

E•QUAL | EMERGENCY QUALITY NETWORK

Opioid Initiative Wave I *The Neurobiology of Addiction*

Presenter



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The Neurobiology of Addiction

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Objectives

1

Understand why adolescents
are at greater risk for
substance use disorders

2

Understand how addiction
changes the brain

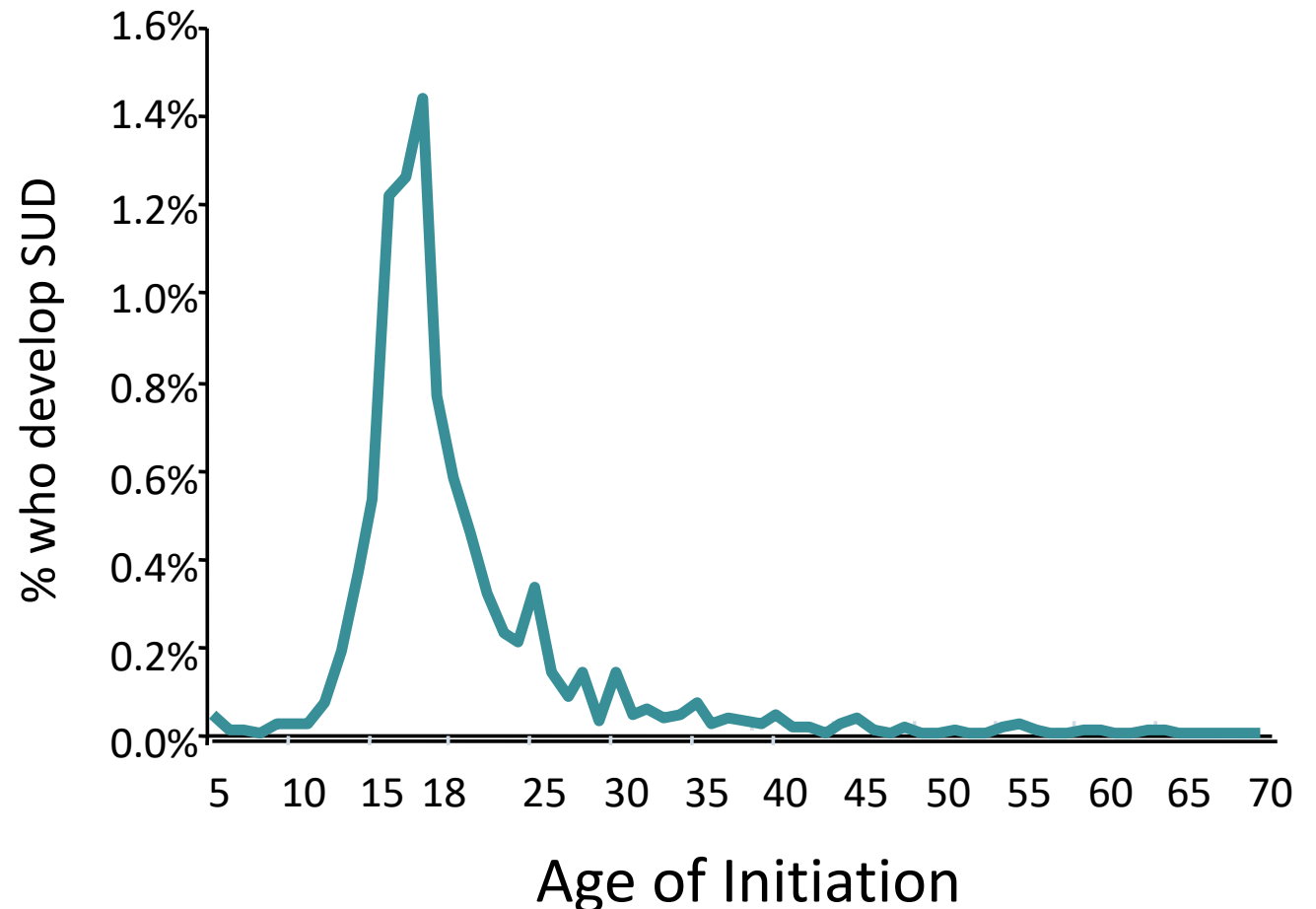


Addiction is a Pediatric Brain Disorder

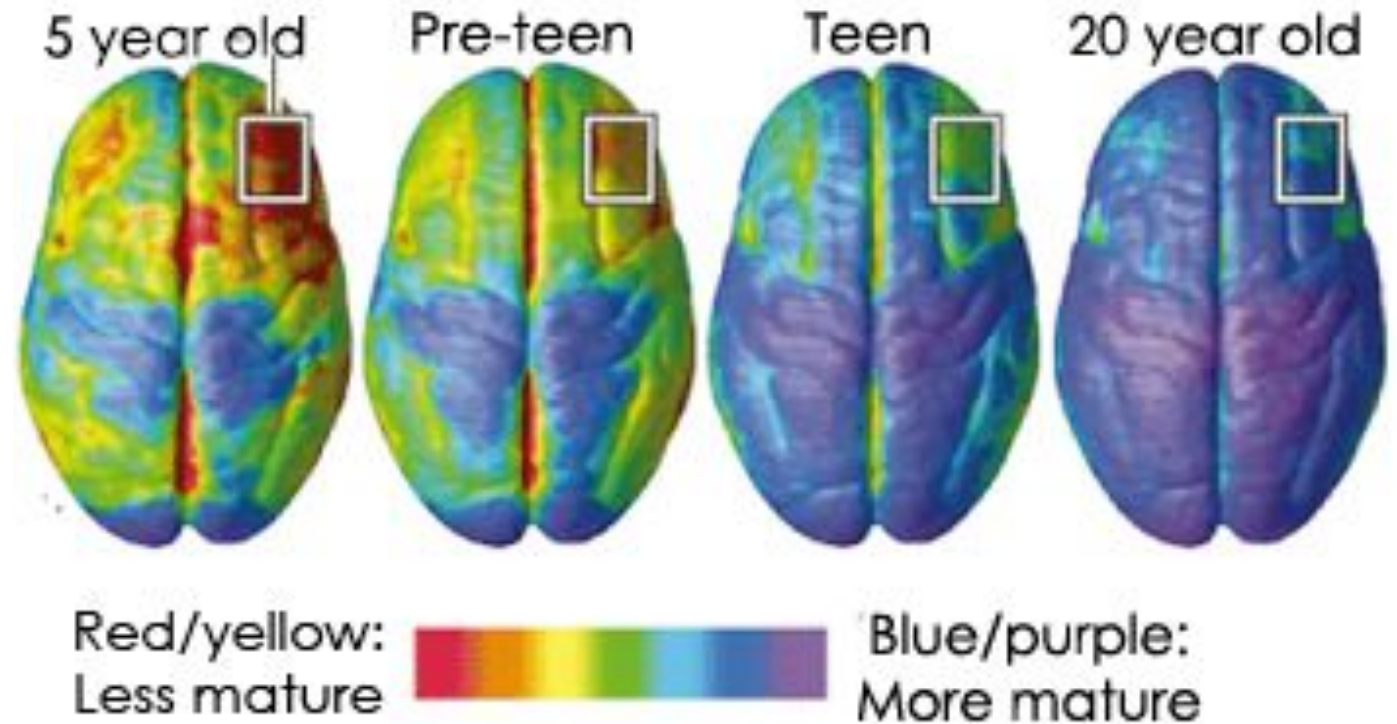


Addiction is a Pediatric Disorder

- 90 percent of adults with any substance use disorder initiated substance use as teens
- Early adverse experiences strongly influence risk for substance use disorder
 - Child neglect and maltreatment
 - Drug use and addiction among parents



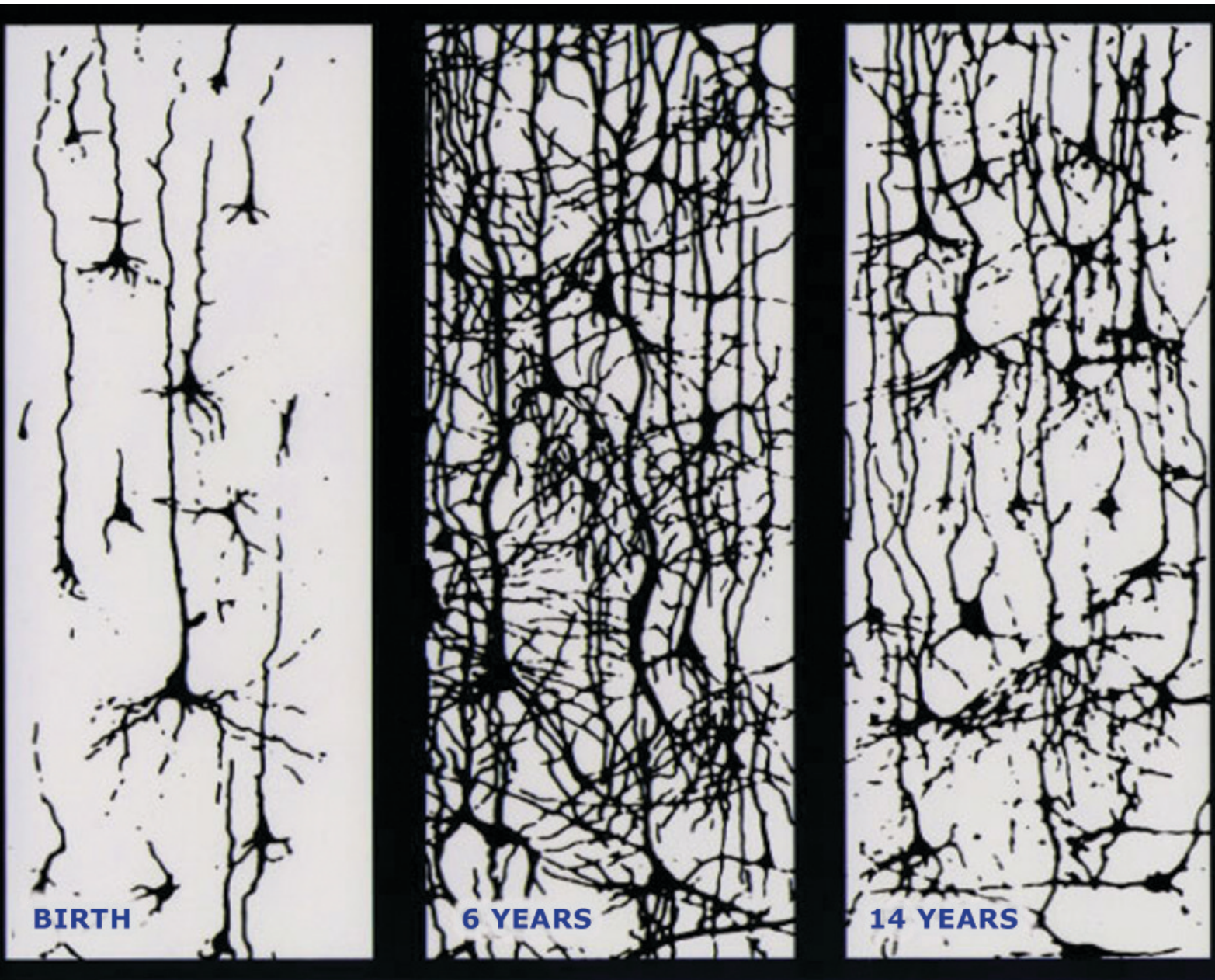
Brain Development Continues Until the Early to Mid 20's





Experiences Drive Brain Development



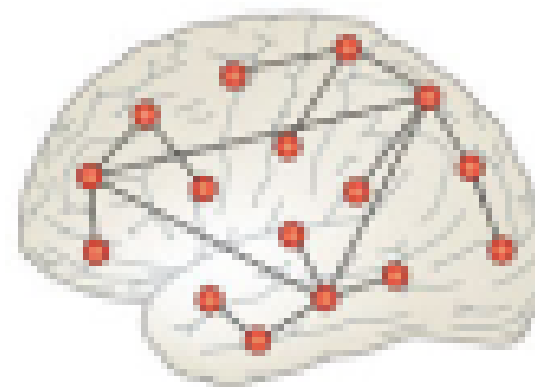
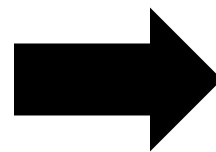
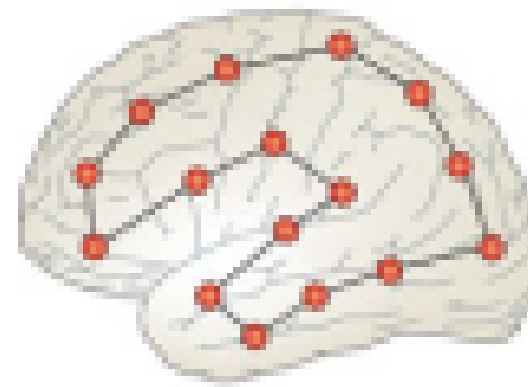
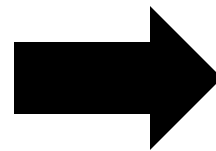
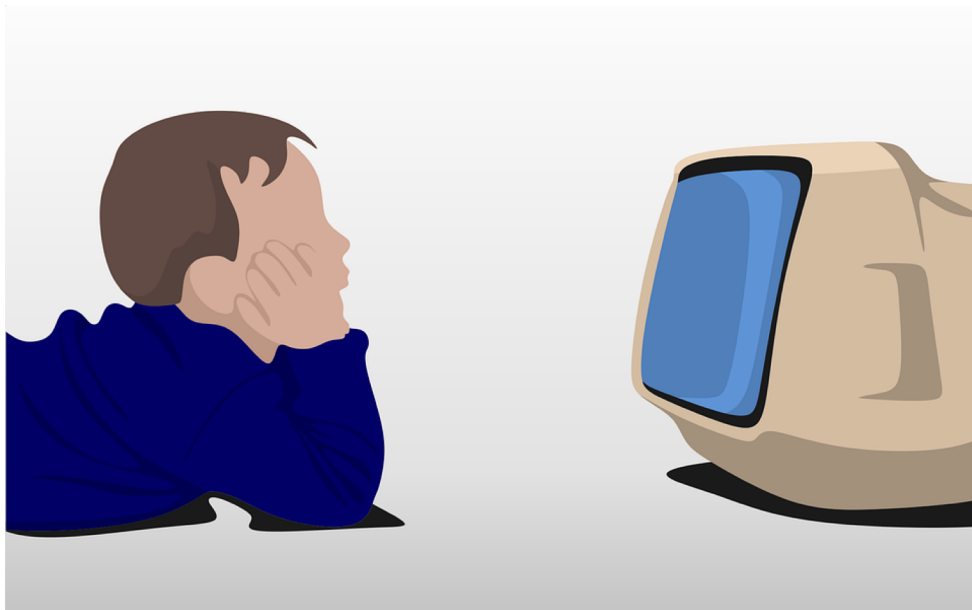


**The brain grows rapidly,
forming trillions of short
and long range connections
between cells**

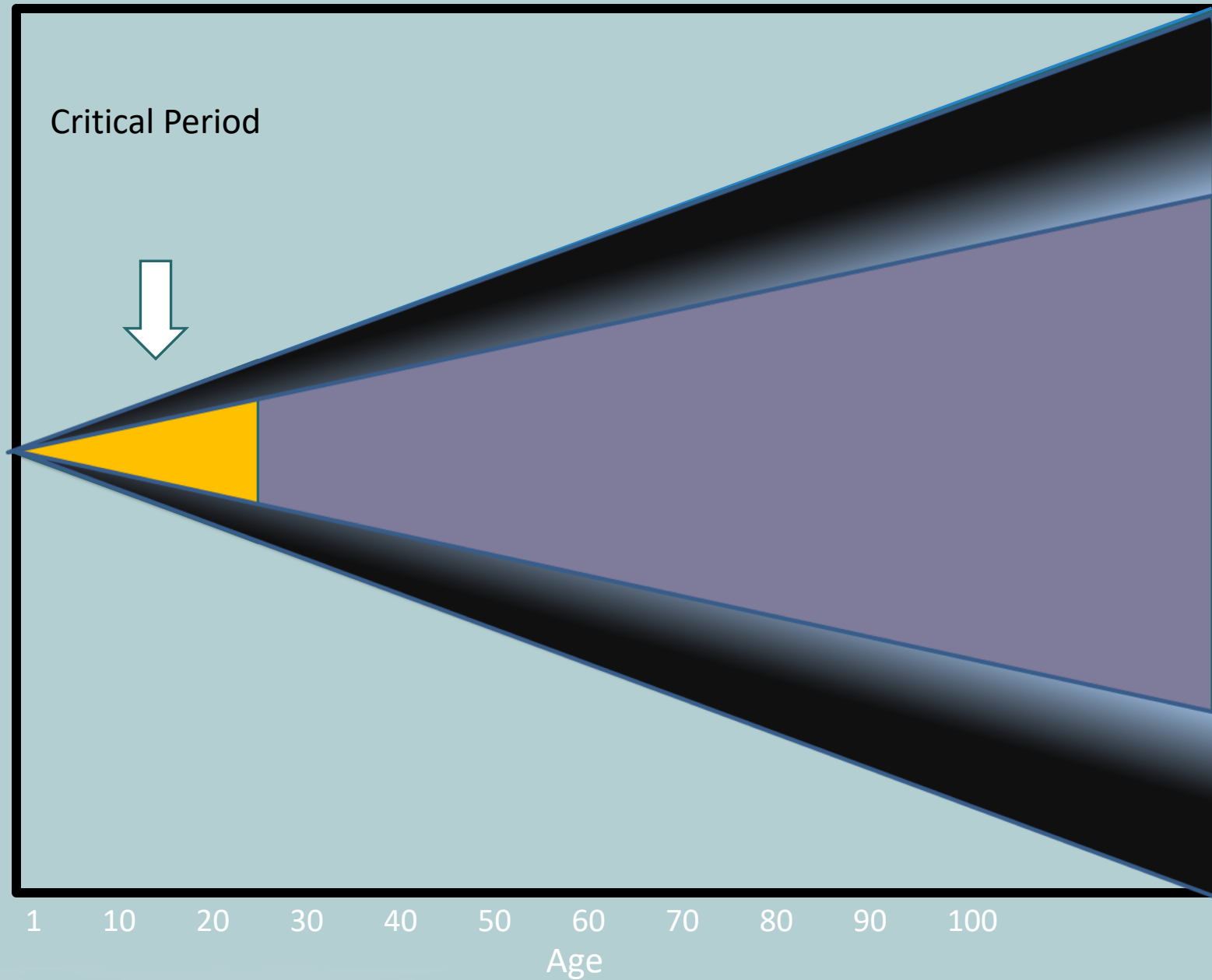
**The final stage of
development is pruning
these connections for
specificity and precision**

**Pruning is driven by
experience**





LIFE TRAJECTORY



Addiction is a Pediatric Disease



- **9 out of 10** people with a substance use disorder started using in adolescence
- Those who use addictive substances before age 15 are **6.5 times more likely** to develop an addiction as those who delay use until age 21 or older
- **11%** of adolescents develop a substance use disorder before they reach 18
- Earlier onset of substance use **predicts greater addiction severity**

Delaying Initiation is **Key** to Prevention



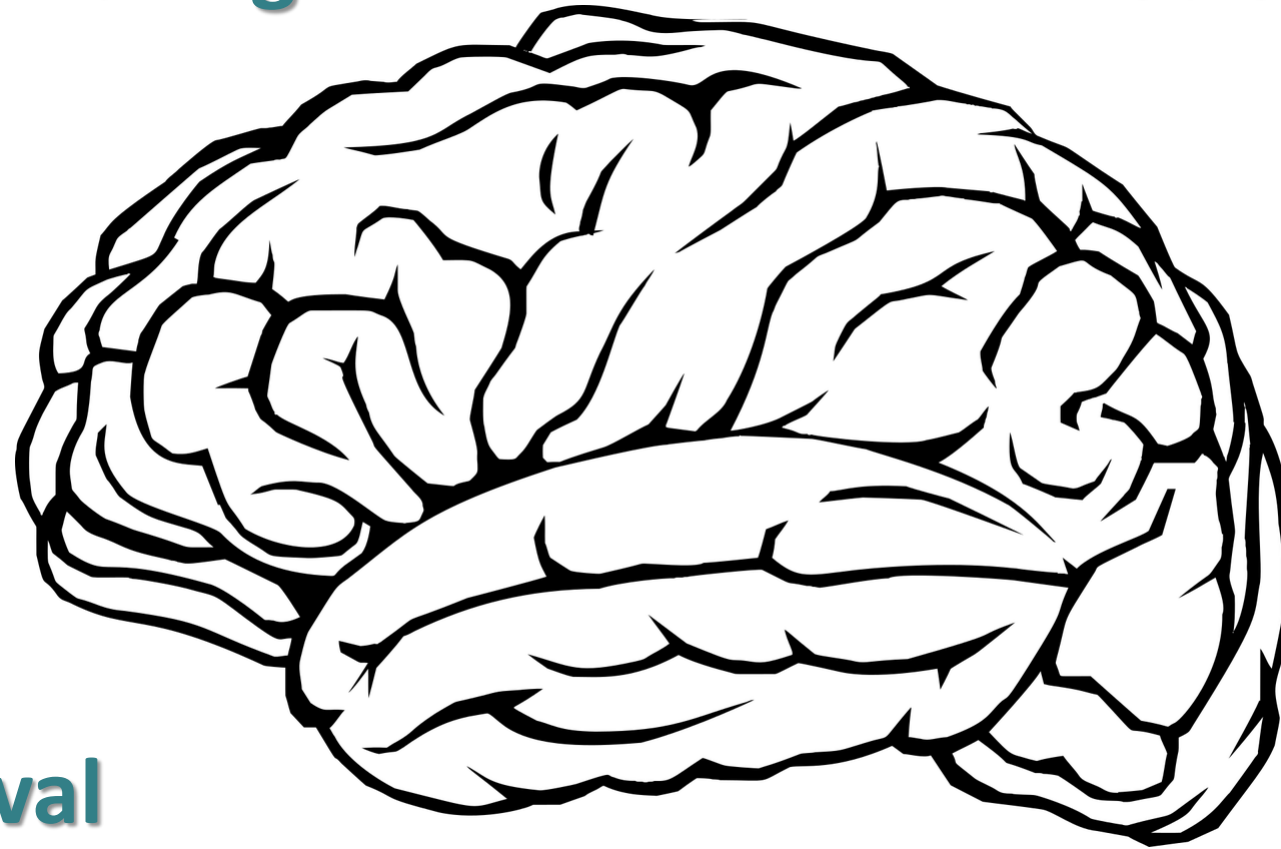
Addiction Changes the Brain



Addiction Changes Brain Circuits

Decision Making

Stress



Impulse Control

Motivation

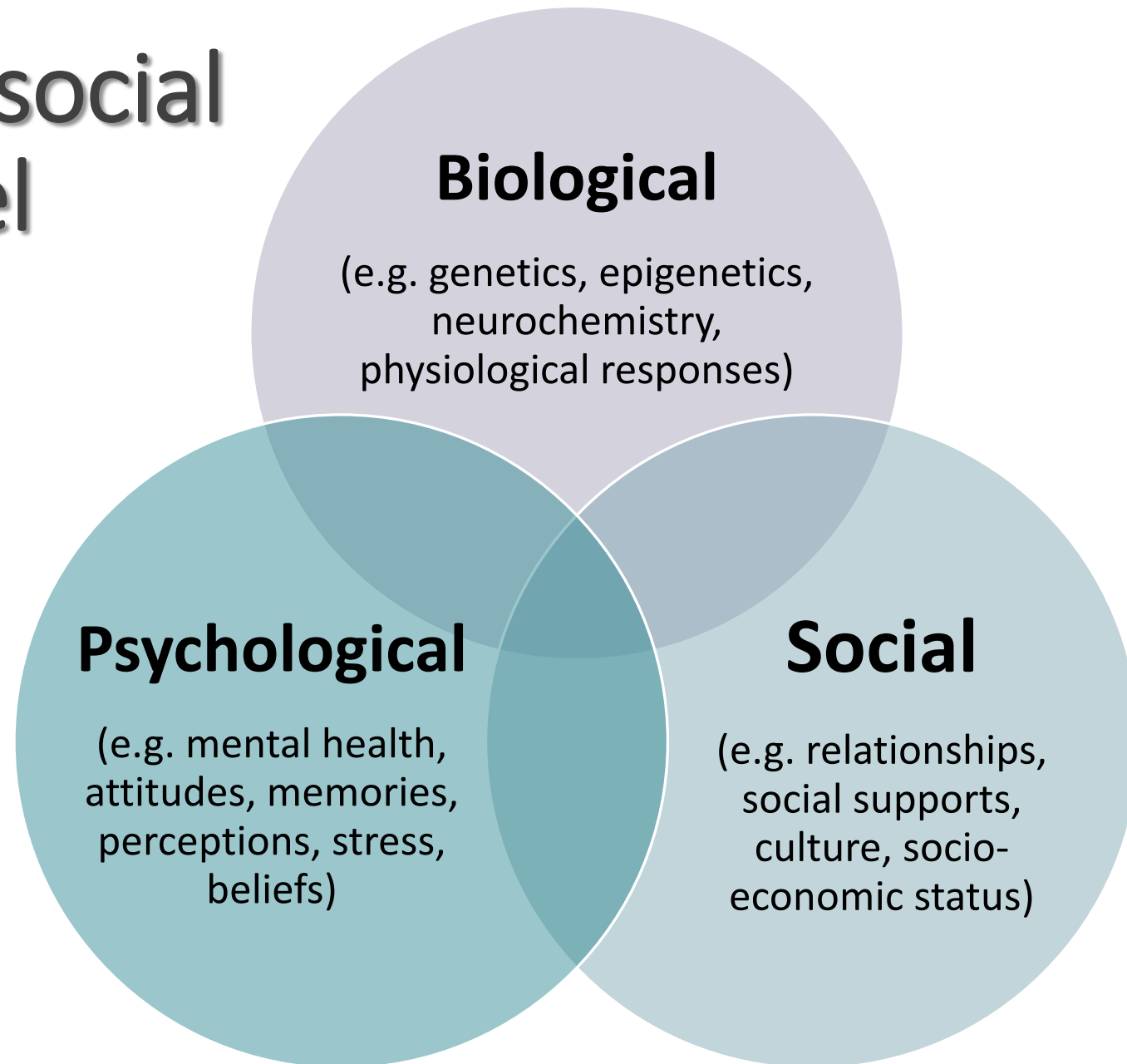
Reward/Survival

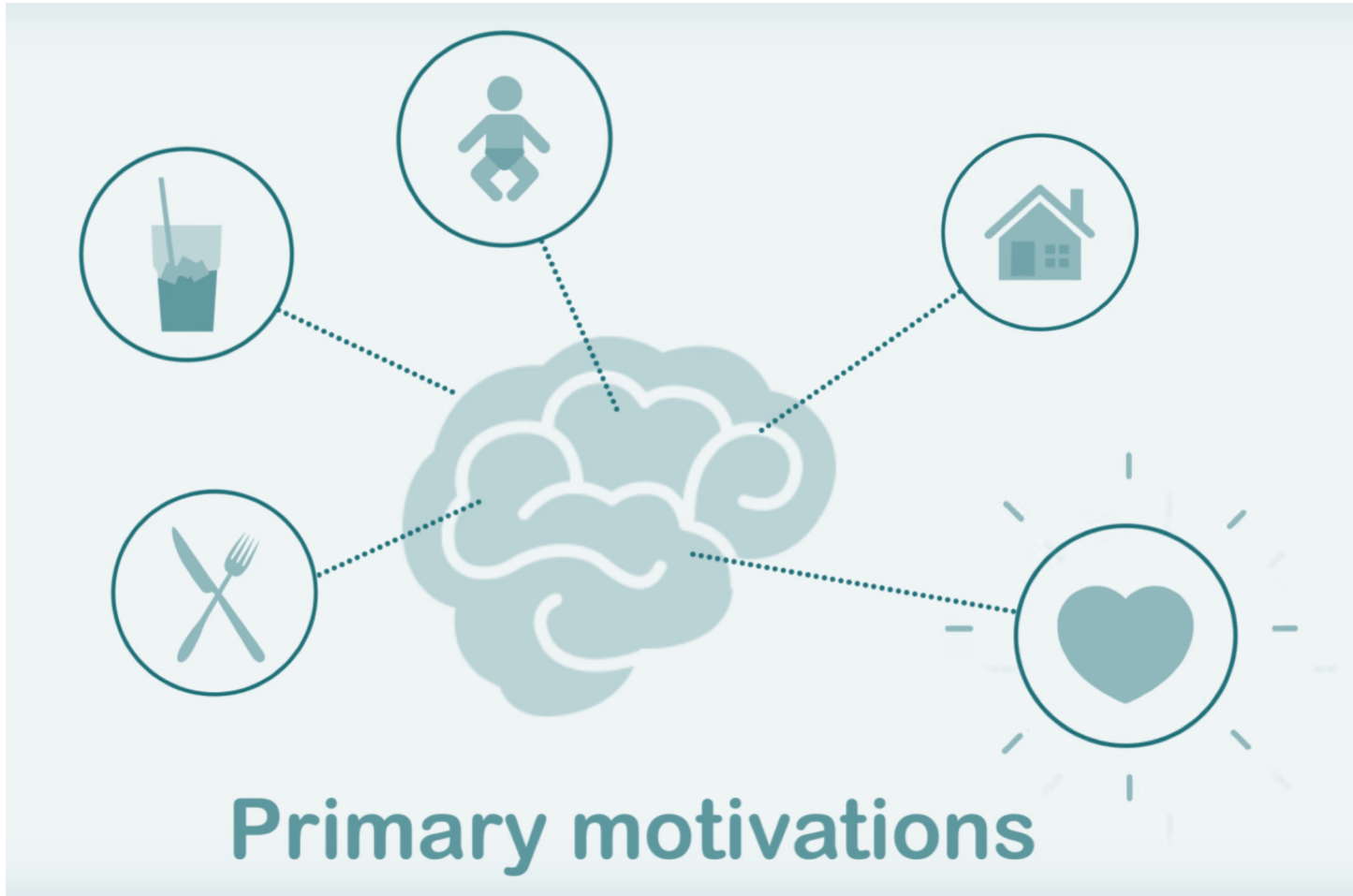
Memory

Learning



Biopsychosocial Model

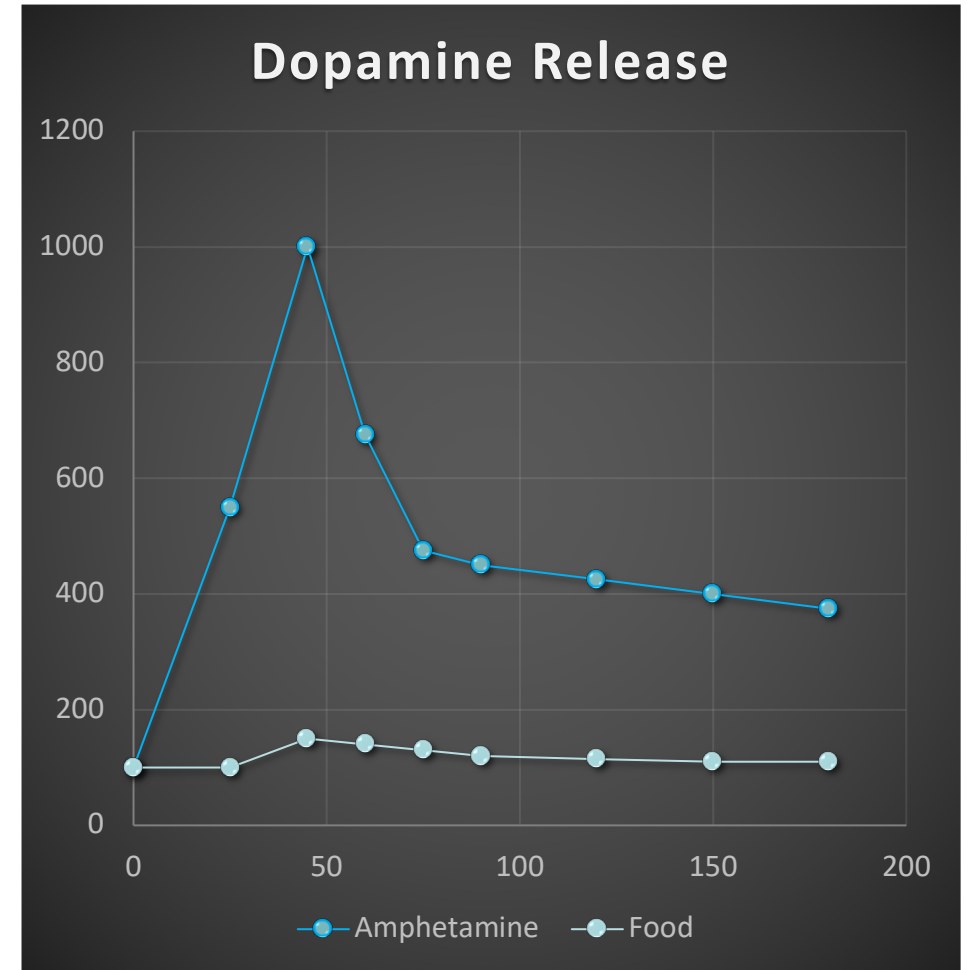
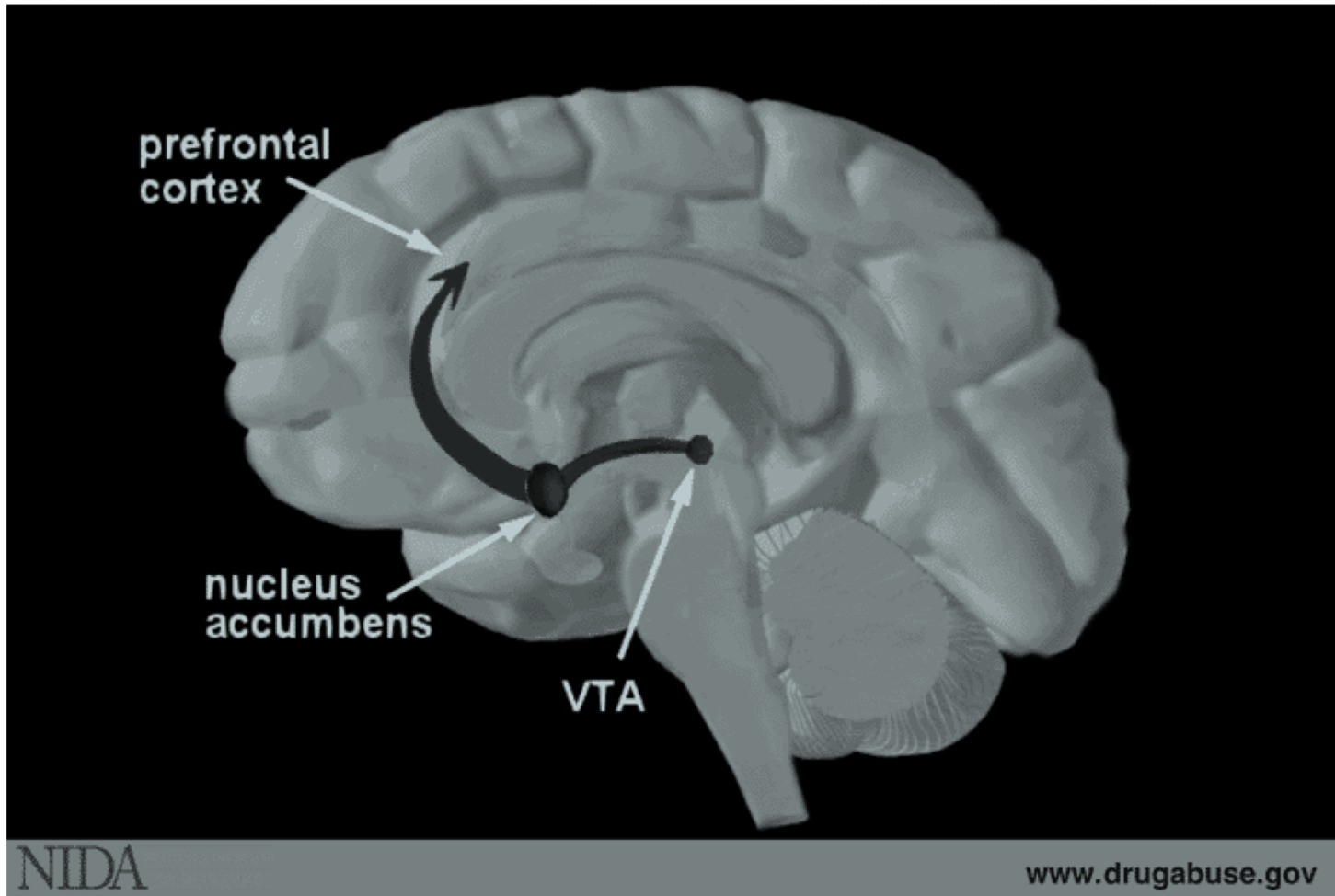




The Reward
Circuit
Reinforces
Behaviors that
are Essential for
Survival



What makes substances addictive?



Hijacking the Survival Center

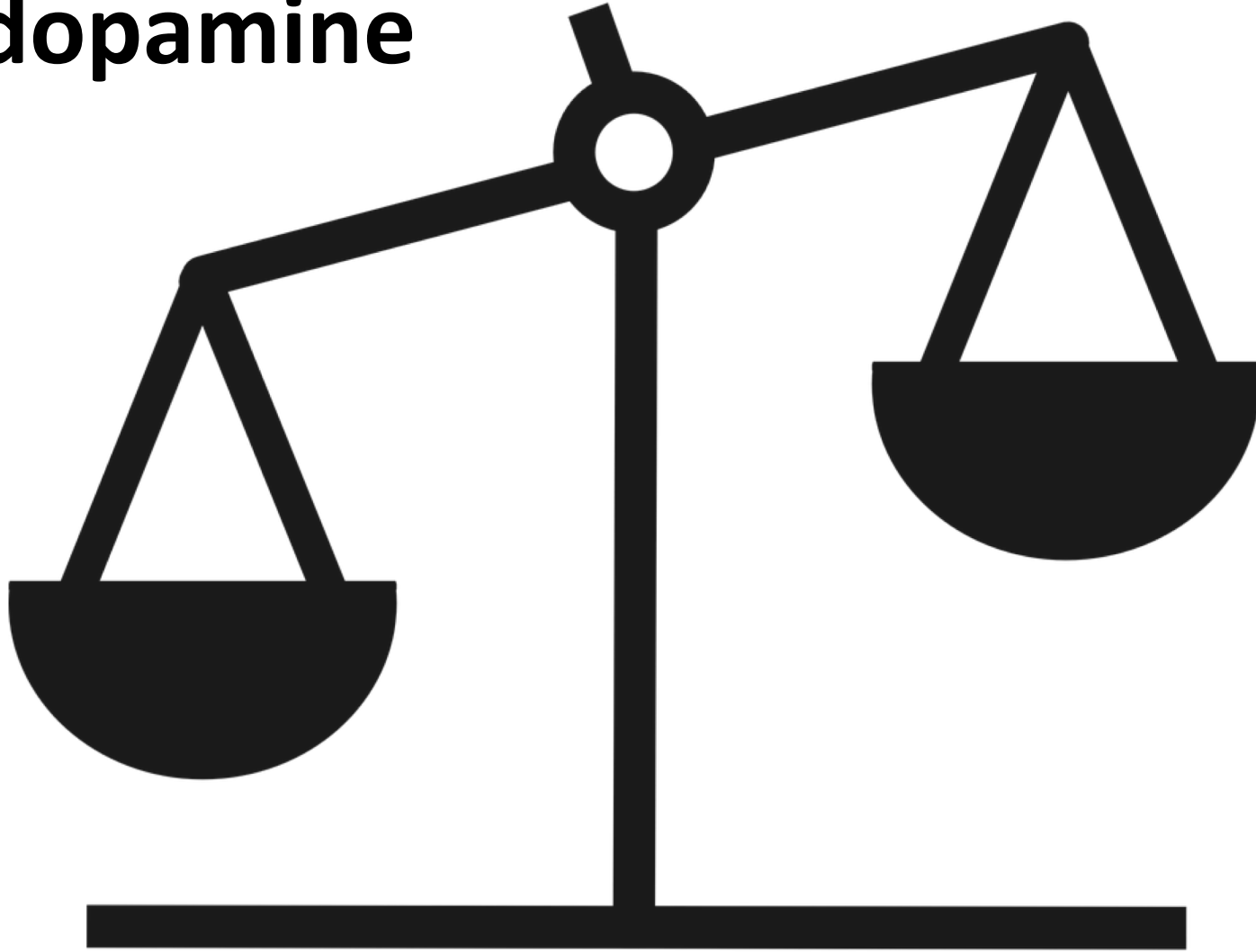




Your
Brain
Likes
Balance



Too much dopamine



**Your brain adjusts to
be less responsive to
dopamine**



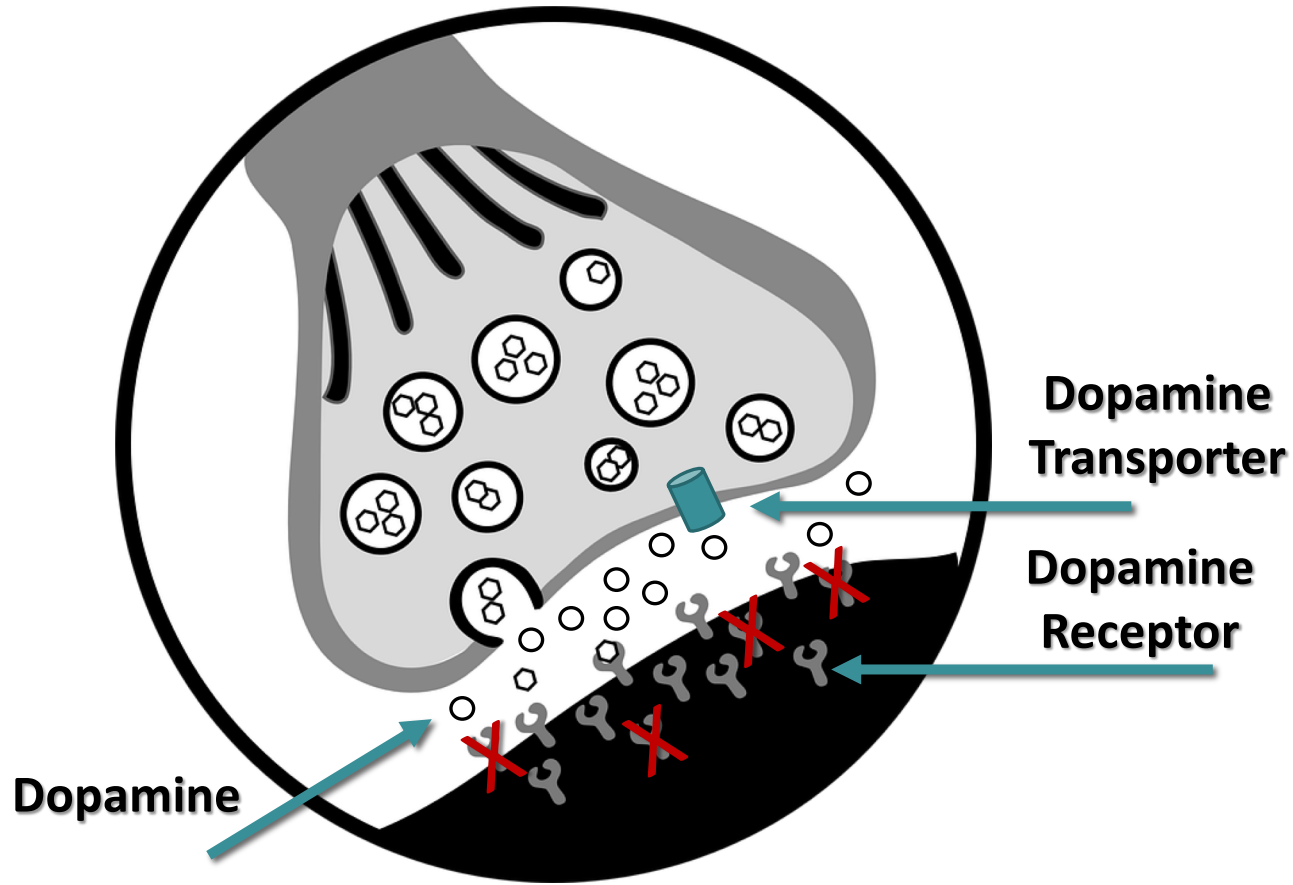
**With abstinence
dopamine decreases
and the circuit is out
of balance in the other
direction**



**Because the adolescent
brain is more plastic
the changes are more
pronounced and
persistent**

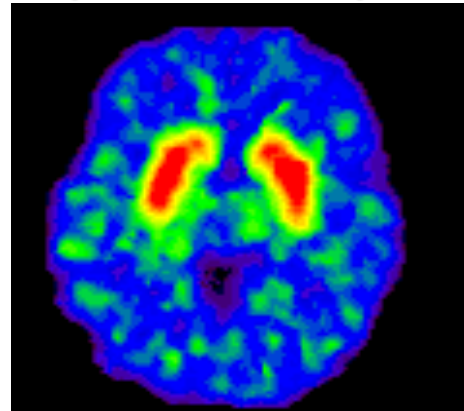


Your Brain Likes to Stay Balanced

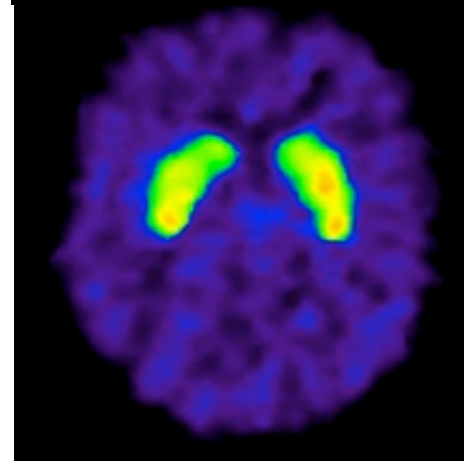


Dopamine Receptors

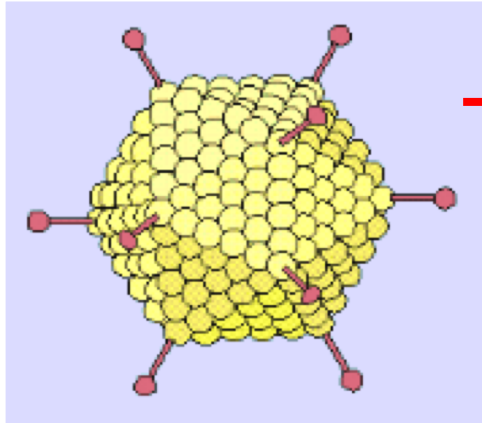
No SUD



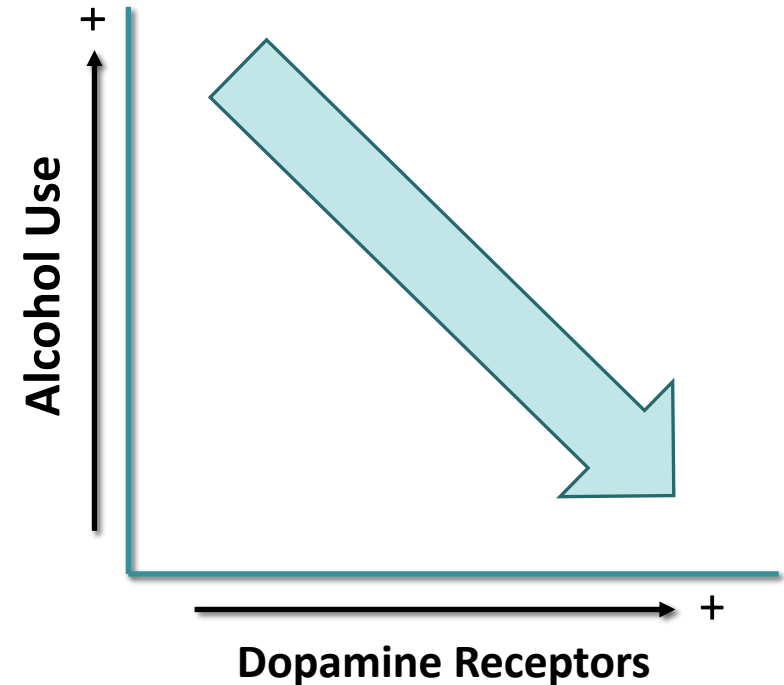
With SUD

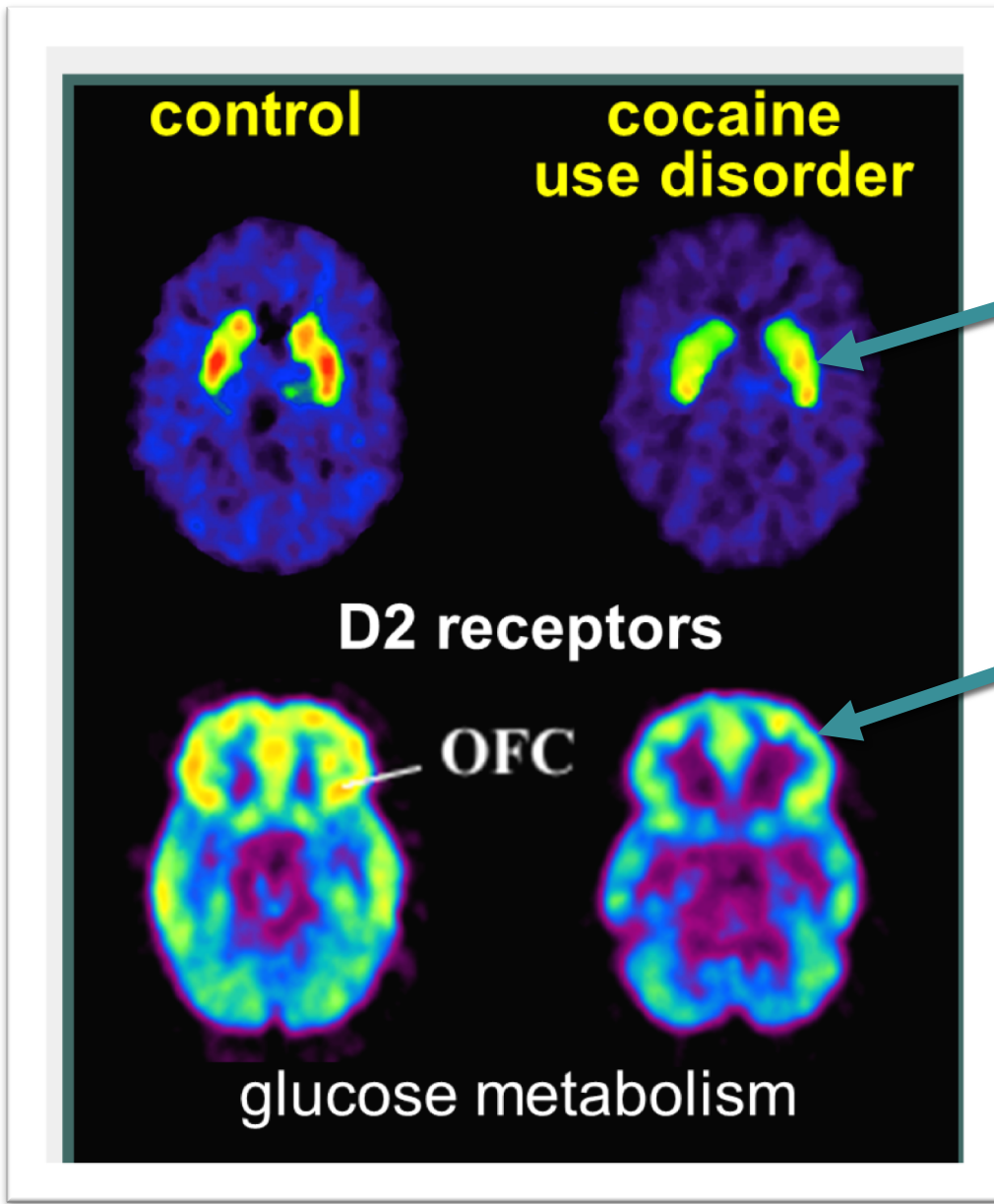


When Dopamine Receptors go Up, Substance Use Goes Down



Virus to Increase
Dopamine Receptors
in the Reward Circuit





Decreased Dopamine Receptors

Decreased Activity in the Prefrontal Cortex

Poor Impulse Control and Decision Making

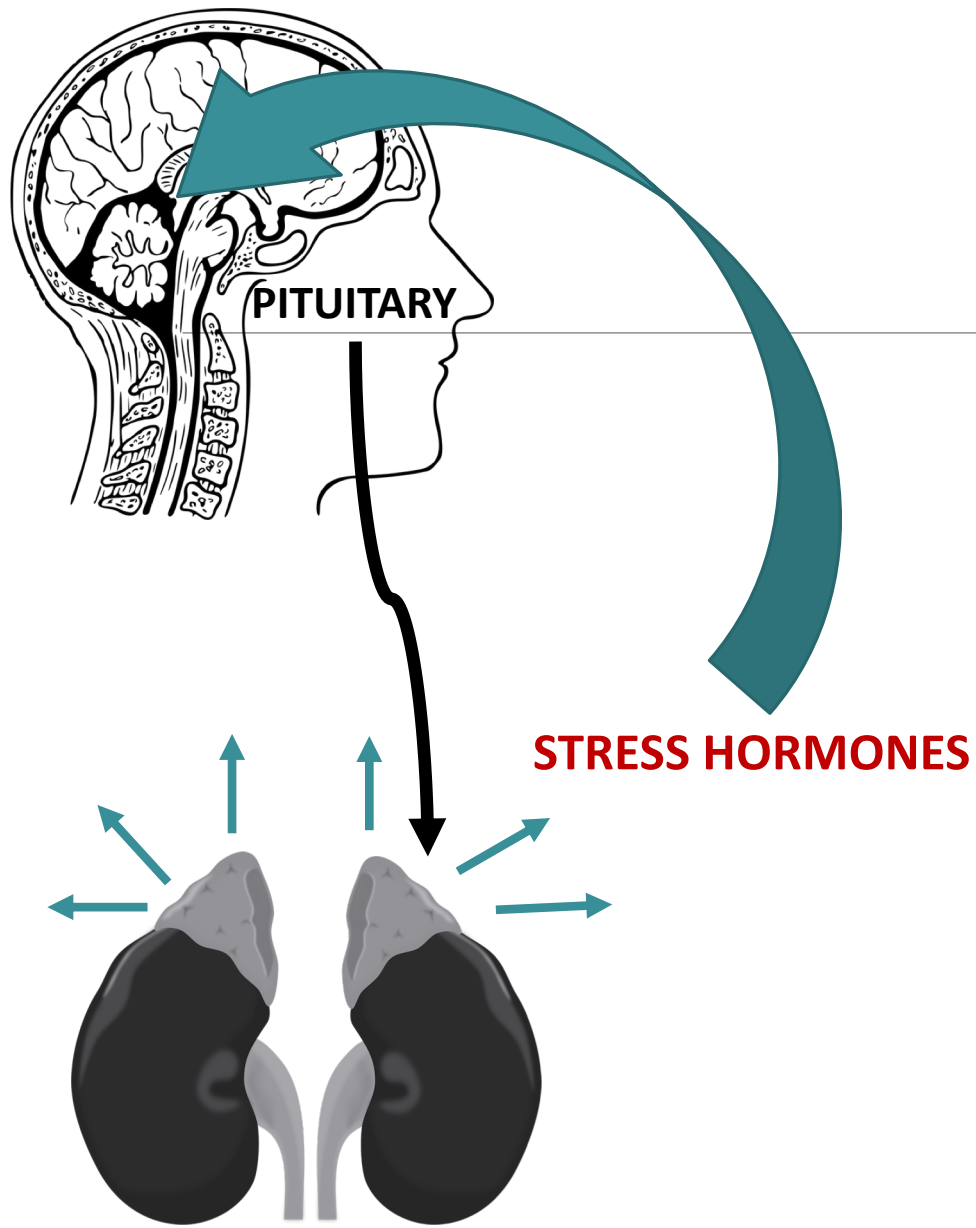


“I NEED it to SURVIVE”

“But I want to get healthy”



Addiction Changes Your Stress Response



In a healthy brain:

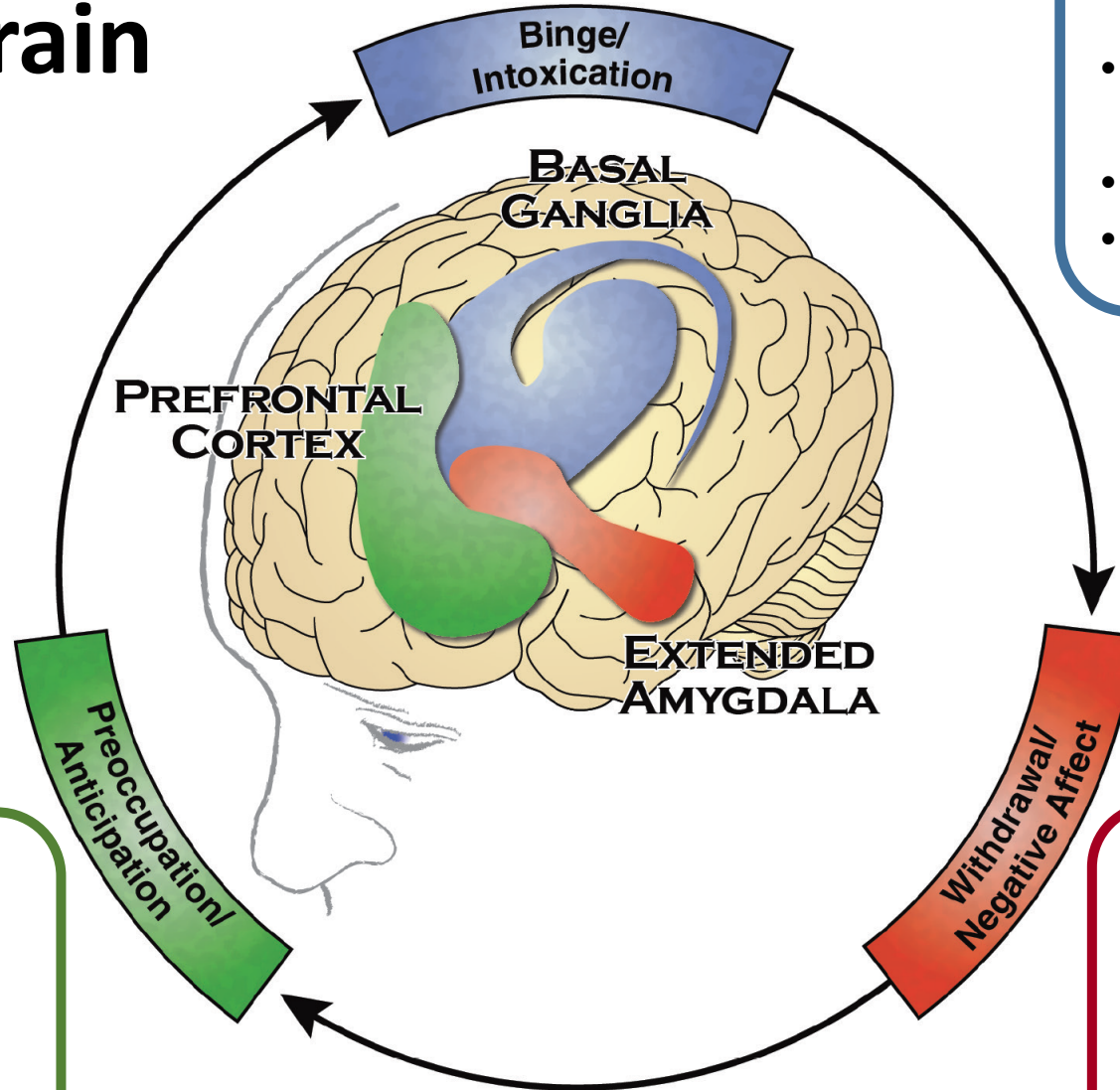
- the stress response is activated
- cortisol is released and spreads through the body
- when cortisol reaches the brain it turns off the stress response

In an addicted brain:

- The brain circuits that normally turn off the stress response don't work very well
- Their stress response stays on high for longer



Addiction is a Progressive Brain Disorder



- Diminished response to natural reward
- Increased motivation to seek substance
- Conditioned cravings (triggers)
- Compulsivity

- Cravings
- Altered perception of substance's value
- Impulse control deficit
- Decision making impairments

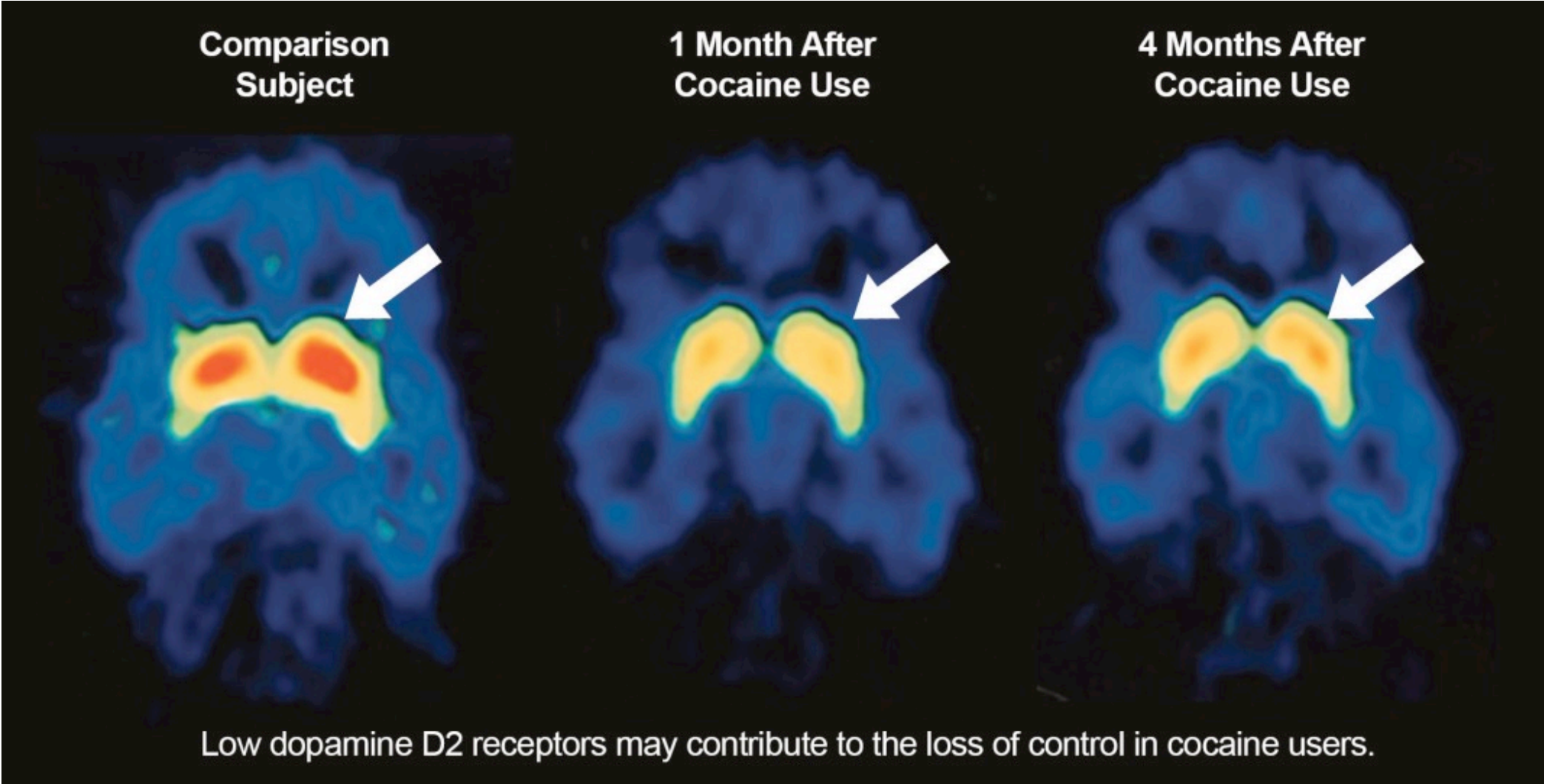
- Withdrawal symptoms
- Anxiety and agitation
- Excessive stress
- Negative reinforcement (avoiding pain of withdrawal)



"I NEED it to SURVIVE"



Brain Circuit Changes Persist After Withdrawal



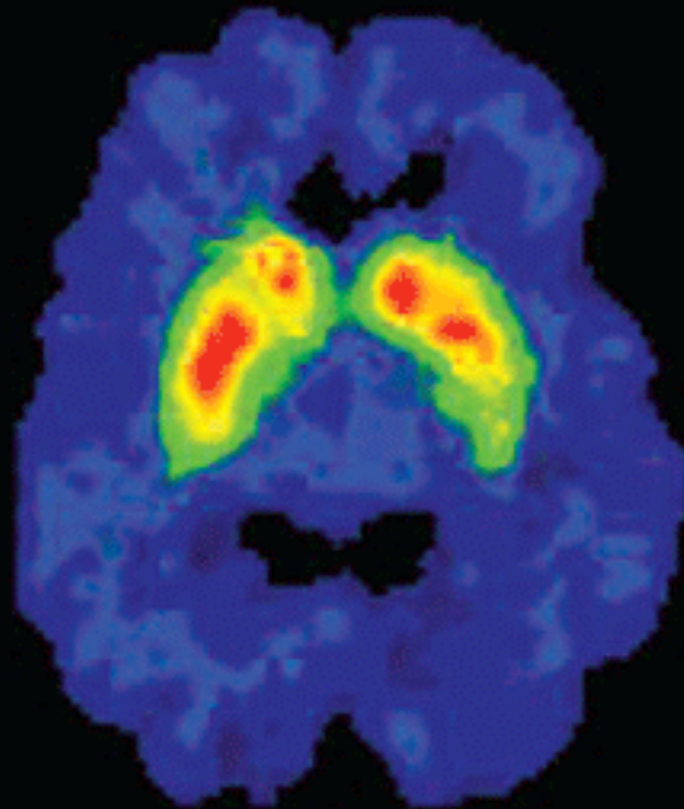
Do NOT Wait for
Rock Bottom



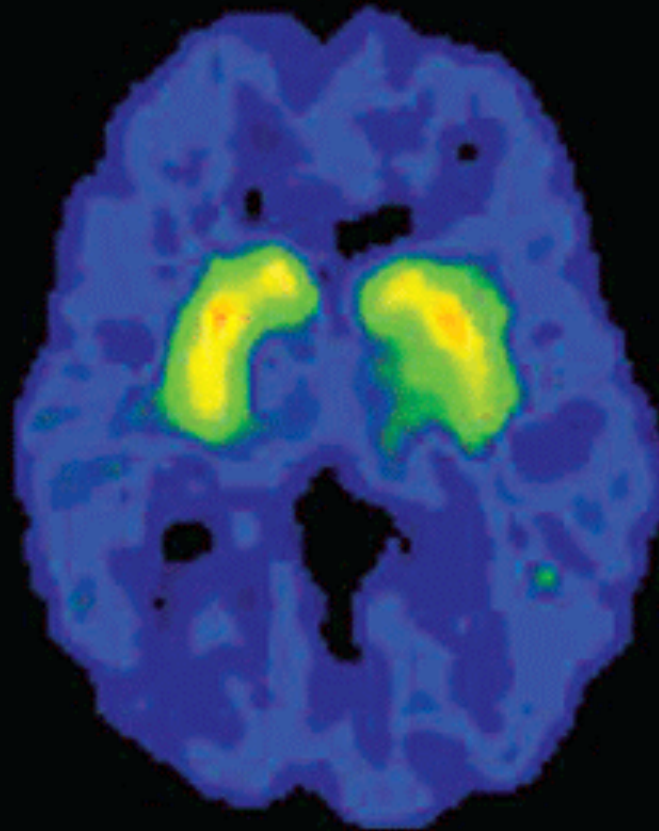
The sooner
treatment starts
the better the
changes of long
term recovery



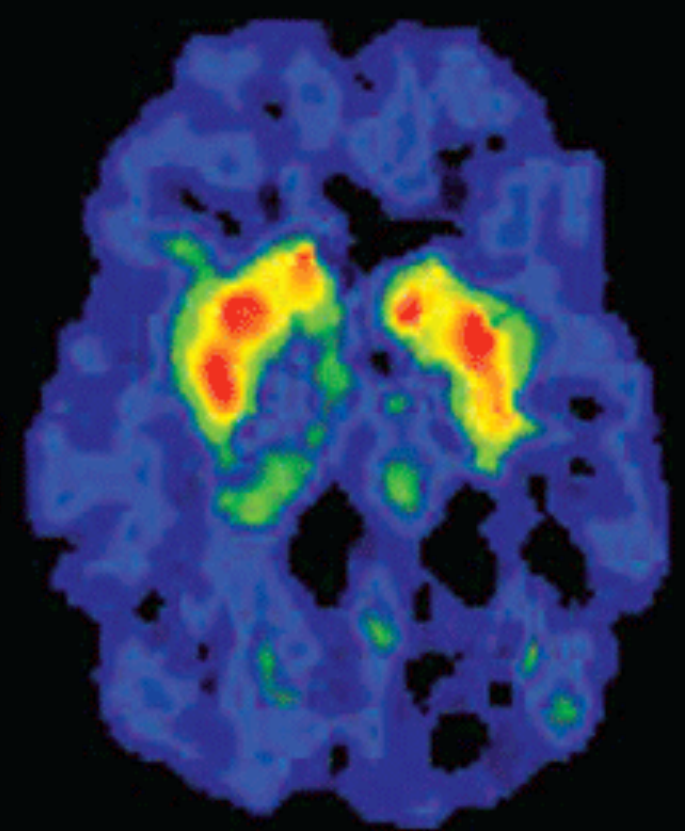
BRAIN RECOVERY WITH PROLONGED ABSTINENCE



Healthy Control



1 Month Abstinence



14 Months Abstinence



Summary

- *Addiction is a pediatric brain disorder*
- *Addiction changes brain circuits – making it progressively harder to stop using*
- *Substance use disorders are **progressive***
- *Early diagnosis and treatment are critical*





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Addiction Policy Forum

The Addiction Policy Forum is a diverse partnership of organizations, policymakers and stakeholders committed to working together to elevate awareness around addiction and to improve national policy through a comprehensive response that includes prevention, treatment, recovery and criminal justice reform.

We envision a world where fewer lives are lost and help exists for the millions of Americans affected by addiction every day.



For More Information

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