
Smoking Cessation
Leadership Center



University of California
San Francisco

The Curious Science of Cravings

Judson A. Brewer, MD, PhD, Professor, Director of Research and Innovation, Mindfulness Center, Department of Behavioral and Social Sciences, Brown University School of Public Health, Department of Psychiatry, The Warren Alpert Medical School of Brown University

October 8, 2024

Moderator

Catherine Bonniot

Executive Director

Smoking Cessation Leadership Center
University of California, San Francisco

Catherine. Bonniot@ucsf.edu



Disclosures

This UCSF CME activity was planned and developed to uphold academic standards to ensure balance, independence, objectivity, and scientific rigor; adhere to requirements to protect health information under the Health Insurance Portability and Accountability Act of 1996 (HIPAA); and include a mechanism to inform learners when unapproved or unlabeled uses of therapeutic products or agents are discussed or referenced.

Dr. Judson Brewer, presenter for this educational event, is a consultant and stockholder for Sharecare, Inc.

All of the relevant financial relationships listed for these individuals have been mitigated.

All others in control of content have no relevant financial relationships with ineligible companies.

Thank you to our funders



Housekeeping

- All participants will be **automatically muted** and **the audio will be streaming via your computers**, when you join the webinar.
- Please **make sure your computer speakers are on** and adjust the volume accordingly.
- All participants **cameras will be off** when you join the webinar.
- **This webinar is being recorded** and will be available on SCLC's website, along with a PDF of the slide presentation.
- Use the **'Q & A' box** to send questions at any time to the presenters.
- If **closed captioning** is needed, click on the "More" button at the bottom of your Zoom screen and then click on "Close Caption" to activate the program.

CME/CEU Statements

Accreditations:

In support of improving patient care, the University of California, San Francisco is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

UCSF designates this live activity for a maximum of *1.0 AMA PRA Category 1 Credit™*. Physicians should claim only the credit commensurate with the extent of their participation in the webinar activity.

Advance Practice Registered Nurses and Registered Nurses: For the purpose of recertification, the American Nurses Credentialing Center accepts *AMA PRA Category 1 Credit™* issued by organizations accredited by the ACCME.

Physician Assistants: The National Commission on Certification of Physician Assistants (NCCPA) states that the *AMA PRA Category 1 Credit™* are acceptable for continuing medical education requirements for recertification.

California Pharmacists: The California Board of Pharmacy accepts as continuing professional education those courses that meet the standard of relevance to pharmacy practice and have been approved for *AMA PRA category 1 Credit™*. If you are a pharmacist in another state, you should check with your state board for approval of this credit.

California Psychologists: The California Board of Psychology recognizes and accepts for continuing education credit courses that are provided by entities approved by the Accreditation Council for Continuing Medical Education (ACCME). *AMA PRA Category 1 Credit™* is acceptable to meeting the CE requirements for the California Board of Psychology. Providers in other states should check with their state boards for acceptance of CME credit.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs.

Up to 1.0 CE Credit may be claimed.

Social Workers: As a Jointly Accredited Organization, UCSF Continuing Education is approved to offer social work continuing education by the Association of Social Work Boards (ASWB) Approved Continuing Education (ACE) program. Organizations, not individual courses, are approved under this program. Regulatory boards are the final authority on courses accepted for continuing education credit. Social workers completing this course receive 1.0 general continuing education credit.

Interprofessional Continuing Education Credit (IPCE): This activity was planned by and for the healthcare team, and learners will receive 1.0 Interprofessional Continuing Education (IPCE) credits for learning and change.

California Addiction Professionals: The California Department of Healthcare Services (DCHS) recognizes up to 10 hours of continuing education from a non-accredited provider. If you are a provider outside of California, please check with your state board for your credit policy.



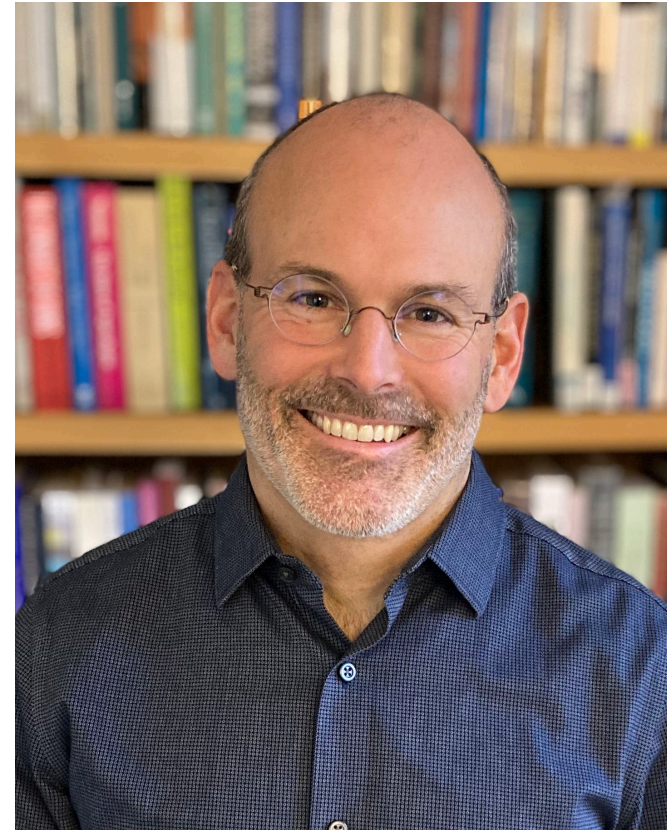
- CDC *Tips*® Campaign 2024
- *Tips From Former Smokers*® Motivational Cards:
<https://www.cdc.gov/tobacco/campaign/tips/resources/motivational-cards/index.html>
- Find resources at: <https://www.cdc.gov/tobacco/campaign/tips/index.html>

Today's Presenter

Judson Brewer, MD, PhD

Professor, Director of Research and Innovation, Mindfulness Center

Department of Behavioral and Social Sciences, Brown University School of Public Health, Department of Psychiatry, The Warren Alpert Medical School of Brown University



Using Our Brains for Behavior Change

Jud Brewer MD PhD

Director of Research & Innovation, Mindfulness Center
Professor, Behavioral and Social Sciences & Psychiatry
Brown University School of Public Health, Alpert Medical School



BROWN
Mindfulness Center



Financial Disclosures

Dr. Brewer owns stock in, and serves as a paid consultant for Sharecare Inc. the company that owns the mindfulness apps described in this talk. The financial interest has been disclosed to and is being managed by my institution, Brown University, in accordance with its Conflict of Interest and Conflict of Commitment policies.



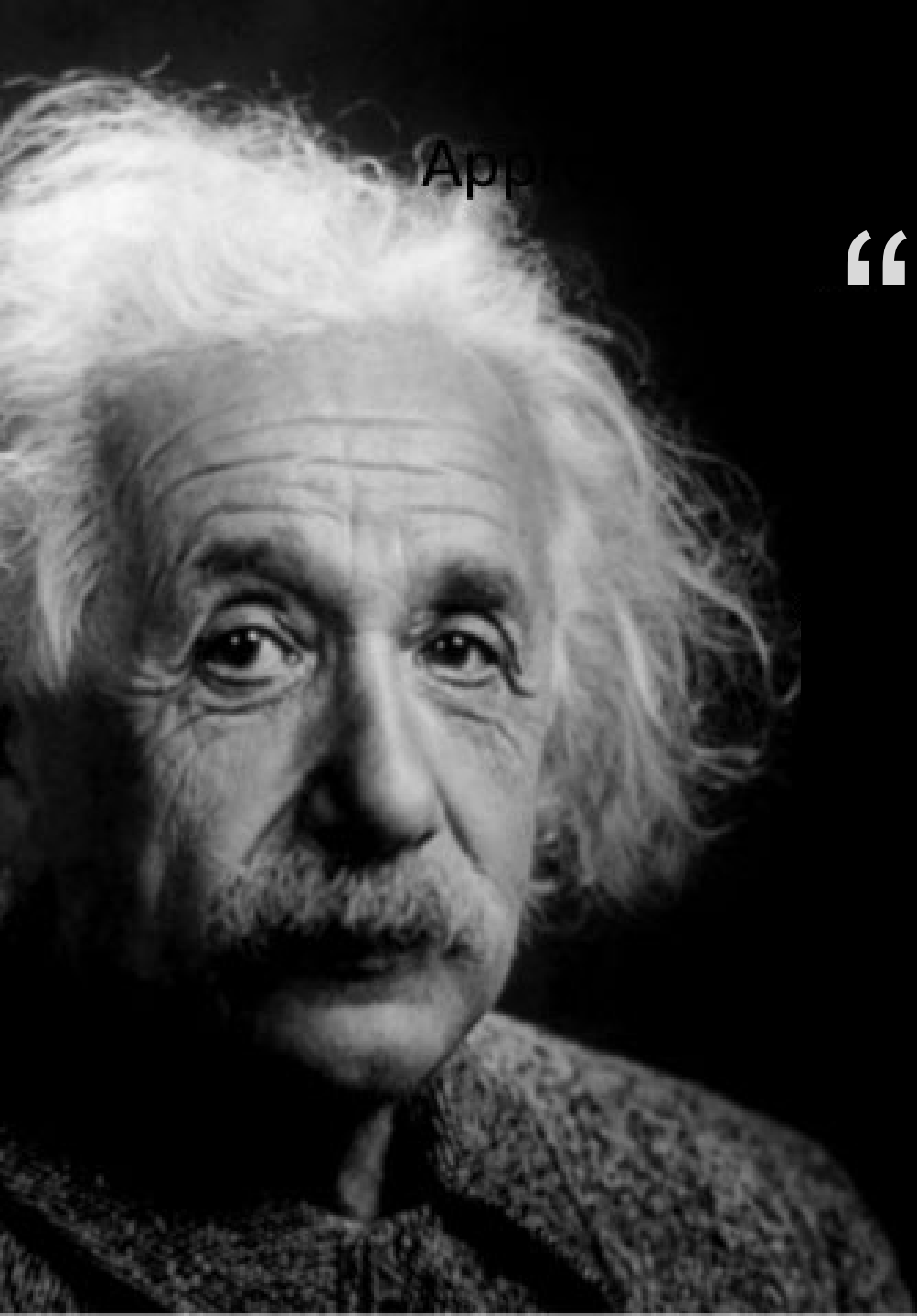






W. M. Heil

"I see, and have you tried worrying about it?"



App

“

*No problem can be solved from
the same level of consciousness
that created it.*

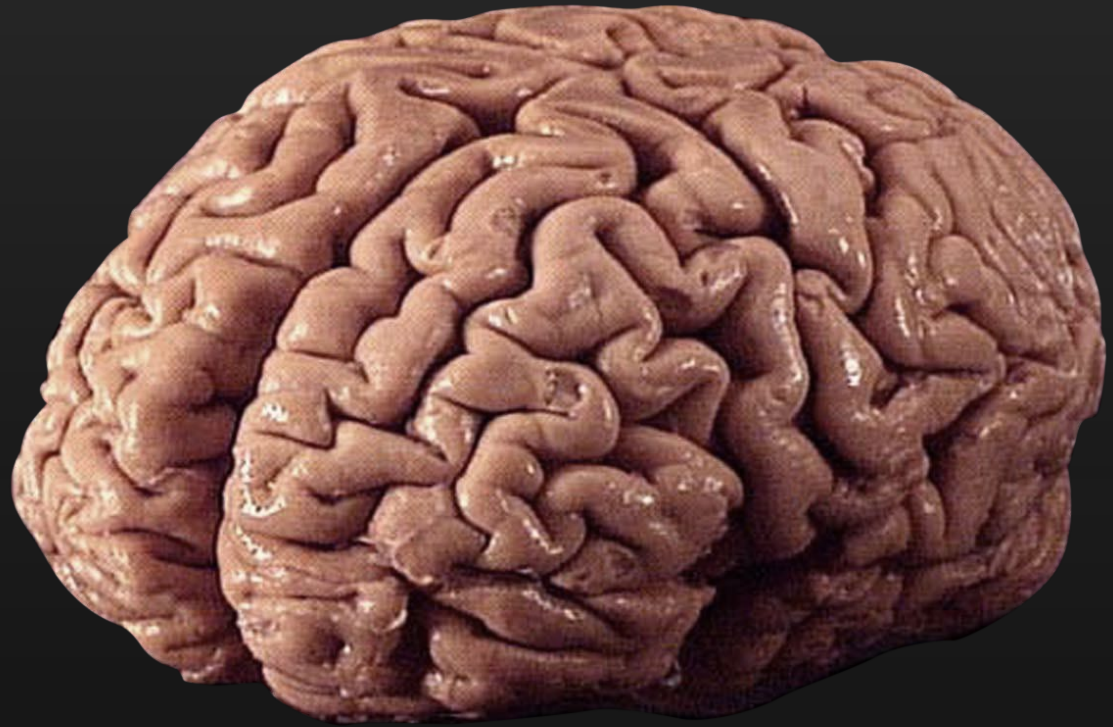
”

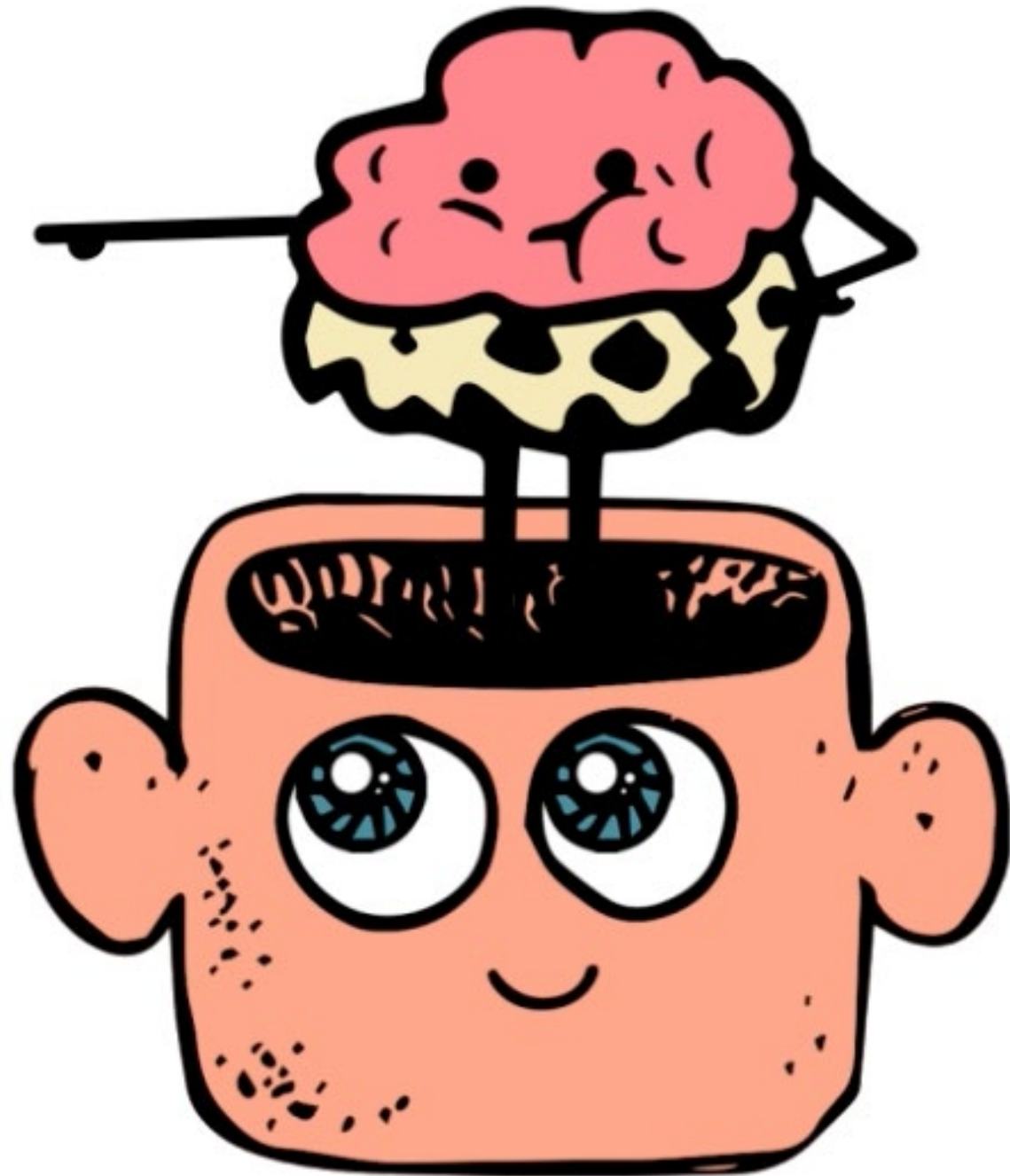
Albert Einstein

Prefrontal Cortex



?

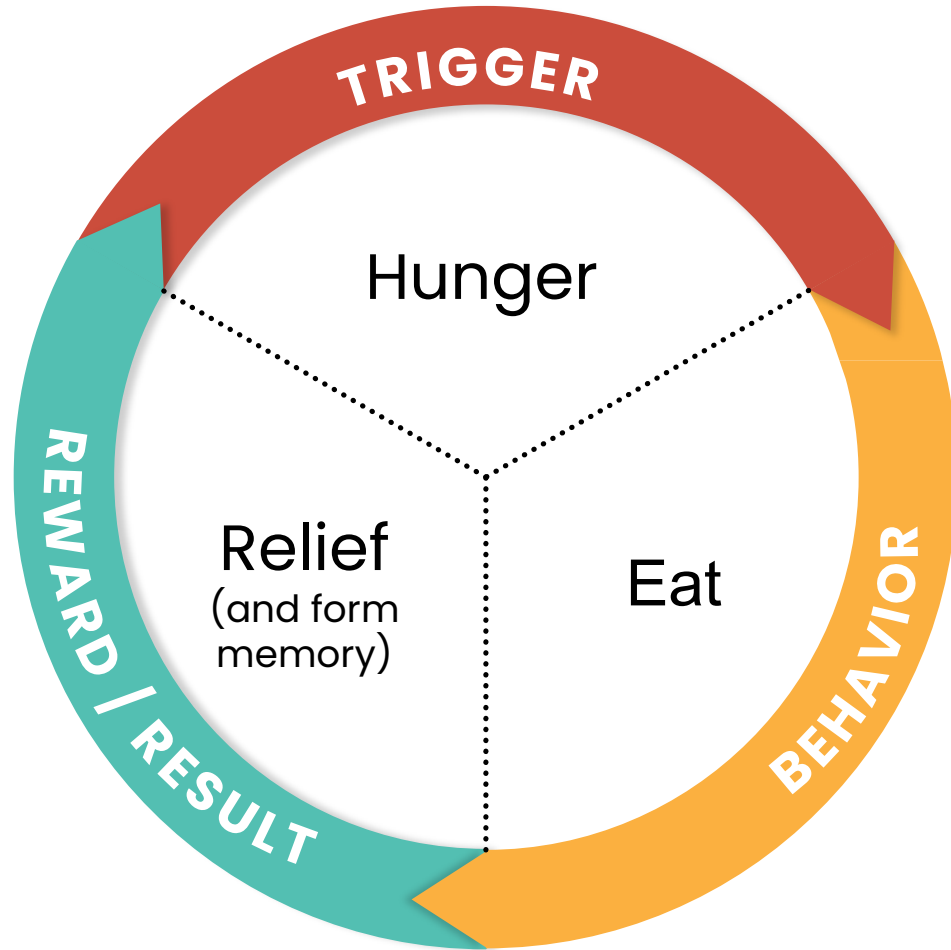




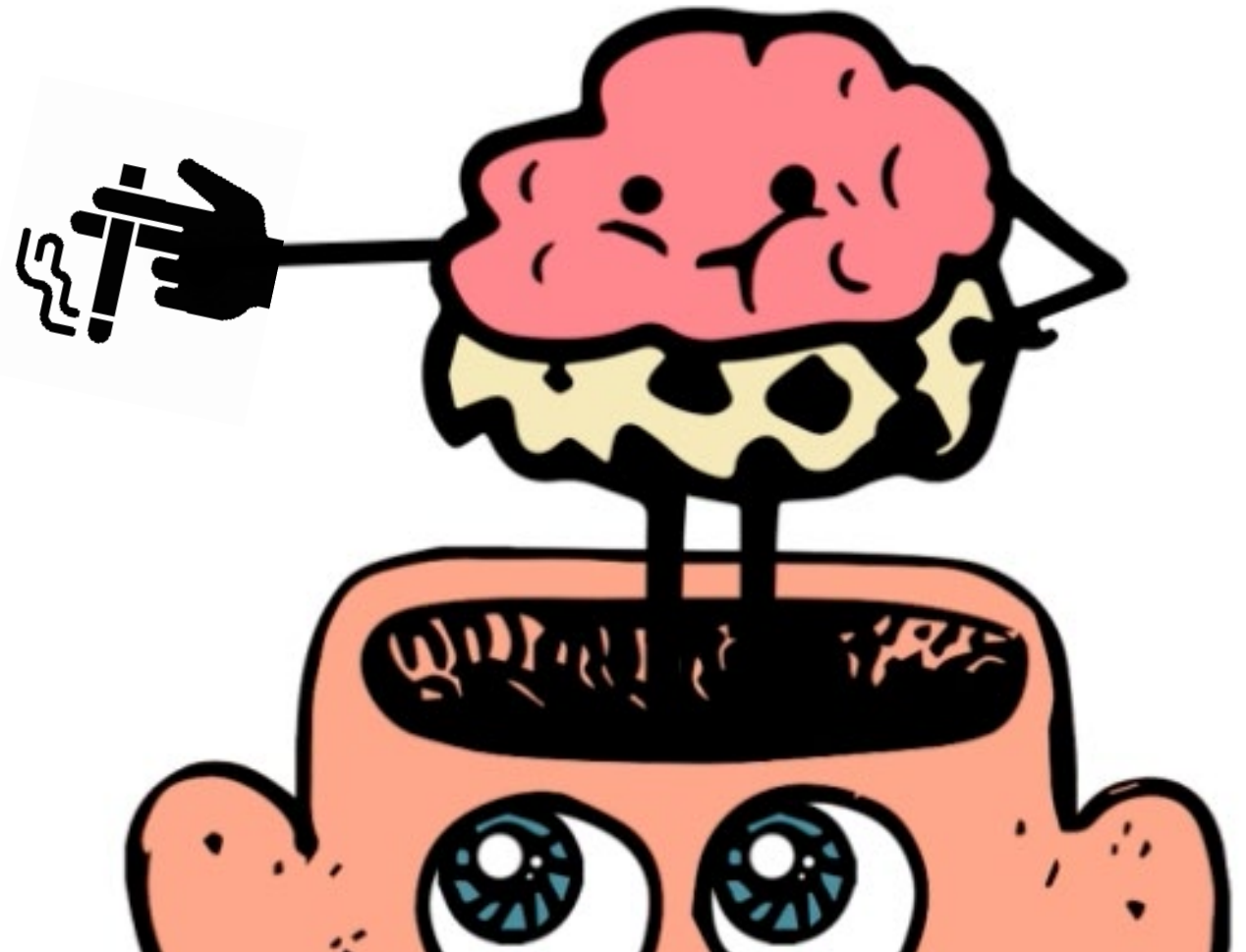
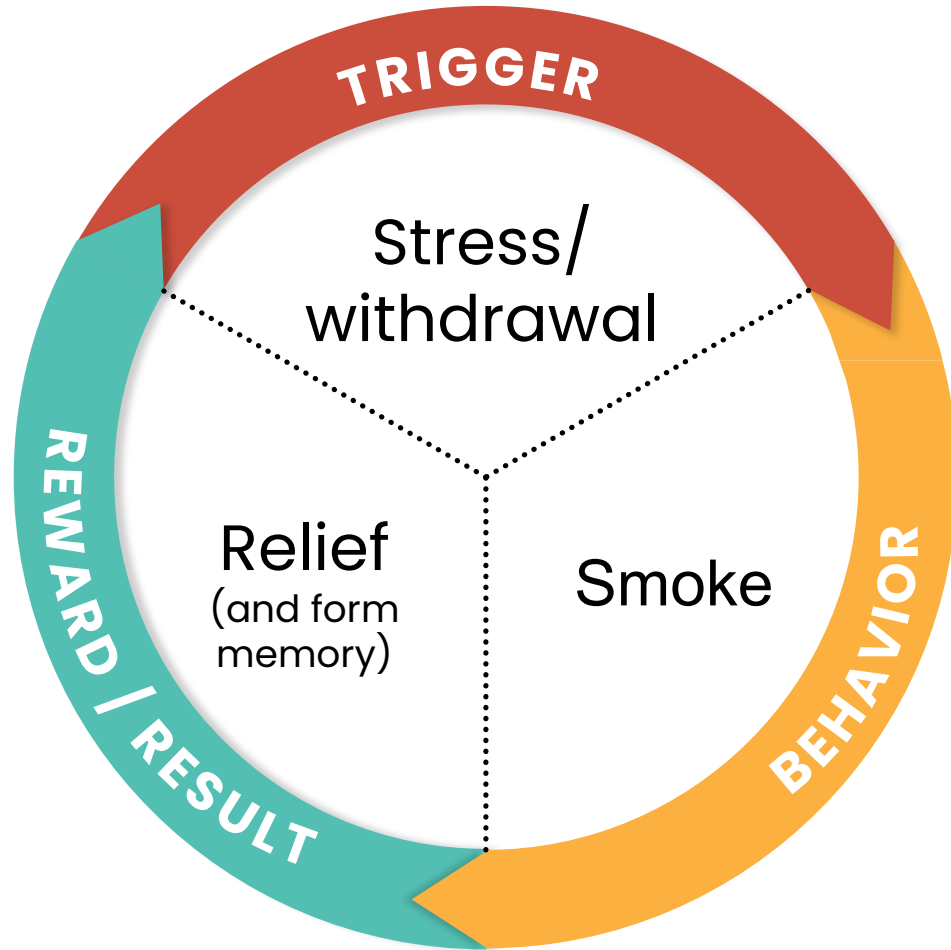
OLD BRAIN:
Limbic System
Survival

NEW BRAIN:
Prefrontal Cortex
Thinking, Planning

REWARD-BASED LEARNING

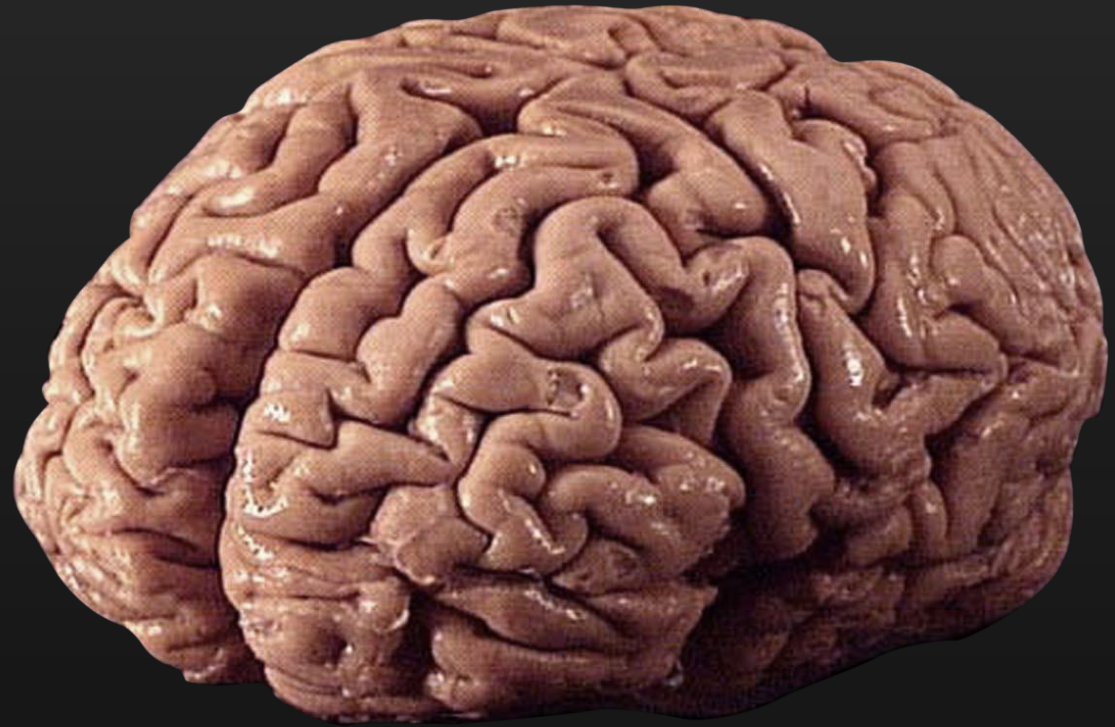


REWARD-BASED LEARNING





!!





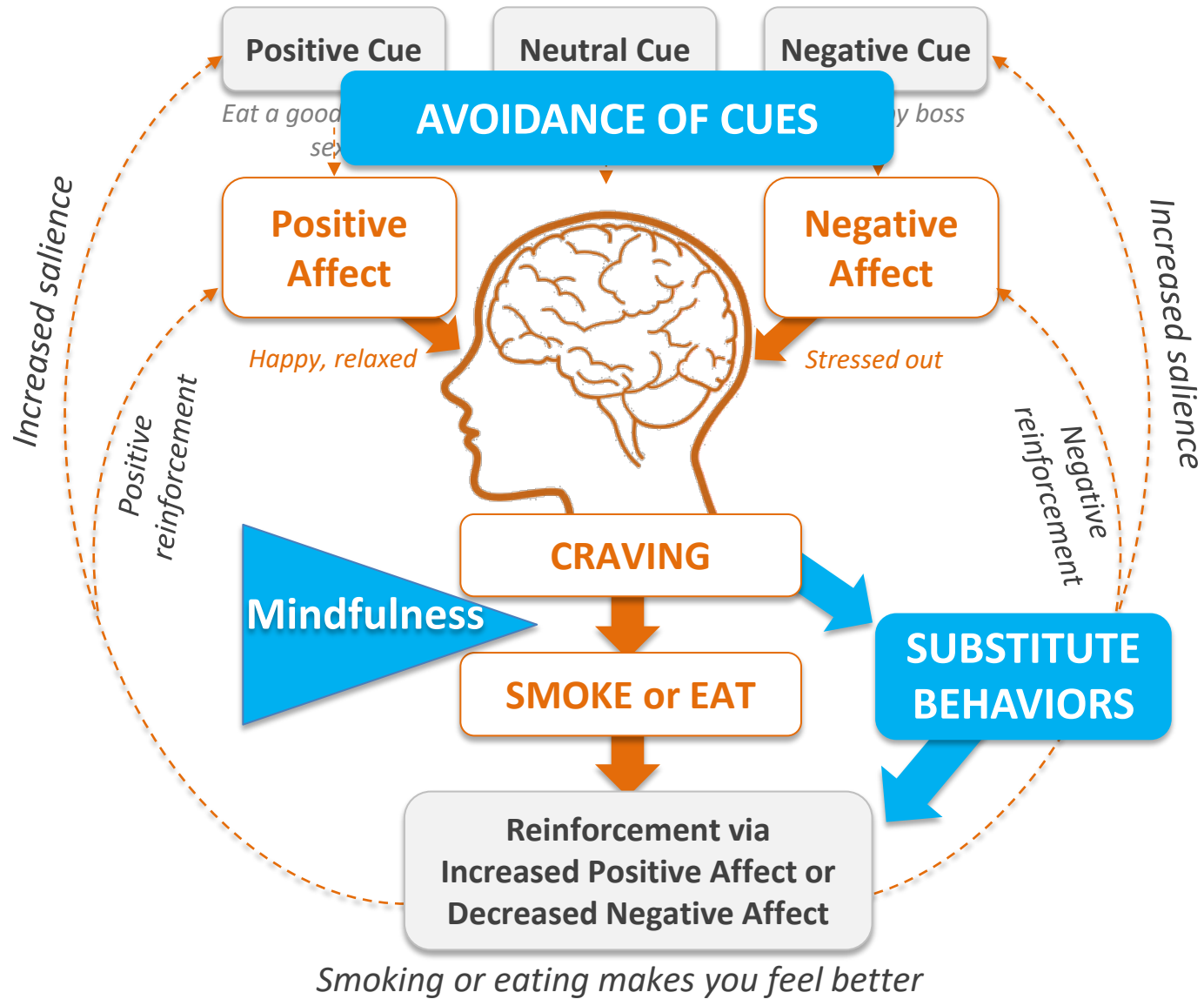
Plot twist. Waldo finds himself.

“

Paying attention in the present
moment, on purpose, non-
judgmentally

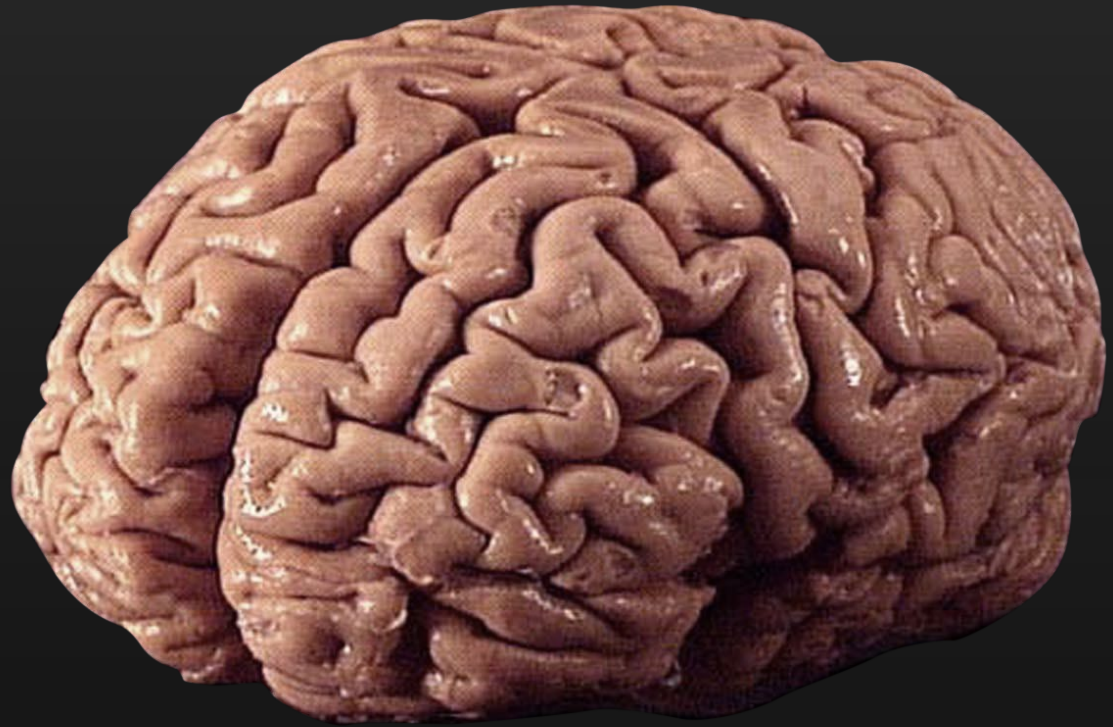
”

Jon Kabat-Zinn
Full Catastrophe Living





?



The paradox of Mindfulness: less is more

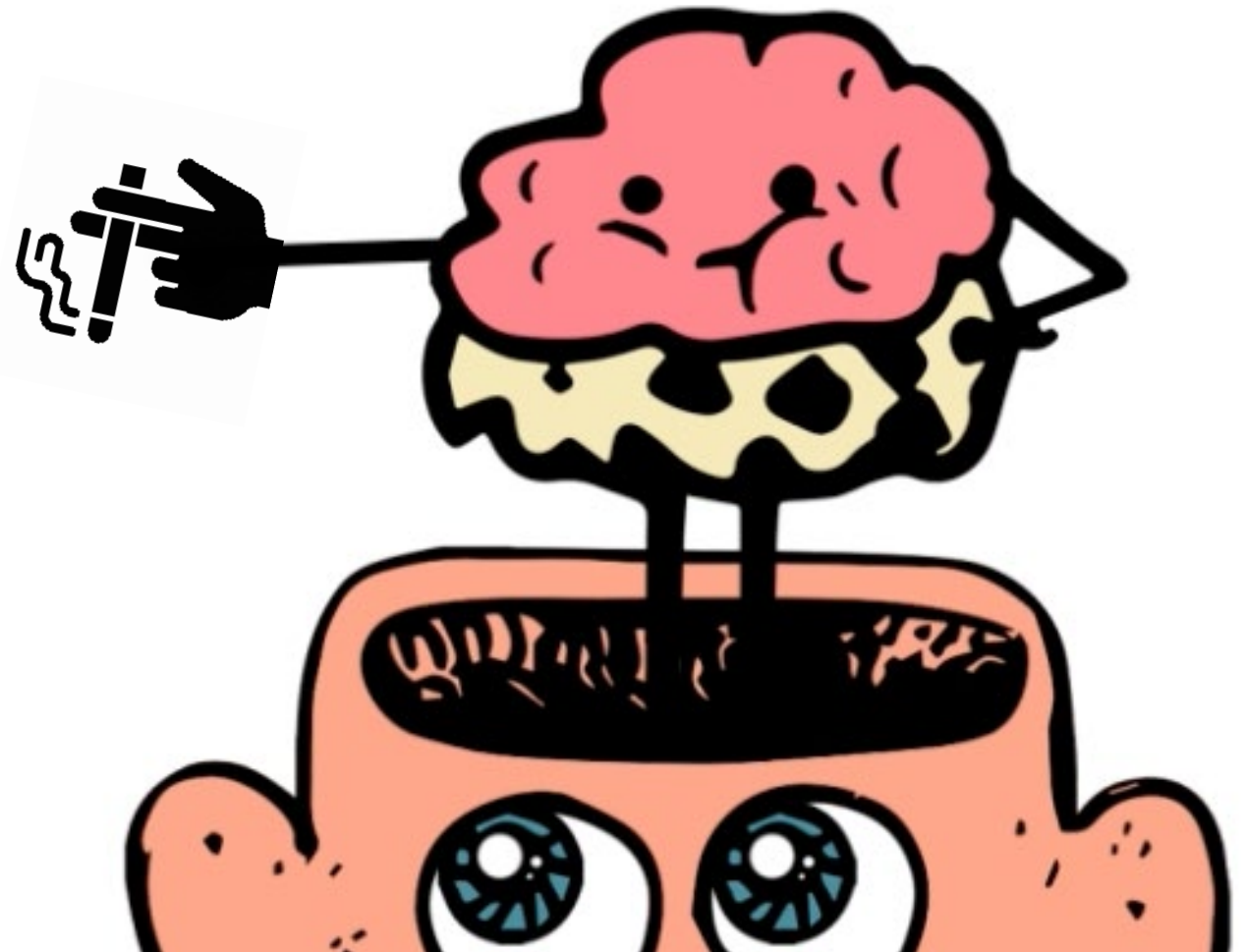
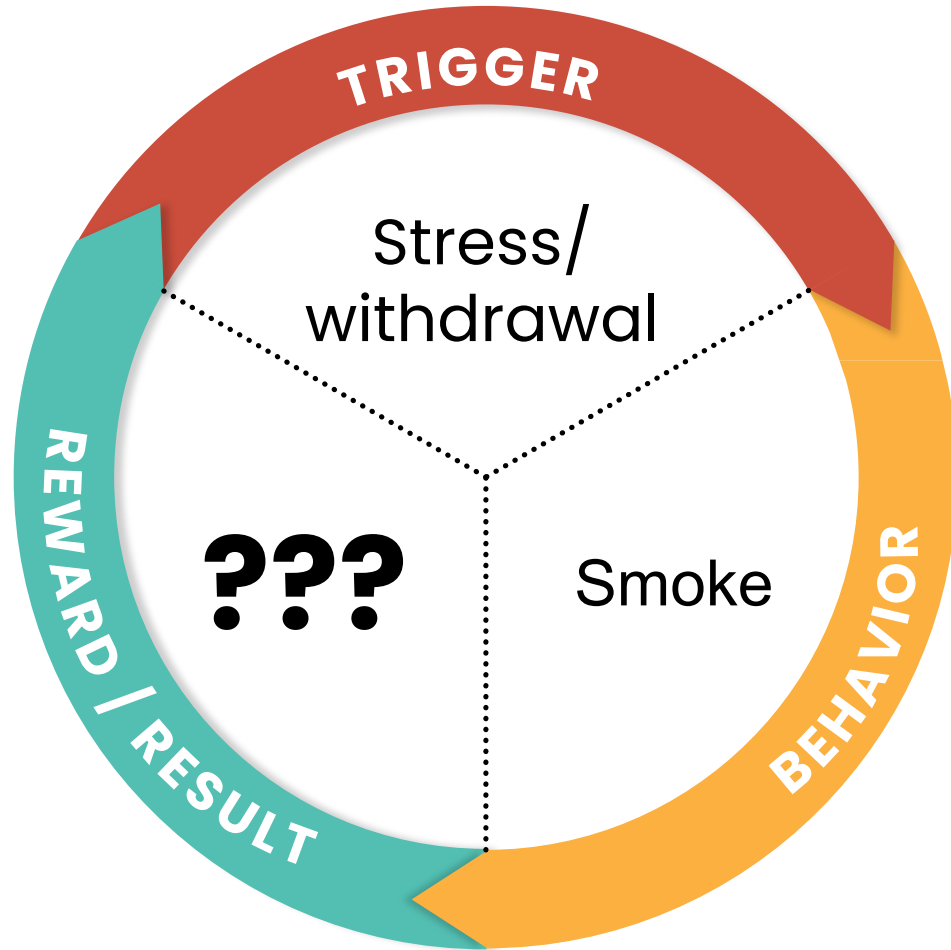
Pay attention, and everything else will take
care of itself (really).

Roz posted an update 1 week, 2 days ago

Mindful smoking smells like stinky cheese and tastes like chemicals.

YUCK!

REWARD-BASED LEARNING



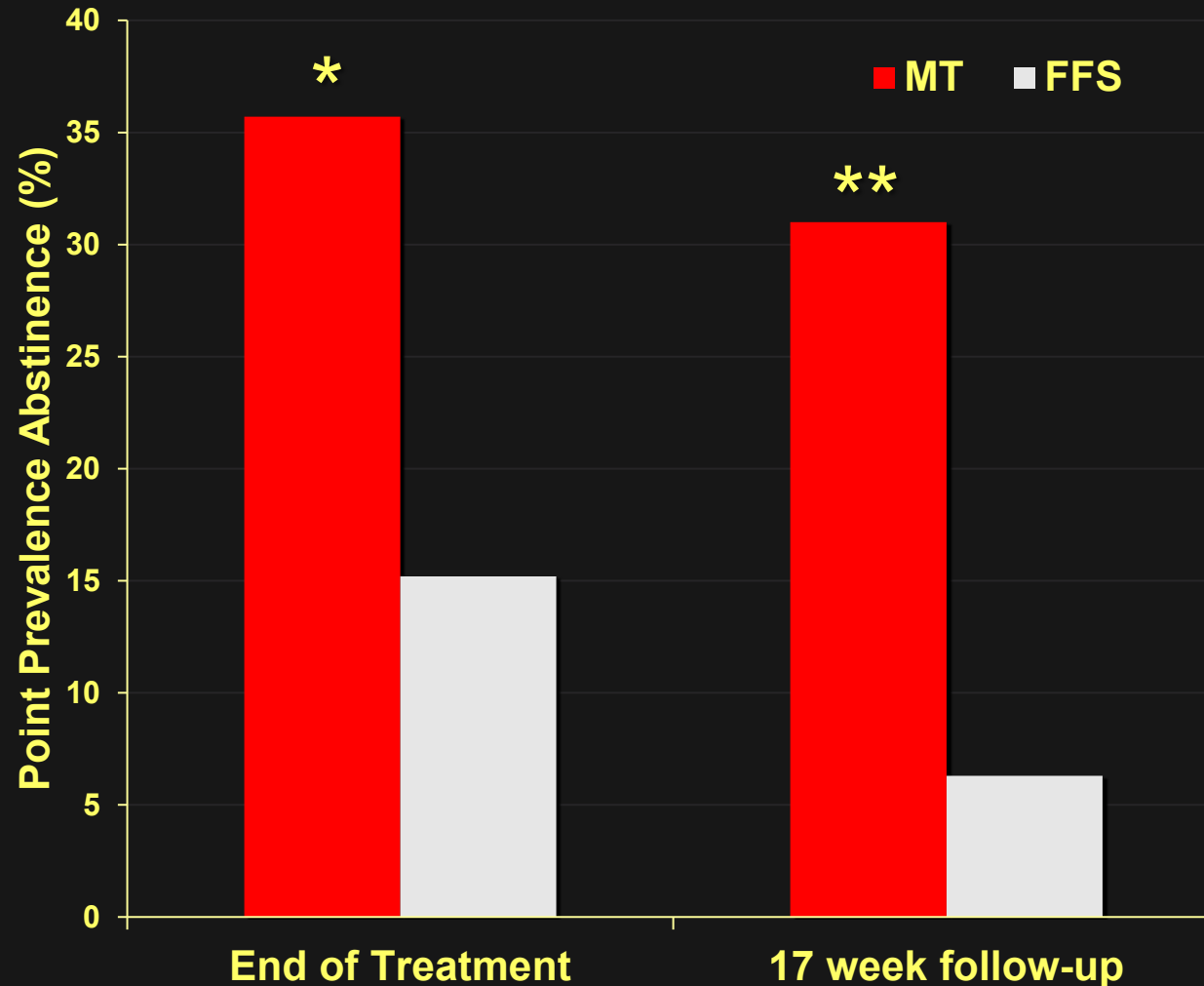
“

*You can observe a lot
just by watching.*

”

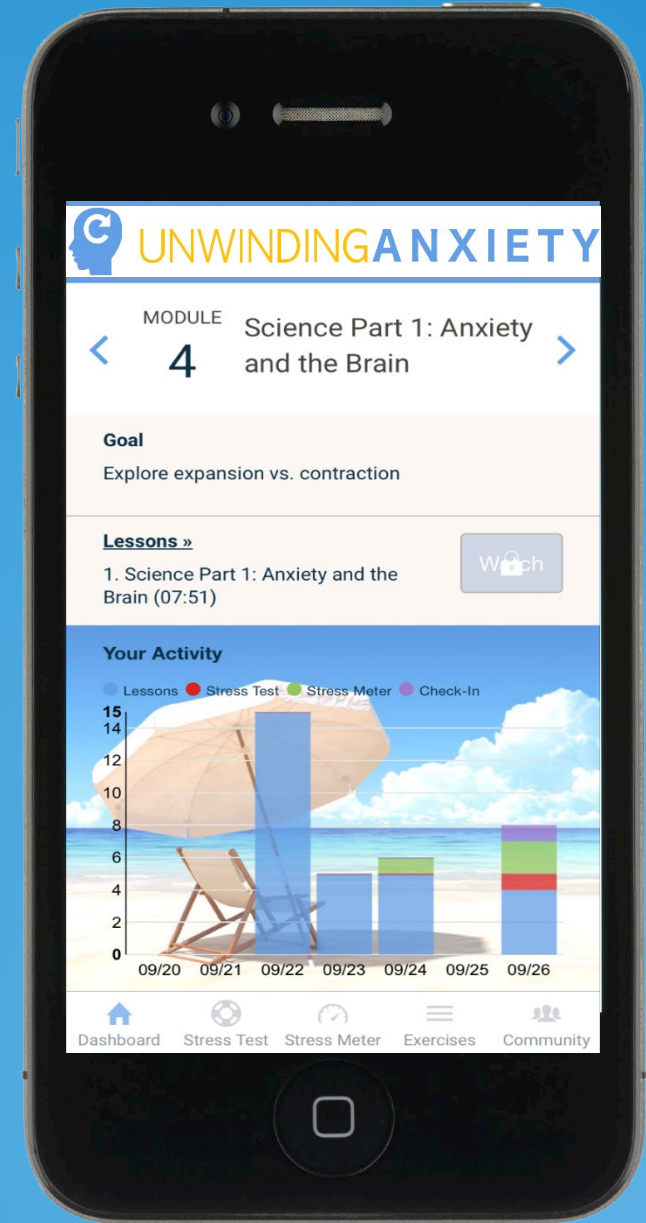
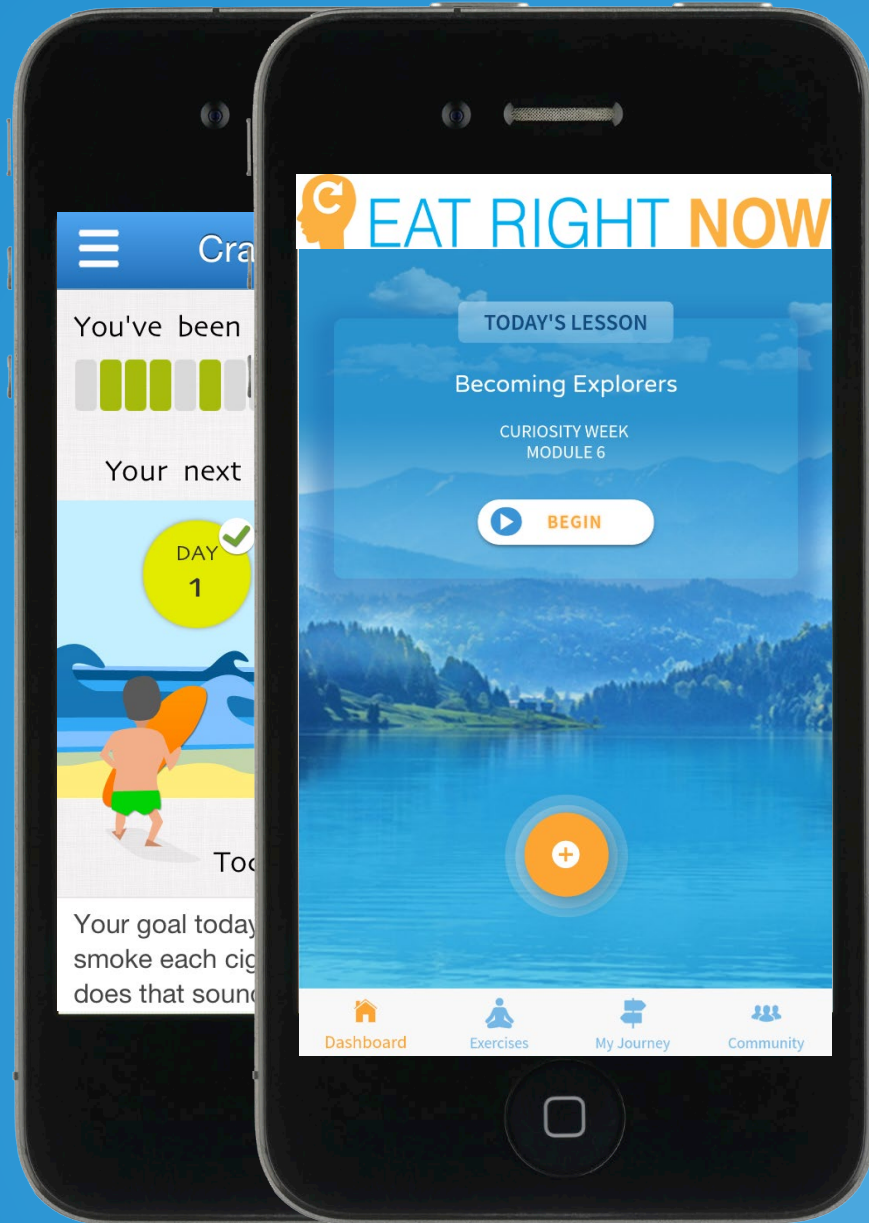
Yogi Berra

Greater smoking abstinence with MT vs. Freedom from Smoking

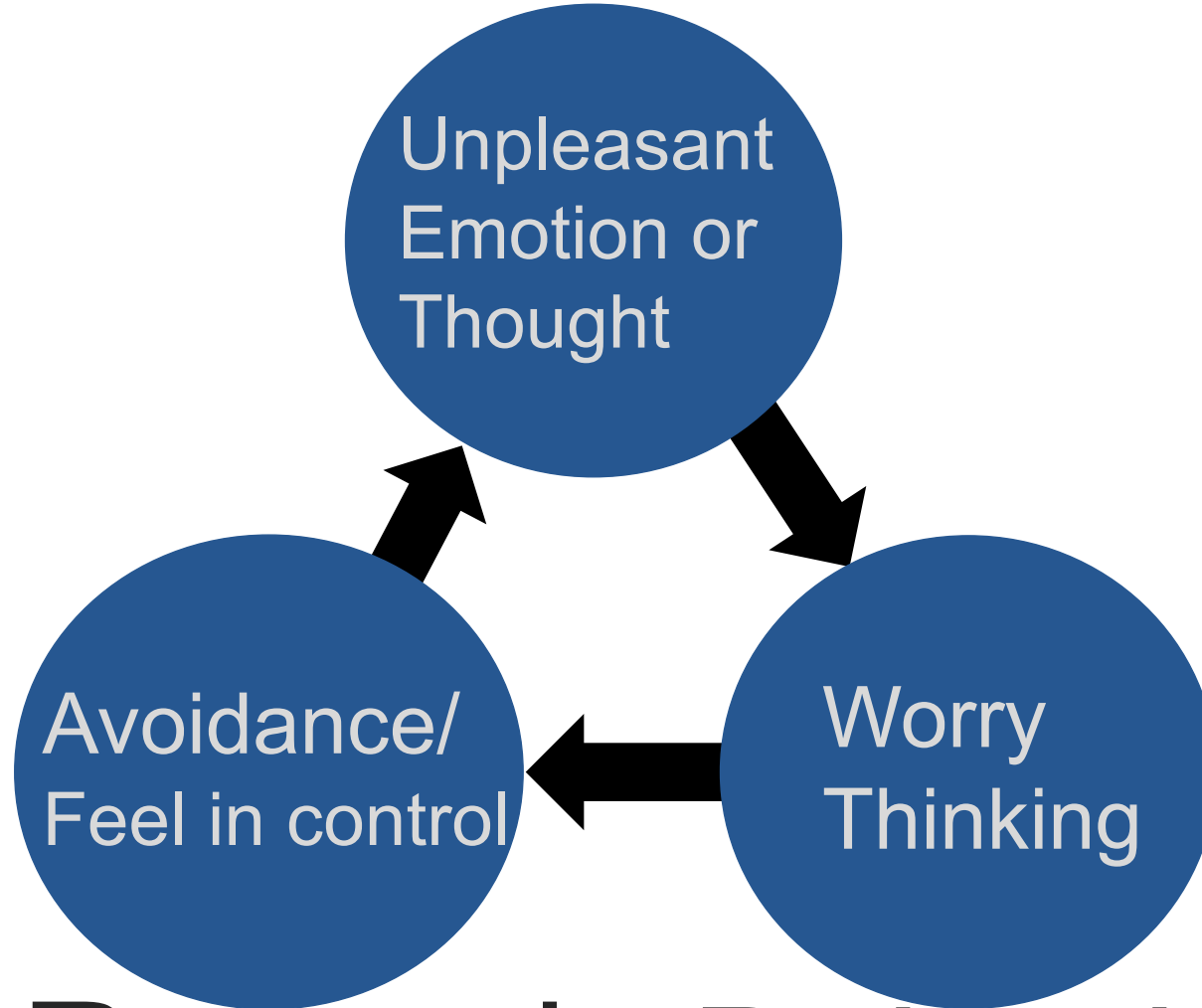


*p = .063

**p = .012



Trigger

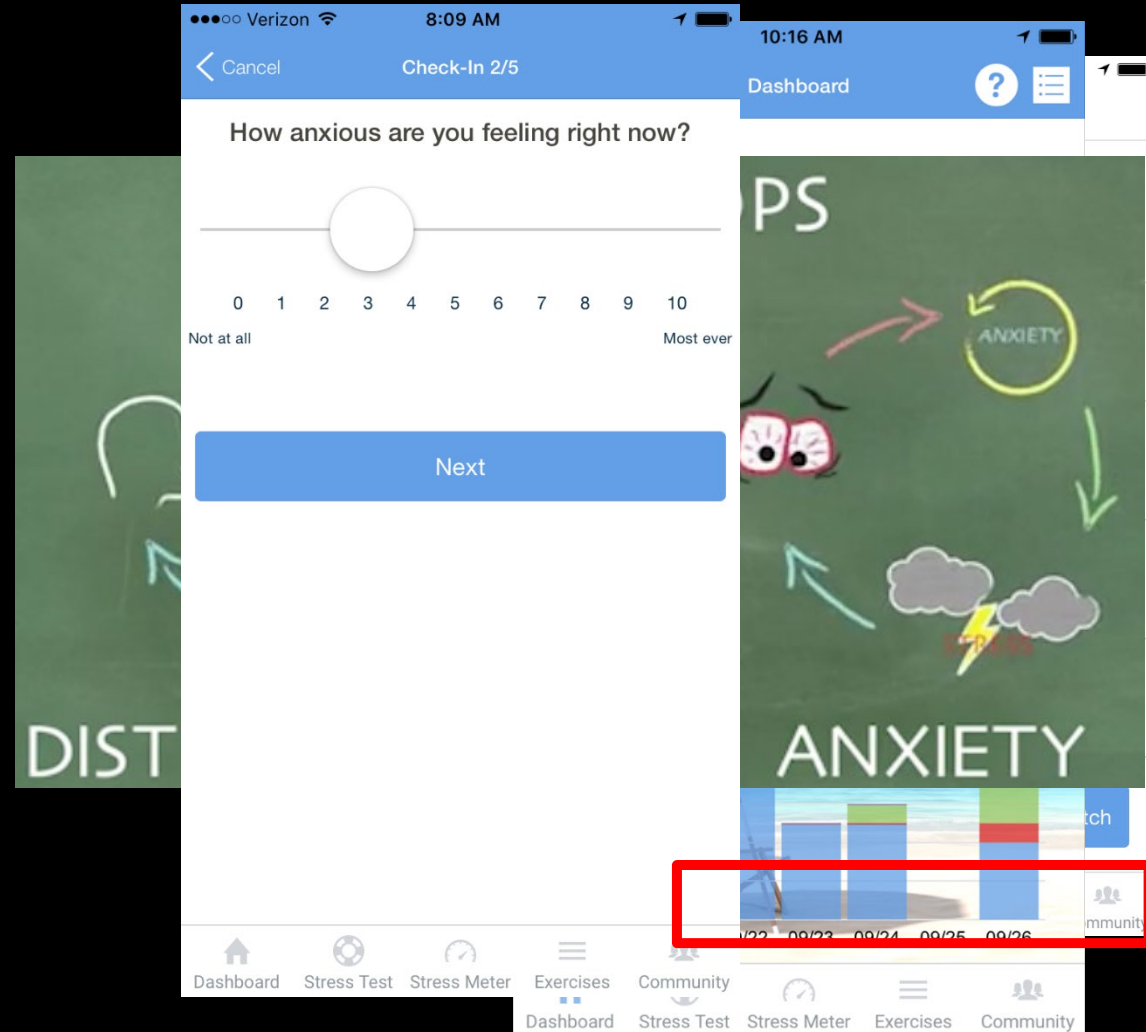


Reward

Behavior

(e.g. Sibrava & Borkovec 2008)



- Gradual training (30+ modules)
 - Understand our mind
 - Directly link to mindfulness
- Daily modules (10 minutes)
 - animations
- In-the-moment exercises
- Experience Sampling
 - Track progress & test efficacy



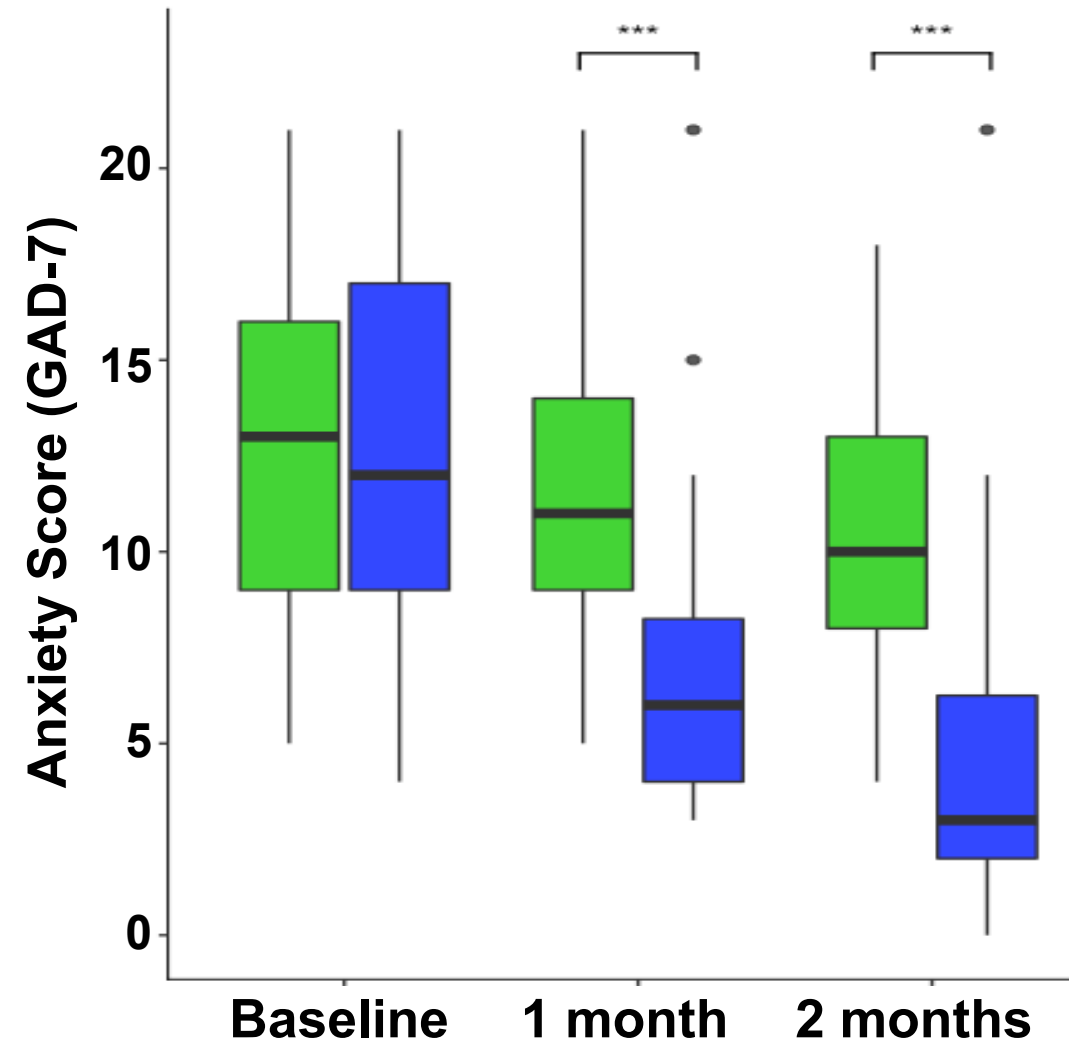


UNWINDING ANXIETY[®]

- ✓ 45% reduction in anxiety at 1 month ($p < .001$)
- ✓ 67% reduction in anxiety at 2 months ($p < .001$)
- ✓ 64% (vs. 3%) achieved remission
- ✓ Number Needed to Treat = 1.6

 TAU + UA (n = 32)
 TAU (n = 33)

(Roy et Al., 2021)



*** $p < 0.001$

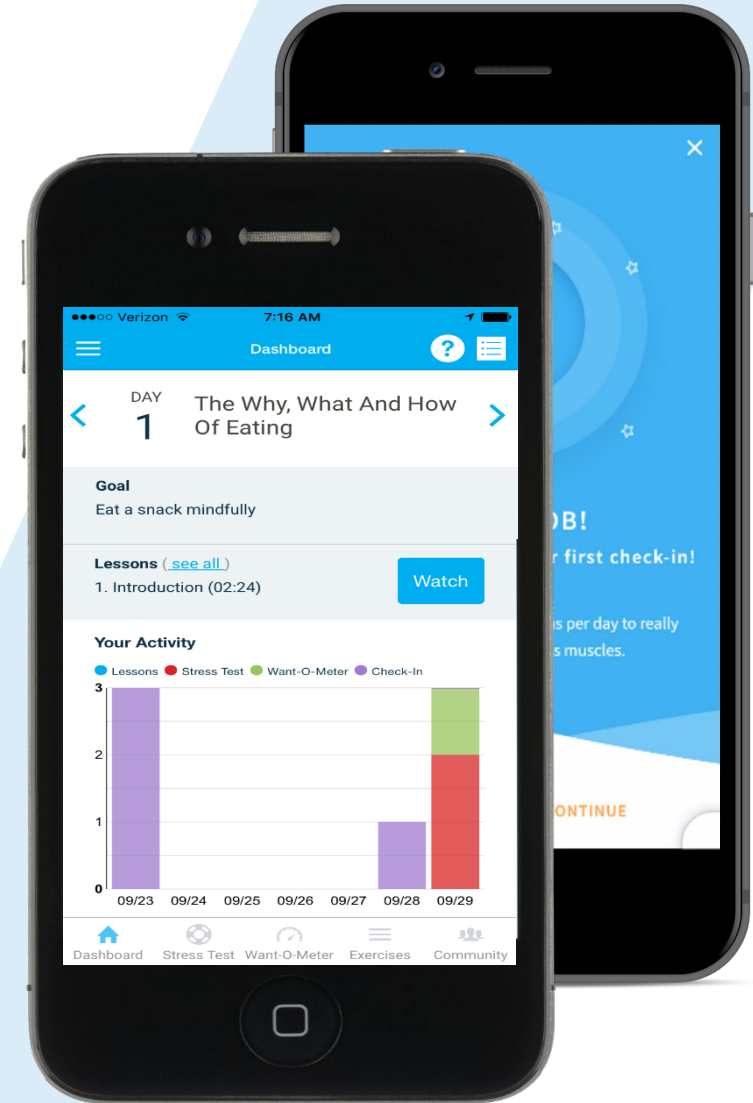


UCSF study (feasibility, mechanism, PI: Mason)

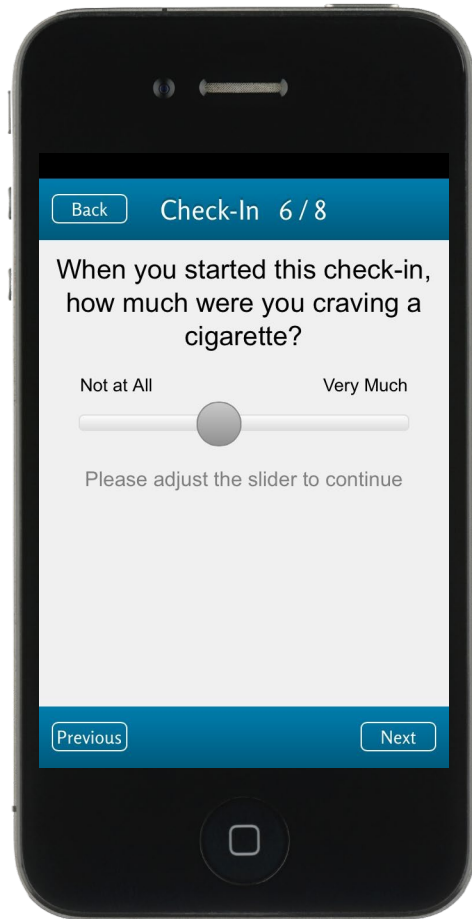
Primary outcome: craving-related eating (n = 104)

- ✓ 40% reduction in craving-related eating ($p < 0.001$)
- ✓ 35% reduction in eating to cope with negative emotions ($p < 0.001$)

(Mason et. Al., *J. of Behav Med* 2017)



Craving to Quit: Experience sampling study



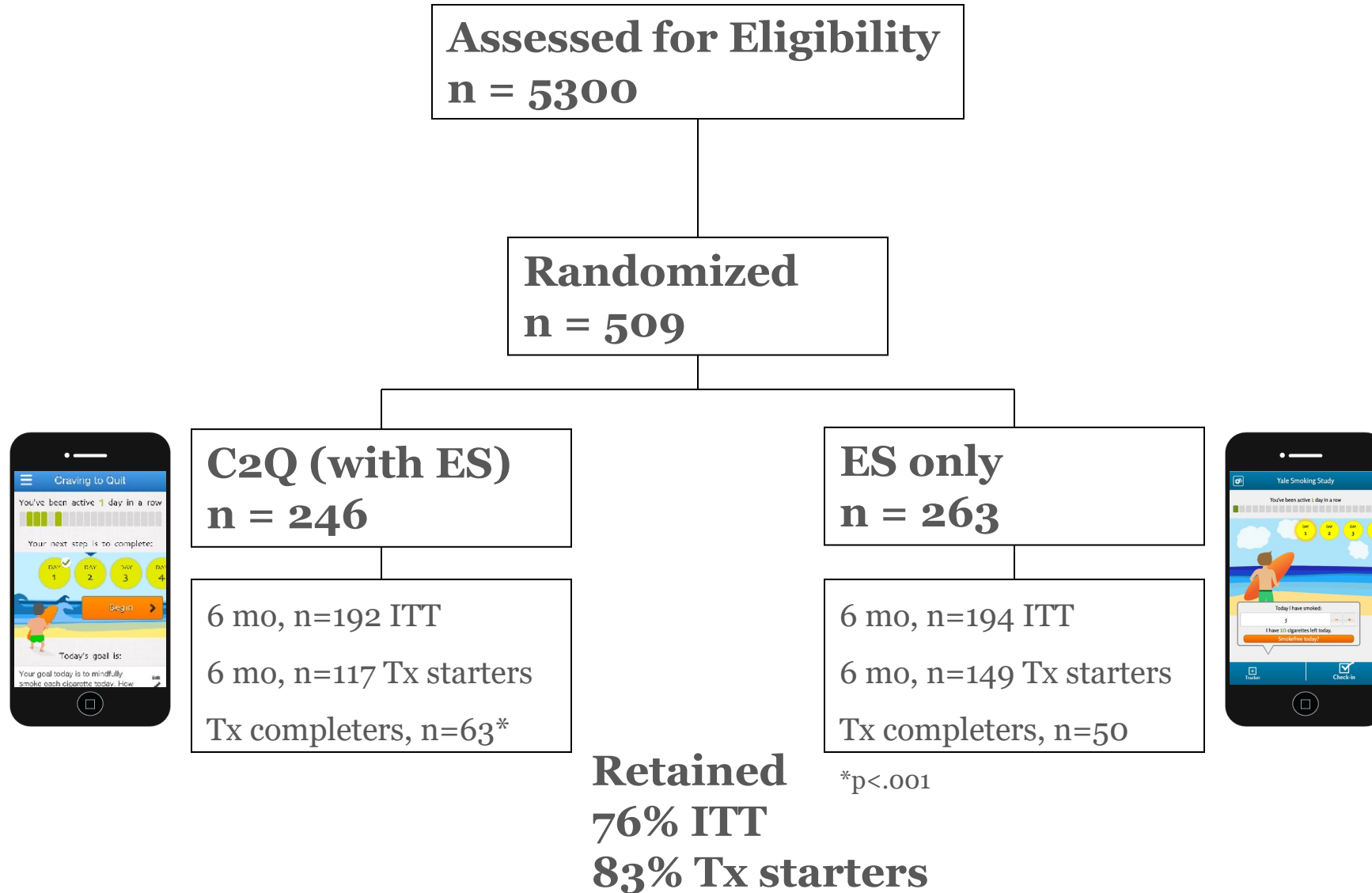
Craving

Mechanistic Question:

Does Craving to Quit decouple craving and smoking in a similar manner as mindfulness training delivered in-person?

Garrison et al (2018)

Treatment retention



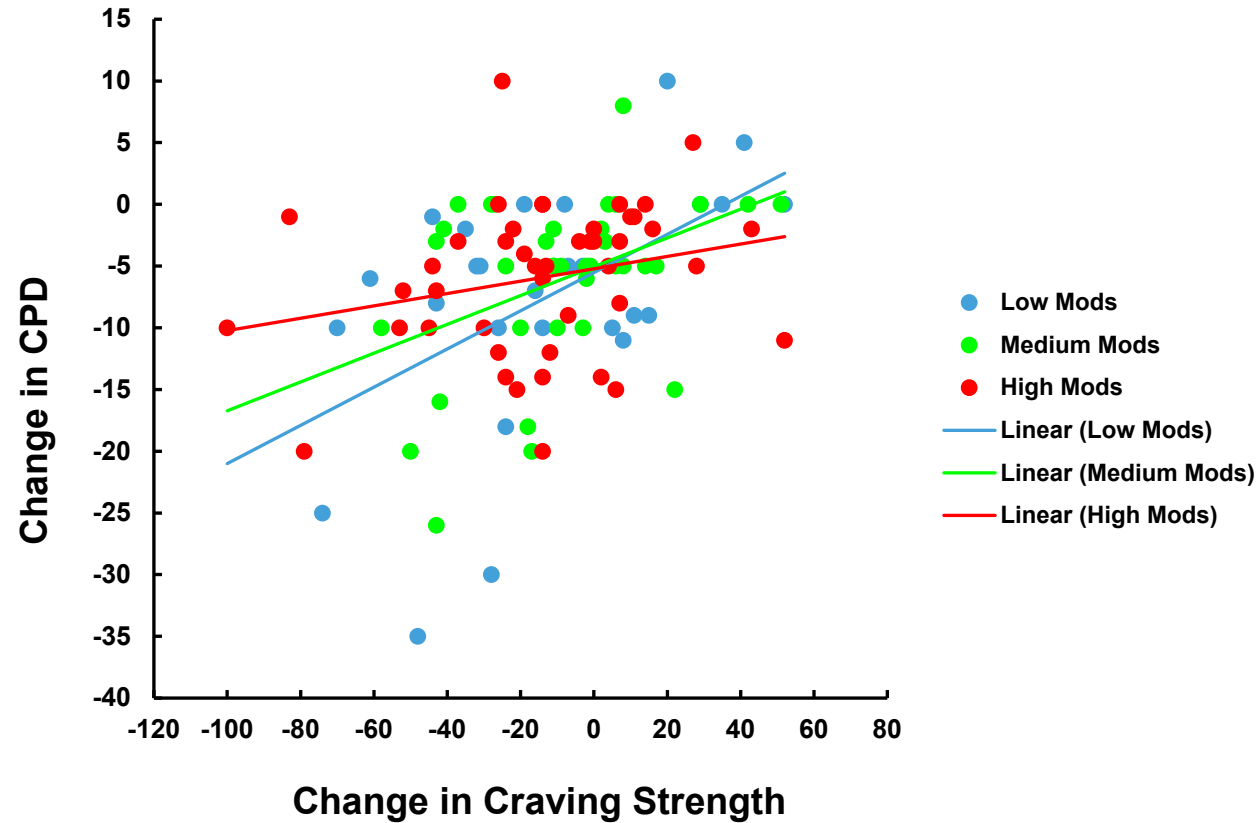
Craving and smoking across treatment

- Greater craving is associated with greater smoking overall
- Craving * Group interaction
- Craving predicts smoking for control app
- Craving does not predict smoking for Craving to Quit

Model Results				
Effect	F Value (DF)	Pr > F		
Group	0.73 (3781)	0.39		
Crave	15.54 (3781)	<.0001		
Crave*Group	3.72 (3781)	0.05		
TimeBin	225.22 (3781)	<.0001		
Slope Estimates				
Label	Estimate	Standard Error	t Value (DF)	Pr > t
Overall Slope	0.06	0.01	3.94 (3781)	<.0001
C2Q Slope	0.03	0.02	1.33 (3781)	0.18
ES Slope	0.08	0.02	4.48 (3781)	<.0001

Garrison et al (2018)

Craving strength decreases with program use



($F(1,104)=4.44$, $p=.04$)

Garrison et al (2018)

Success Stories

"Learning to surf my way through cravings was the best thing I learned. I no longer give in to craving a cigarette like before. More importantly, I opened my eyes to all the wasted time, effort and money consumed on finding my next cigarette, and I can now say cigarettes are not part my life as before."

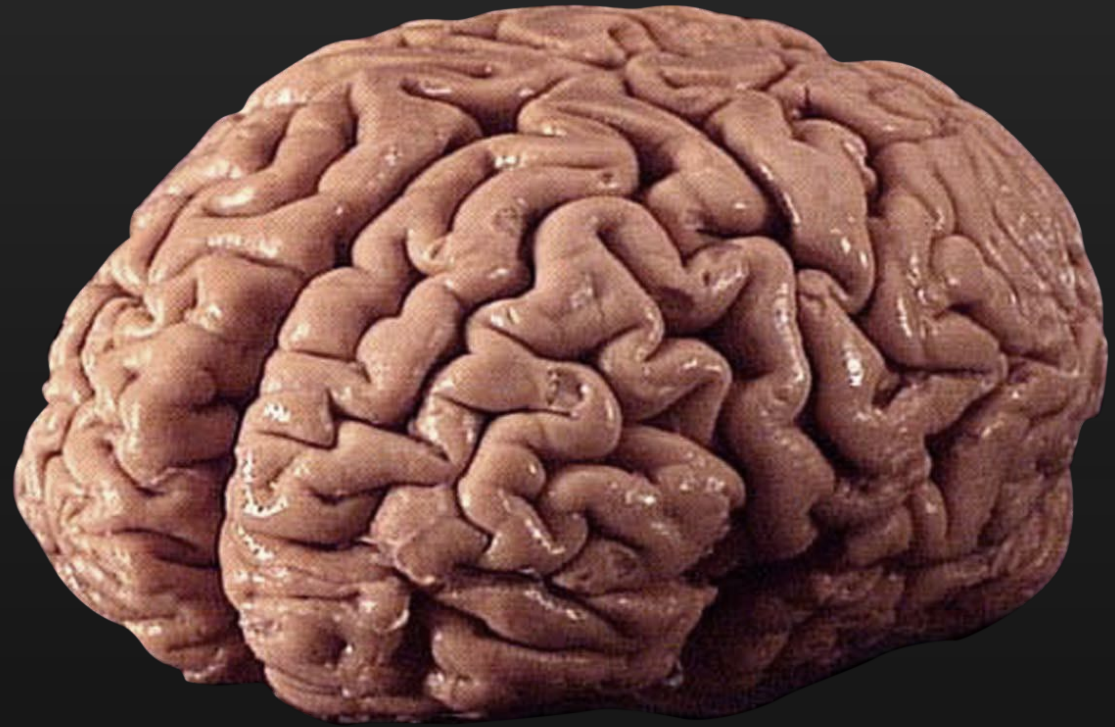
-Robert, San Bernardino, CA

"I began this program a skeptic, but saw its benefits almost immediately. I went from smoking 10 cigarettes a day, literally afraid to leave the house without a pack and a lighter – and after 21 days I have been able to stop smoking all together, this would have never been possible without Craving to Quit."

-Michael, Washington, DC

"For me, the Craving to Quit program was a revelation. I had tried several forms of quitting before, but without success....Then I tried Craving to Quit -- and everything changed. This program is unique, simple to follow, and it works -- it definitely works. What is key here is the mindfulness meditation approach, which helps you to de-stress and also allows you to really think about what smoking feels like physically -- and how you can live without it. You are taught to deal effectively with cravings, to be gentle and kind with yourself, and to feel hope. The videos and animated lessons are superb... This program speaks to your mind, your body and your consciousness. It is the best!!"

-Carolyn, Ontario, Canada



The “Caught Up” Continuum

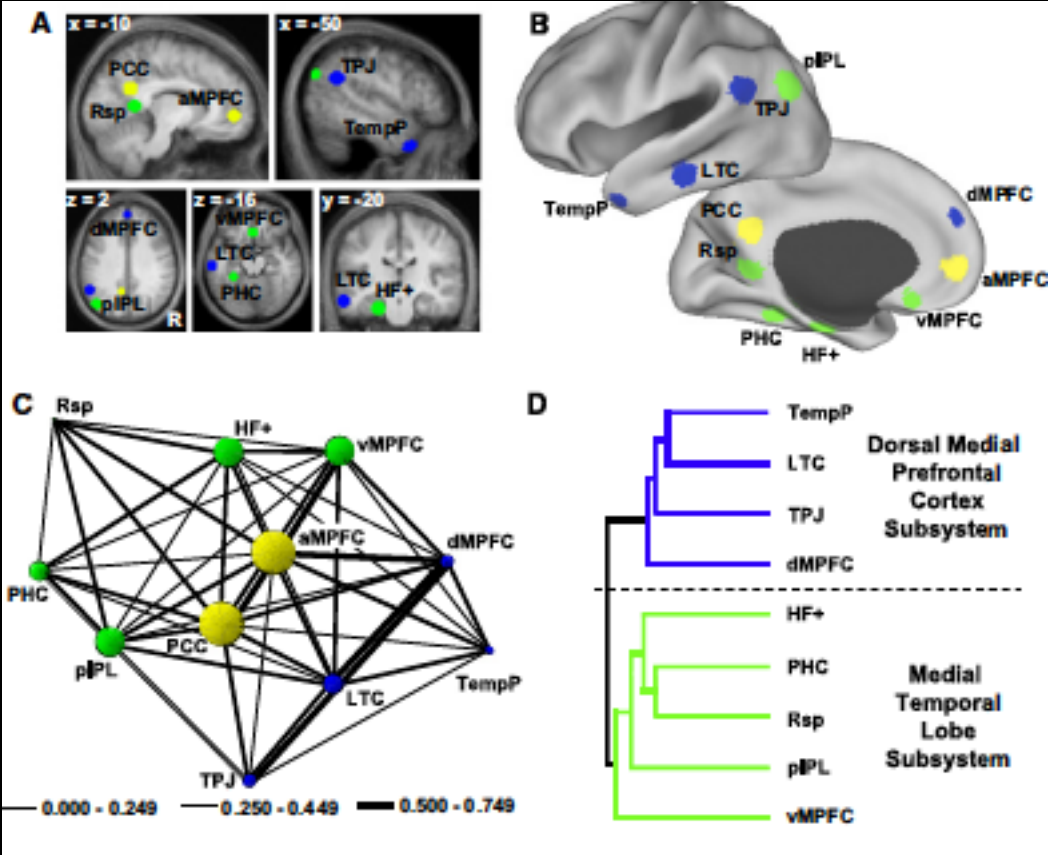


DAYDREAMING

STRESS

ADDICTION

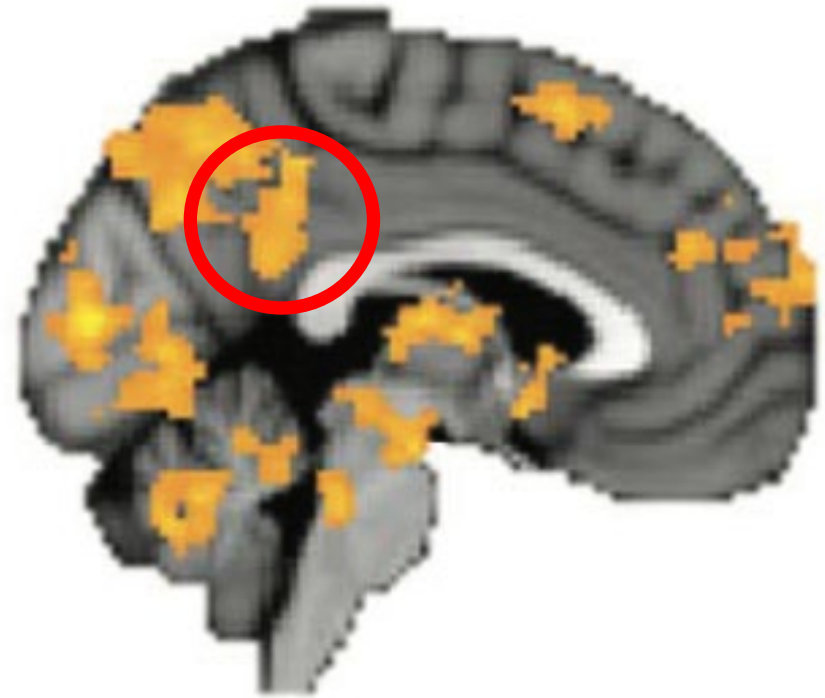
Default Mode Network (DMN)



Adolescents' Own Images

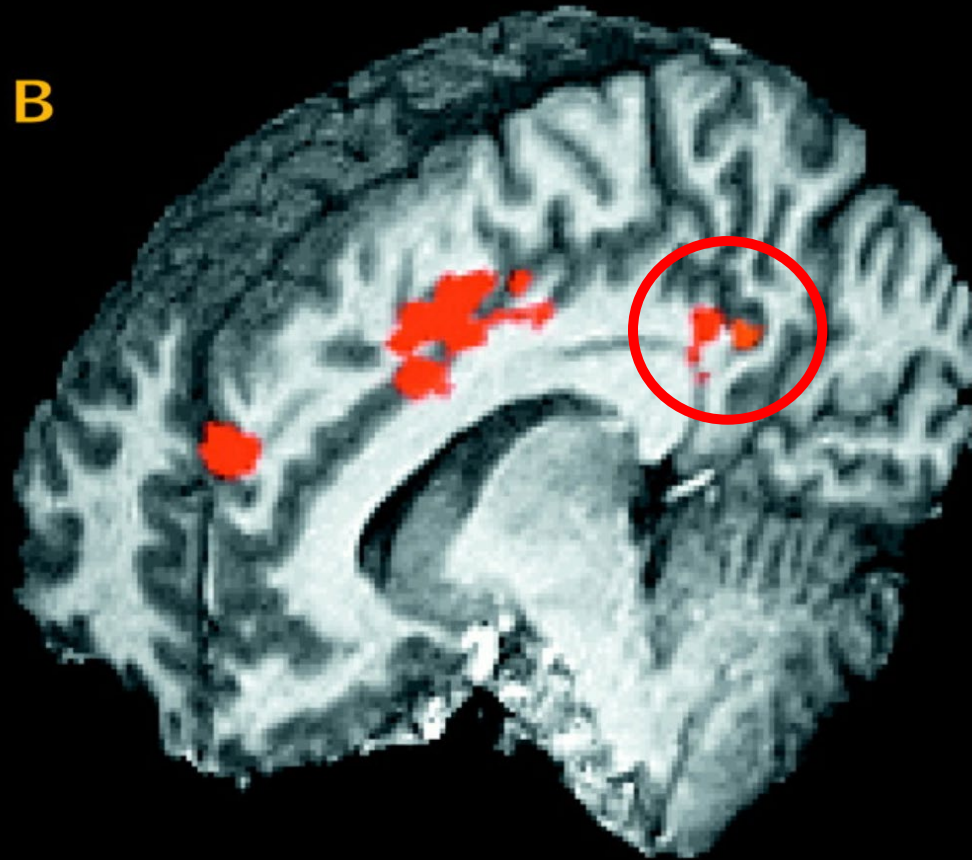
Many Likes > Few Likes

- Viewed simulated “Instagram” feed
- Brain activation was compared during viewing own images with many > few likes:
 - NAcc
 - PCC/precuneus

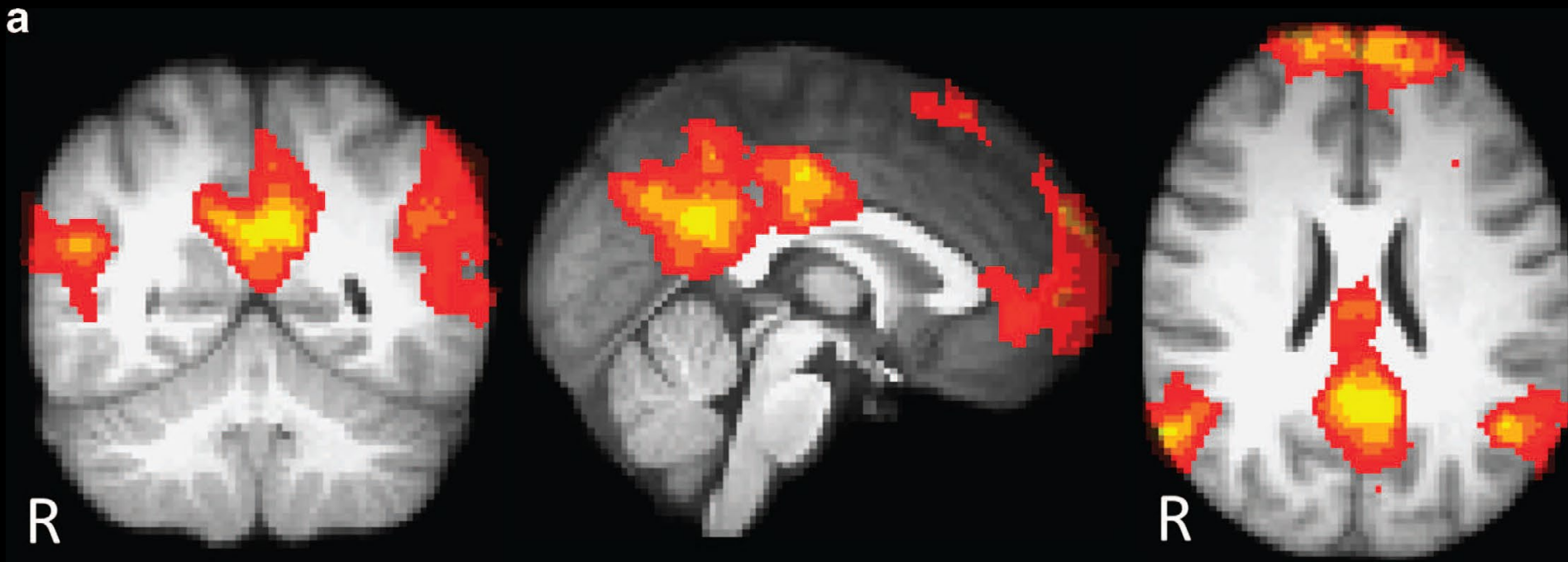


Sherman *et al* (2016)

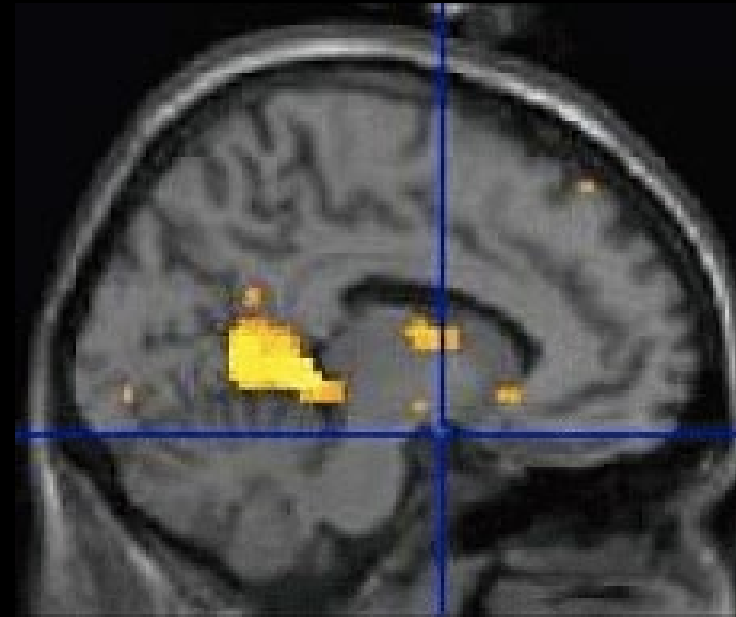
Cocaine cue-induced craving



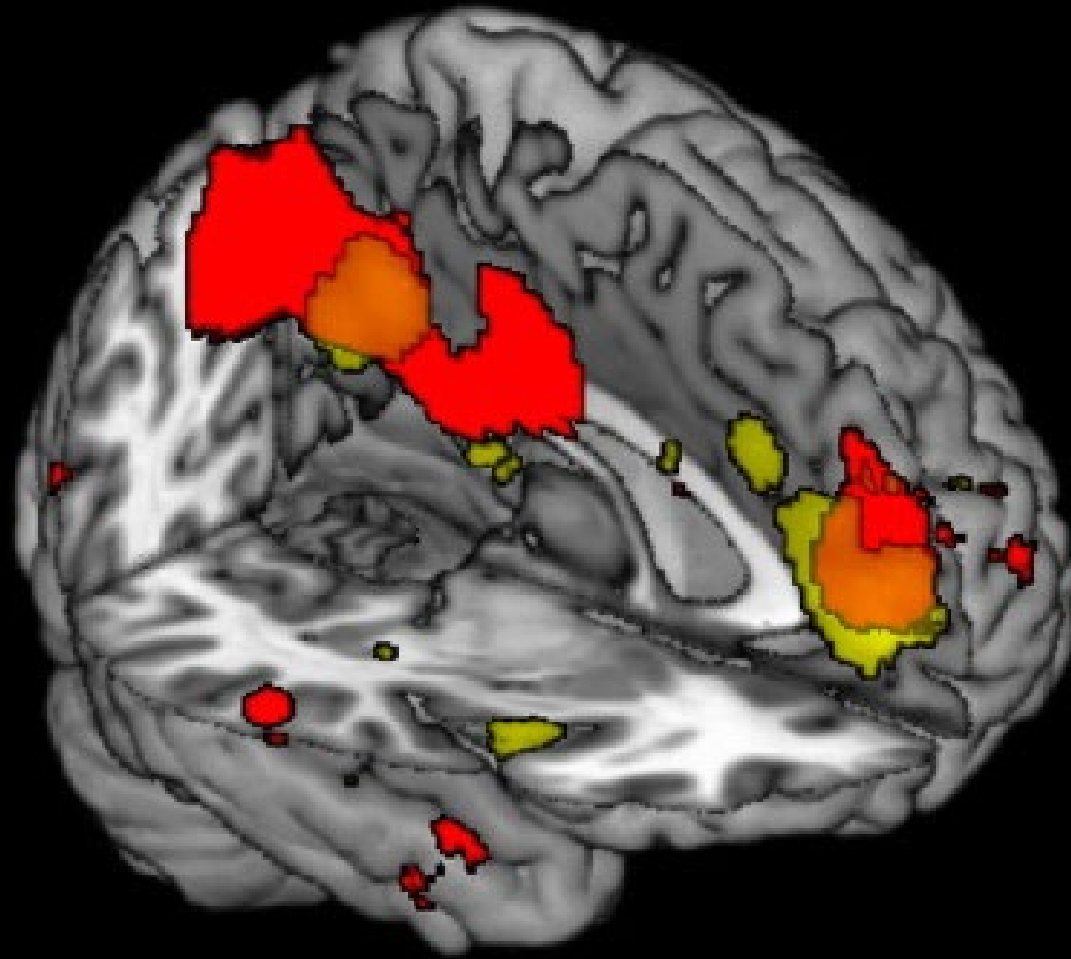
Viewing smoking pictures activates the DMN



Viewing gambling pictures activates the PCC



Worry activates the DMN



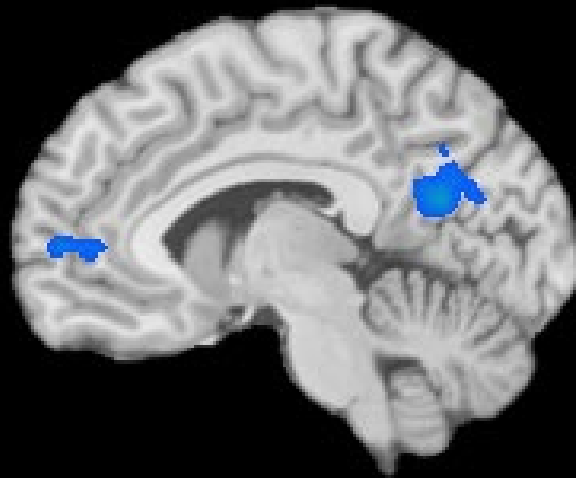
Task of mindfulness training?

Get out of your own way

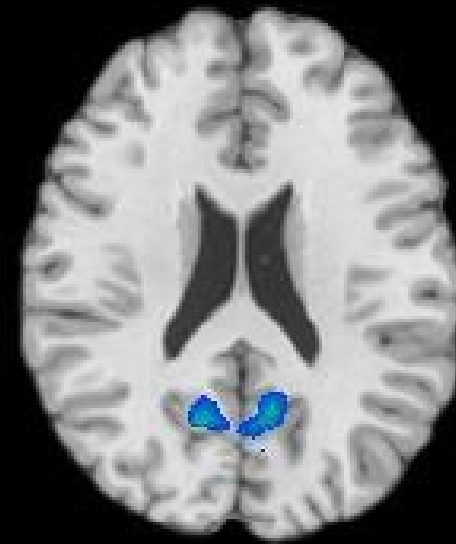
(Don't get caught up in yourself!)

Decreased DMN activity during meditation in experienced meditators

(all meditations, Experienced > Novice)

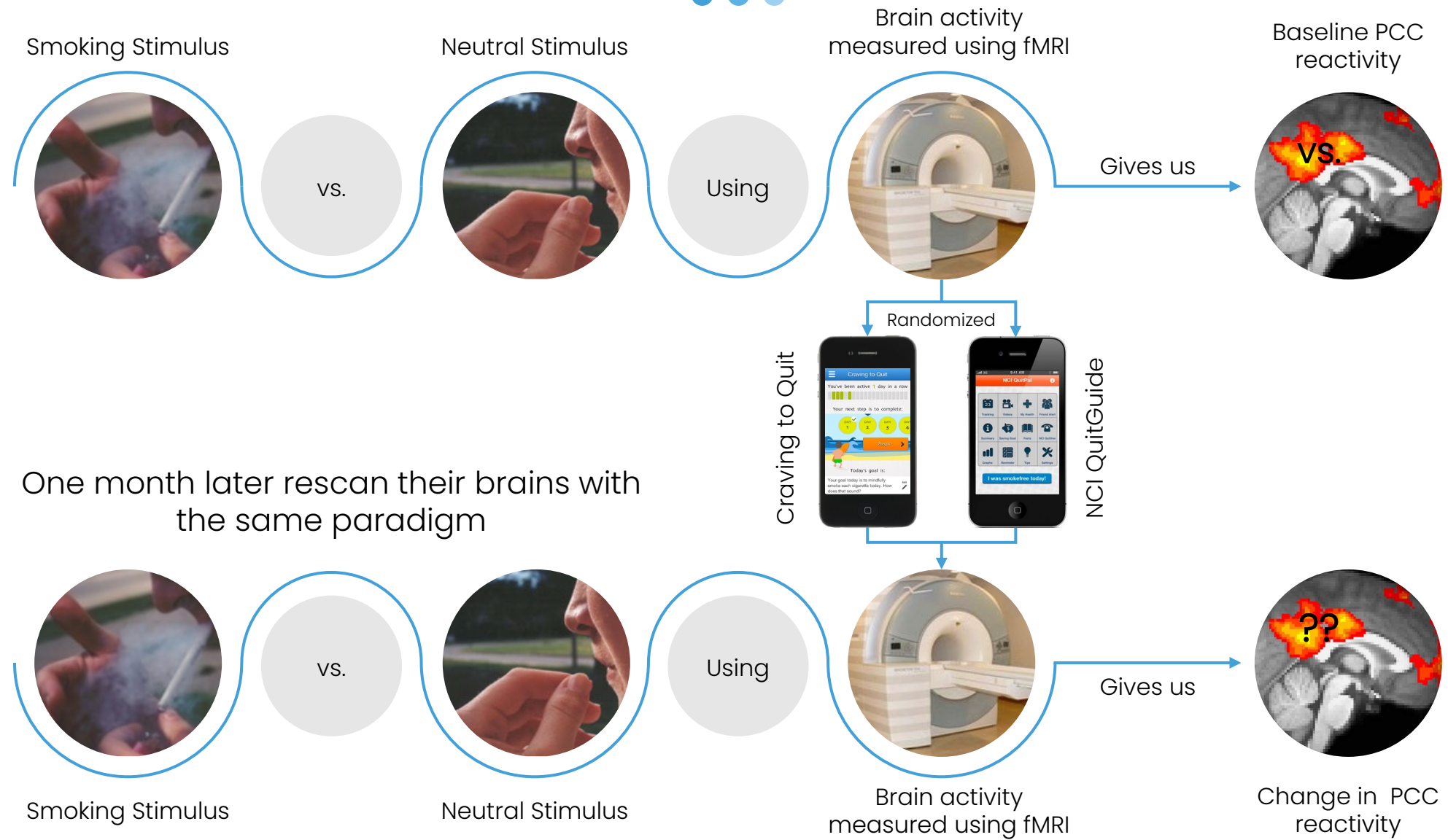


$x = -6$



$z = 21$

CAN APP-BASED MINDFULNESS TRAINING CHANGE BRAIN ACTIVITY?



DECREASED PCC ACTIVITY CORRELATES WITH DECREASED IN CIGARETTE SMOKING ONLY WITH MINDFULNESS TRAINING



C2Q
(n = 33)

NCI
(n = 34)

PCC activity

$r = .39$
 $p = .02$

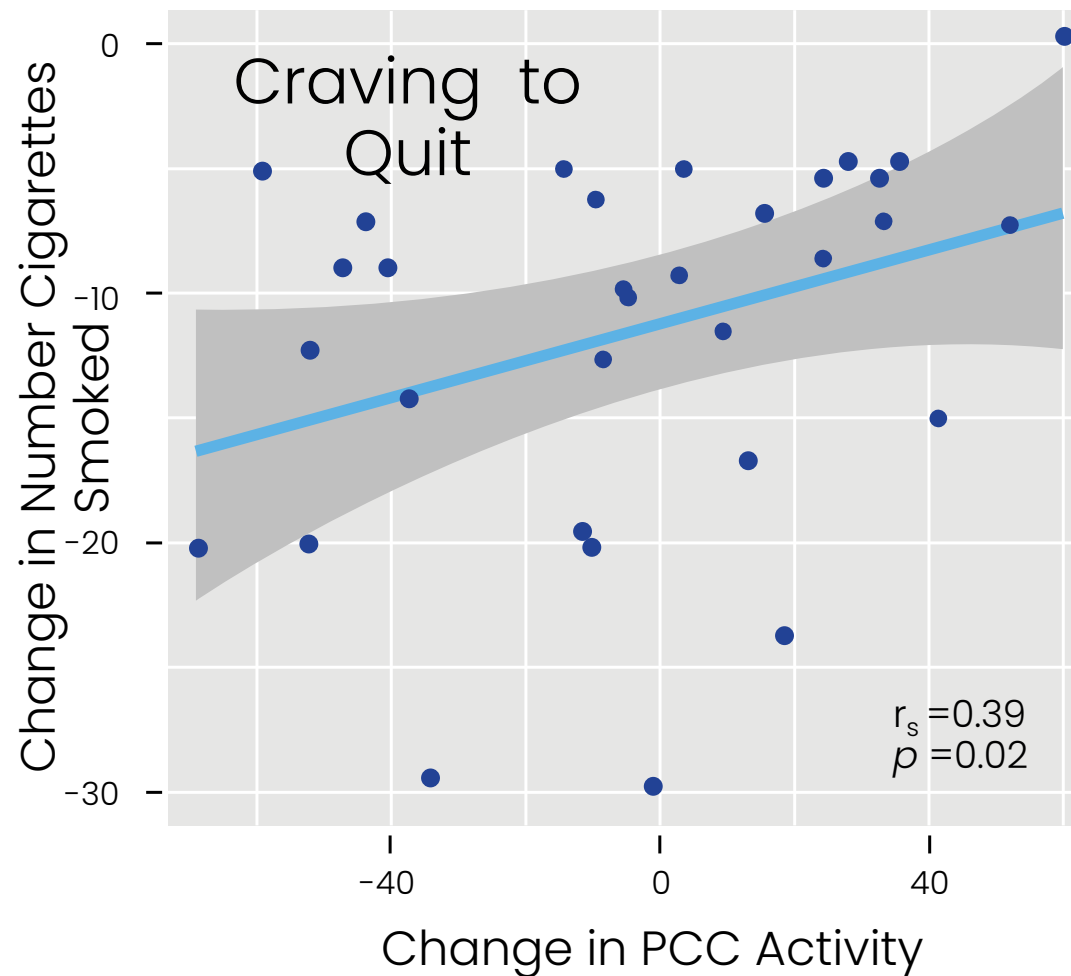
$r = .08$
 $p = .65$

Number of
modules
completed

$r = .49$
 $p = .004$

$r = .20$
 $p = .24$

Janes et al (2019)



Three Steps of Behavior Change

- First step: Awareness of being caught up in a habit loop
- Second step: Exploring the results/rewards of the behavior
 - “What do I get from this?”
- Third step: Stepping out of the habit loop
 - RAIN
 - Breathing into anxiety
 - Loving kindness etc.

Step 1:
Recognizing habit
loops

“

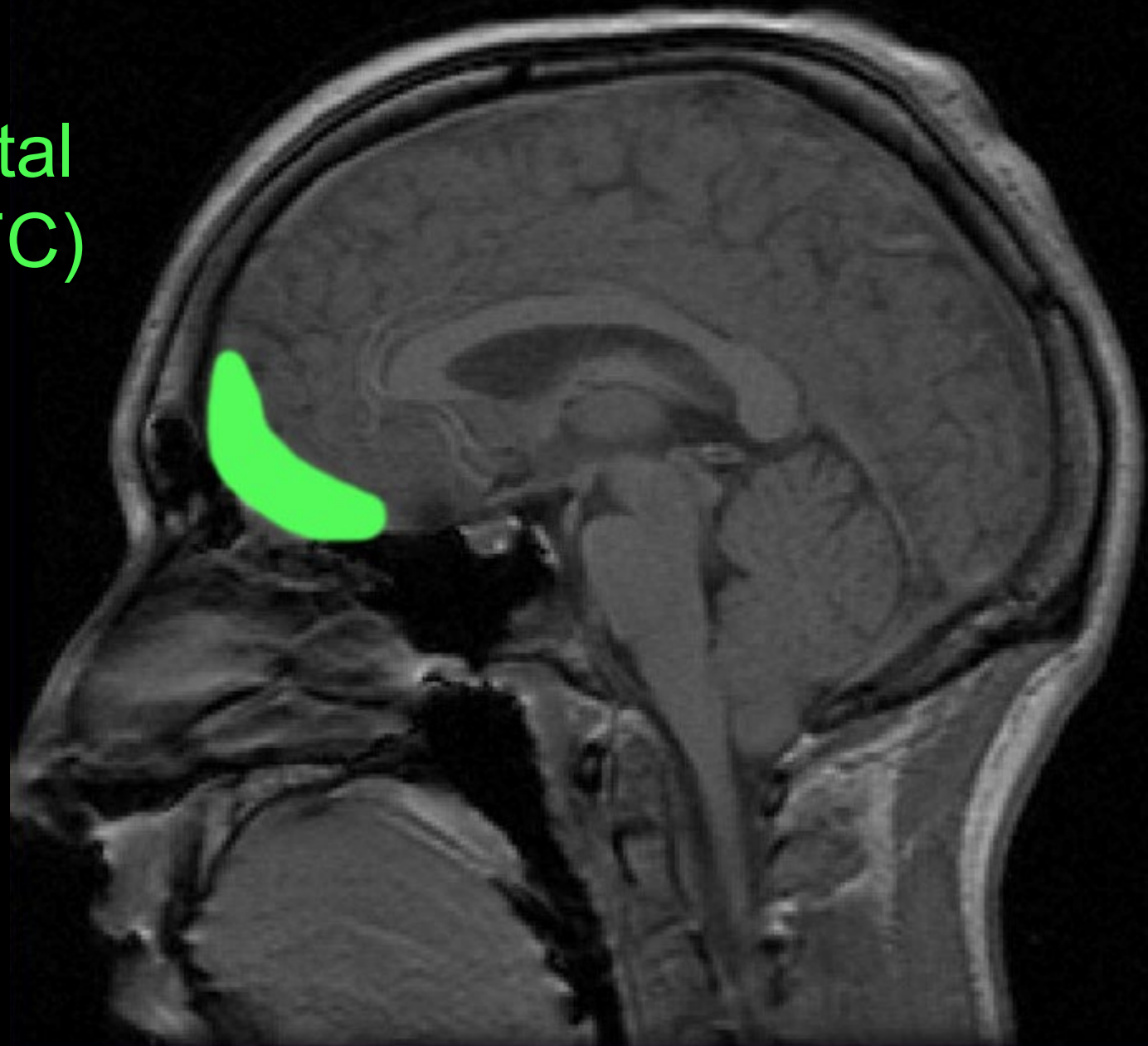
I understand why I go to food to avoid or cover up or distract from uncomfortable feelings such as anger, sadness, or restlessness. Who wants to feel those things? **Trigger:** uncomfortable feeling, **Behavior:** eat something that temporarily diminishes the feeling. **Reward:** still have to deal with the unpleasant feelings, plus the sugar headache! I can clearly see how I got caught in this habit loop, trying to escape difficult feelings with food, but that ultimately it doesn't work.

”

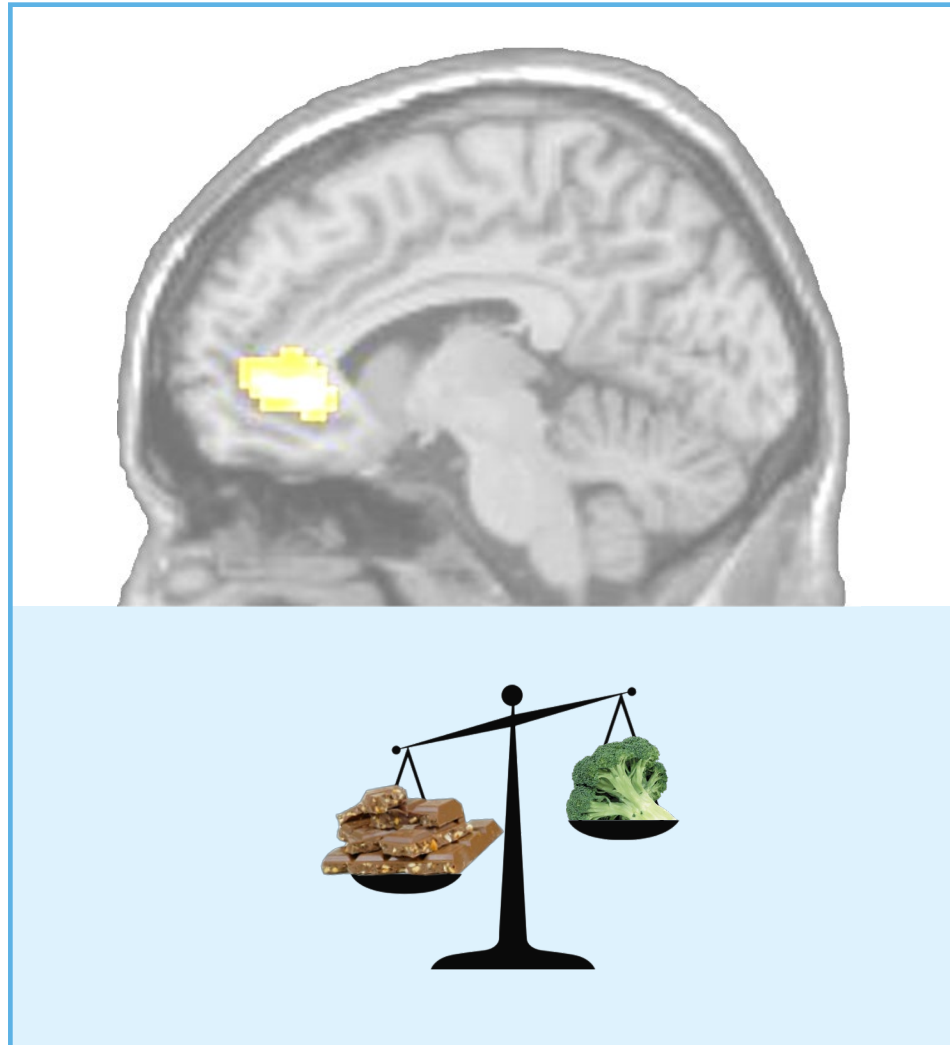
Eat Right Now member

Step 2:
The beginning of
the end

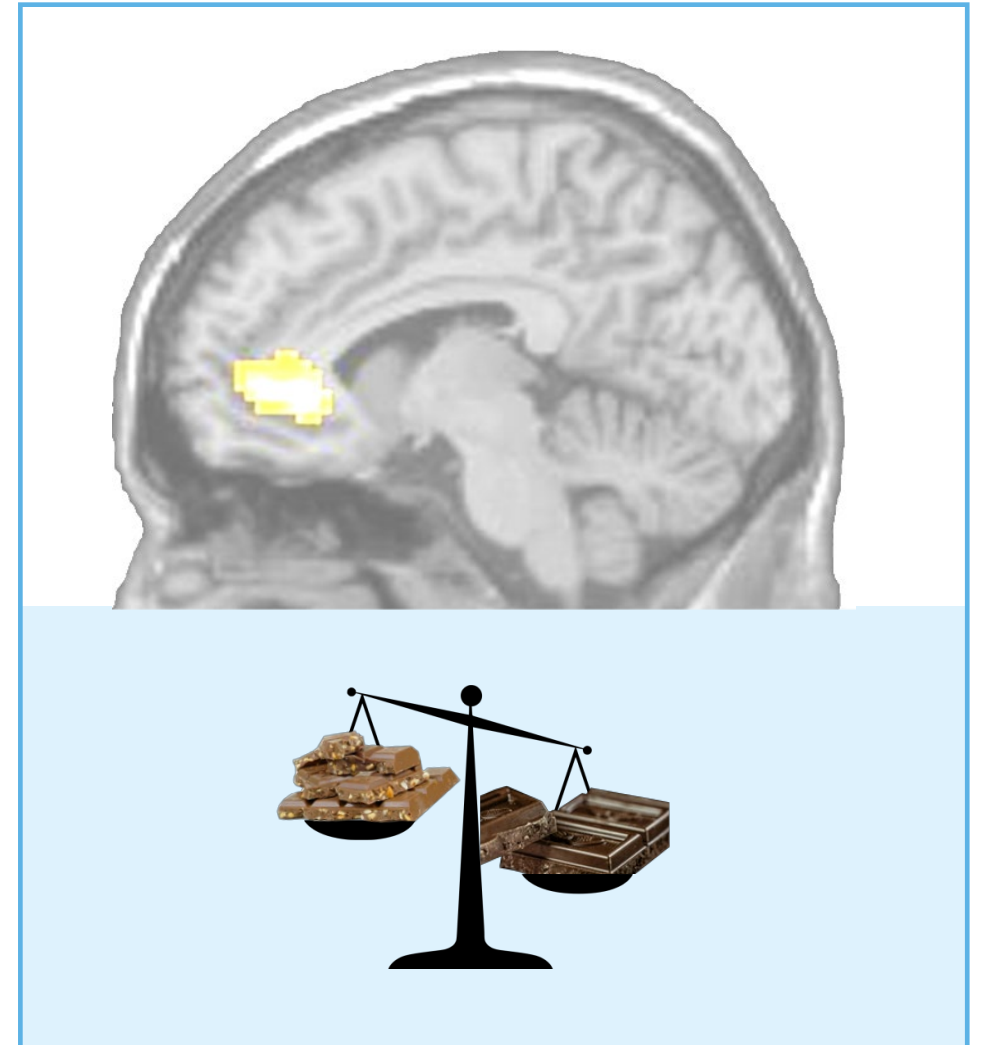
Orbitofrontal
cortex (OFC)



THE ORBITOFRONTAL CORTEX STORES REWARD VALUE



Eat dark
chocolate



Reinforcement Learning Models and Mindfulness-based Craving Tool

Standard Rescorla-Wagner (RW) reinforcement learning model:

- $V_{t+1} = V_t + \alpha \delta t$
→ *Reward Value of consuming craved item*
- $\delta t = \lambda t - V_t$
 - λt : actual outcome. learning signal = contentment felt after eating
 - Proxy for V of eating (measure onto which V is fitted) = craving change
 - If craving has been reduced from the exercise -> less motivation to eat
 - if craving has increased after exercise -> more motivation to eat

δt = Prediction Error (PE) = *discrepancy between an expected outcome and actual outcome*

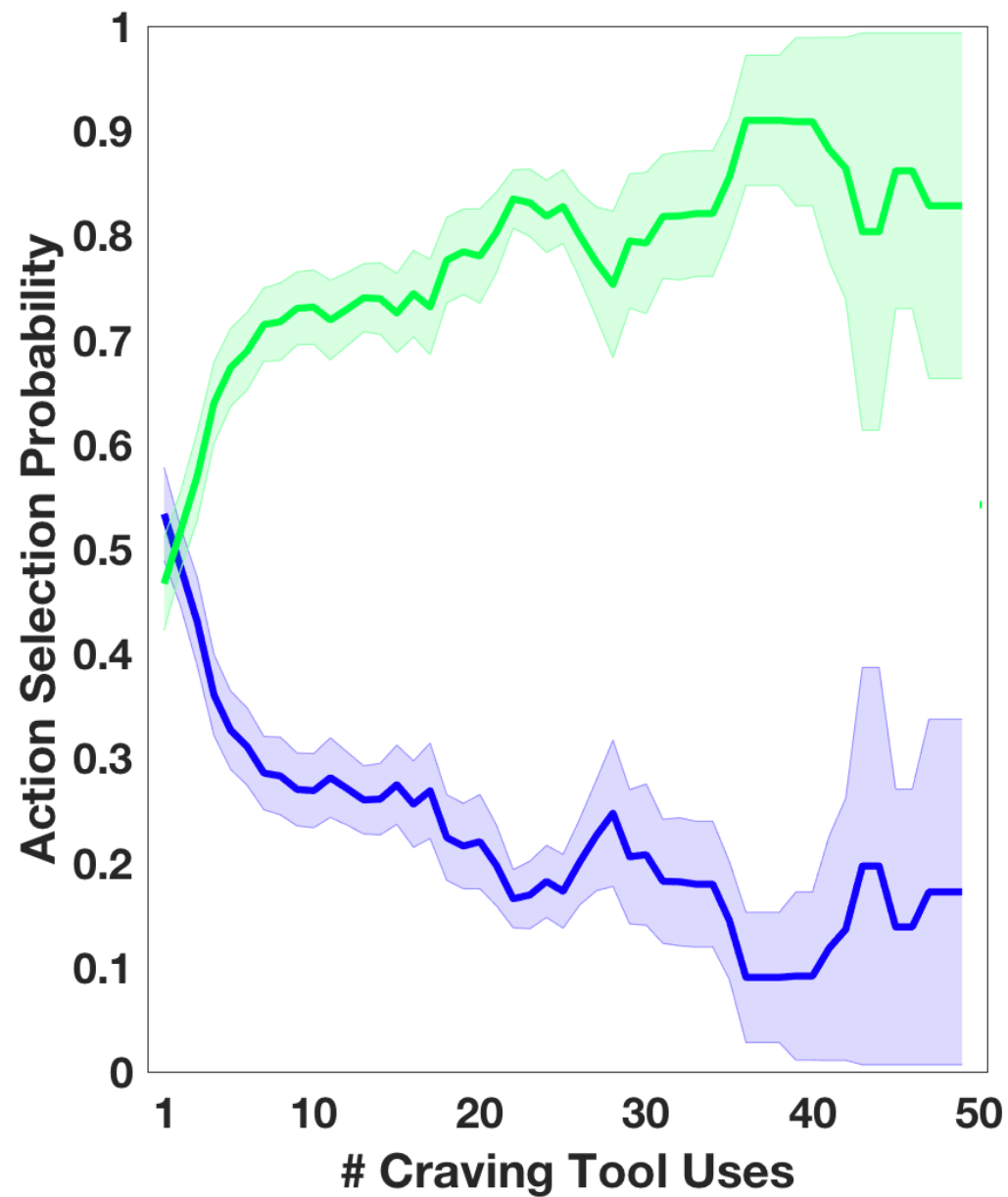
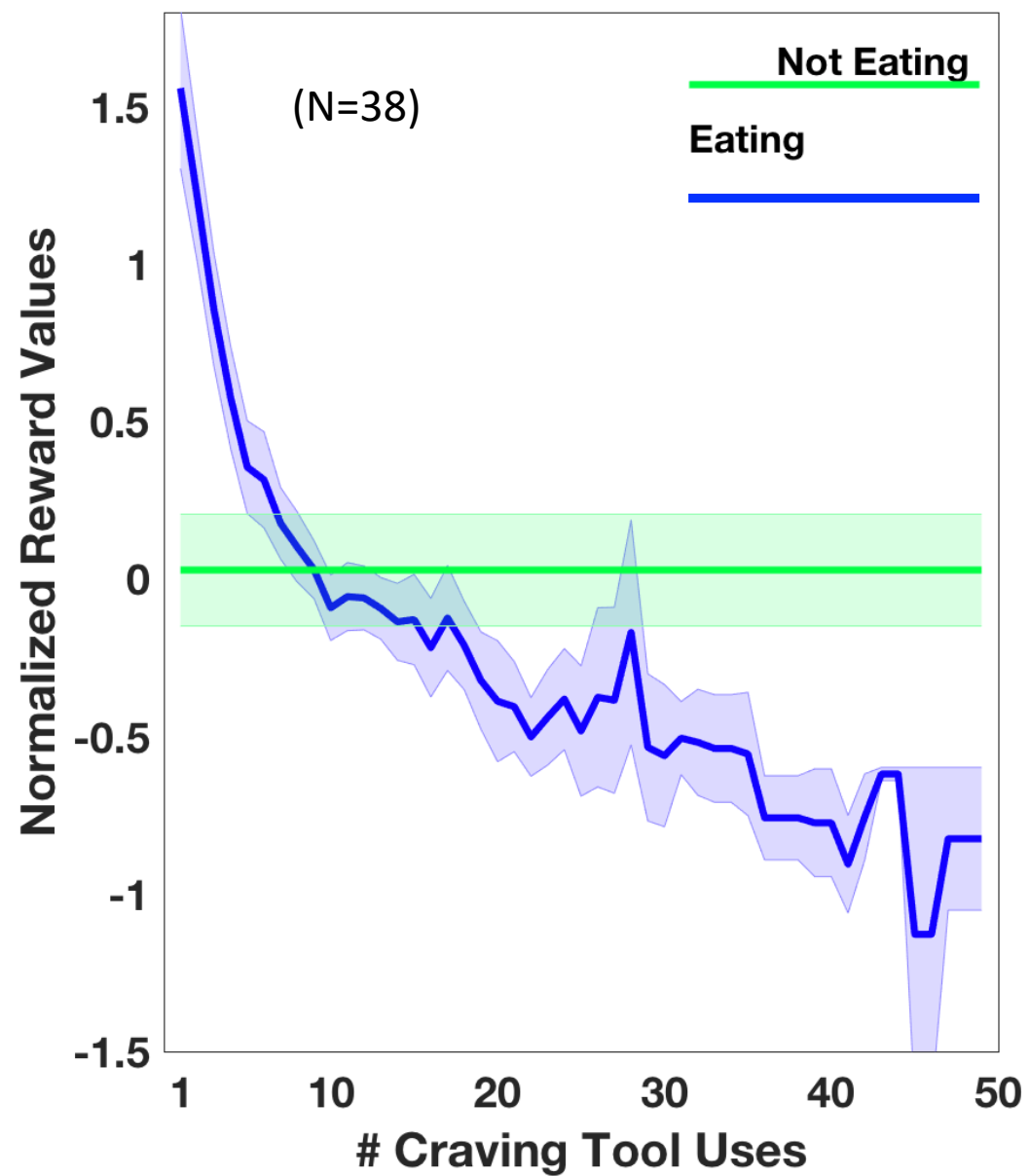
(Eg. Expecting to feel very content after smoking a cigarette yet experiencing strong disgust towards actual sensations from smoking)

- α : a static subject-level parameter which modulates the rate of learning or update in value from the PE signal

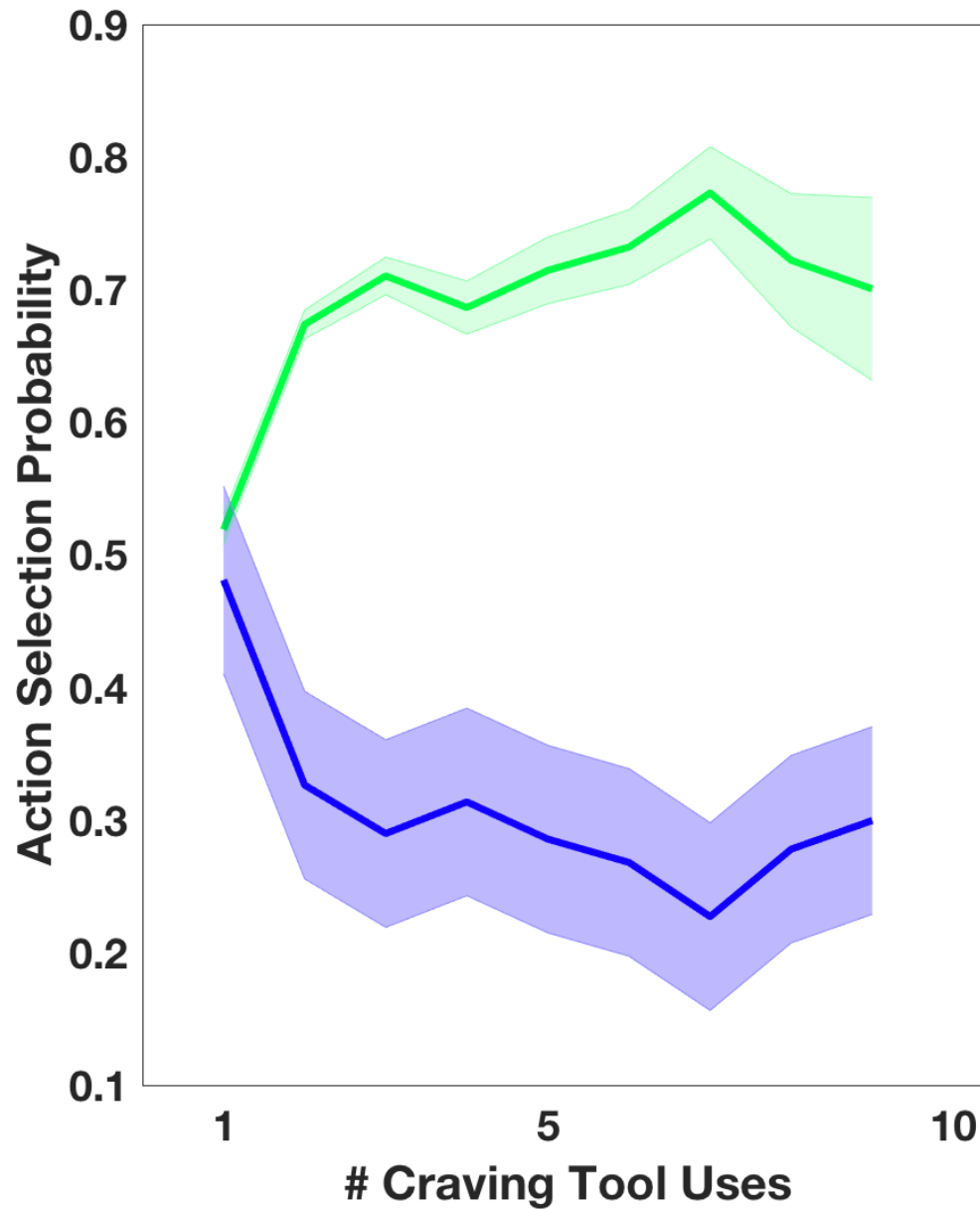
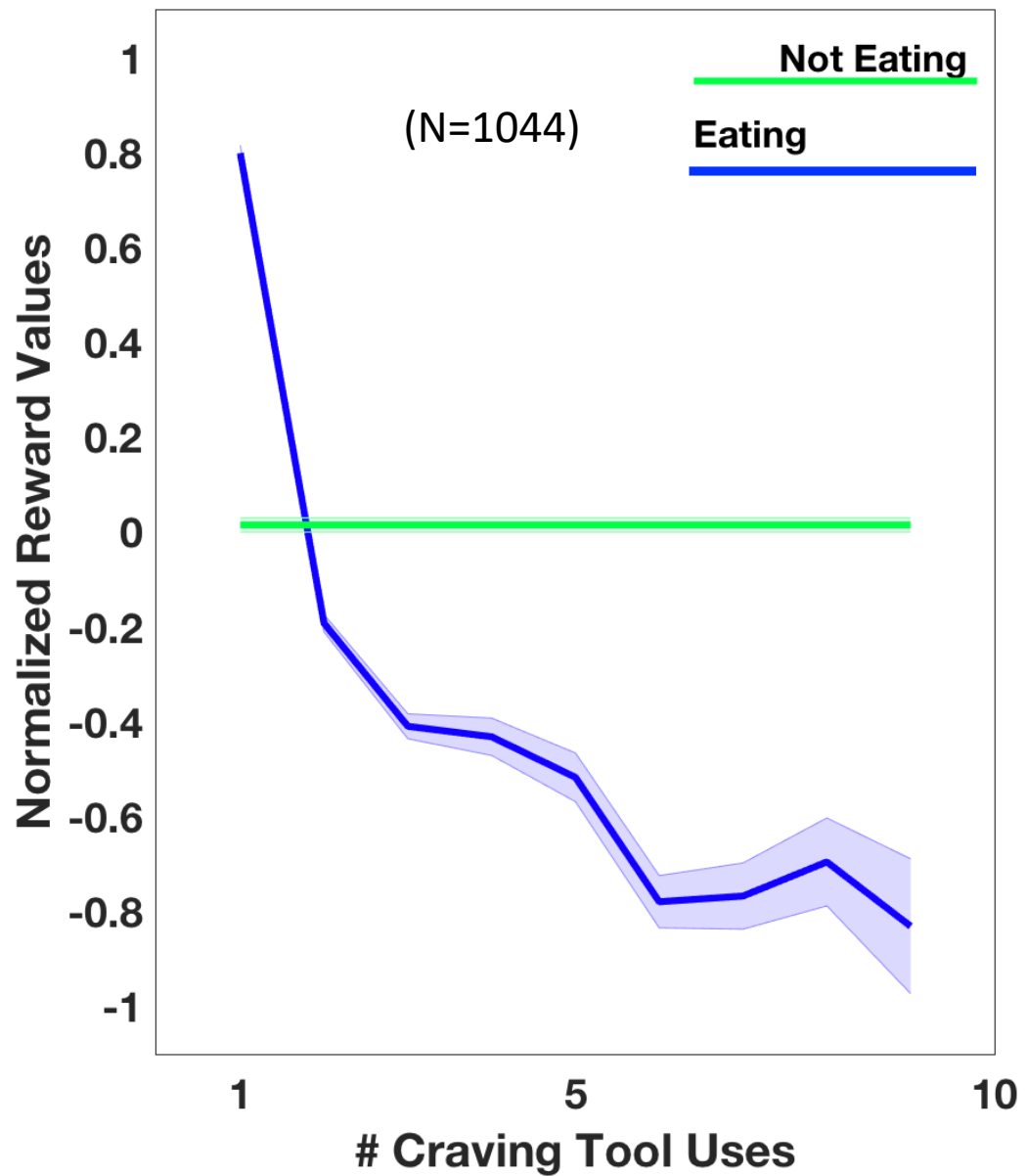
The interface is divided into two main sections. The left section is a list of prompts under two columns: 'TYPE' and 'AMOUNT'. The 'TYPE' column has an orange header, and the 'AMOUNT' column has a white header. The prompts are:

- Bring to mind the food you are **STRUGGLING** with
- IMAGINE** eating the amount that you usually eat of it.
- Let it settle in your stomach.
- Now, focus on what it feels like in your belly. Notice what your body feels like after you ate it.
- Notice your thoughts and emotions.

The right section is a slider titled 'How strong is your craving now compared to before the exercise?'. The slider has a blue knob positioned at 0. The scale ranges from -10 (a lot weaker) to +10 (a lot stronger), with intermediate markers at -5 (same as before) and +5. Below the slider is a question 'Do you want to eat now?' with two orange buttons: 'NO' and 'YES'.



(Taylor et al., 2021)



(Taylor et al., 2021)

“

Dear sneaky habit loop that
says eating junk food is fun: I
AM ON TO YOU.

”

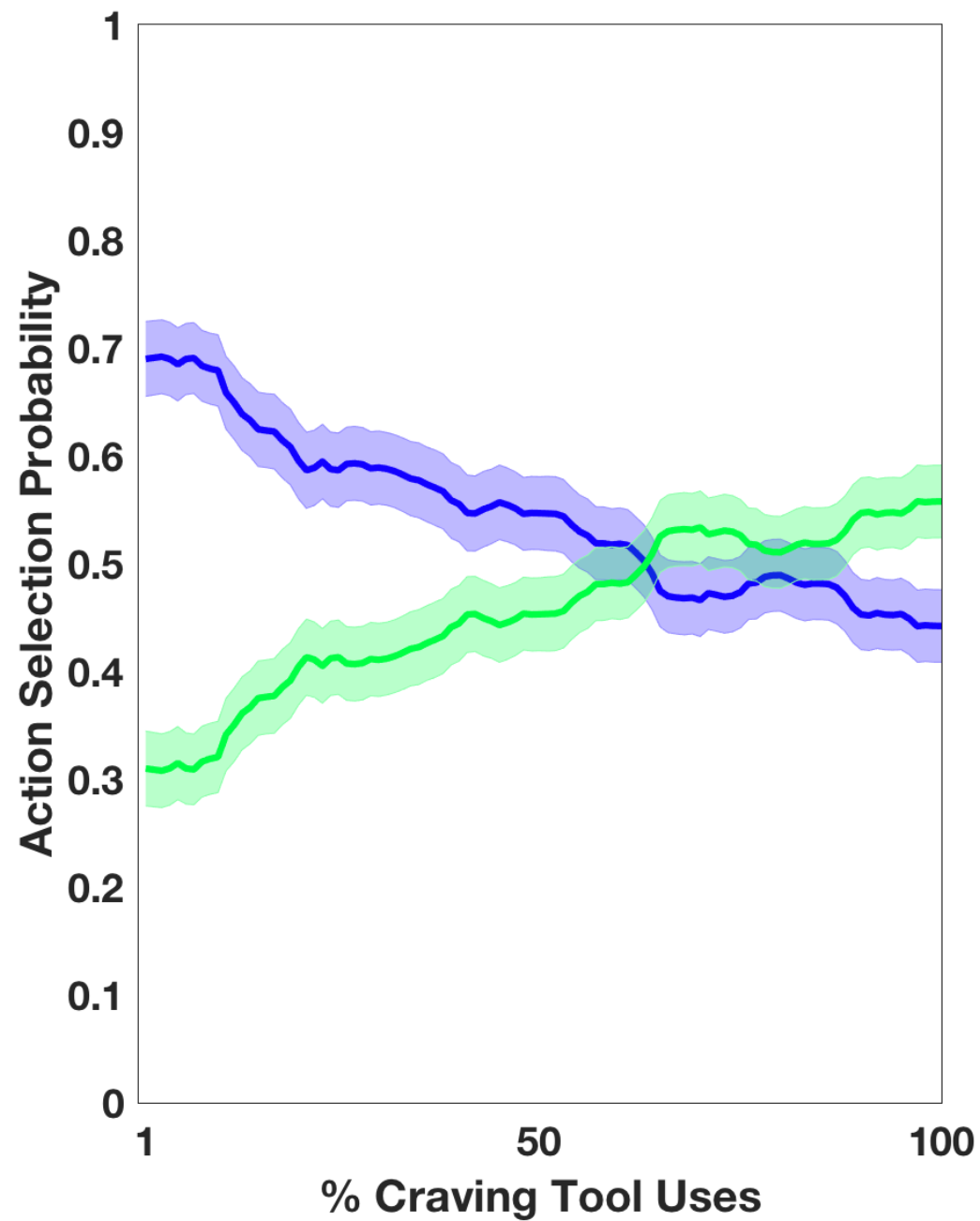
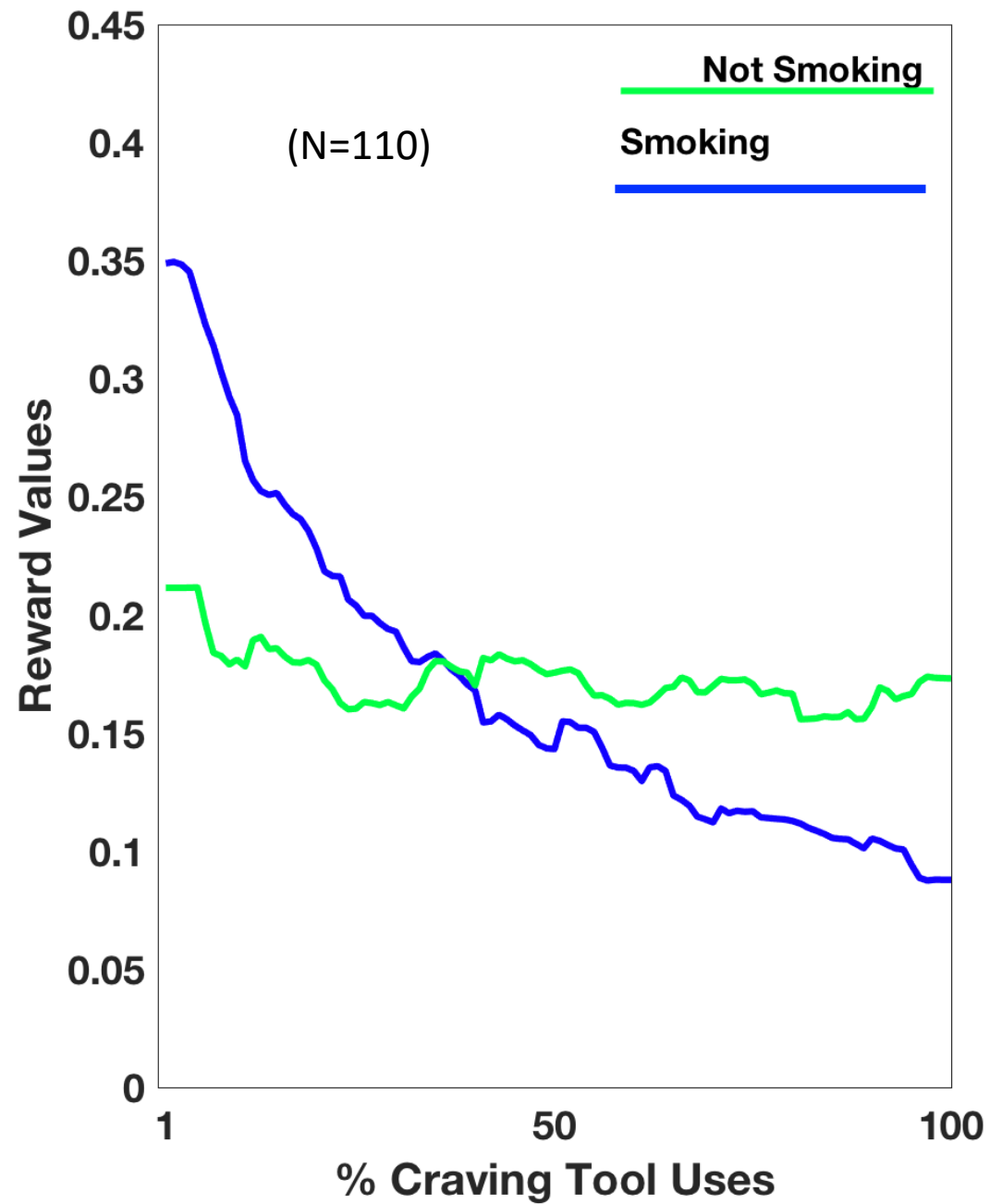
Eat Right Now member

“

A shift is happening; I'm choosing more healthy foods. The sugary things are less attractive. Satiety is now coming into focus.

”

Eat Right Now member



“

Today all the cigarettes I smoked
were disgusting.

”

Craving to Quit member

Step 3:
Rewards that are
more rewarding

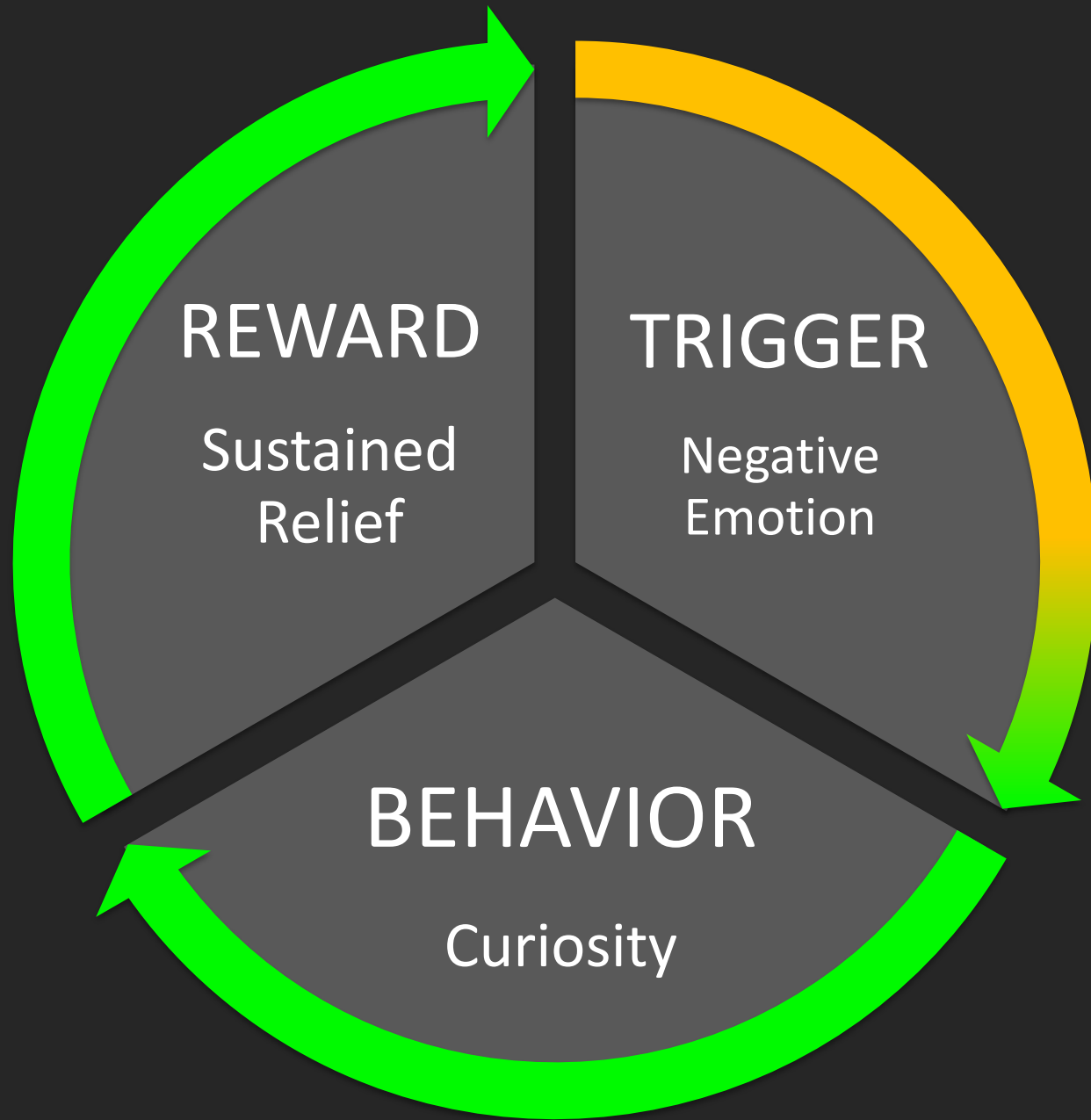


“

I have no special talents. I am
only passionately curious.

”

-Albert Einstein



REWARD

Sustained
Relief

TRIGGER

Negative
Emotion

BEHAVIOR

Curiosity

“

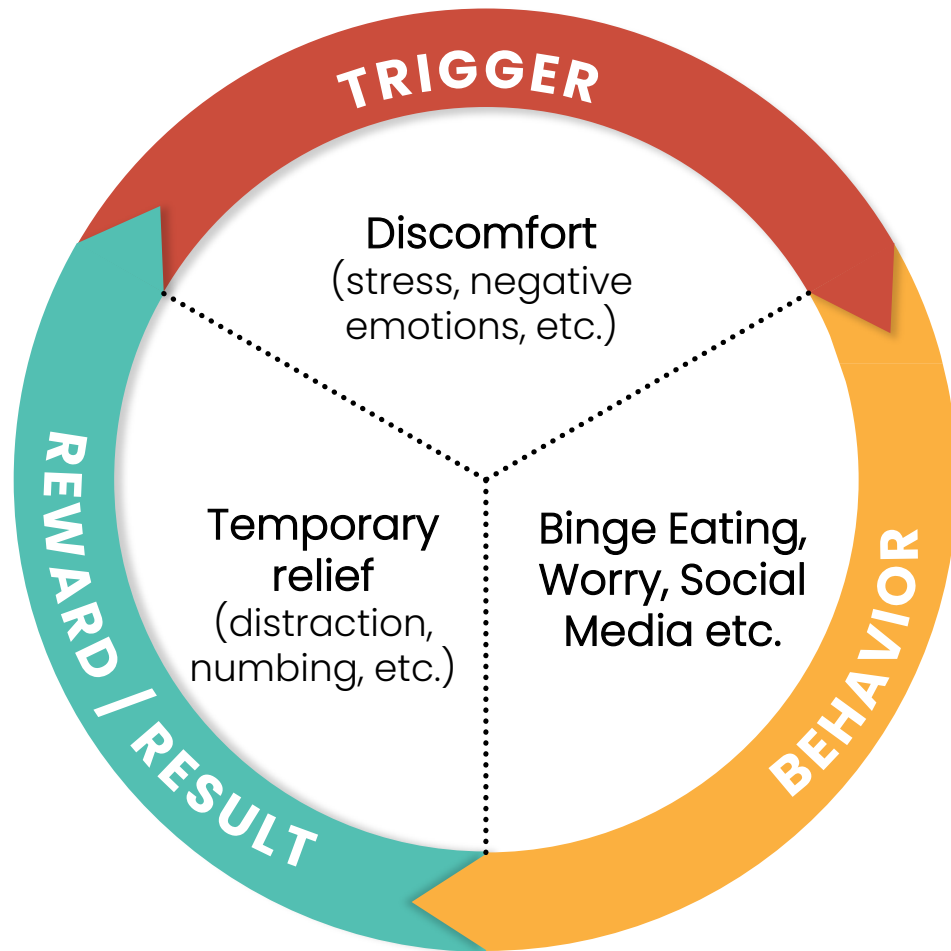
When I first started the program, I didn't quite buy into the benefits of curiosity. Today I felt a wave of panic and instead of immediate dread or fear, my automatic response was, "Hmm, that's interesting."

That took the wind right out of its sails!
I wasn't just saying it was interesting, I actually felt it.
I was so thrilled.

”

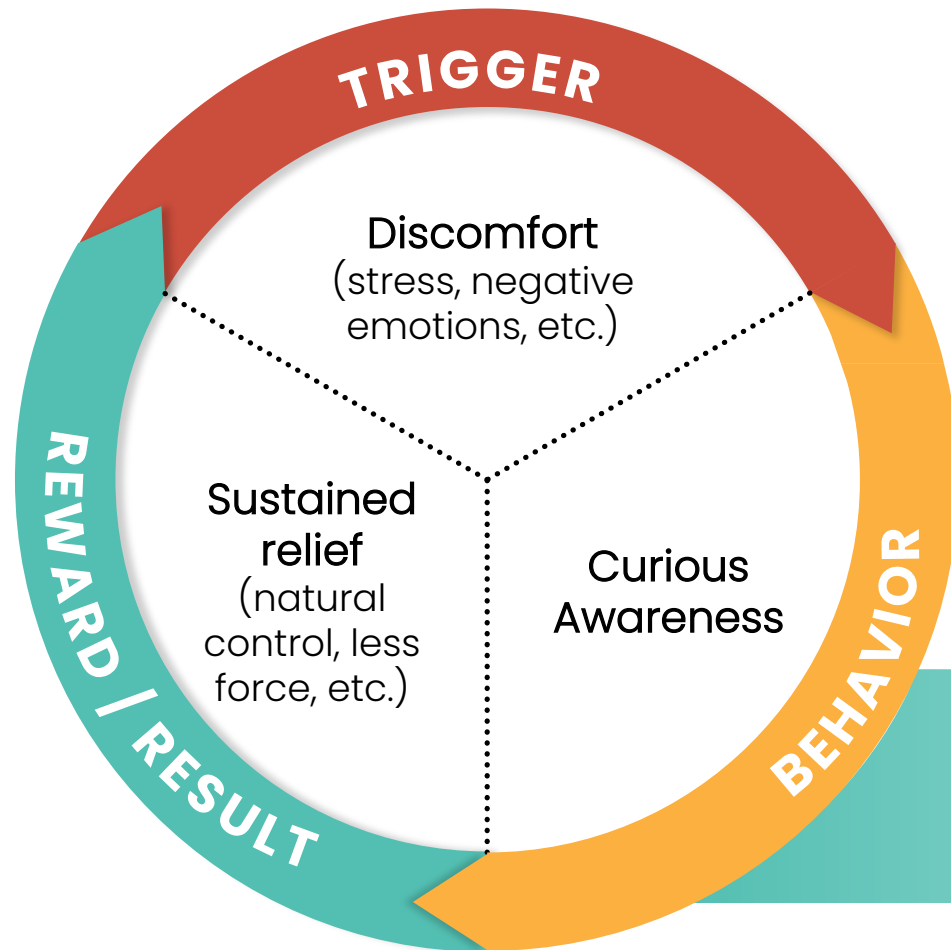
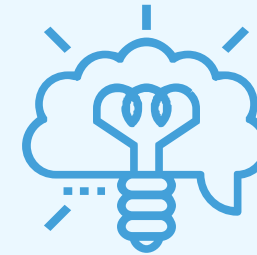
Unwinding Anxiety member

EVERYDAY ADDICTION LOOP



The same ancient learning system that evolved to form survival habit loops is the source of everyday addictions.

HACKING THE HABIT LOOP



The habit loop **can be re-purposed** using reproducible and validated methods: it can be hacked using **curiosity**...

Operational target for mindfulness training: bringing into awareness behaviors that are more rewarding





“

There is a worm
addicted to eating grape leaves
Suddenly he wakes up,
call it grace, whatever, something
wakes him, and he is no longer a worm,
He is the entire vineyard,
and the orchard too, the fruit, the trunks,
a growing wisdom and joy
that does not need to devour

”

- Rumi, “The Worm’s Waking”

Gratitude!

Subjects

Lia Antico
Bruce Barton (UMass)
Sarah Bowen (UW)
Willoughby Britton (Brown)
Kathy Carroll (Yale)
Neha Chawla (UW)
Todd Constable (Yale)
Jake Davis (CUNY)
Gaëlle Desbordes (MGH)
Susan Druker (UMass)
Hani Elwafi
Kathleen Garrison (Yale)
Jeremy Gray (Yale)
Elizabeth Hoge (Georgetown)
Sean (Dae) Houlihan
Catherine Kerr (Brown)

Hedy Kober (Yale)
Vera Ludwig
Sarah Mallik
G. Alan Marlatt (UW)
Ashley Mason (UCSF)
Linda Mayes (Yale)
Bill Nardi
Alex Ossadtchi (SSI)
Prasanta Pal
Xenios Papademetris (Yale)
Lori Pbert (UMass)
Mark Pflieger (SSI)
Marc Potenza (Yale)
Maolin Qiu (Yale)
Rahil Rojiani
Alex Roy

Bruce Rounsaville (Yale)
Juan Santoyo (Brown)
Cliff Saron (UC Davis)
Dustin Scheinost (Yale)
Ryan Smith (Laureate Inst.)
Veronique Taylor
Danny Theisen
Evan Thompson (Toronto)
Tommy Thornhill
Nicholas Van Dam (NYU)
Remko van Lutterveld
Andrea Ruf
Katie Witkiewitz (UNM)
Jochen Weber (Columbia)
Sue Whitfield-Gabrieli (MIT)
Patrick Worhunsky (Yale)

FUNDING: NCCIH (R01 AT007922, R61AT009337, UH2 AT008145, R34 AT008948), NIMH (R41MH118130), NCI (R21CA184254), NIDA (R34 DA037886, R03 DA029163, K12 DA00167, P50 DA09241), NIA (R21AG062004), Yale Center for Clinical Investigation (UL1 RR024139), VAMC MIRECC, Fetzer Trust, Mind and Life

THE MINDSHIFT **MISSION**



We're on a mission to **transform addiction recovery at scale** using compassionate, evidence-based solutions that remove barriers to accessing treatment for problematic substance use (SUD) and dispelling the stigma around addiction.

We want to:

- Replace judgement & stigma with connection and compassion — creating space for curiosity and growth
- Maximize accessibility via digital delivery at low to no cost
- Support populations not well-served by existing in-person treatment options (i.e. women, parents, LGBTQ+, BIPOC)

www.mindshiftrecovery.org

MORE INFORMATION:

- www.drjud.com
- www.mindshiftrecovery.org
- Mindfulness Center @Brown

INSTRUCTIONS FOR LIVING:

1. PAY ATTENTION
2. BE ASTONISHED
3. TELL ABOUT IT

- Mary Oliver



BROWN
Mindfulness Center

Submit questions via the **'Q & A' box**



CME/CEU Statements

Accreditations:

In support of improving patient care, the University of California, San Francisco is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

UCSF designates this live activity for a maximum of *1.0 AMA PRA Category 1 Credit™*. Physicians should claim only the credit commensurate with the extent of their participation in the webinar activity.

Advance Practice Registered Nurses and Registered Nurses: For the purpose of recertification, the American Nurses Credentialing Center accepts *AMA PRA Category 1 Credit™* issued by organizations accredited by the ACCME.

Physician Assistants: The National Commission on Certification of Physician Assistants (NCCPA) states that the *AMA PRA Category 1 Credit™* are acceptable for continuing medical education requirements for recertification.

California Pharmacists: The California Board of Pharmacy accepts as continuing professional education those courses that meet the standard of relevance to pharmacy practice and have been approved for *AMA PRA category 1 Credit™*. If you are a pharmacist in another state, you should check with your state board for approval of this credit.

California Psychologists: The California Board of Psychology recognizes and accepts for continuing education credit courses that are provided by entities approved by the Accreditation Council for Continuing Medical Education (ACCME). *AMA PRA Category 1 Credit™* is acceptable to meeting the CE requirements for the California Board of Psychology. Providers in other states should check with their state boards for acceptance of CME credit.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs.

Up to 1.0 CE Credit may be claimed.

Social Workers: As a Jointly Accredited Organization, UCSF Continuing Education is approved to offer social work continuing education by the Association of Social Work Boards (ASWB) Approved Continuing Education (ACE) program. Organizations, not individual courses, are approved under this program. Regulatory boards are the final authority on courses accepted for continuing education credit. Social workers completing this course receive 1.0 general continuing education credit.

Interprofessional Continuing Education Credit (IPCE): This activity was planned by and for the healthcare team, and learners will receive 1.0 Interprofessional Continuing Education (IPCE) credits for learning and change.

California Addiction Professionals: The California Department of Healthcare Services (DCHS) recognizes up to 10 hours of continuing education from a non-accredited provider. If you are a provider outside of California, please check with your state board for your credit policy.

Free 1-800 QUIT NOW cards



Take Control
1-800-QUIT-NOW
Call. It's free. It works.
1-800-784-8669
For details on your state services, go to: <http://map.naquitline.org>



- ✓ Refer your clients to cessation services

Post Webinar Information

- You will receive the following in our post webinar email:
 - ✓ Webinar recording
 - ✓ Instructions on how to claim FREE CME/CEUs
 - ✓ Information on certificates of attendance
 - ✓ Other resources as needed

- All of this information will be posted to our website at <https://SmokingCessationLeadership.ucsf.edu>



SCLC next live webinar is “*Empowering Futures: Culturally Tailored Commercial Tobacco Cessation Programs in American Indian and Alaska Native Communities*”

- **Thursday, November 21, 2024**
- **1:00 – 2:00 pm ET**
- **Registration will open soon!**



Contact us for free technical assistance



- **Visit** us online at smokingcessationleadership.ucsf.edu
- **Call** us toll-free at [877-509-3786](tel:877-509-3786)
- **Provide Feedback** - complete the evaluation, which you will see at the end of this webinar

Smoking Cessation
Leadership Center

UCSF

University of California
San Francisco



University of California
San Francisco

SmokingCessationLeadership.ucsf.edu

Toll-Free 877-509-3786