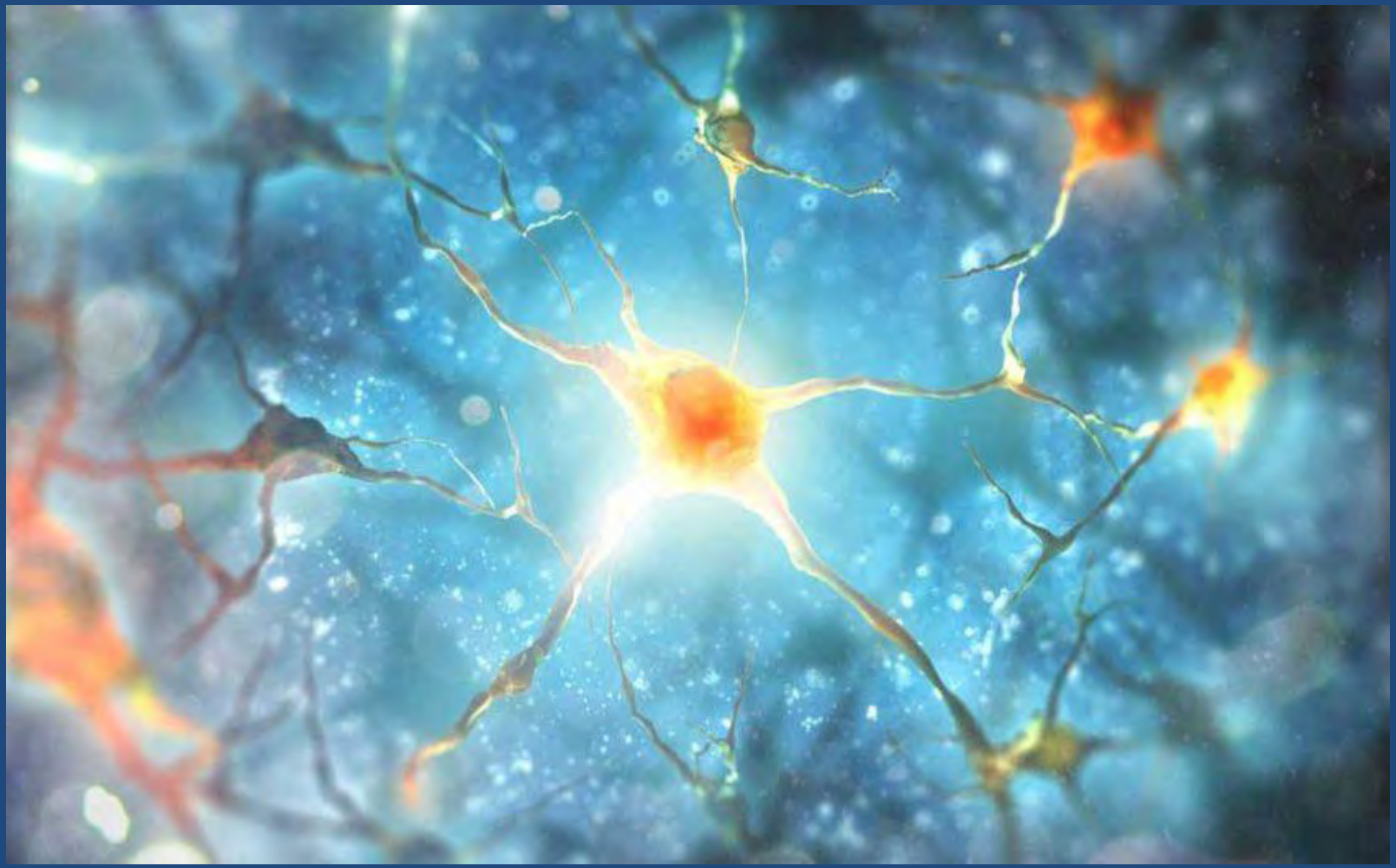
- Biology accounts for half of the vulnerability
- Gender, ethnicity, and mental disorders
- Environment
  - Support system
  - Socioeconomic status
  - Peer pressure
  - Trauma and abuse
- Development – age use begins

https://newsinhealth.nih.gov/2015/10/biology-addiction

Neuroscience Supports Substance Use Disorder = Brain Disease

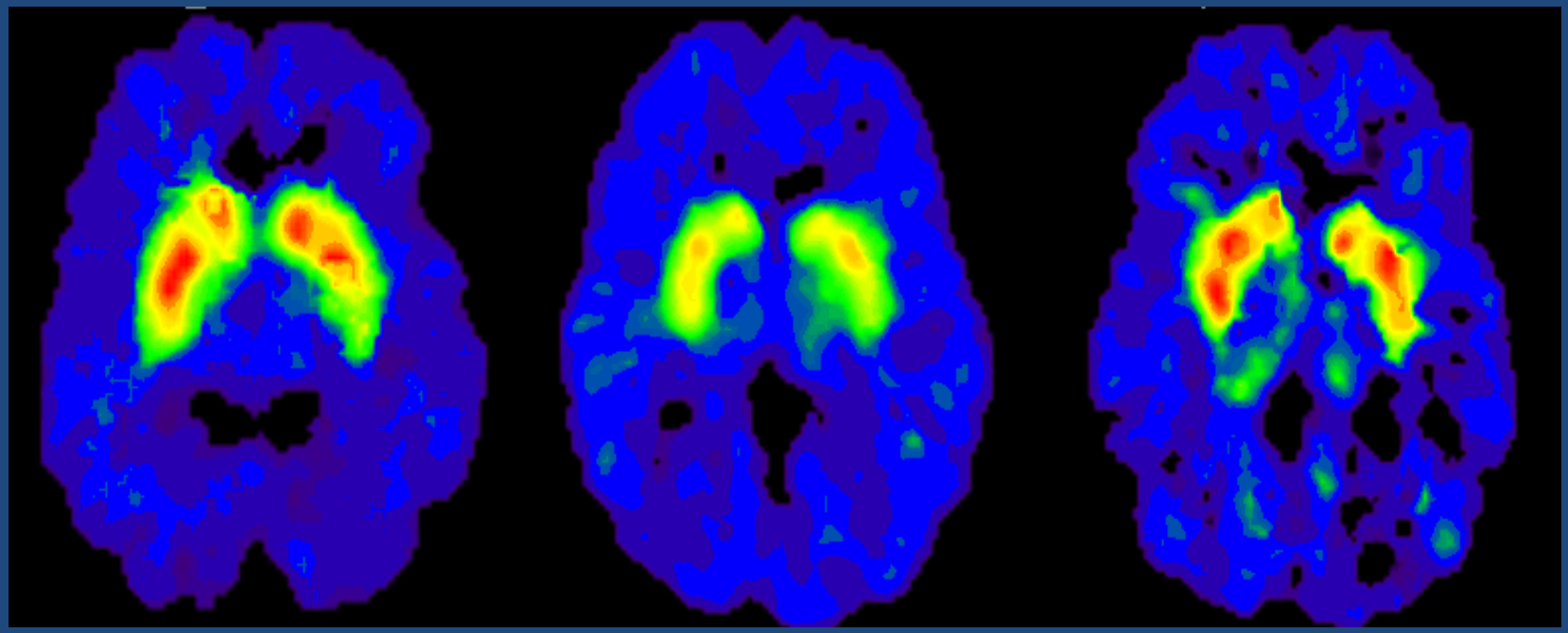
Neuroplasticity

- The ability of the neurons to change their function, chemical profile (amount and type of neurotransmitters) or structure
- The plastic changes in neurons can occur
  - Physiologically according to activity or skills
  - Pathologically due to injury or disease



NEUROPLASTICITY PROVIDES US WITH A BRAIN THAT CAN ADAPT NOT ONLY TO CHANGES INFLICTED BY DAMAGE, BUT **ALLOWS ADAPTATION** TO ANY AND ALL EXPERIENCES AND CHANGES WE MAY ENCOUNTER...

Why is Continued Treatment Critical?



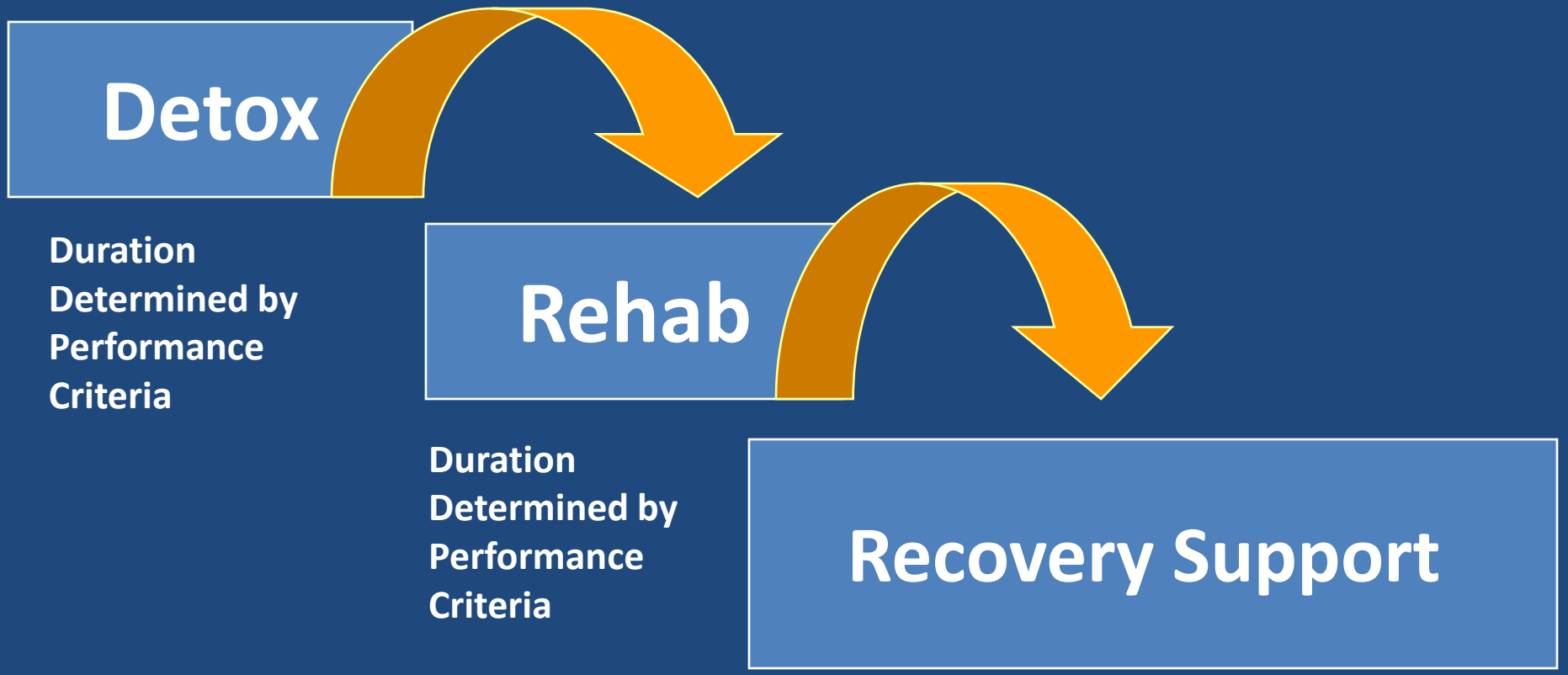
Normal Control

Meth user (1 month abstinent)

Meth user (36 months abstinent)

Partial Recovery of Dopamine Transporters After Prolonged Abstinence

Treatment Model



ASAM CRITERIA

- Founded in 1954 by Ruth Fox
- Professional Medical Society
- Prevention, Treatment, Remission, Recovery
- Accessibility

ASAM American Society of Addiction Medicine

AT A GLANCE: THE SIX DIMENSIONS OF MULTIDIMENSIONAL ASSESSMENT

ASAM's criteria uses six dimensions to create a holistic, biopsychosocial assessment of an individual to be used for service planning and treatment across all services and levels of care. The six dimensions are:

Acute Intoxication and/or Withdrawal Potential

Exploring an individual's past and current experiences of substance use and withdrawal

Biomedical Conditions and Complications

Exploring an individual's health history and current physical condition

Emotional, Behavioral, or Cognitive Conditions and Complications

Exploring an individual's thoughts, emotions, and mental health issues

Readiness to Change

Exploring an individual's readiness and interest in changing

Relapse, Continued Use, or Continued Problem Potential

Exploring an individual's unique relationship with relapse or continued use or problems

Recovery/Living Environment

Exploring an individual's recovery or living situation, and the surrounding people, places, and things

Levels of Care

- Early intervention
- Outpatient services
- Intensive Outpatient/Partial Hospital Services
- Residential/Inpatient Services – clinically managed - high and low intensity
- Medically managed intensive inpatient services

All are determined by medical necessity.

Treatment Plans

- Client-centered
- Personal information
- Diagnosis
- Problem statement in behavioral terms
- Goals – SMART (What)
  - Specific
  - Measurable
  - Attainable
  - Realistic
  - Time-limited
- Interventions (How)
- Timeframes (When)
- Responsibility (Who)
- Review of progress and outcomes

Lessons Learned from Treatment

- Behavior change is necessary for sustained benefit
- Treatment effects do not last very long after treatment stops
- Patients not in some form of treatment or monitoring are at greater risk for relapse
- Retention is critical
- Monitoring is essential

Evidence-Based Practices

- Cognitive Behavioral Therapy
- Motivational Interviewing
- Recovery Support
- Medication-Assisted Treatment

https://www.mentalhealth.va.gov/providers/sud/selfhelp/docs/4_moos_timko_chapter.pdf
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3753023/

Other Best Practices

- 12 Steps (Alcoholics Anonymous, Narcotics Anonymous)
- Women for Sobriety
- LifeRing Secular Recovery
- SMART Recovery

Resources

- American Society of Addictive Medicine – ASAM - https://www.asam.org/asam-criteria/about
- SAMHSA - https://www.samhsa.gov/
- National Institute on Drug Abuse - https://www.nih.gov/about
- Illinois Division of Substance Use Prevention & Recovery – SUPR - https://www.dhs.state.il.us/page.aspx?item=29759
- Addiction Technology Transfer Center – ATTC - https://attcnetwork.org/