

Addiction in the Developing Brain

Join Dr. Crystal Collier, Ph.D. to learn how the brain becomes addicted to alcohol, drugs, and other high-risk behavior. This presentation will review the effects of substance and process addictions on the brain, how the disease of addiction creates an alcoholic psyche, and strategies for healing.


The following slides are adapted from her excellent talk:
https://www.youtube.com/watch?v=ItQ1IXiEDDs&ab_channel=HopeandHealingCenter%26Institute

FREE EDUCATIONAL PROGRAM

THE NEUROSCIENCE OF ADDICTION & ALCOHOLIC PSYCHE

HHCI Hope and Healing Center & Institute

FEBRUARY 23
Wednesday @ 12 p.m. CT
HHCI Auditorium | Online
Continuing Education Available

PRESENTED BY:
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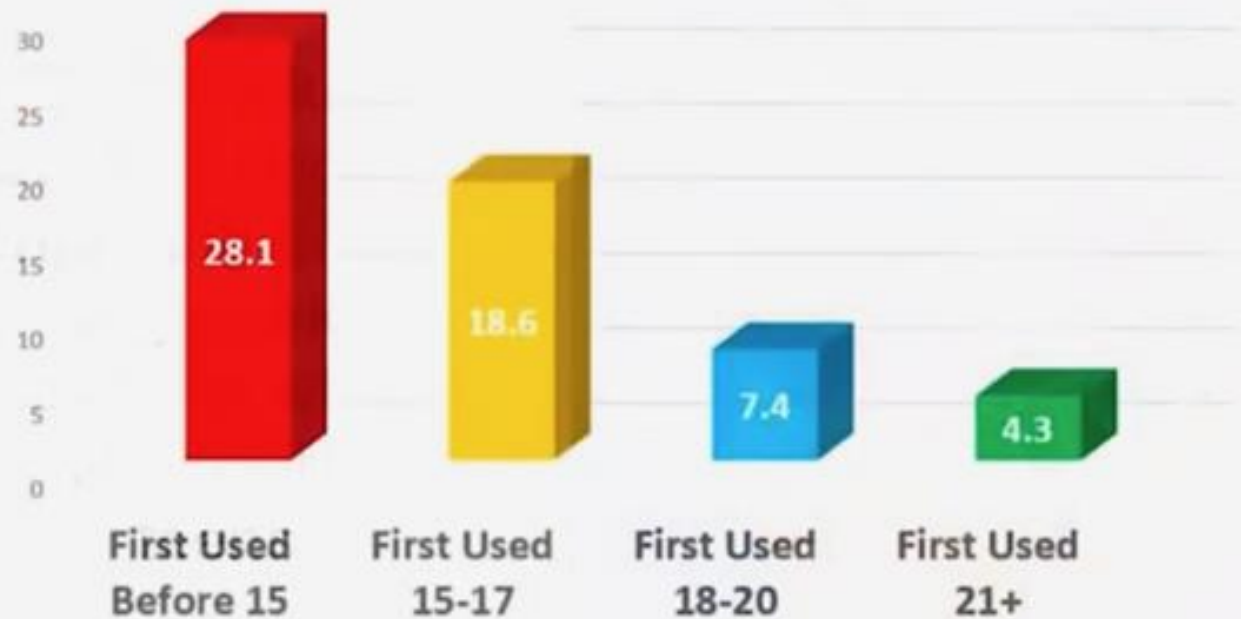
About Dr. Collier

Crystal Collier, PhD, herself a person in long-term recovery, is a therapist and educator who has been working with adolescents and adults suffering from mental illness, behavioral problems and substance use disorders since 1991. Her area of expertise includes adolescent brain development, prevention programming, parent coaching, addiction, family-of-origin work, and training new clinicians.



The earlier a teen uses, the greater risk of a lifetime addiction.

The Earlier Teens Use Any Substance the Greater Risk of Addiction



Center on Substance Abuse and Addiction (2009)

Most adult addicts started evidencing high risk behavior when they were teens

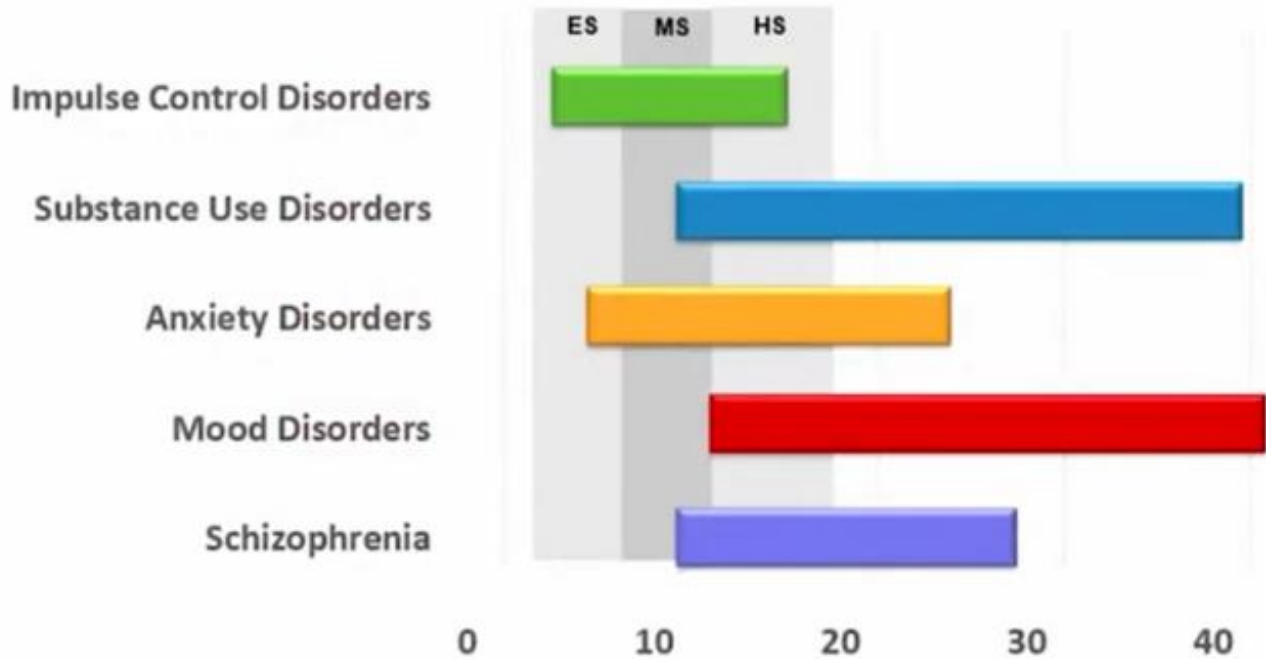
Is it *really* so harmful?

90% of adults addicts began engaging in the high-risk behavior when they were teens



Mental health disorders typically start early and dramatically raise the likelihood of addiction.

Onset Range for Mental Disorders



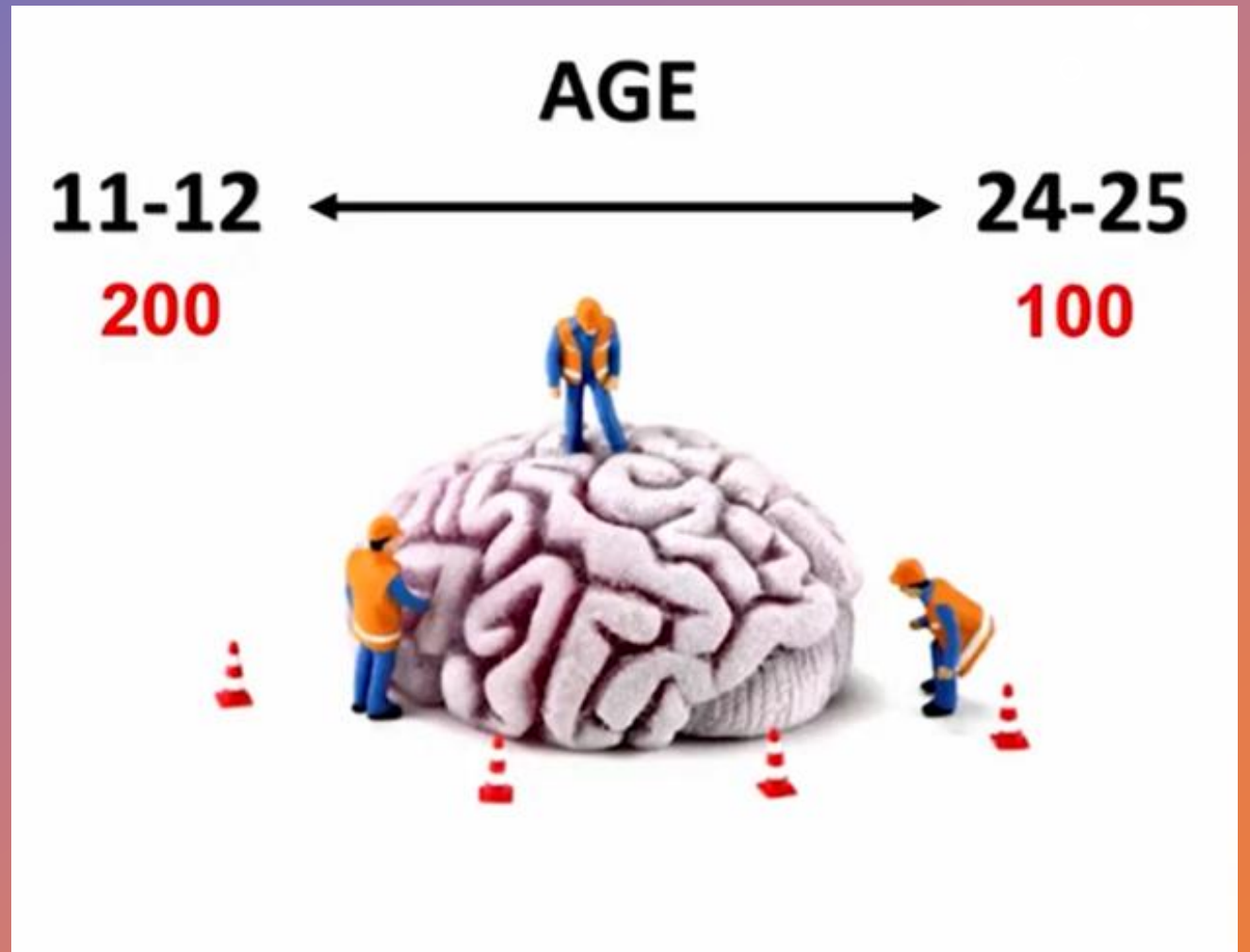
Kessler, et al (2005); Merikangas, et al (2010); Paus, et al (2008)

The infant neuron and its dendritic tree shown on the left is quite simple and you can see how its dendritic tree increases in complexity across the lifespan.

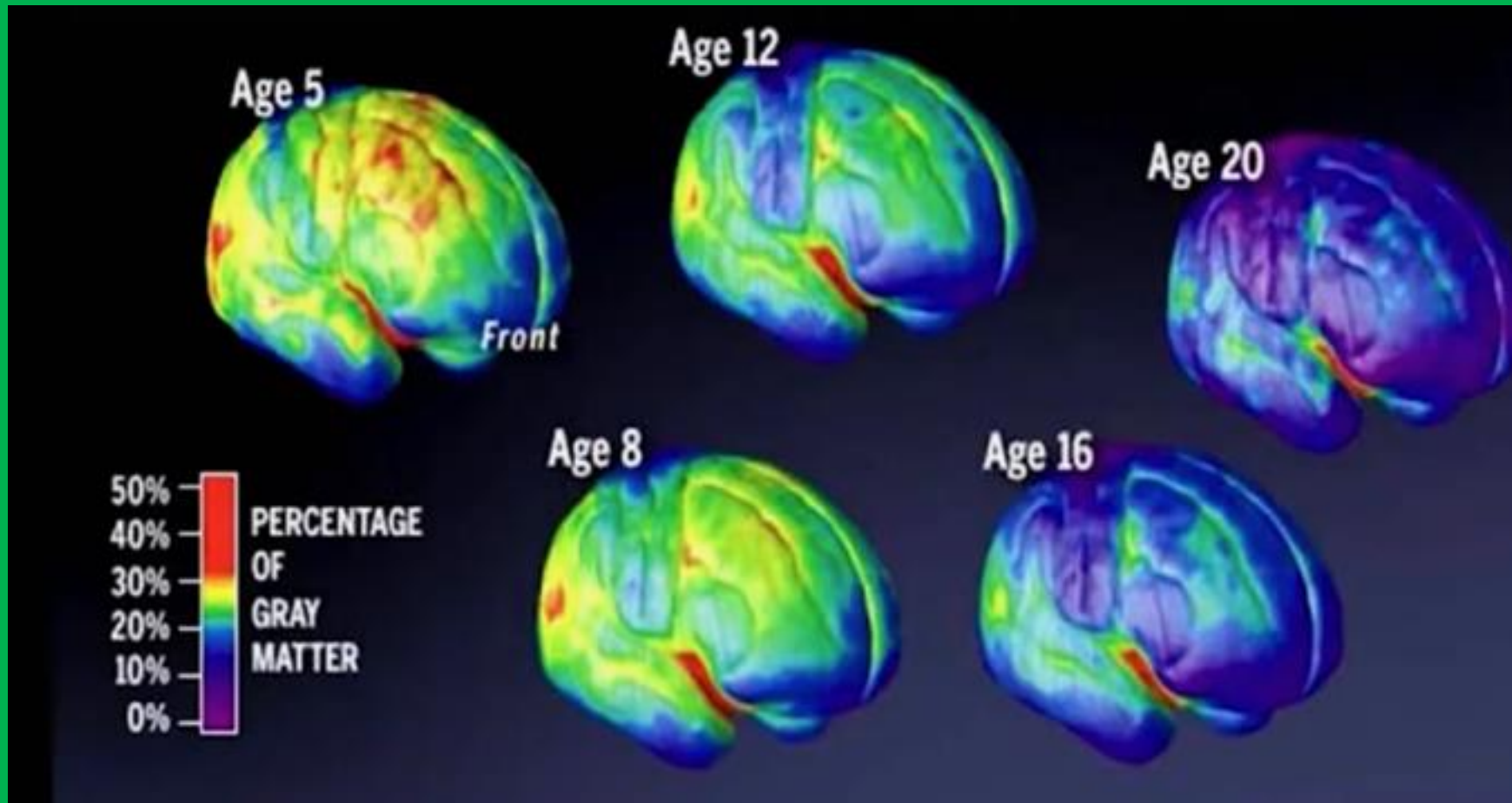


The Second Phase of Brain Growth

The second phase of brain growth starts at about 12 and continues to age 25. During this time, the brain prunes out little-used/unneeded neurons and the brain thus decreases from 200 billion to 100 billion neurons. During this time, pathways that are used myelinate to increase efficiency. So, ensure that a teen is learning and doing good things during this time as this will wire into what becomes the adult brain.



As the brain develops gray matter or unmyelinated neurons become myelinated to become white matter. This slide nicely how much growth occurs across childhood into early adulthood. THC and other drugs arrest this growth process.



So – use the brain and wire in good stuff during adolescence or you lose good brain function in adulthood



Executive functioning in the prefrontal cortex run the show so it is essential that we teach our children these skills early.

Executive Functioning



Elementary/Middle

- Task Initiation
- Flexible Thinking
- Planning and Prioritizing
- Organization
- Working Memory
- Self-Monitoring
- Selective Attention
- Coordination

Middle/High School

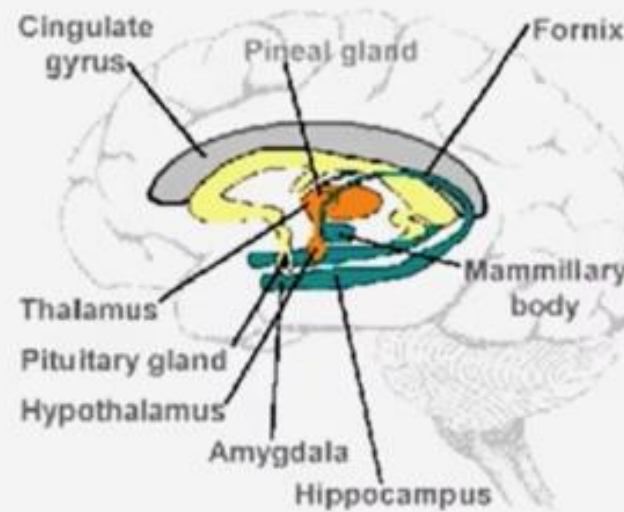
- Abstract; conceptual understanding
- Impulse Control
- Problem-Solving
- Decision-Making
- Judgment
- Emotion Regulation
- Frustration Tolerance
- Ability to Feel Empathy

The limbic system directs the survival fight or flight system as well as pleasurable experiences.

Limbic System

1) Survival: Fight or Flight

2) Pleasurable Experiences

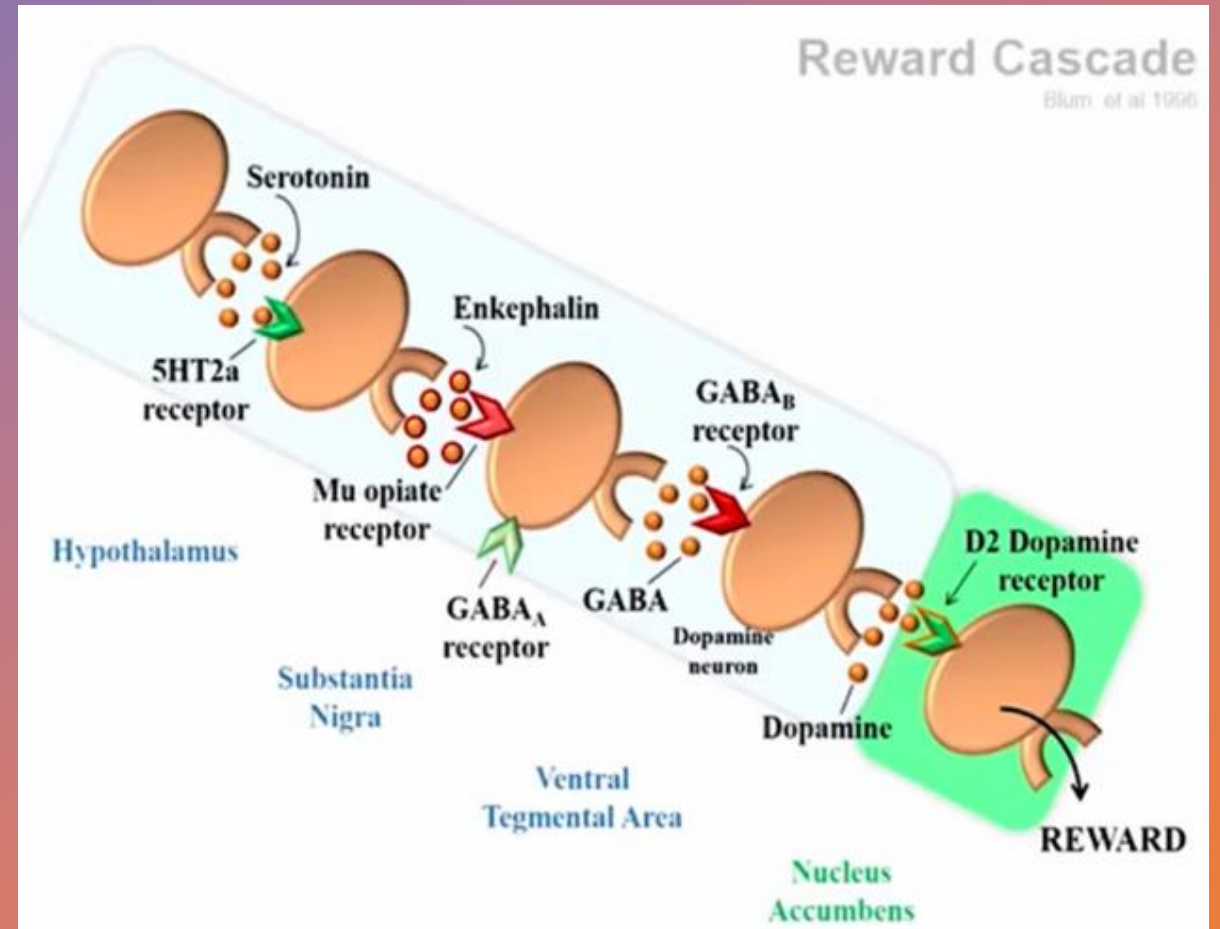


The Limbic System



Reward Cascade

The reward cascade starts with serotonin on the 5HT_{2a} receptor which triggers Enkephalin on the Mu opiate receptor, GABA_A receptor, and GABA_B receptor which drives dopamine on the D2 dopamine receptor. All of this process transverses from the Hypothalamus, to the Substantia Nigra, to the Ventral Tegmental Area, and finally the Nucleus Accumbens.



Gene expression is triggered by the environment which results in the phenotype or our observable characteristics and traits.



Low dopamine drives addiction and this can be caused by genetics and can be exacerbated by stress and trauma.

Addictive **Personality** = Hypodopaminergic



Normal Dopamine =
pleasure, stress
reduction, feelings of
well-being

Low Dopamine =
cravings, inability to
cope with stress,
predisposed to seek
substances to provide
a **pseudo-sense** of
well-being.

Low dopamine drives the addictive personality . If you have an A1 polymorphism of the DRD2 receptor, you will have a 74.4% chance of developing Reward Deficiency Syndrome (RDS).

Addictive **Personality** = Hypodopaminergic



Low Dopamine = Restless, Irritable, Discontented, Angry, Anxious, Low Self-Esteem

Addictive **Personality** = Hypodopaminergic

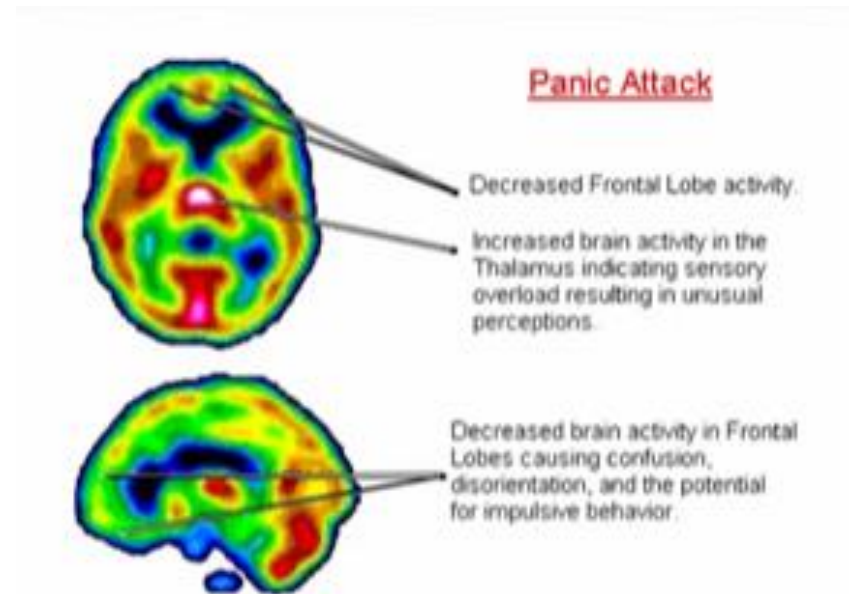


Taq A1 polymorphism of the DRD2 receptor have a **74.4%** chance of developing RDS

Hypofrontality drives both an inability to control impulses to overly pursue pleasure as well as exaggerated fear response. If this persists during development, you will see a developmental arrest.

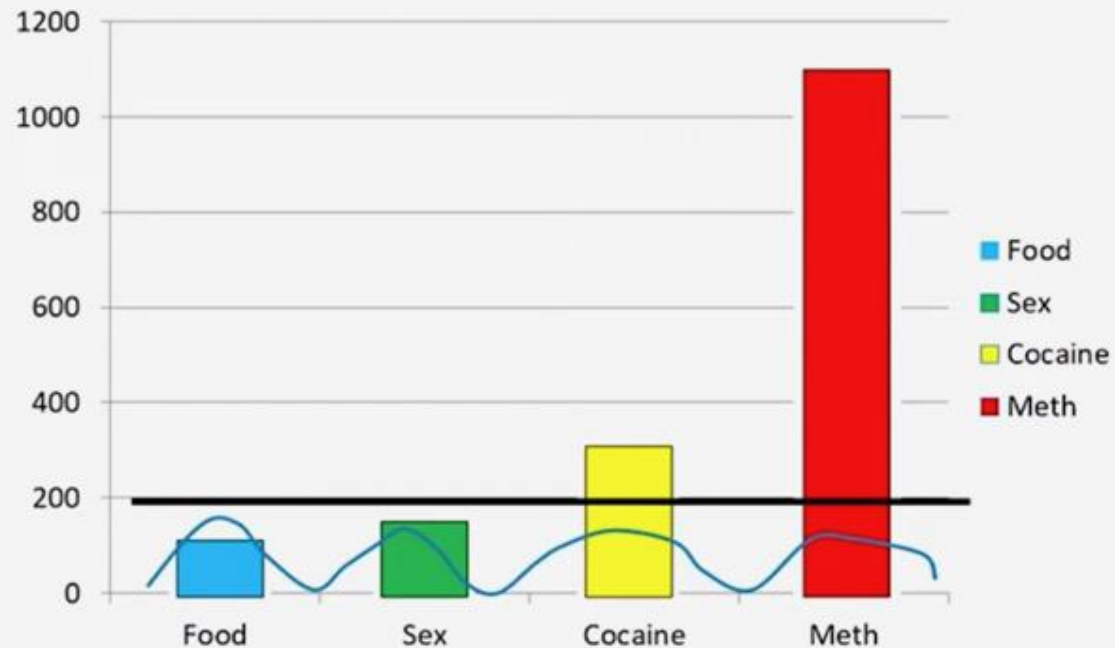


Panic attacks shut down frontal lobe activity which leads to confusion, disorientation, and possible impulsive behavior

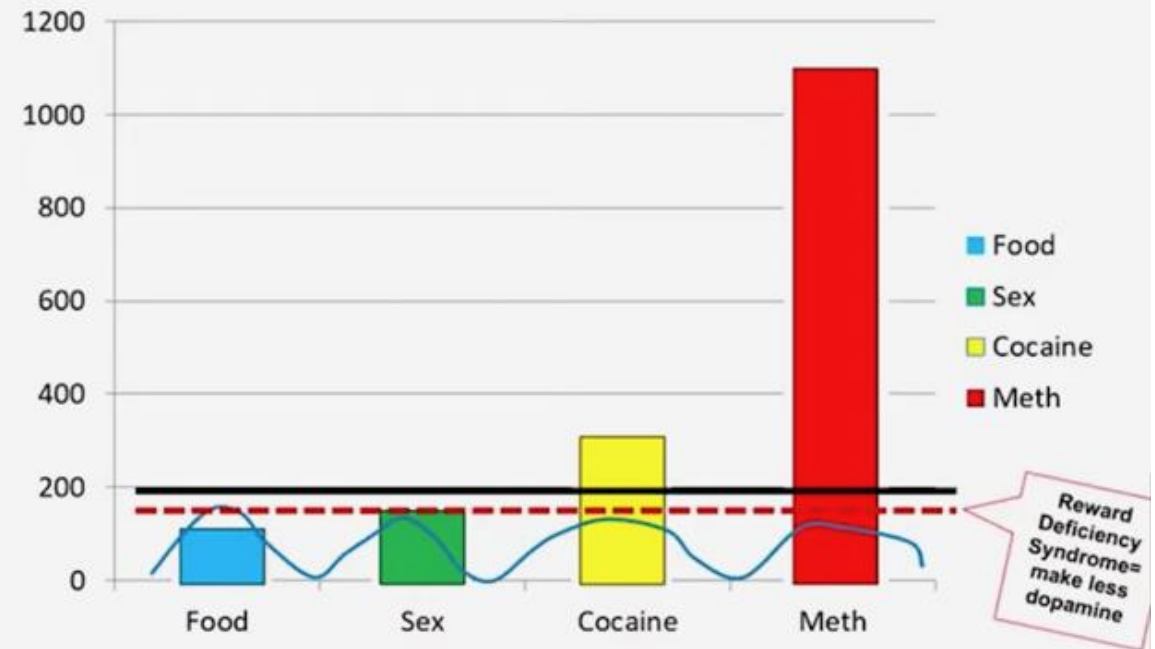


The hedonic (pleasure) threshold changes with genetics and/or with dopamine overuse which means that it will take more dopamine-driven behavior or substances to have an enjoyable effect.

Dopamine Release and the Hedonic (pleasure) Threshold



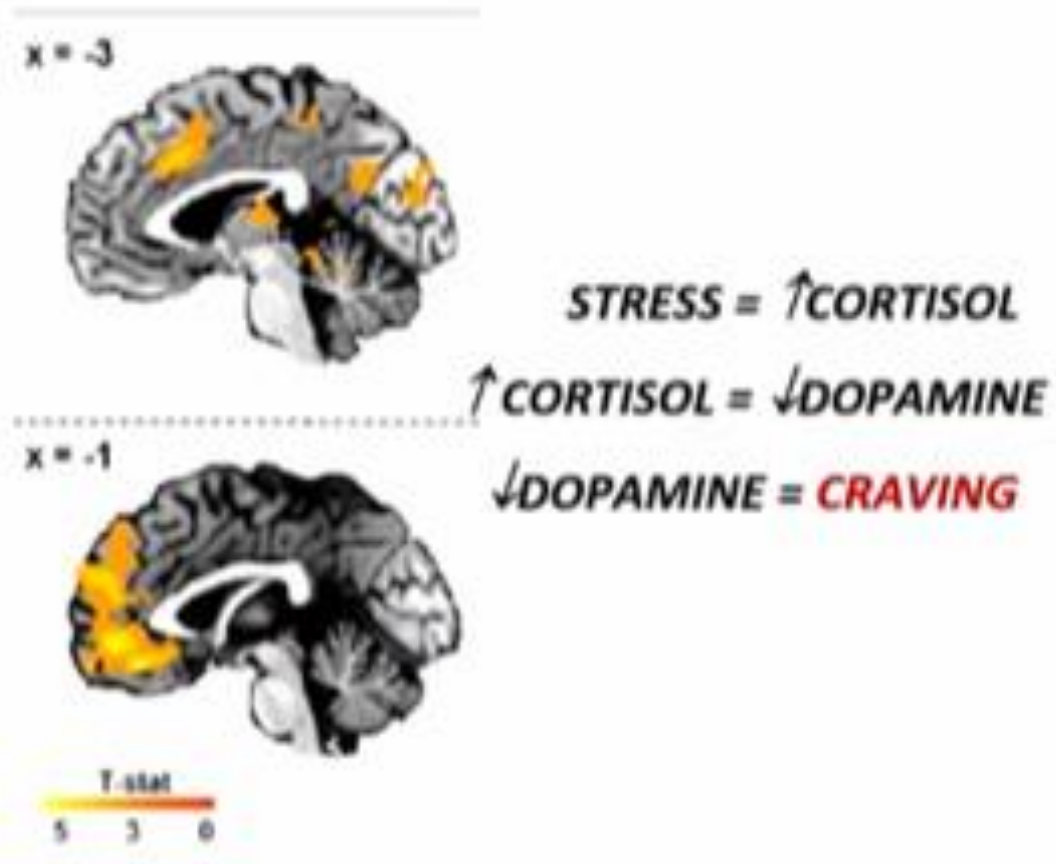
Dopamine Release and the Hedonic (pleasure) Threshold



Excessive dopamine flow triggered by addiction causes dendritic growth on the neuron which results in permanent changes in the brain. This explains why craving is an everlasting consequence that must be respected throughout the lifetime.



Stress increases the stress hormone cortisol which drives down dopamine levels which leads to craving.



Prevention

- ✓ Genetic Testing
- ✓ Consistent Education in Schools & Home
- ✓ Prosocial Activity
- ✓ Regular Family Dinners
- ✓ Create Family Code of Ethics
- ✓ Give Consistent Consequences
- ✓ Pro-active Community Action
- ✓ Treat Problems Immediately

