



ADDICTION: Pediatric vulnerability
and the new concept of Preadiction
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with George F. Koob, Ph.D

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Health Conference
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Bangkok



Presentation objectives



Understanding the cycle of addiction.

Understanding why addiction is a pediatric vulnerability.

Knowing some of the tools useful to prevent teenagers and young adults from entering the cycle of addiction or escaping it if they are already in it.

Understanding the concept of Preaddiction

Presentation outline



Introduction: Addiction is a brain disorder, not a moral weakness!

Part 1: The addiction cycle.

Part 2: Adolescents, young adults and the addiction cycle.

Part 3: Some of the tools to prevent adolescents and young adults to enter the addiction cycle or to escape it if they are already in it.

Conclusion: “ Preaddiction”: A missing concept to prevent addiction

Introduction



- **Addiction is a brain disorder with biological, psychological and social roots. it is not a moral failure. We have a variety of tools we can use for early detection, prevention and treatment.**

Introduction



- This message removes the guilt attached to addiction and motivates the patient to join recovery programs. It also gives hope to the families.





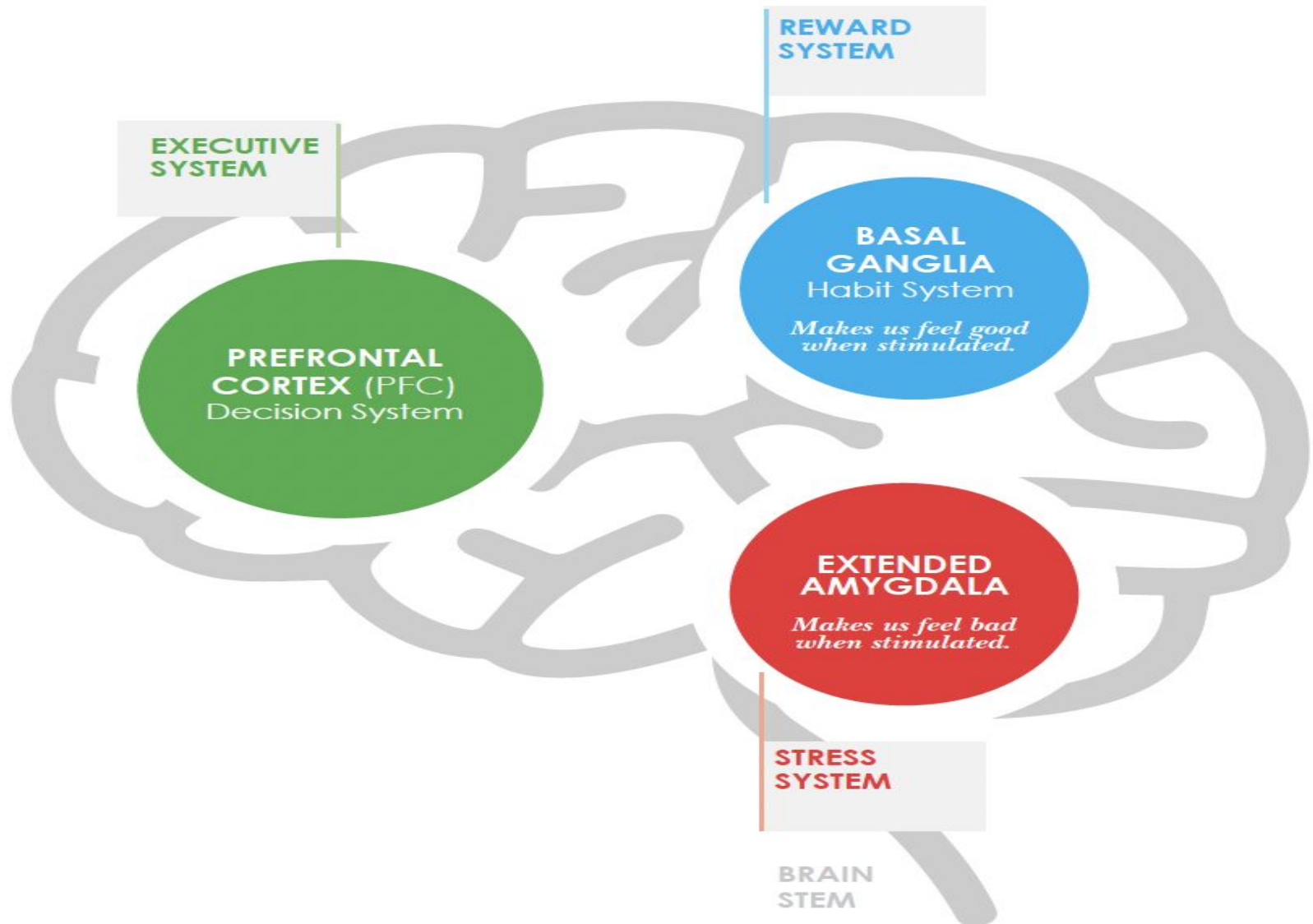


Part 1: The Addiction cycle



- ❑ ADDICTION V PHYSICAL DEPENDENCE
- ❑ ADDICTION is a BRAIN DISEASE, not a moral defect, IT AFFECTS GLOBAL FUNCTIONING and implies LOSS OF CONTROL.
- ❑ PHYSICAL DEPENDENCE is a body physiological adjustment to the used substance. It implies TOLERANCE and WITHDRAWAL.
- ❑ It means that when we are using a SUBSTITUTION TREATMENT like suboxone or methadone, and are REGAINING CONTROL OF OUR LIFE, we are not substituting one addiction for another! We may still be dependent to the substance but not addicted.

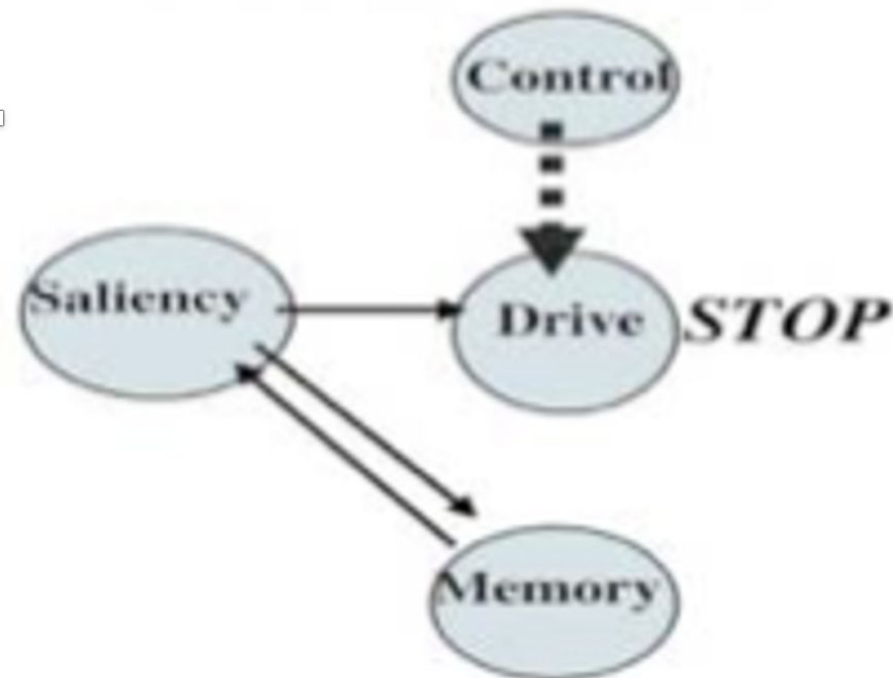
BASIC HUMAN BRAIN GEOGRAPHY



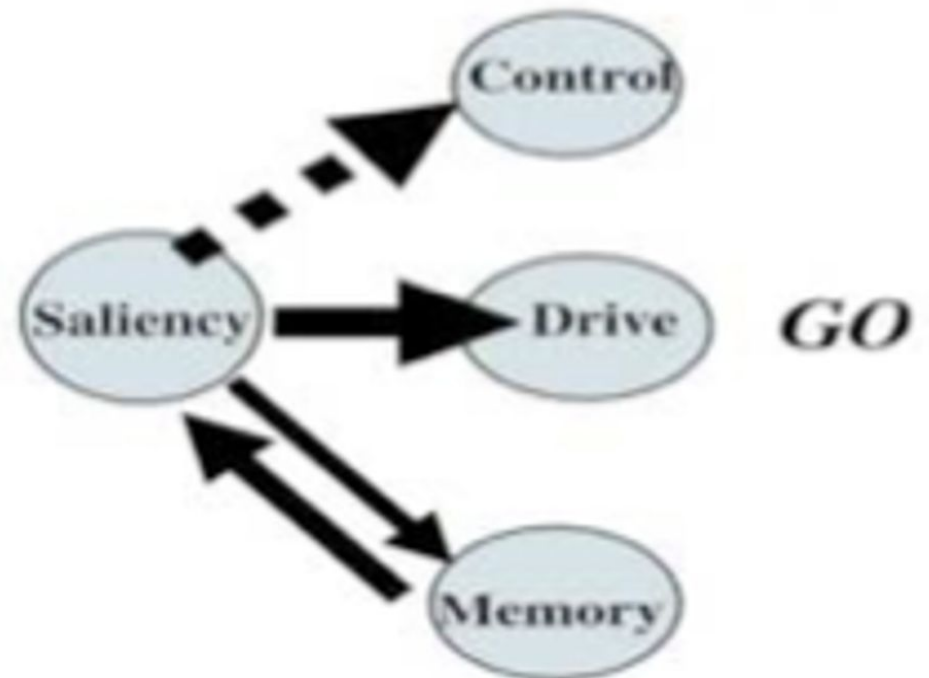


Nora Volkow, NIDA

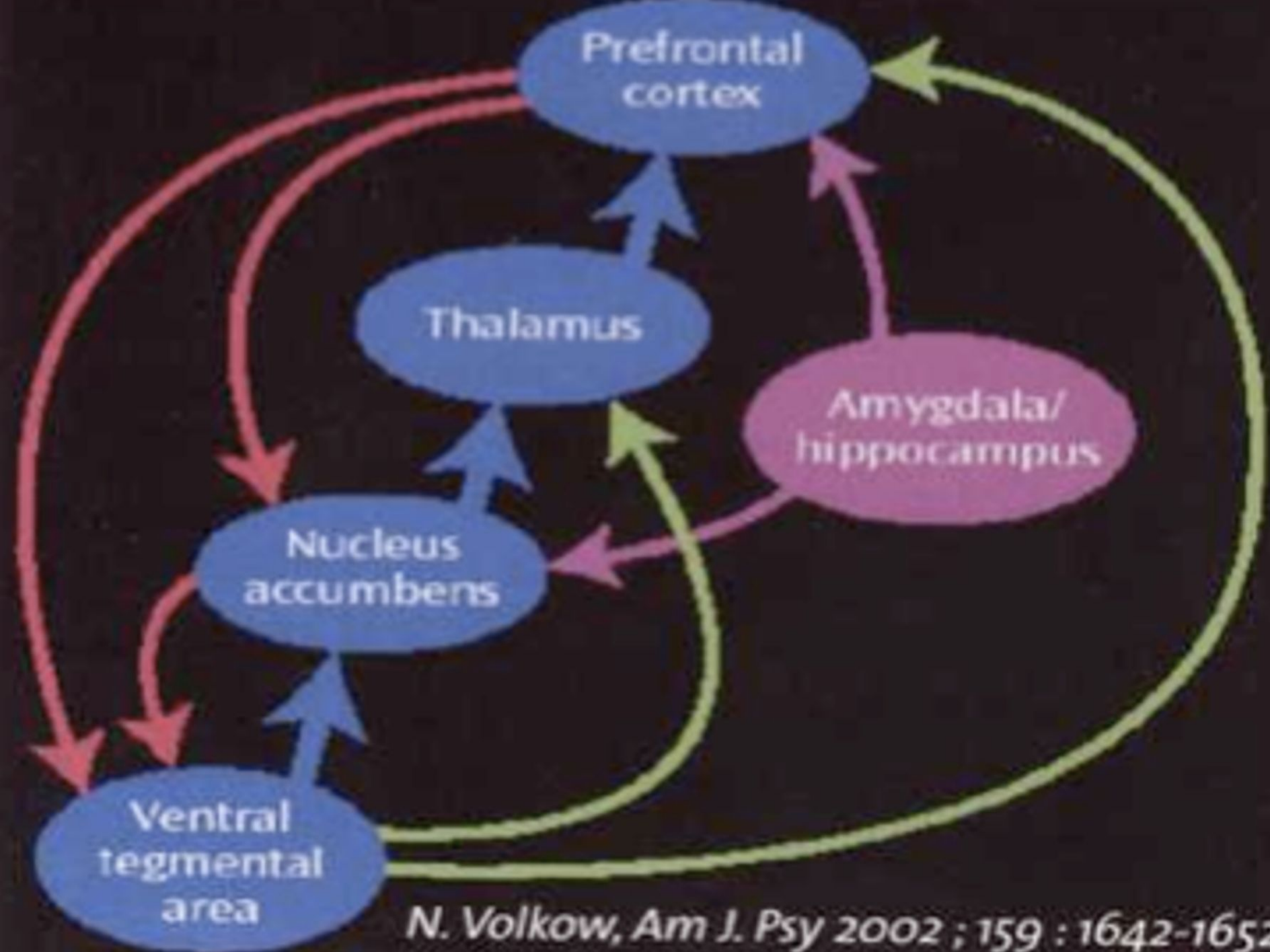
Non Addicted Brain



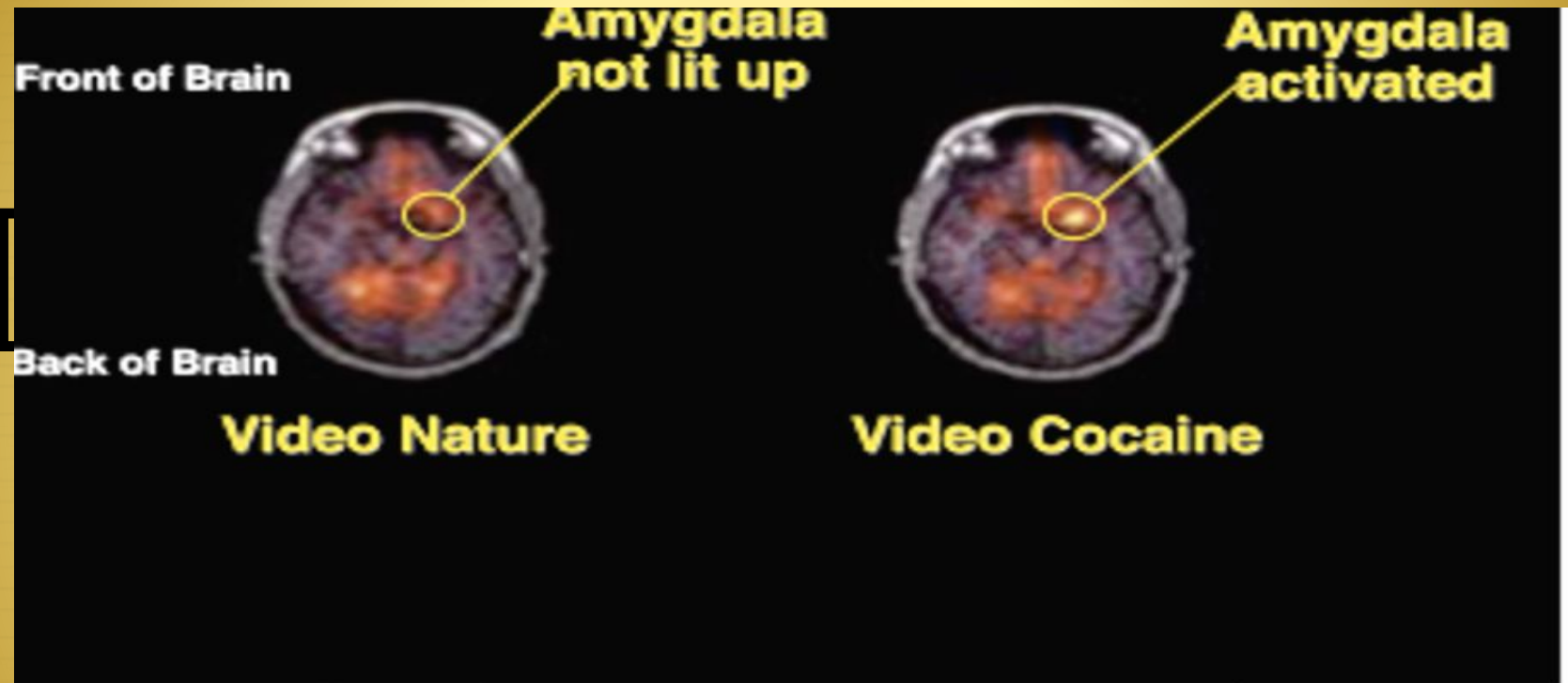
Addicted Brain



Courtesy of NIDA



The Amygdala Remembers and anticipates intense pleasure!



The trap is set !

tesy of NIDA

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Addicted Brain

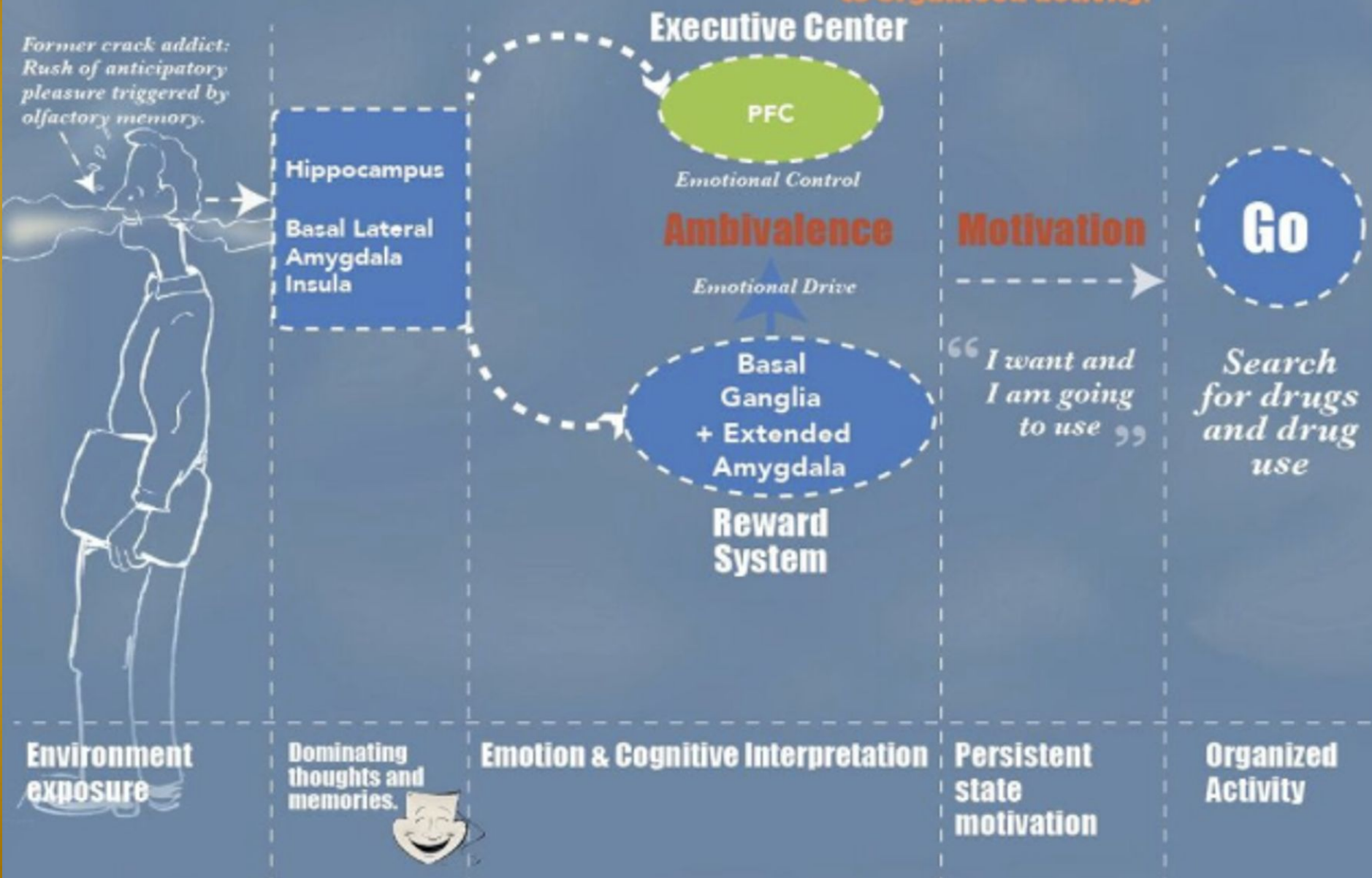
From emotion to cognitive interpretation,

to motivation,

to organised activity.

PatrickBordeaux^{md}

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Non-Addicted Brain

From emotion to cognitive interpretation,

to motivation,

to organised activity.

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Former crack addict:
Rush of anticipatory
pleasure triggered by
olfactory memory.



Hippocampus
Basal Lateral
Amygdala
Insula

Executive Center

PFC

Emotional Control

Ambivalence

Emotional Drive

Basal
Ganglia
+ Extended
Amygdala

Reward
System

Motivation

Stop

“I am not
going
to use”

I keep
walking
and
forget
about
drugs

Environment
exposure

Dominating
thoughts and
memories.



Emotion & Cognitive Interpretation

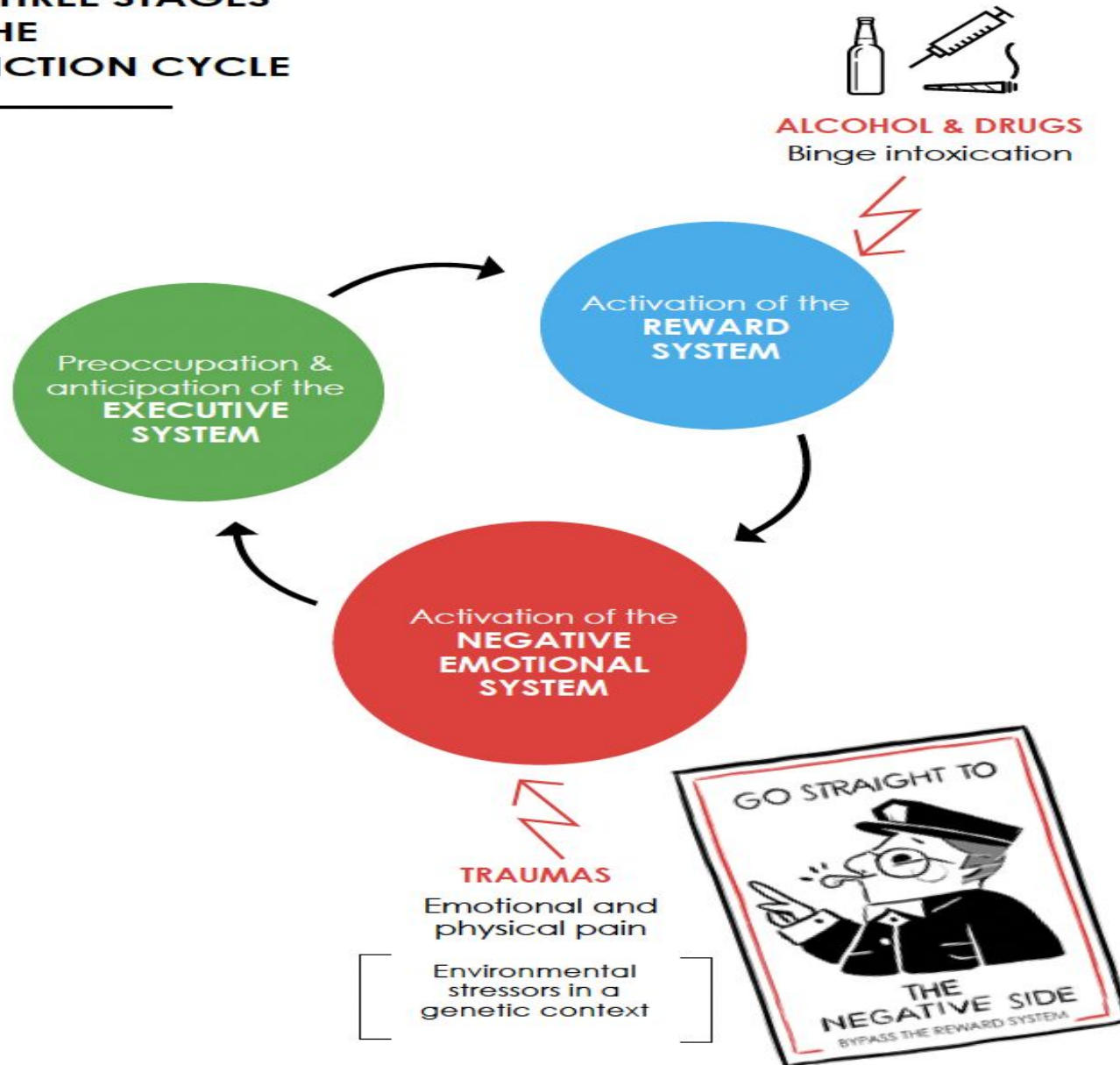
Persistent
state
motivation

Organized
Activity

George F. Koob, Director NIH, NIAAA

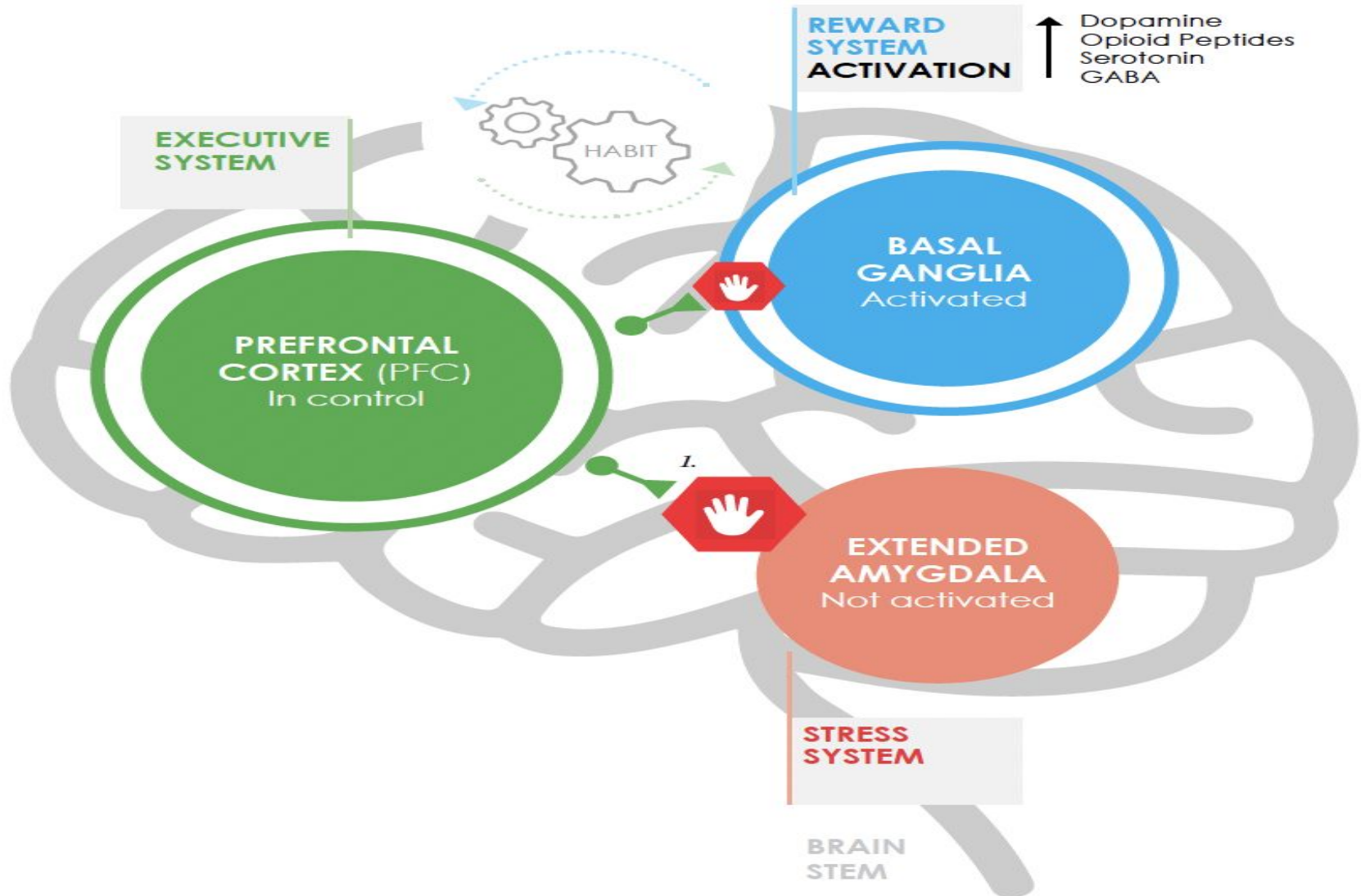


THE THREE STAGES OF THE ADDICTION CYCLE

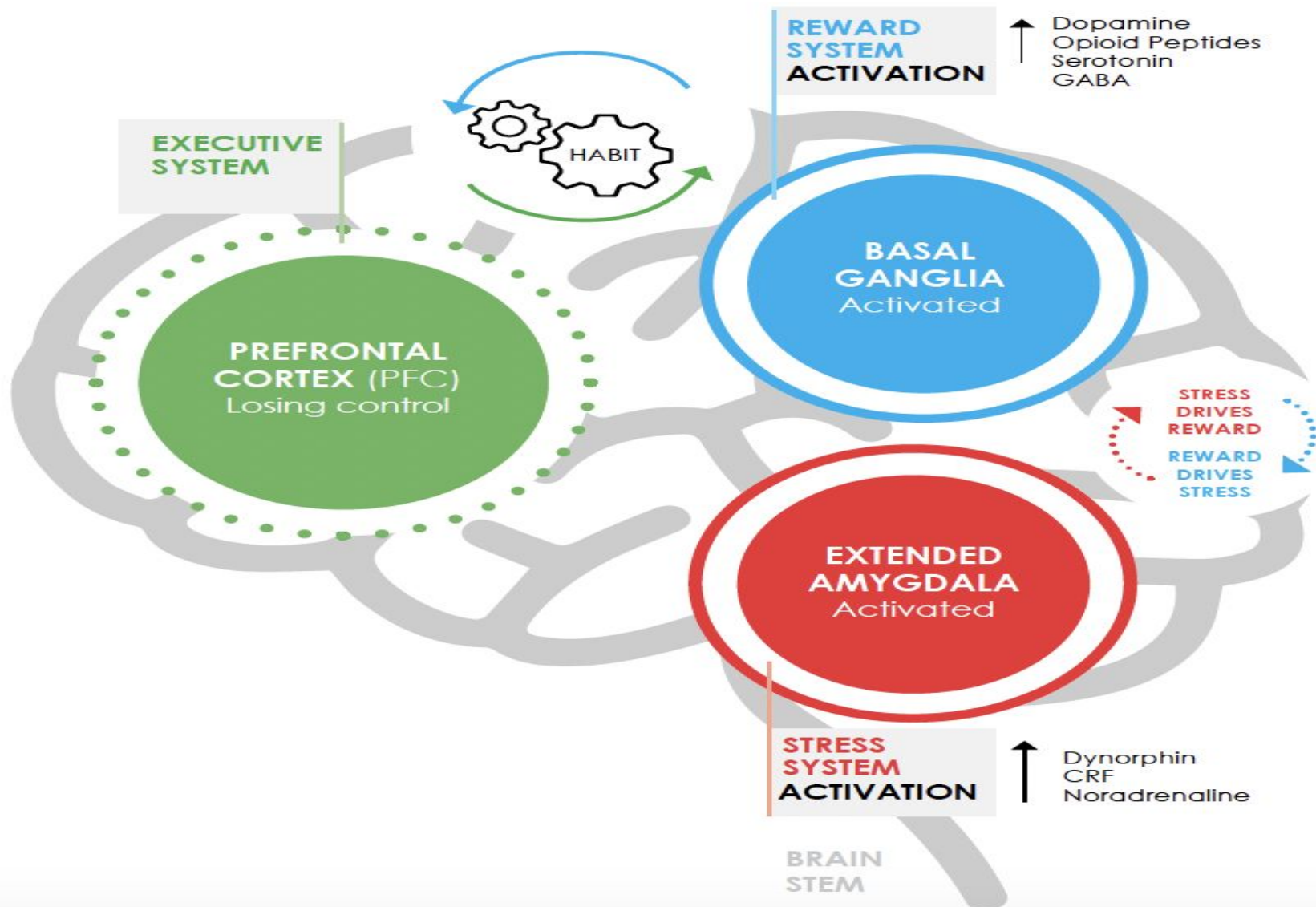


STAGE 1: IMPULSIVITY RECREATIONAL & CASUAL USE

1. The PFC is in control, it can contribute to keep the reward and stress systems from being overactivated.

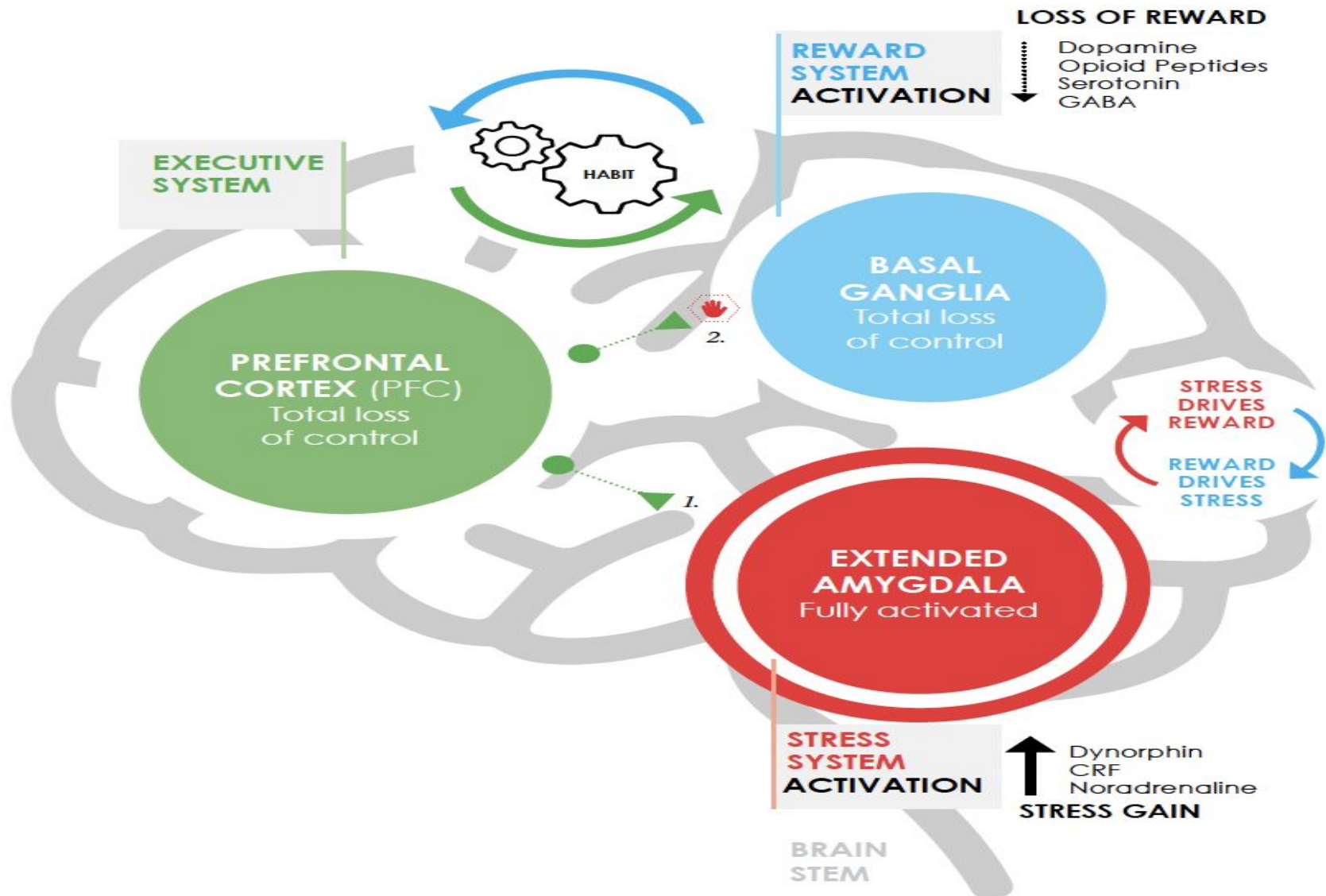


STAGE 2: TRANSITION FROM IMPULSIVITY TO COMPULSIVITY

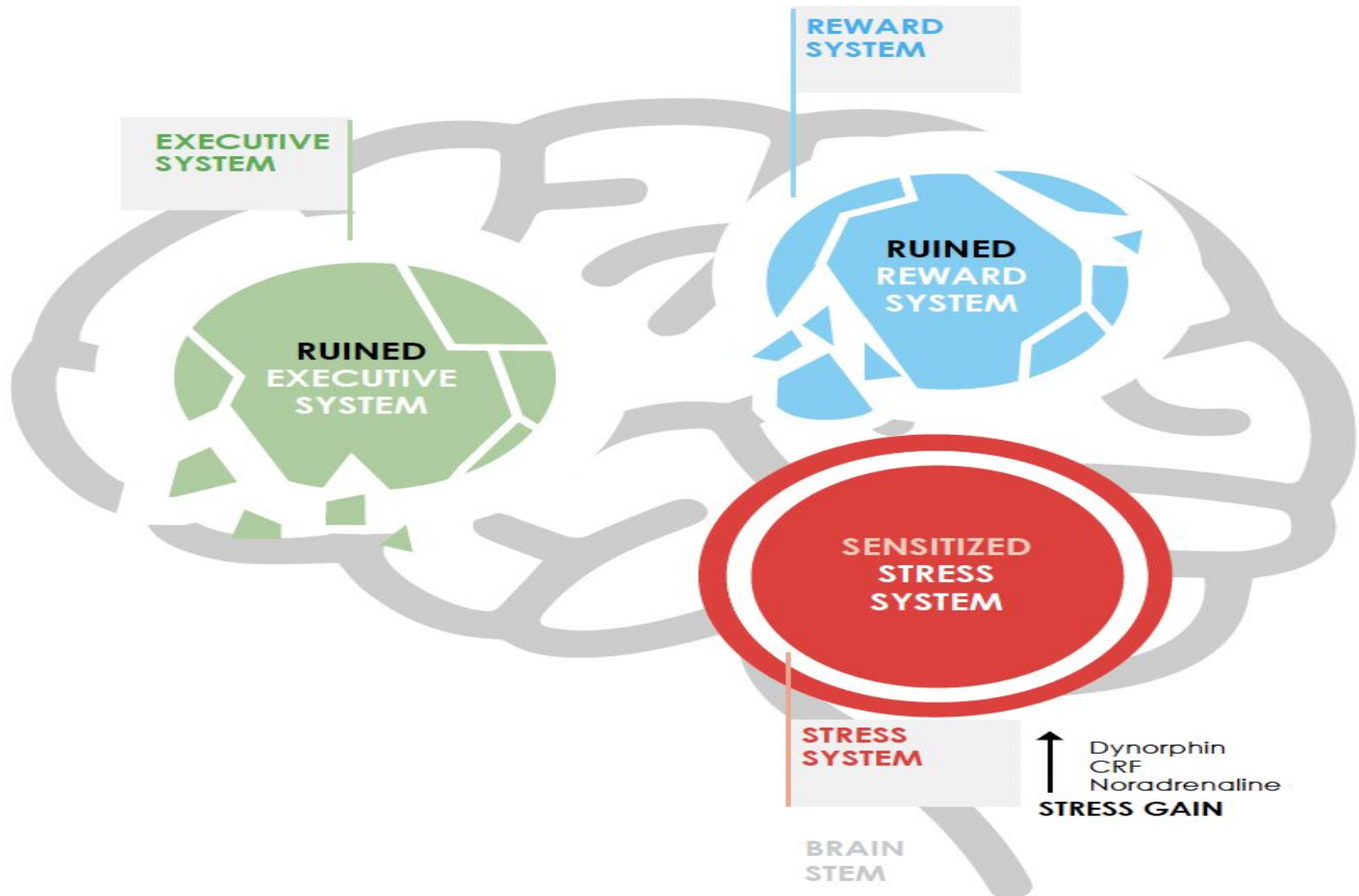


STAGE 3: COMPULSIVITY AND ADDICTION

1. The PFC lost control, it can no longer contribute to keep the stress system from being overactivated.
2. The reward system is washed-out + no more control from the PFC.

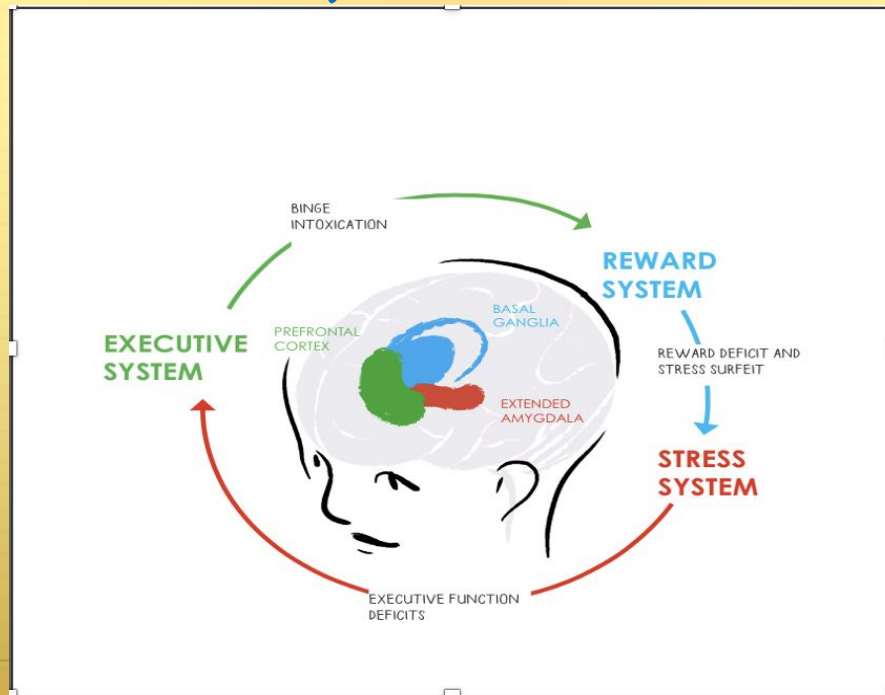


CONSEQUENCES OF COMPULSIVITY



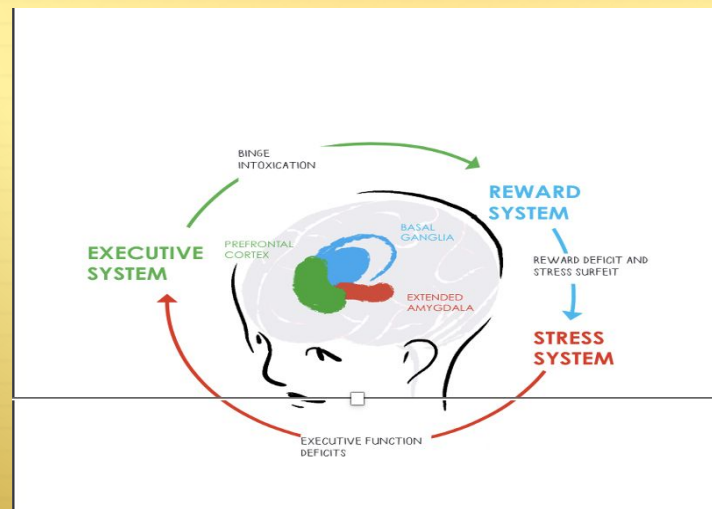
The addiction cycle

- STAGE 1: Binge intoxication stage
- Activation of the basal ganglia
- The Brain Reward system



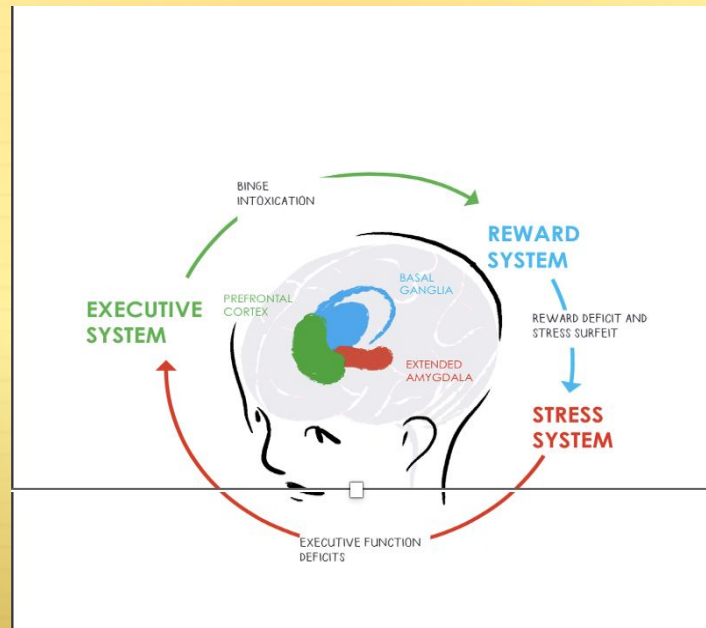
The addiction cycle

- **STAGE 2: NEGATIVE AFFECT STAGE**
- Activation of the extended amygdala
- The Brain Stress System
- The concept de stability or hedonic balance



The addiction cycle

- STAGE 3 : PREOCCUPATION AND ANTICIPATION STAGE
- Stimulation of the prefrontal cortex, (the executive system) Deficit of the executive function and craving.



The two biggest dangers on the recovery road

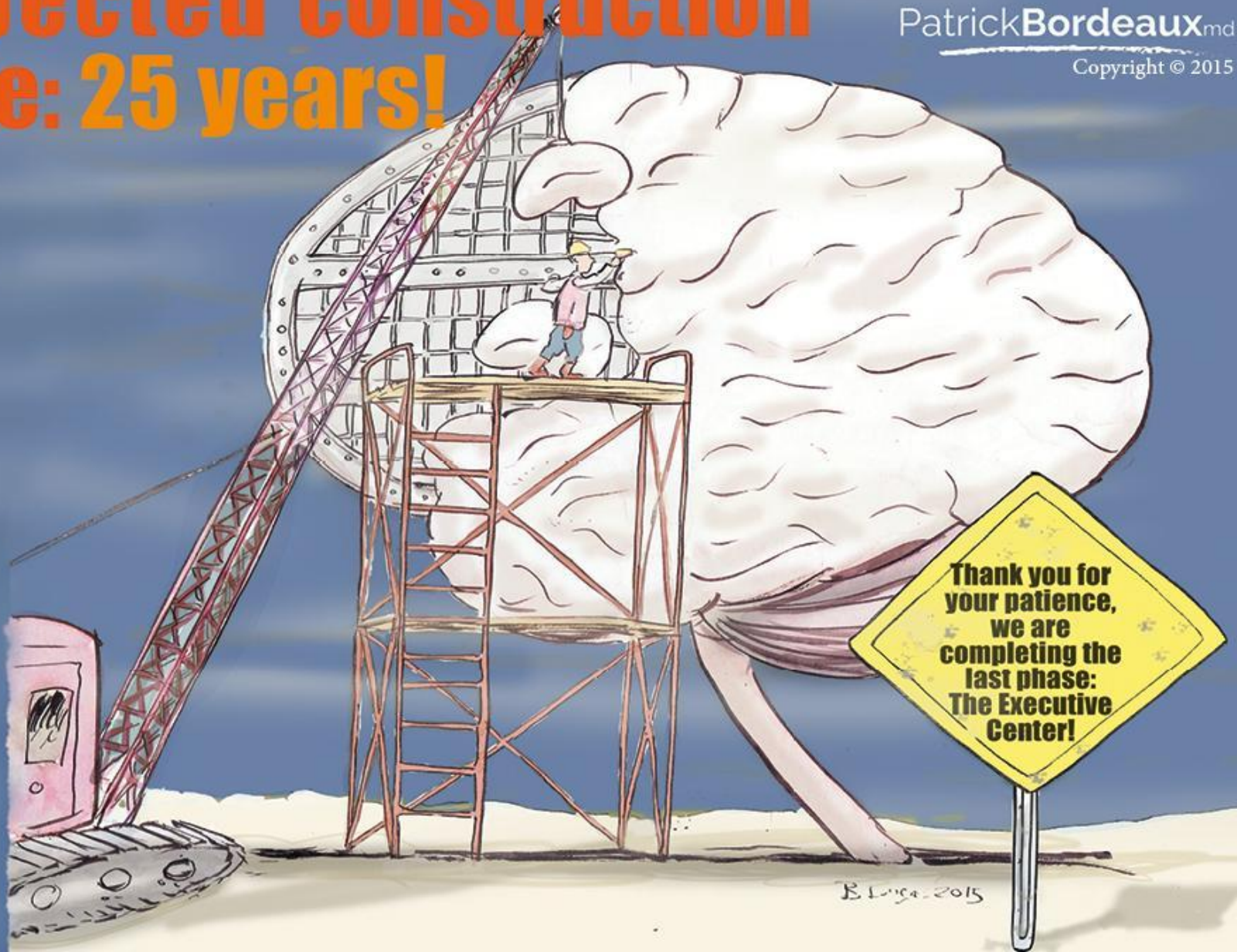
- INCENTIVE SALIENCE AND HYPERSENSITIVITY TO PHYSICAL AND ÉMOTIONAL PAIN (Hyperalgesia et hyperkatifeia)



**Human brain
expected construction
time: 25 years!**

PatrickBordeaux_{md}

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Knowing teenagers! The vendor.



Knowing teenagers! RENTAL CARS!



Part 2: Adolescence and the addiction cycle



- Brain growth: From the back to the front.
 - 1/ Brain stem
 - 2/ The Reward System (The basal ganglia)
 - 3/ The negative affect stage(The extended amygdala)
 - So, **The adolescent's brain is mostly driven by the search for pleasurable experiences and overwhelmed by all kind of emotions.**
 - **« Addiction almost always starts during adolescence. »
Jean Bernard Daepfen, M.D « La Maladie du Désir.
(The Disease of Desire)**

Part 2: Adolescence and the addiction cycle



- **The DOPAMINE and SEROTONIN levels are lower during adolescence.** So, adolescents may look for more extreme risky behaviors to release enough of these neurotransmitters to reach a sufficient degree of pleasure. **So, Search for RISKS and EUPHORIA »**



Part 2: Adolescence and the addiction cycle



- ❑ **Neurotransmitters system: GABA/GLUTAMATE:**
- ❑ The **GABA** system (inhibitor, brake) is still not completed.
- ❑ The **GLUTAMATE** system (stimulator, accelerator) benefits from an early growth
- ❑ **This predominance of the glutamate system increases:**
- ❑ **Impulsivity, emotional instability and make children and adolescents more vulnerable to epilepsy.**

❑

Part 2: Adolescence and the addiction cycle



- ❑ **1970: WALTER MISCHEL** (Professor of psychology, Stanford University, California) and the Marshmallow experiment.
- ❑ **The ability to delay gratification:**
- ❑ **1990:** Better cognitive and academic results among the subjects that have been capable to delay the gratification.
- ❑ **2011:** Brain imaging of those subjects, now in their 40s, that were capable to delay the gratification.
- ❑ The prefrontal cortex was more active in the individuals that were able to delay the gratification.

Part 2: Adolescence and the addiction cycle

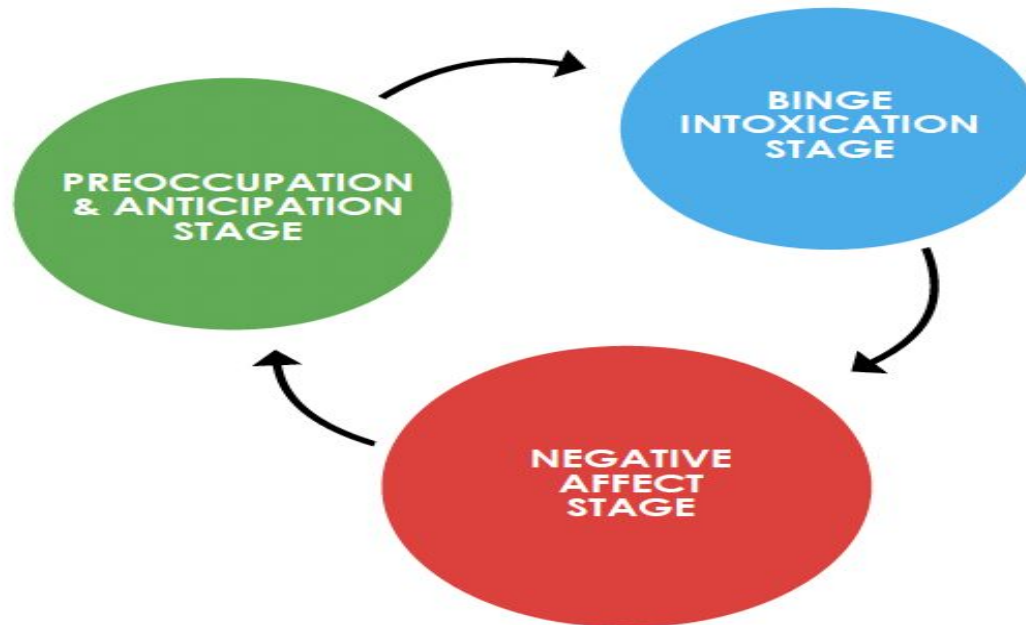


- **ROPER V. SIMMONS (2005)**
- A landmark decision by the Supreme Court of the United States in which the Court held that it is unconstitutional to impose the death penalty for crimes committed under the age of 18.
- In a 5-4 opinion delivered by Justice Anthony Kennedy, the Court ruled that executing minors is « a cruel and unusual punishment » prohibited by the Eighth Amendment.
- The Justices took into consideration the immaturity of the brain at that age as presented to them by neuroscientists.

Part 3: Escaping addiction

- 1/ TO ESCAPE ADDICTION WITH PHARMACOTHERAPY
- 2/ TO ESCAPE ADDICTION WITH NONPHARMACOLOGICAL TOOLS
 - MOTIVATIONAL INTERVIEWING
 - COGNITIVE BEHAVIORAL THERAPY
 - LES SUPPORT GROUPS (AA, NA, GA)
 - MEDITATION AND SPIRITUALITY

THE POSSIBLE INTERVENTIONS ON THE THREE STAGES OF THE ADDICTION CYCLE



WE REMEMBER THAT THE THREE STAGES AROUND THE ADDICTION CYCLE ARE:

- The binge/intoxication stage taking place for the most part in what we call the "Reward system" (The Basal Ganglia).
- The withdrawal negative affect stage taking place for the most part in what we call the "Negative Emotional System" (The extended amygdala).
- The preoccupation/anticipation stage taking place for the most part in what we call the "Executive System" (The prefrontal cortex).

Part 3 Escaping Addiction

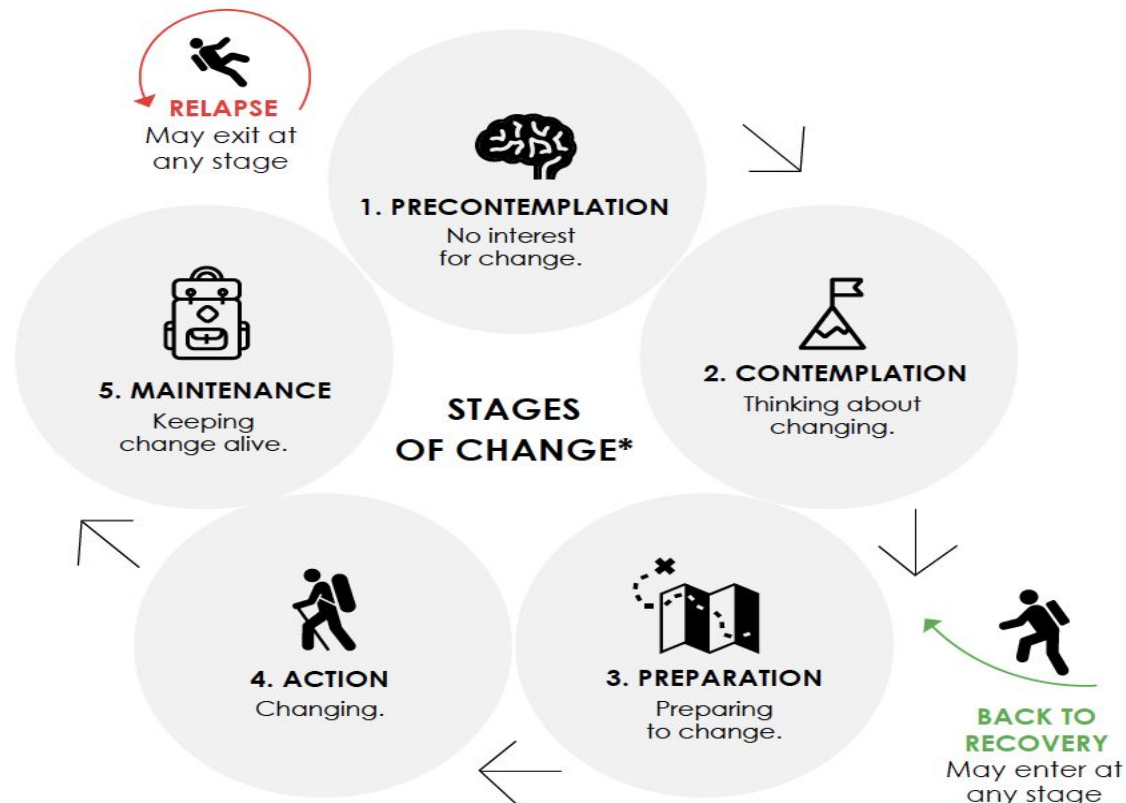
TARGETING THE THREE STAGES OF THE ADDICTION CYCLE

The goal of all treatments is to target one or more of the specific three steps of the addiction cycle and modulate its level of activation in order to help the system to go back to the homeostatic point of equilibrium.

<div>Rx</div> <div>Product</div>	Target	REWARD SYSTEM (BASAL GANGLIA) BINGE INTOXICATION STAGE	NEGATIVE EMOTIONAL SYSTEM (EXTENDED AMYGDALA) NEGATIVE AFFECT STAGE	EXECUTIVE SYSTEM (PREFRONTAL CORTEX) PREOCCUPATION & ANTICIPATION STAGE
Methadone		✓	✓✓	
Buprenorphine		✓	✓	
Varenicline		✓	✓	
NRT NICOTINE REPLACEMENT THERAPY			✓✓	
Bupropion			✓	✓✓
Acamprosate			✓	✓✓
Naltrexone		✓		

Part 3 Escaping Addiction

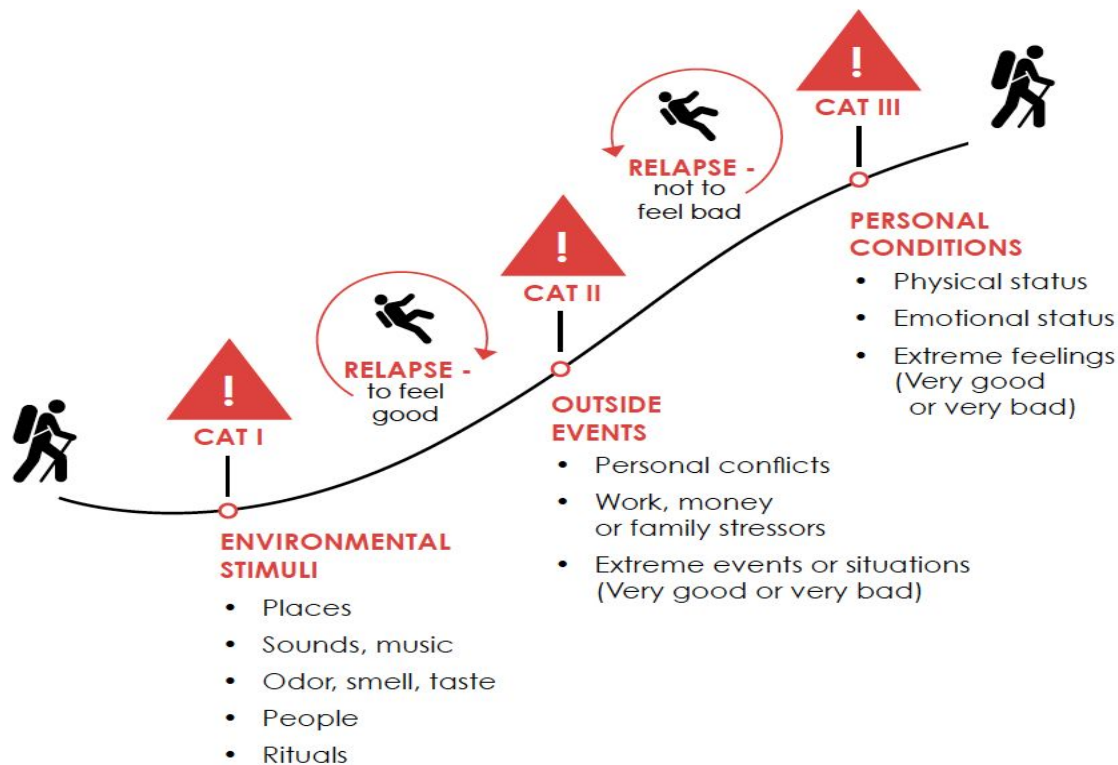
THE CYCLE OF CHANGE



Part 3 Escaping Addiction

THE KOOBIAN CBT ROAD TO RECOVERY

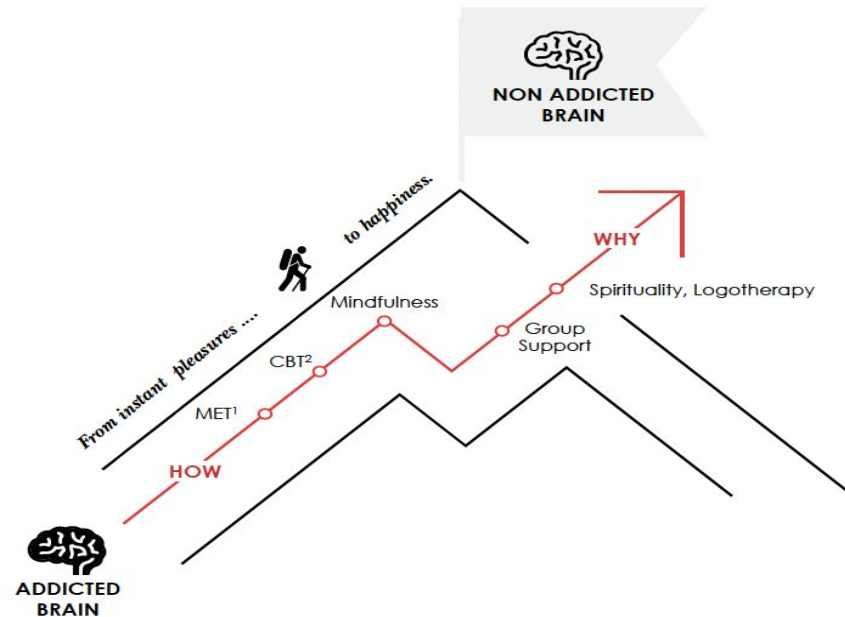
CBT is like a survival manual and a map, carried by a hiker in its backpack in order to keep moving along a treacherous mountain trail.



Part 3 Escaping Addiction

JOURNEY FROM AN ADDICTED BRAIN TO A NON-ADDICTED BRAIN

Various interventions may be used to help someone move from the search for immediate and intense pleasures to addiction-free happiness.



1. Motivational Enhancement Therapy
2. Cognitive Behavioral Therapy
3. Mindfulness-based cognitive therapy

Part 3: Escaping Addiction

- « It is not enough to live; you must have a reason to live. »
Viktor Frankl (Logotherapy)



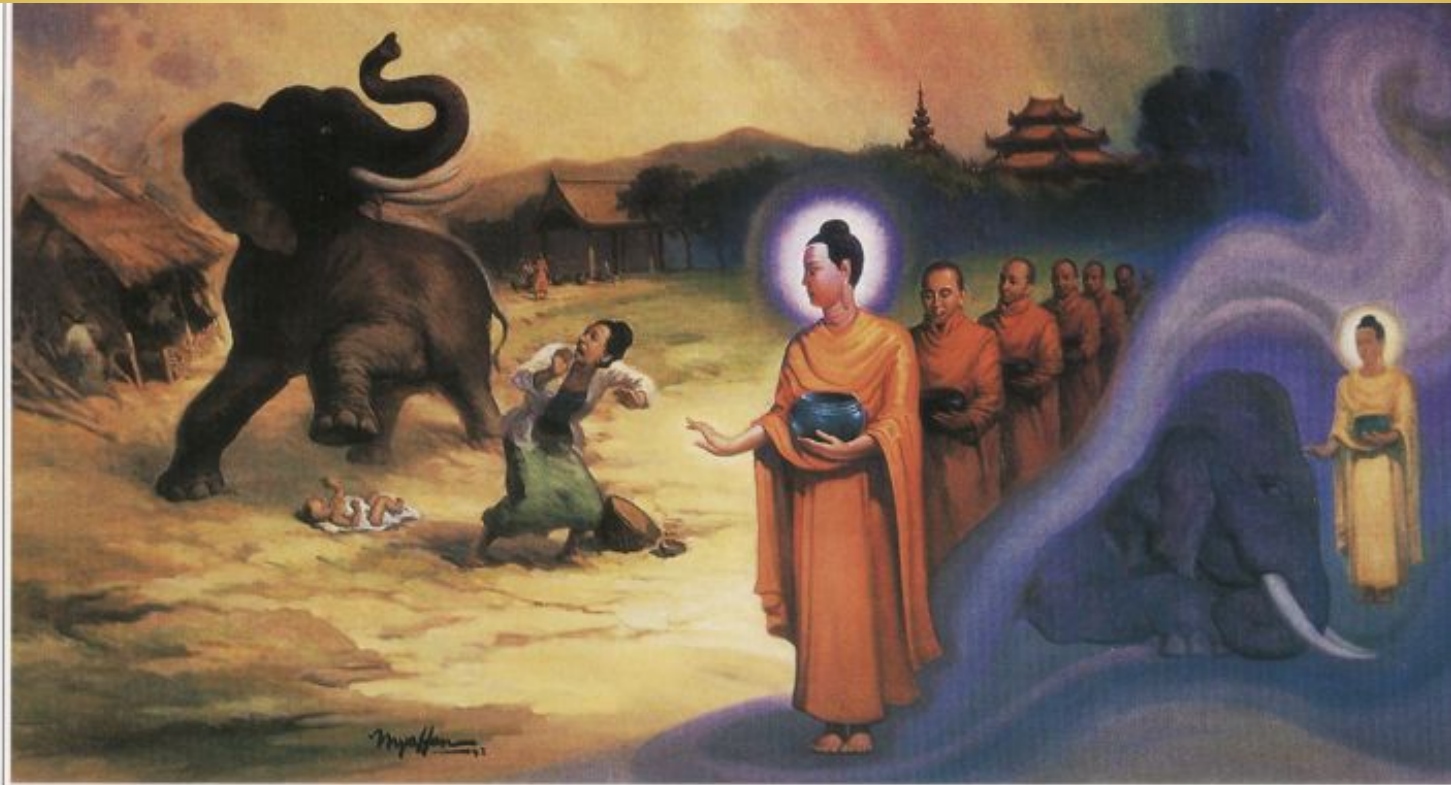
**He who has a why to live
can bear almost any how.**

Friedrich Nietzsche

Instant pleasure vs happiness

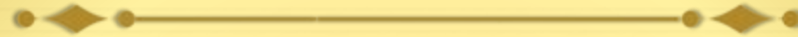


Part 3 Freedom from Fear



The Buddha subduing the fierce, drunken elephant, Nalagiri; released by the wicked Devadatta.

As a conclusion, Let's talk about PREVENTION



THE CONCEPT OF PREADDICTION

PREDIABETES AND PREADDICTION: SAME STRATEGY

« **Preaddiction-A Missing Concept for Treating Substance Use Disorders**” *JAMA Psychiatry*. 2022;79(8):749-751.
doi:10.1001/jamapsychiatry.2022.1652 , A.
Thomas McLellan, PhD¹; George F. Koob, PhD²; Nora D. Volkow, MD³

THE CONCEPT OF PRE-ADDICTION



In 2001 the American Diabetes Association introduced the concept of PREDIABETES.

They defined it by elevated scores of:

Impaired glucose tolerance

Impaired fasting glucose

The term of PREDIABETES was specifically selected to trigger motivation in the public to avoid full blown diabetes.

THE CONCEPT OF PRE-ADDICTION



The results of this new strategy were:

- A Higher rate of early detection
- A shorter delay between symptoms onset and the beginning of a treatment.
- Success in stopping progression to diabetes

The terms PREDIABETIC or PRECANCEROUS for cells have a motivational value. The people concerned become motivated to look for early intervention and clinical follow up.

THE CONCEPT OF PRE-ADDICTION



- **WHY NOT USING THE SAME STRATEGY FOR ADDICTION?**
- **The bad news:** The immediate consequences of substance abuse can be severe and deadly.(accidents, violent behaviors, overdose, death)
- **The good news:** The evolution towards addiction (loss of control of personal and professional life) is a slow and progressive process and is not that frequent.
- **This long latency period gives us many opportunities to intervene and stop the progression of the disease.**

THE CONCEPT OF PRE-ADDICTION



□ INTERVENING DURING THE PREADDICTION PHASE:

- Physical and mental evaluation
- Computerized version of Cognitive Behavioral therapy for Substance Use Disorder (SUD)
- Motivational Interviewing (MI)
- Influencers and virtual coaches on Twitter, Tik Tok, You Tube to motivate healthy behaviors adapted to the state of preaddiction.

THE CONCEPT OF PRE-ADDICTION



- The authors suggest to consider the DSM-5 two to five criteria, necessary to diagnose a substance use disorder (light to moderate) as the beginning of an operational definition for the state of PREADDICTION.
- This term will motivate the patients to engage in recovery the same way a person hearing the terms PREDIABETIC or PRECANCEROUS CELLS is motivated to change her or his way of life and start a treatment to avoid the worst outcome.

CONCLUSION



□ “A patient will not care how much you know until he knows how much you care”

It is particularly true when we are treating a disease called **ADDICTION!**

Share the message!

