

AACAP 2024

OCT 14-19 | SEATTLE, WA

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AMERICAN ACADEMY OF
CHILD & ADOLESCENT
PSYCHIATRY

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Neuroscience in the Clinic and
the Classroom.
Use simplified drawings of the
reward circuit to engage your
patients and inspire learners

#AACAP24

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Disclosures 1

	Employer	Grant/Rsc h	Royalties	Travel Support this Mtg	Travel Support Other Mtg	Advisory Board	Stock
Idicula	Baylor	none	none	Baylor, Texas Child Hosp	Baylor	Daya Women's Shelter	none
Jaschek	Wash Univ	none	none	Wash Univ	none	none	none
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Disclosures 2

	Employer	Grant/Rsch	Royalties	Travel Support this Mtg	Travel Support Other Mtg	Advisory Board	Stock
Shoemaker	Univ So California/ Childrens Hospital Los Angeles	none	none	Childrens Hosp Los Angeles	none	none	Regeneron, Intuitive Surgical, Abbvie, Gilead, Pfizer, Amgen, Astrazeneca, Merck, Novartis
Stevens	Univ of Iowa	NIH, Univ of Iowa	Univ of Iowa	Univ of Iowa, NIH	Klingenstein Phil, Univ of Iowa	Klingenstein Phil, National Neurosci Curric Initiative	None

Learning Objectives

At the conclusion of this activity, the participant should be able to:

- Draw a simplified version of the dopaminergic reward circuit of the brain and will be able to describe how this circuit is involved in the pathophysiology and treatment for Attention Deficit Hyperactivity Disorder (ADHD) and Substance Use Disorder (SUD).
- Identify how exposure to negative racial/ethnic stereotypes may alter elements of this circuit.
- Integrate the use of this drawing, patient-centered language, and motivational interviewing to engage patients and families in treatment for ADHD and substance use disorders.
- Teach this subject to medical students, psychiatry residents, and other learners.

Rules of Engagement

- In addition to neuroscience, we will be discussing race, ethnicity, and stigma in this presentation
- Please endeavor to be curious and open-minded
- Please be respectful and kind when discussing the patient in the clinical vignette and when addressing your colleagues

Johnny 1: Nine year old boy with ADHD

- 9 year old African American boy, no past psych hx; presents to clinic with parent due to concerns for difficulty following directions, challenging behaviors at home and school, & emotional dysregulation
- He is a bright young man, who teachers say understands academic concepts above his grade level, but he often needs instructions repeated multiple times, is easily sidetracked, messy and disorganized; he is hyperactive, a bit of a daredevil, he makes “silly mistakes”, and is forgetful
- At home, he often spends hours playing video games and can get upset when redirected towards tasks like homework or chores. Recently he had a video game console removed from his room because when told to clean his room he played the game instead.
- He is in 4th grade; parents divorced at a young age. Plays soccer and likes video games.
- Mostly a happy and playful child, although he has made some self-critical comments about how he is a “bad kid” who “just can’t do anything right”

Review of Reward Circuitry

With much gratitude to
the National Neuroscience Curriculum Initiative
And
Khan Academy



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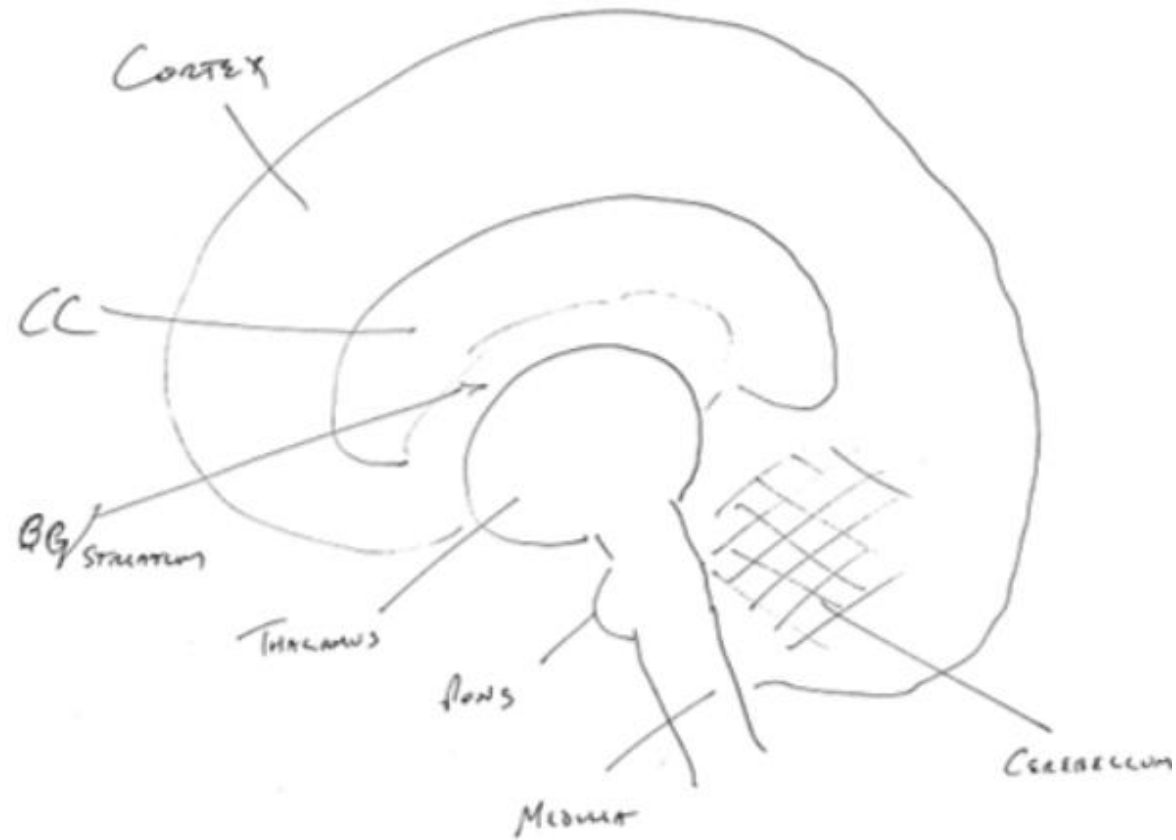
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Let's remember the reward circuitry



Let's remember the reward circuitry

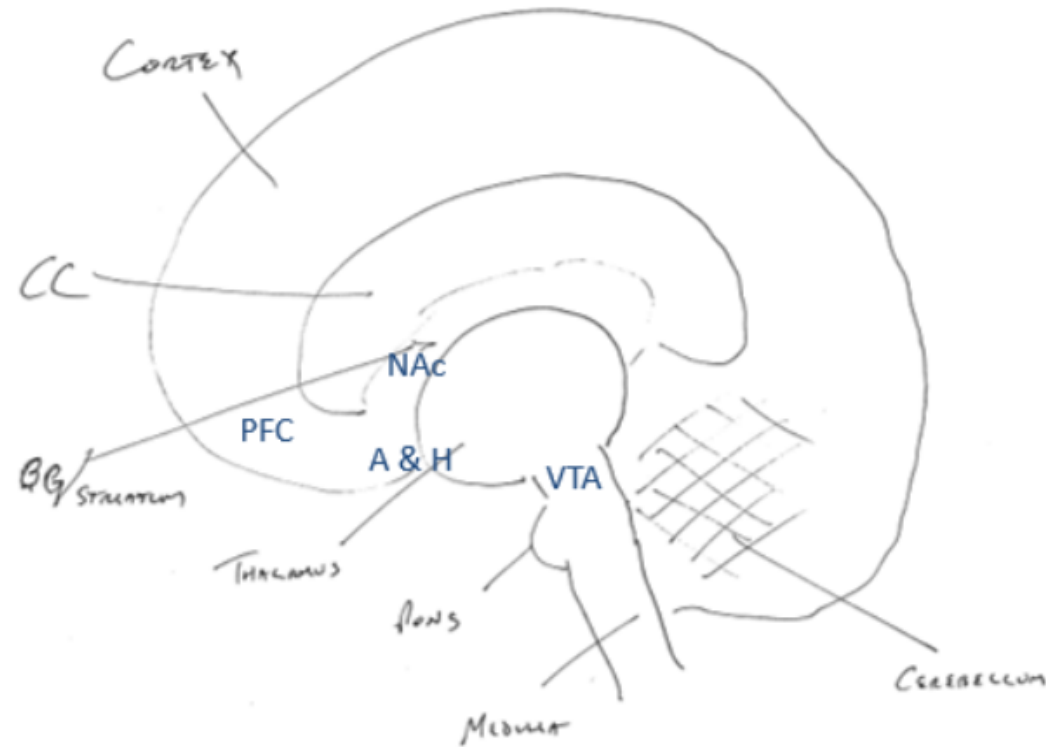
BASIC MODEL:

PFC: MOTIVATION / BEHAVIORAL REGULATION & CONTROL

AMYGDALA &
HIPPOCAMPUS:
AFFECT & MEMORY

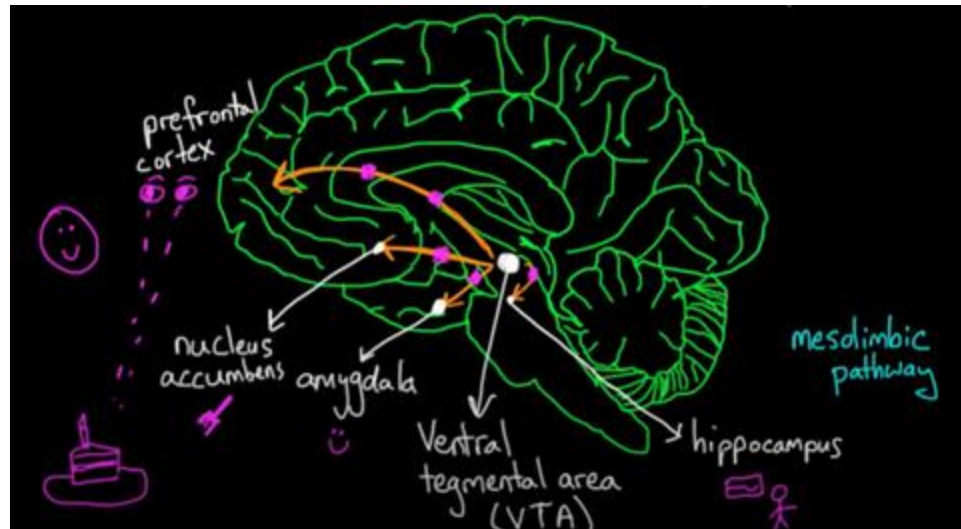
NUCLEUS ACCUMBENS:
REWARD

VTA: DA SIGNAL



Let's remember the reward circuitry

- <https://youtu.be/YzCYuKX6zp8>



Let's apply the reward circuitry to ADHD

[ADHD reward on Vimeo](#)

Let's recall how ADHD medication impacts brain circuitry

- [ADHD treatment and conclusion on Vimeo](#)

Structural Racism Affecting Neurocircuitry

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Original Article

Exposure to negative stereotypes influences representations of monetary incentives in the nucleus accumbens

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How do we communicate to our patients about their lived experiences affecting neurocircuitry?



Introduction



Traditional media has over-saturated false, unflattering, and harmful depictions of racial and ethnic minorities

E.g. African Americans more likely to be depicted as perpetrators of crimes

E.g. Latinos are twice as likely as Whites to appear in newspaper articles about social problems



Encountering negative stereotypes can be a source of ***stigma-related stress for minority individuals***



Work previously demonstrated detrimental effects of stigma-related stress on performance in stigmatized domain

Little research on lingering effects of stereotype exposure on unrelated neural and psychological processes



Study Aims

- Few studies have directly examined how stress influences the *anticipation* and *consumption* of rewards
- Stress can influence the response of the NAcc to rewards
- **Aim:**
 - To examine whether stigma-related negative stereotypes act like other stressors to alter how the brain processes subsequent rewards

Study Design



Design

Random assignment of Mexican American participants to view either stigmatizing or non-stigmatizing video clips in rapid succession



Measurement of effects on neural processing

Monetary incentive delay (MID) task in MRI scanner



Hypotheses

Stigmatized participants, relative to non-stigmatized participants, to demonstrate lower overall NAcc activity when processing rewards

Results



Exposure to negative stereotypes about one's group can influence neural processing of incentives

Stereotype exposure effects on the NAcc when anticipating incentives could be important for understanding mental health disparities



Results of the self-reported affective responses suggest that stigmatizing media messages influenced the arousal of participants

*Consistent with a fatiguing effect of stigma
People who experience stigma do not necessarily report lower self-esteem or regard for one's social group*



Univariate analyses suggest that stigma may have influenced NAcc response during reward anticipation

Limitations

Generalizability: only one group of the Latino demographic tested

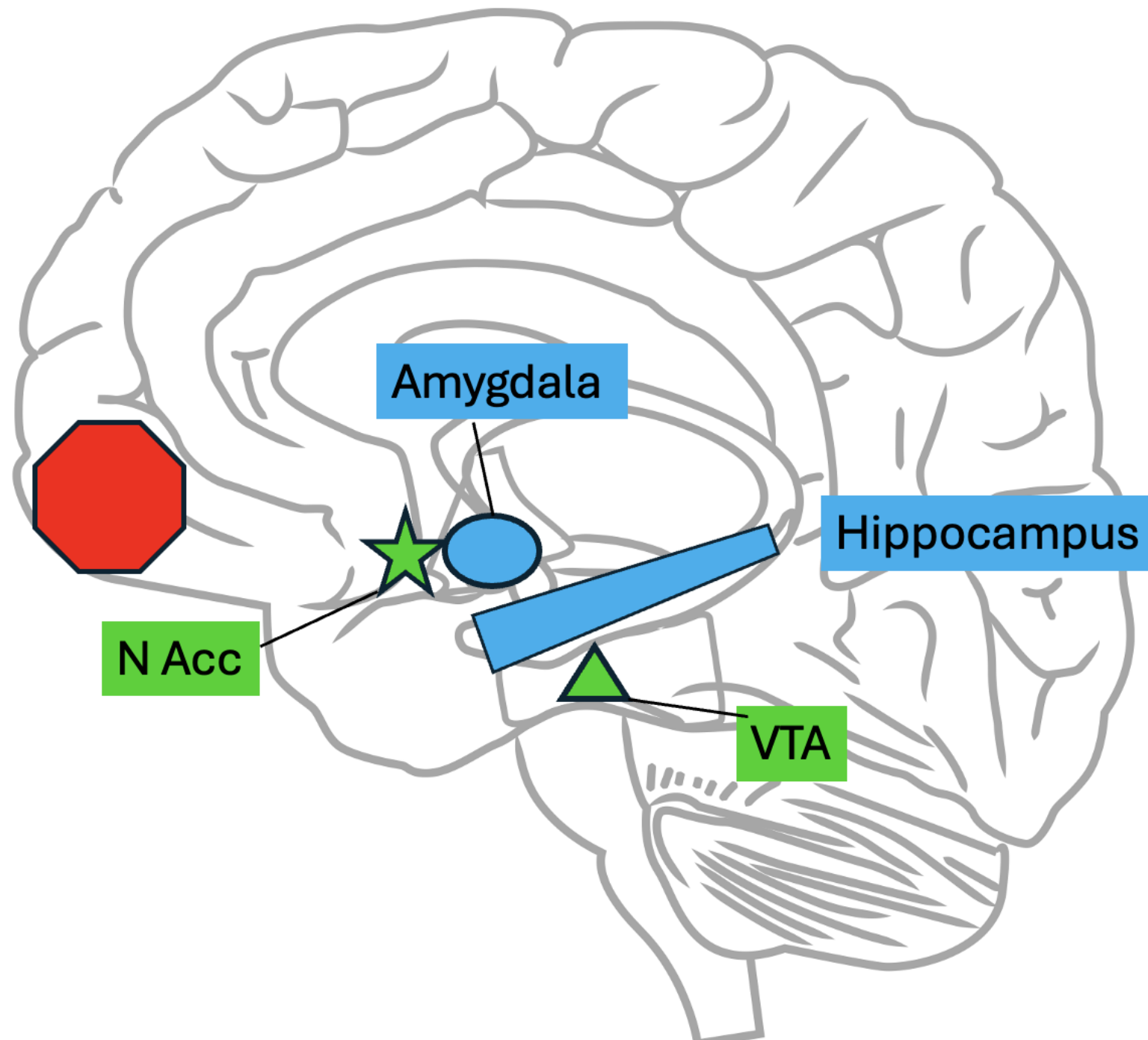
Only one type of ethnicity-related stressor that disadvantaged minorities experience

Unknown how experience with stigma and discrimination influenced their response to the stigma manipulation

Let's Draw!

1. At the level of used to discuss with CAP colleagues or medical trainees, detailing the different brain regions involved in the reward circuit
2. At the level used to provide psychoeducation to families, patients, and laypeople, showing the reward circuit in a way that could be explained at the bedside or in clinic

Prefrontal Cortex



Amygdala

N Acc

Hippocampus

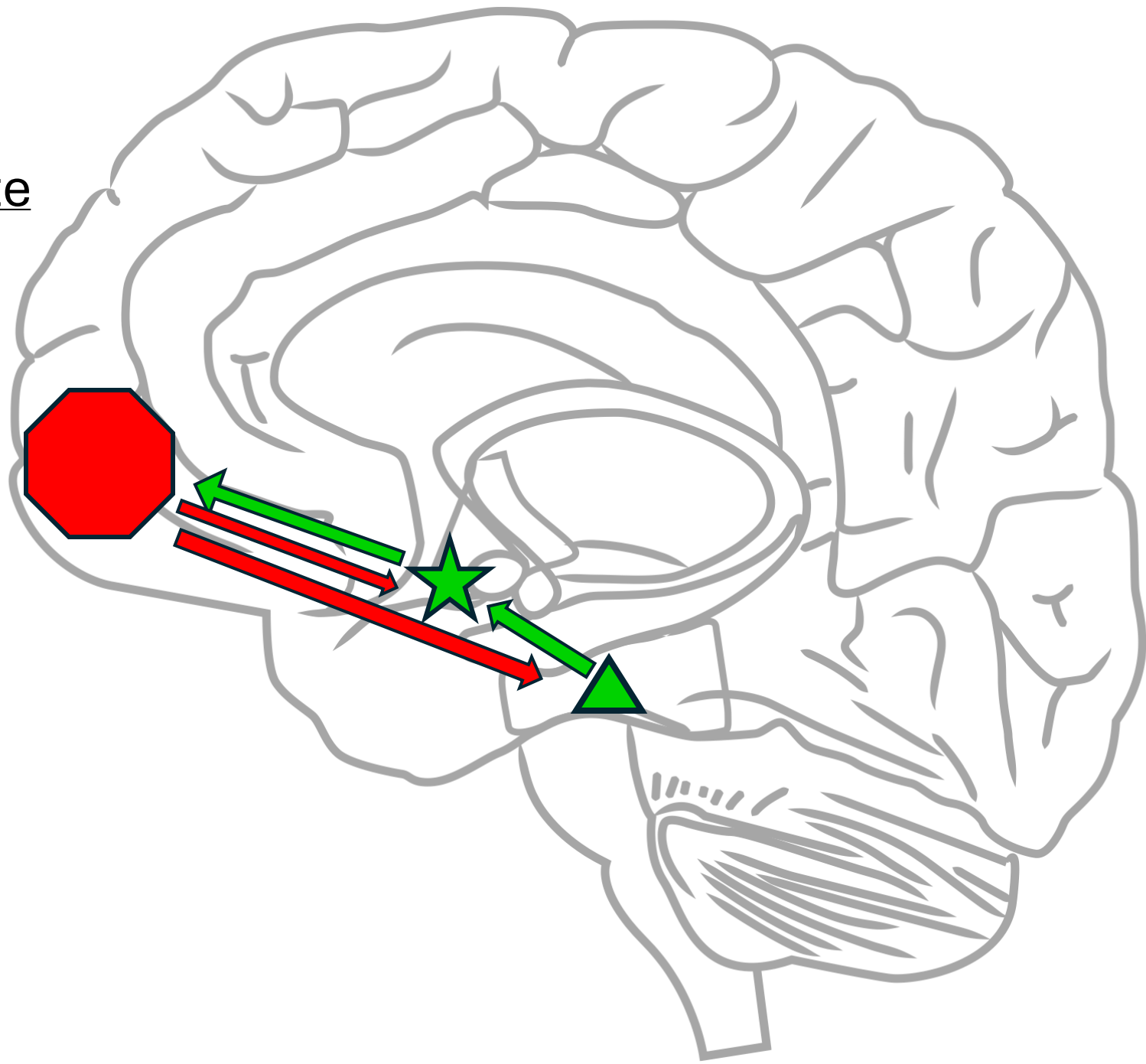
VTA

Johnny 2: Teenager

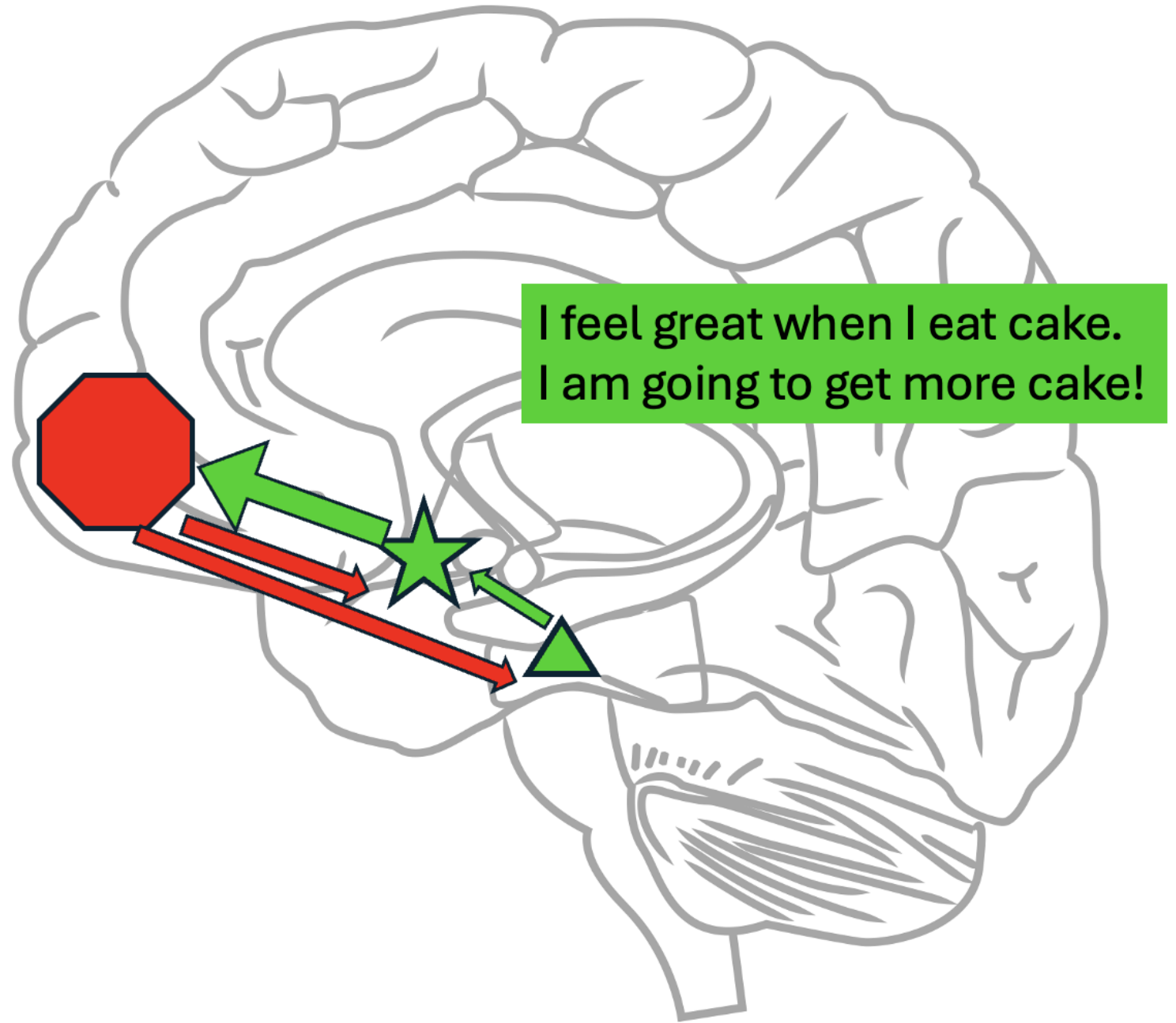
- Johnny is now 16, with the previously mentioned diagnosis of ADHD and now cannabis use. Presents with parent who is concerned about his behavior at school leading to poor academic performance.
- Started on Concerta at 7th grade when first diagnosed with IEP and subsequent improvement in ADHD symptoms.
- He admitted to smoking marijuana which he started in 9th grade and has increased in frequency and quantity over the years due to peer influence.
- However, in the last year in 10th grade, has stagnated and has had new struggles with multiple school detention and expulsion from school team.
- He felt that school has been harder and that "meds hasn't been working anymore".
- Has been off medications for months due to his family not being about to obtain insurance.
- He often acts impulsively, which has led to interpersonal conflicts and problems in school.
- Pertinent findings on show a young boy, who does not care about the encounter, distracted by his phone and playing games on it while in the room. He was calm, cooperative but dismissive of parents' concerns.

The Reward Circuit in Substance Use Disorders

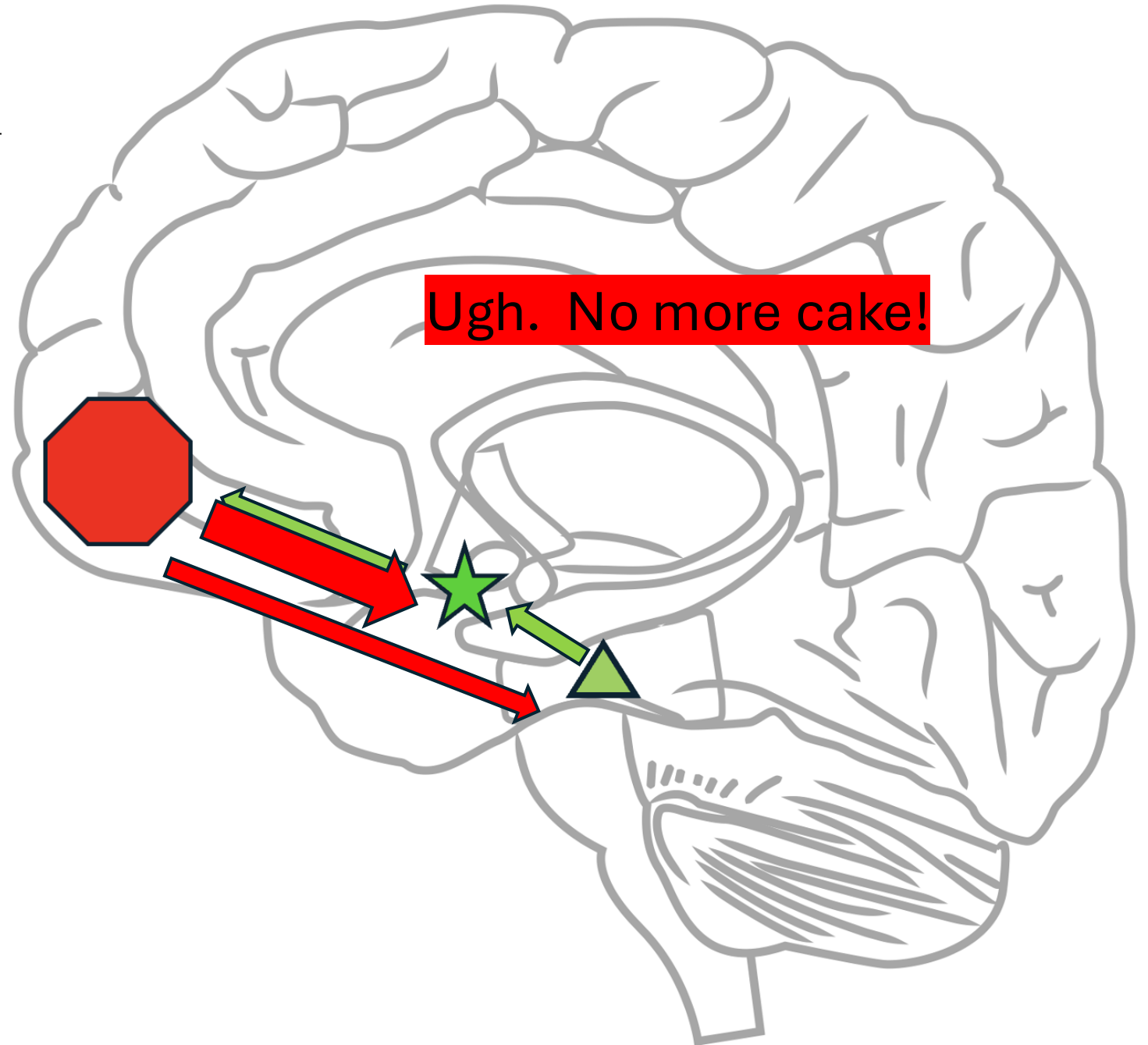
Reward
Circuit:
Resting State



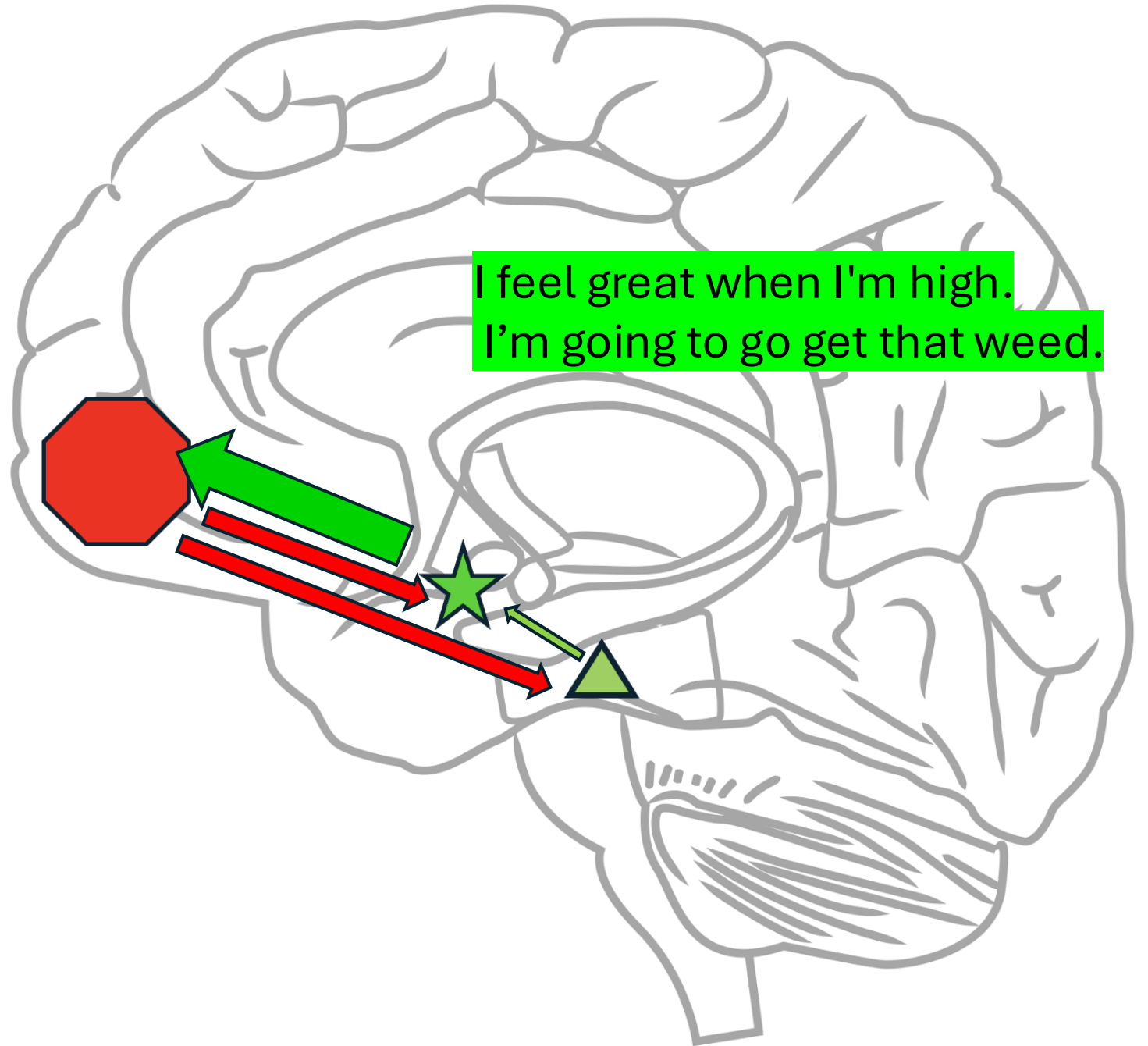
Reward Circuit with a “Natural” Reward



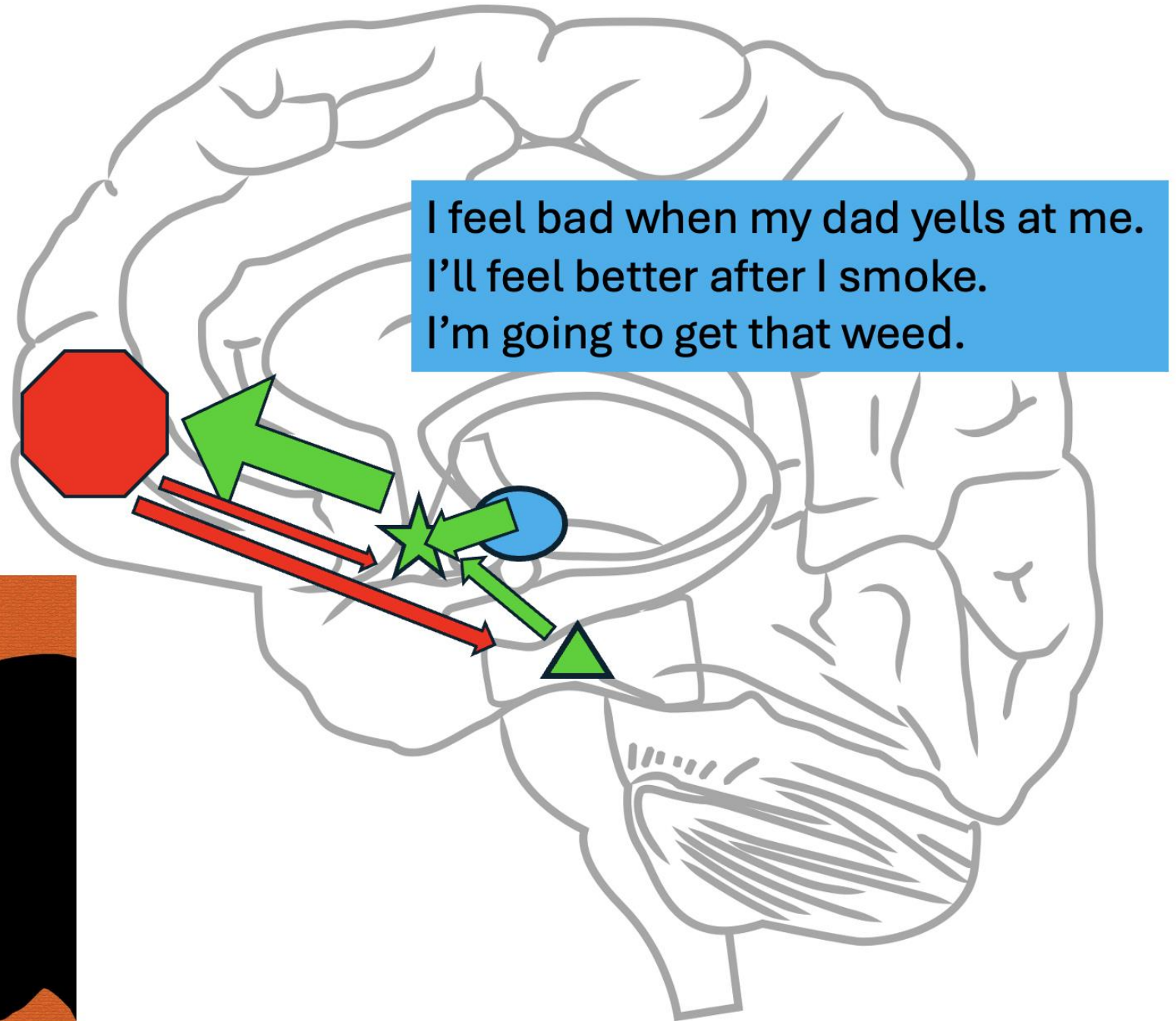
After You Got the Reward:
Cessation of Anticipation/
Motivation



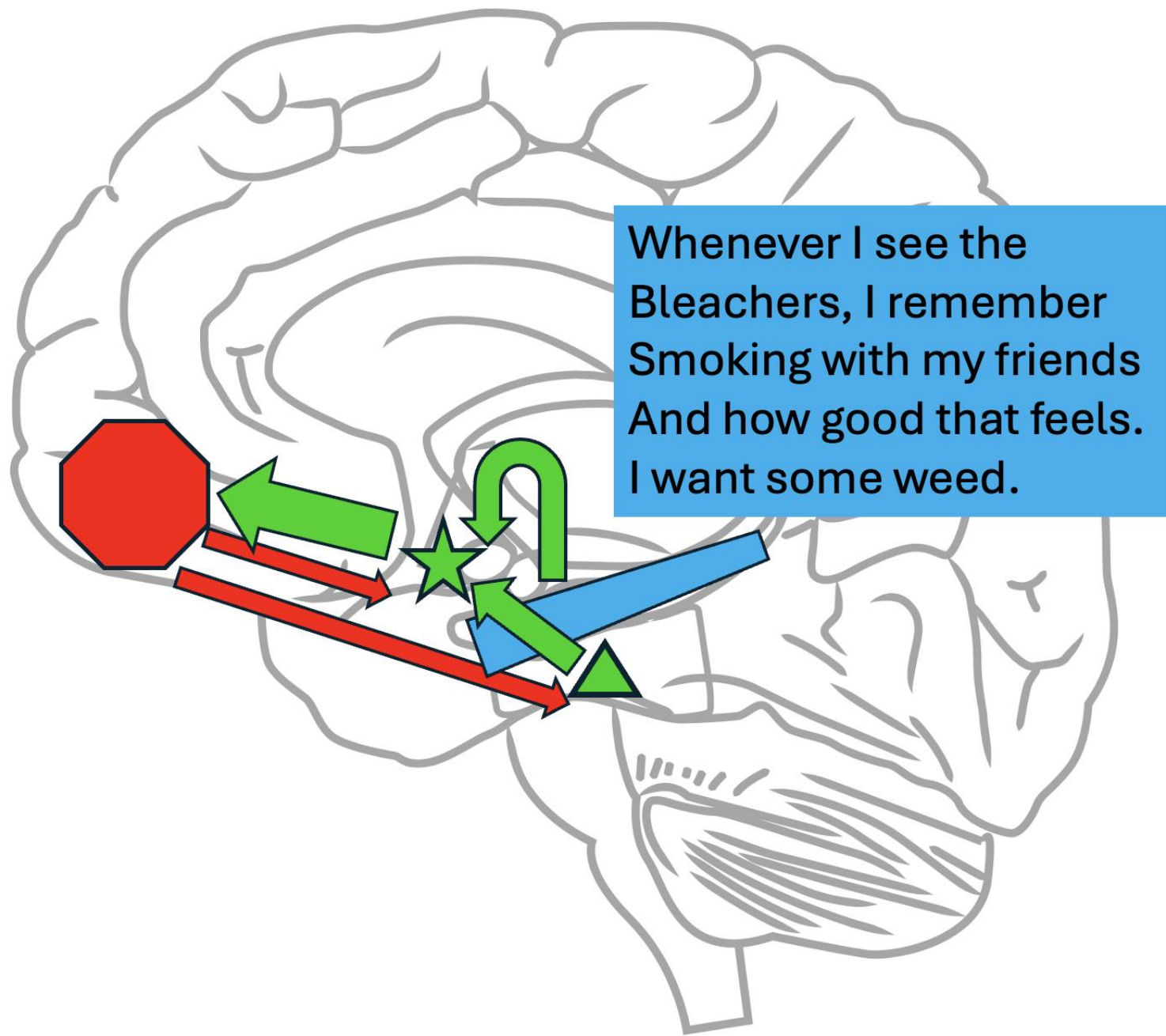
Drugs of Abuse: Early Use,
Intoxication & Anticipation



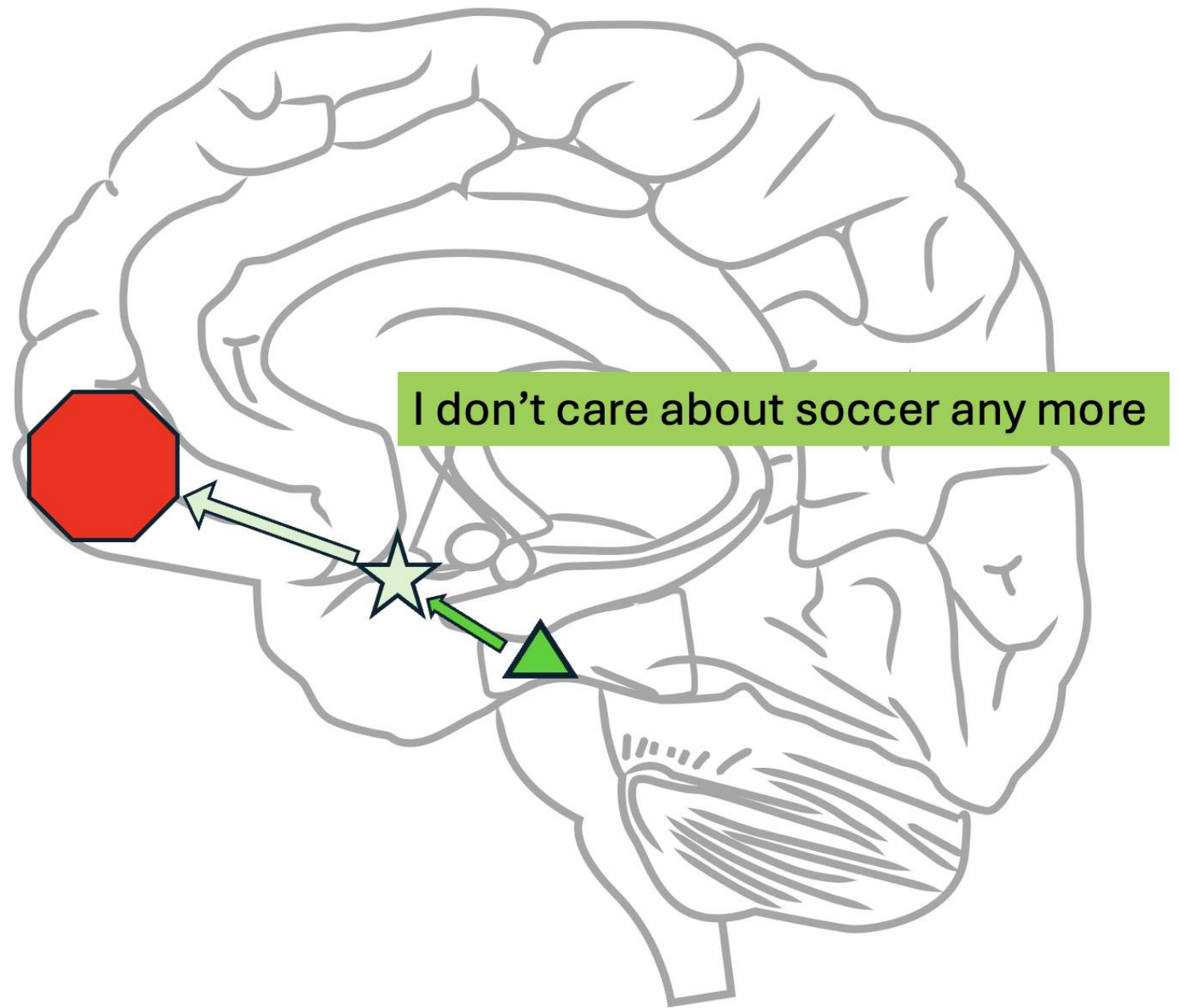
Chronic Use:
Strong Negative
Emotions → Trigger
for Craving



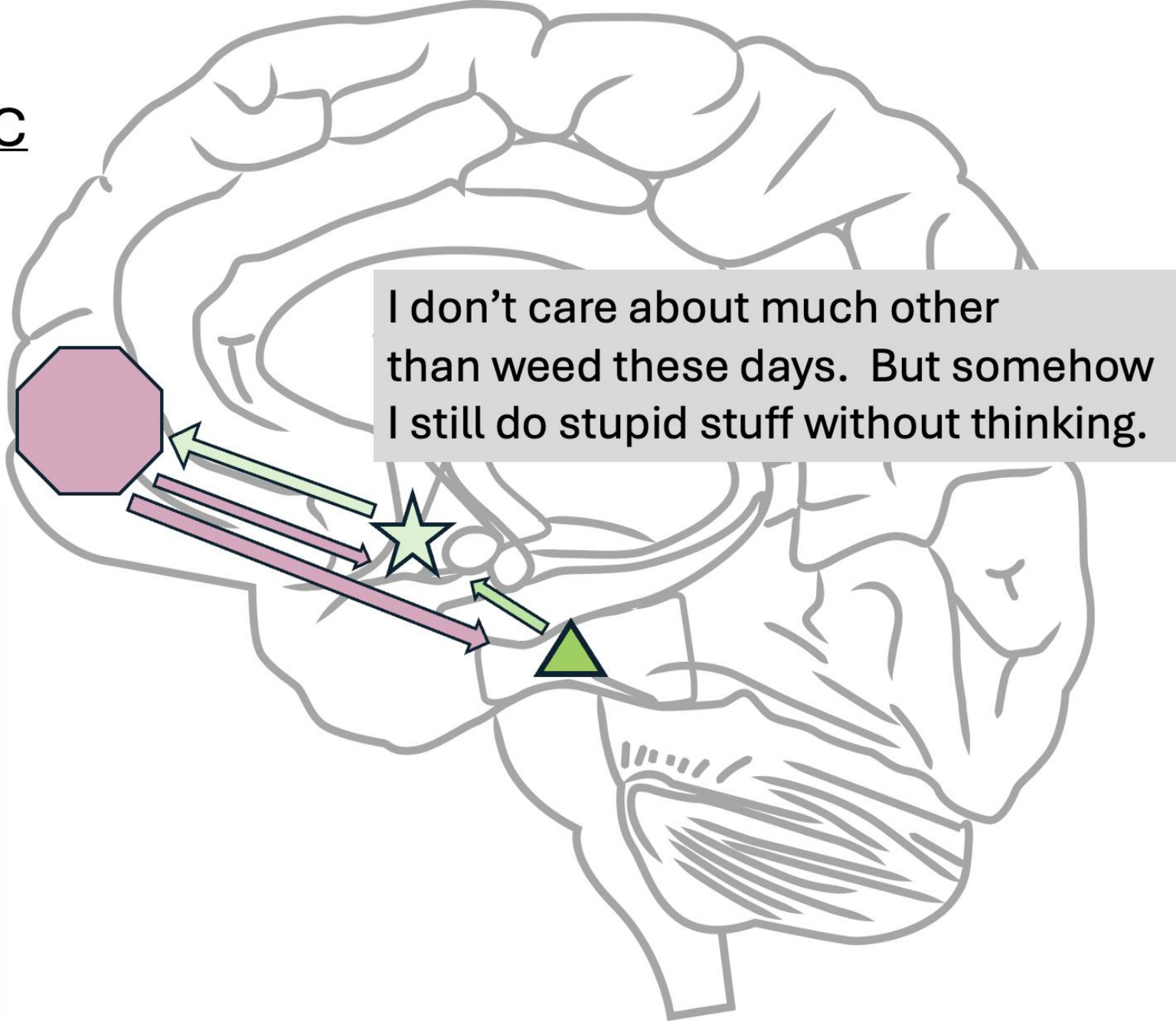
Chronic Use:
Associative
Learning → Triggers for
Anticipation/Craving



Chronic Use:
Downregulation
DA R in Nacc →
Reduced Motivation
For Things Other Than
Drug



Chronic Use: Weakening of PFC
And Top-Down Inhibitory
Connections



The Neurocircuitry of Motivational Interviewing (and other Psychosocial Interventions)

Sindhu A. Idicula, MD

Motivational Interviewing Steps



Engaging



Focusing



Evoking



Planning

Motivational Interviewing Steps



Engaging: build rapport, actively listen, create a non-judgmental environment



Focusing: Develop a clear direction on the specific change the patient wants to make, agree on an agenda and identify areas of conflict



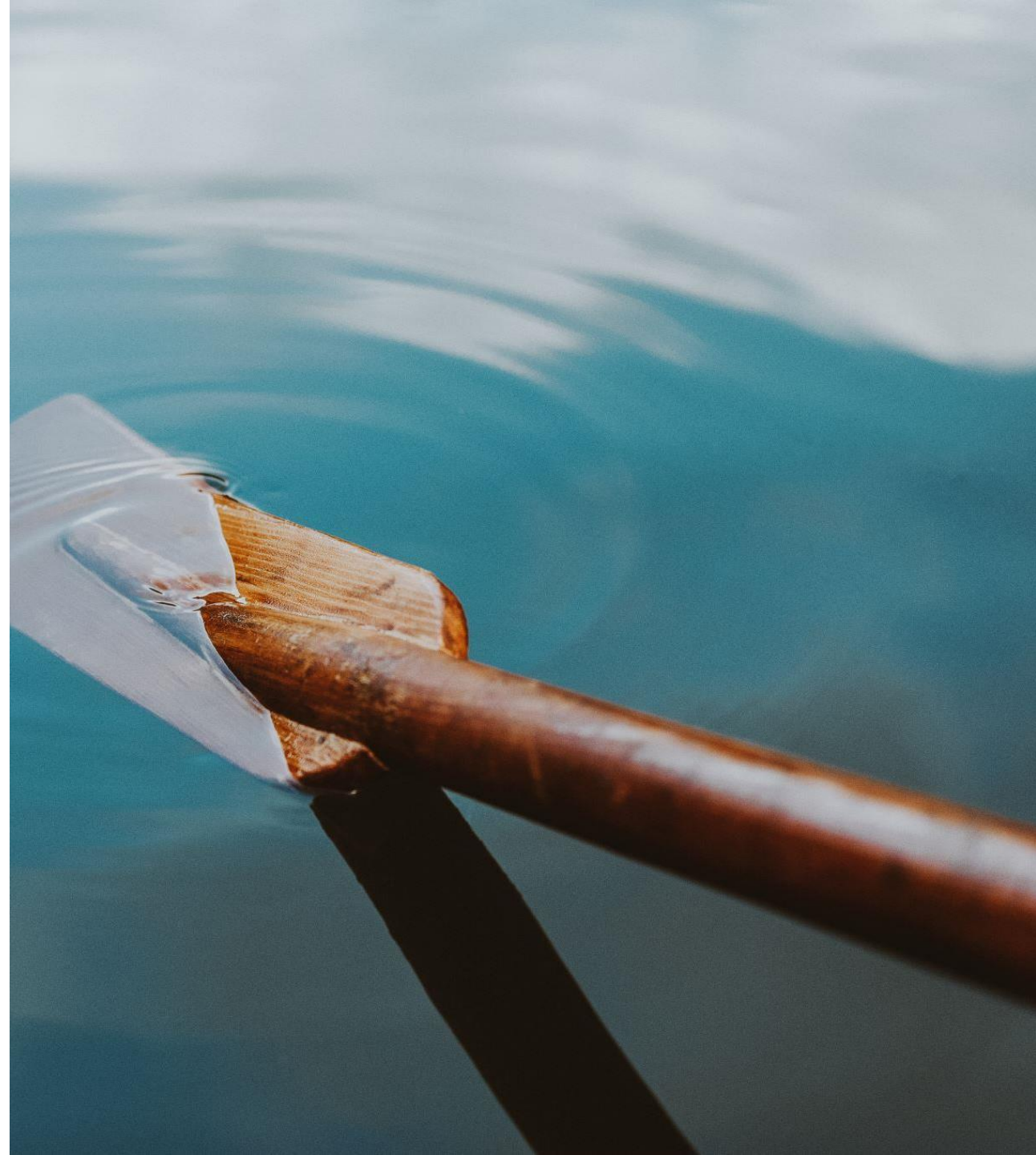
Evoking: Help the patient articulate their own reasons for change - "change talk" - draw out internal motivations and ambivalence



Planning: Once a patient has expressed readiness to change, develop a plan of action, including realistic goals, steps towards change, and troubleshooting obstacles

MI Guiding Principles (OARS)

- Open-ended questions
- Affirmations
- Reflective listening
- Summarizing



Why understand the neuroscience of MI?

01

More direct and effective interventions

02

Track the progress of a given treatment biologically

03

Tailor interventions based on neurobiological phenotype, not just behavioral

What do we know?

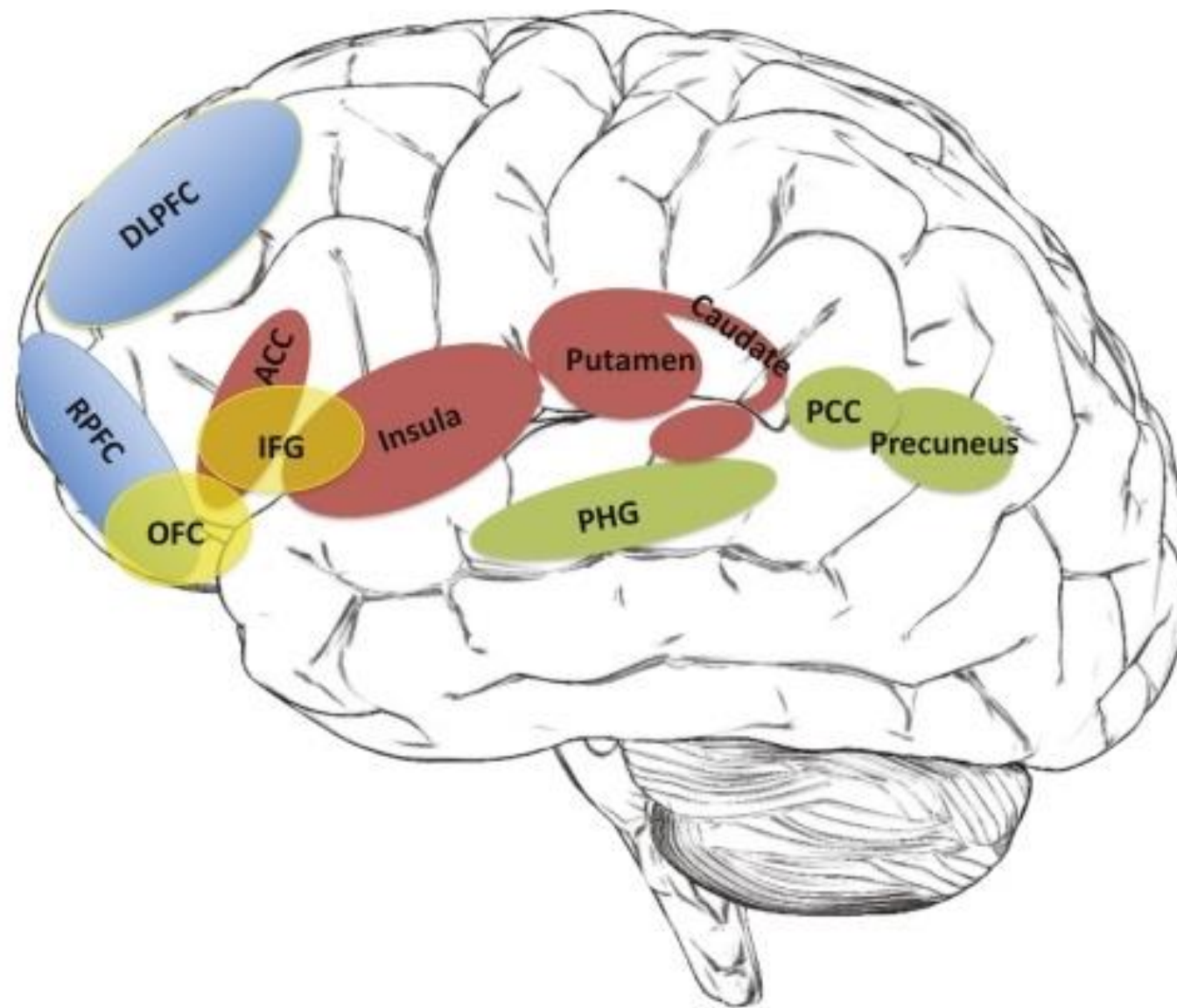
MI works on Change Talk and Reward Circuitry

Change Talk (Resnicow, et al; Houck et al)

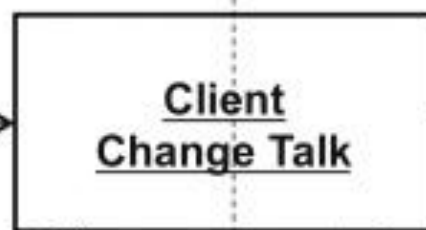
- Significant activation in inferior frontal gyrus, insula, and superior temporal cortex
- Involved in self-perception, cognitive dissonance, and attitude change

Reward Circuitry (Feldstein et al)

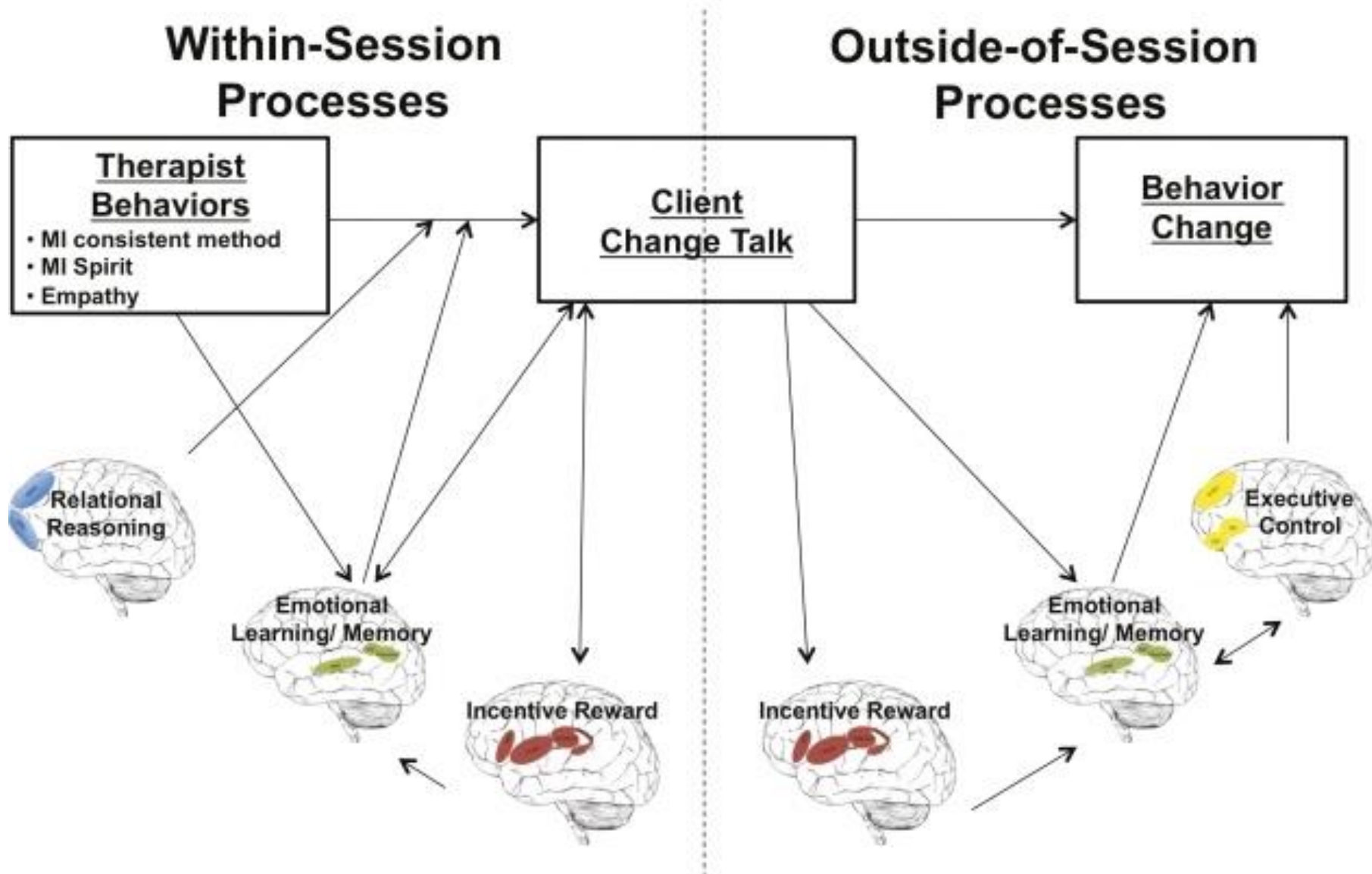
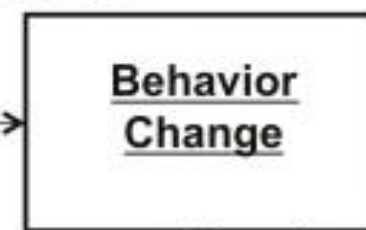
- No activation in reward processing area (OFC, nucleus accumbens, insula, caudate, putamen, PCC, ACC) with alcohol cue
- Dampen reward / motivational circuitry



Within-Session Processes

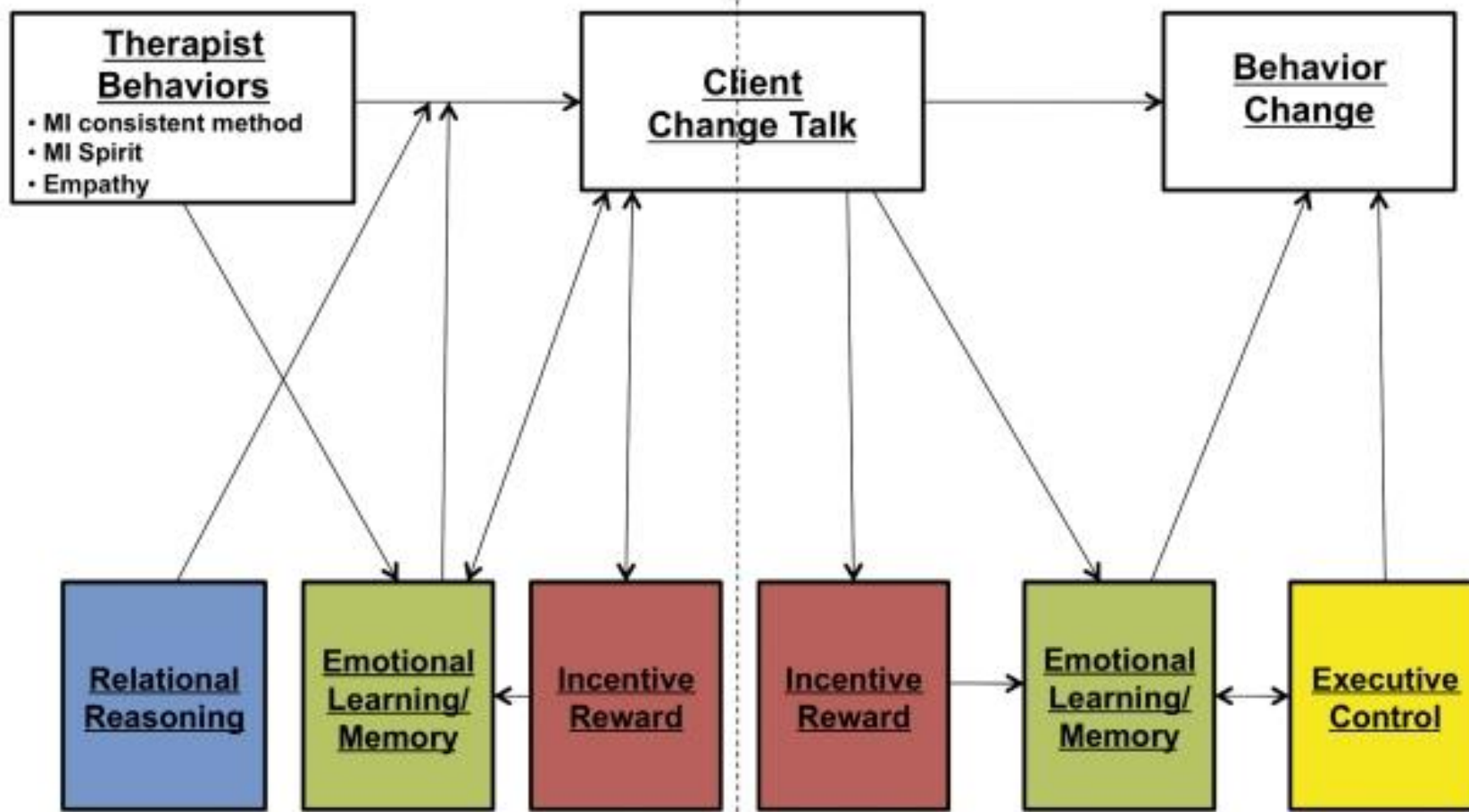


Outside-of-Session Processes



Within-Session Processes

Outside-of-Session Processes



Let's Practice!

You are the psychiatrist working with Johnny now that he is using cannabis and performing poorly in school. He appears like he does not care about the encounter, is distracted by his phone, and pleasant, but dismissive of the session.

Motivational Interviewing Strategy:

1. Engage
2. Focus
3. Evoke
4. Plan

We would find
your feedback
very
REWARDING



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