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Emotion Regulation through Meditation

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Emotion regulation through meditation

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Center for Mindfulness
in Medicine, Health Care, and Society



Disclosures

- There is no money in mindfulness training
- There is no money for research
 - Write your congressperson!
 - Formed goBlue labs (Claritas Mindsciences)
 - Yale spin-off startup company
 - Working with social entrepreneurs to translate research into clinical practice

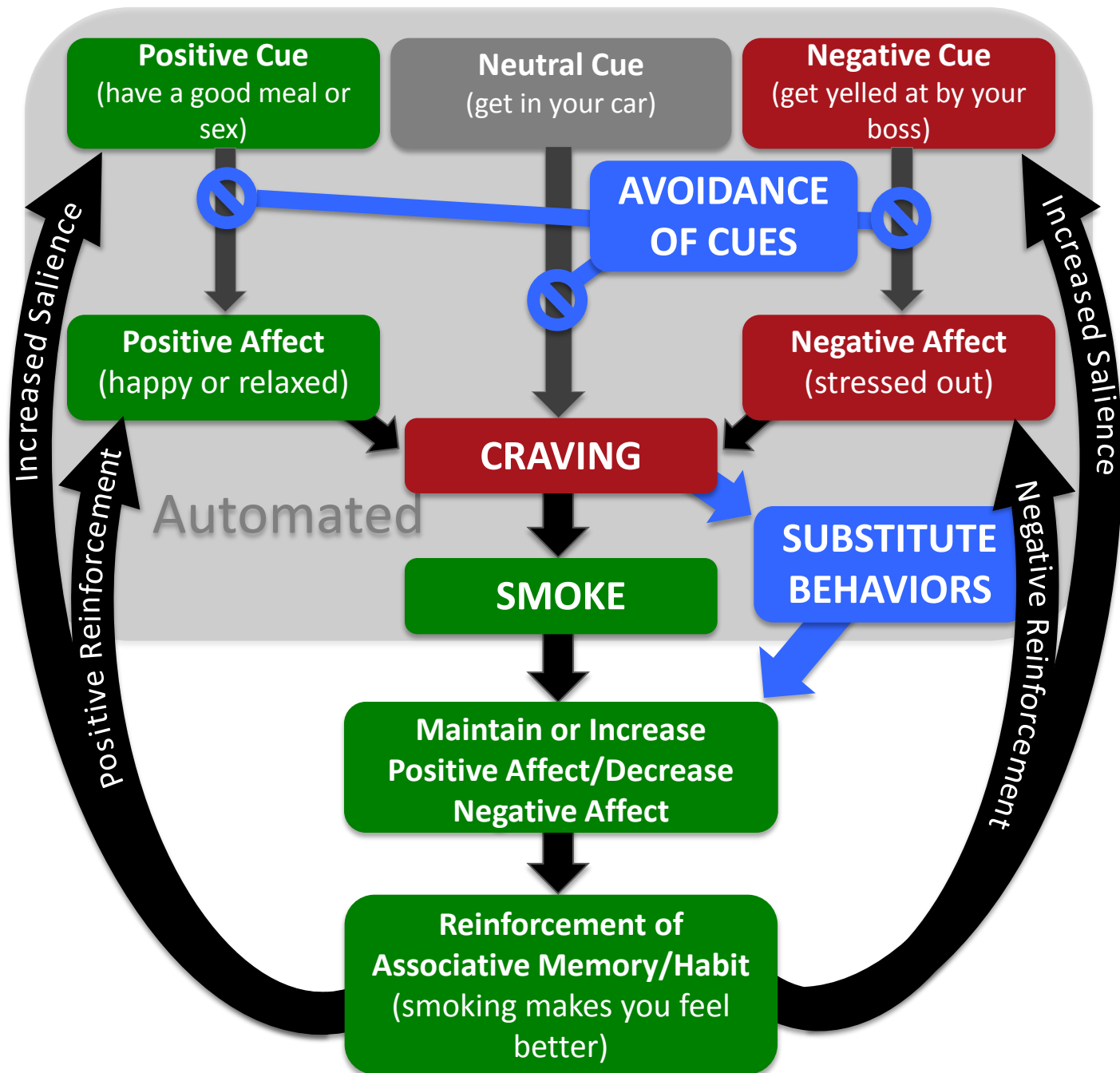


Center for Mindfulness

in Medicine, Health Care, and Society

Therapeutic Neuroscience Lab

*Investigating the mind
to improve wellbeing and
realize human potential*



Thorndike 1898, Skinner, 1938, Zinser 1992, Piasecki 1997, Carter 1999, Lazev 1999, Cox 2001, Robinson 2003, Bevens 2004, Baker 2004, Cook 2004, Olausson 2004, Shiffman 2004, Carter 2008, Perkins 2010

“Just as a tree, though cut down, can grow again and again if its roots are undamaged and strong, in the same way if the roots of craving are not wholly uprooted sorrows will come again and again.”

-Dhammapada (338)

*“I can't get no satisfaction
I can't get no satisfaction
'Cause I try and I try and I try and I try
I can't get no, I can't get no...”*

-Mick Jagger

Self-control: competing systems

- **Affective (self-referential?)/hot processing**
 - involves self-referential valuation, is automatic and unplanned, and influences behavior through impulses (Weber 2004, Kable 2007).
 - fronto-striatal limbic loop including the orbitofrontal cortex, ventromedial prefrontal cortex (vmPFC), posterior cingulate cortex (PCC), and ventral striatum (McClure 2004; Hare 2009; Kober 2010)
- **Deliberative/cold processing**
 - effortful, influences behavior through rules of logic and involved in inhibitory control (Weber 2004; McClure 2004; Ochsner 2005, Knoch 2007; Hare 2009)
 - dorsolateral prefrontal cortex (dlPFC), and posterior parietal cortex, etc (McClure 2004; Hare 2009; Kober 2010; Steinbeis 2012)

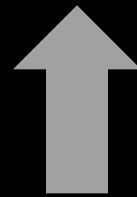
I WANT!

It's not about me

How to improve the balance between cold and hot processing?



HOT

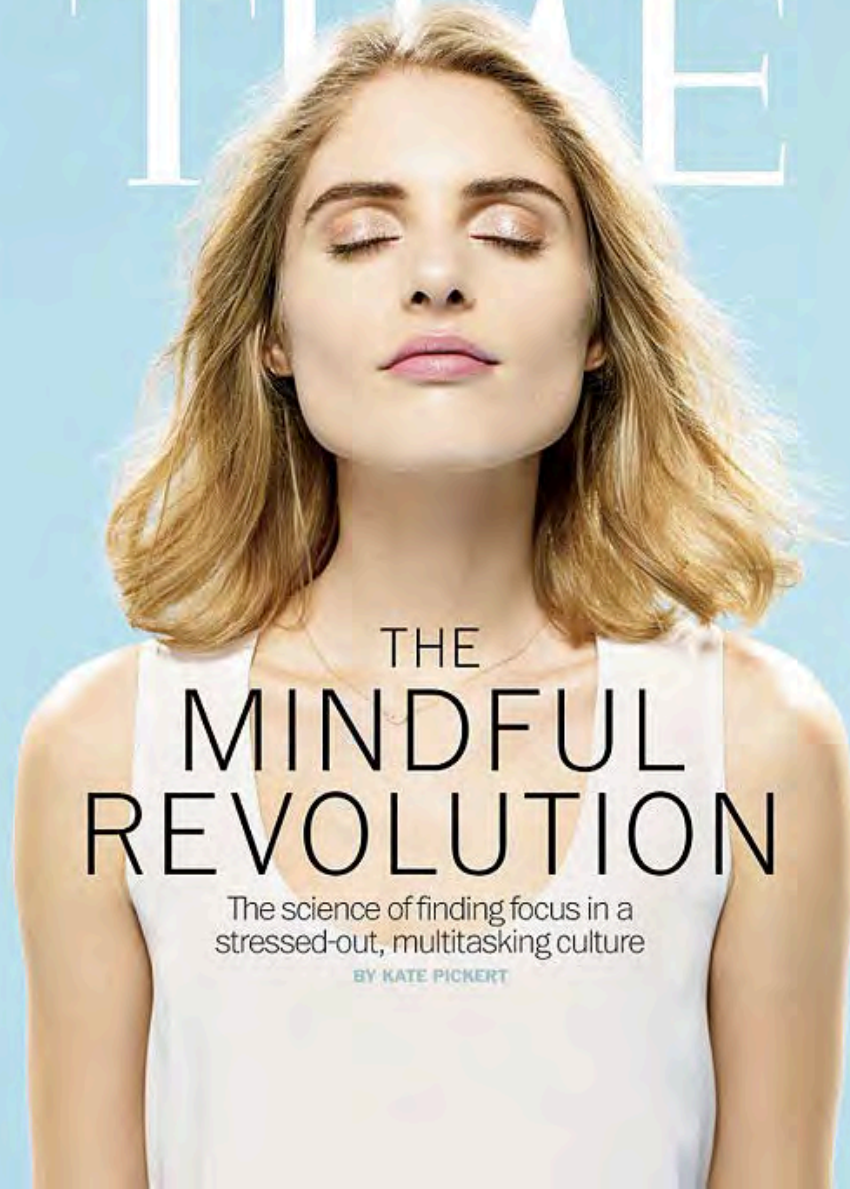


COLD

FEBRUARY 3, 2014

Fleeing Syria Photographs by James Nachtwey / Peyton Power / Steve McQueen

TIME



THE
MINDFUL
REVOLUTION

The science of finding focus in a stressed-out, multitasking culture

BY KATE PICKERT

time.com

Overview of Mindfulness

Two Component Definition:

- 1) Self-regulation of attention so that it is maintained on immediate experience, thereby allowing for increased recognition of mental events in the present moment.
- 2) Adopting a particular orientation toward one's experiences in the present moment, characterized by curiosity, openness, and acceptance.

Mindfulness-based treatments

Effective for:

- **Anxiety** (Kabat-Zinn et al 1992, Goldin 2009, others)
- **Depression** (Teasedale et al 2000; Ma et al 2004, Eisendrath 2008, Segal 2010, others)
- **Pain** (e.g. Kabat-Zinn et al 1985, Kingston et al 2007, others)
- **Addiction** (e.g. Brewer 2009, Bowen 2009, Brewer 2011, Elwafi 2013, Carim-Todd 2013)
- **Boost immune system function** (e.g. Davidson 2003, Pace 2009, others)
- **Boost GRE scores!** (Mrazek 2013)

Does mindfulness
training work for
smoking cessation?

Nicotine dependence is difficult to treat

- 70% of smokers report wanting to quit (CDC, 2002)
- 5% of individuals achieve abstinence annually (CDC, 2002)
- High relapse rates (>70%)

The paradox of Mindfulness: less is more

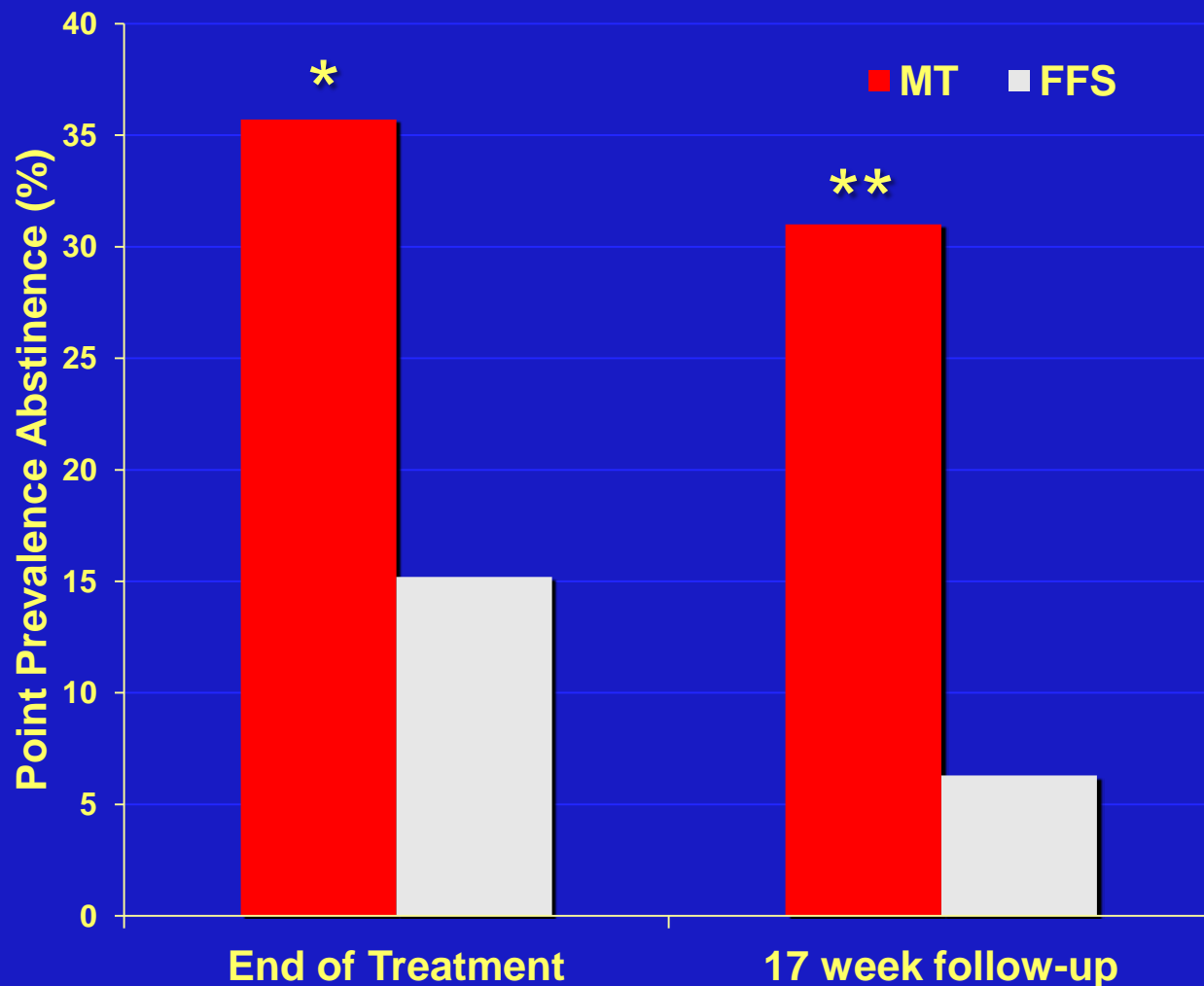
Pay attention, and everything else will
take care of itself (really).

Roz posted an update 1 week, 2 days ago

Mindful smoking smells like stinky cheese and tastes like chemicals.

YUCK!

Greater smoking abstinence with MT vs. Freedom from Smoking



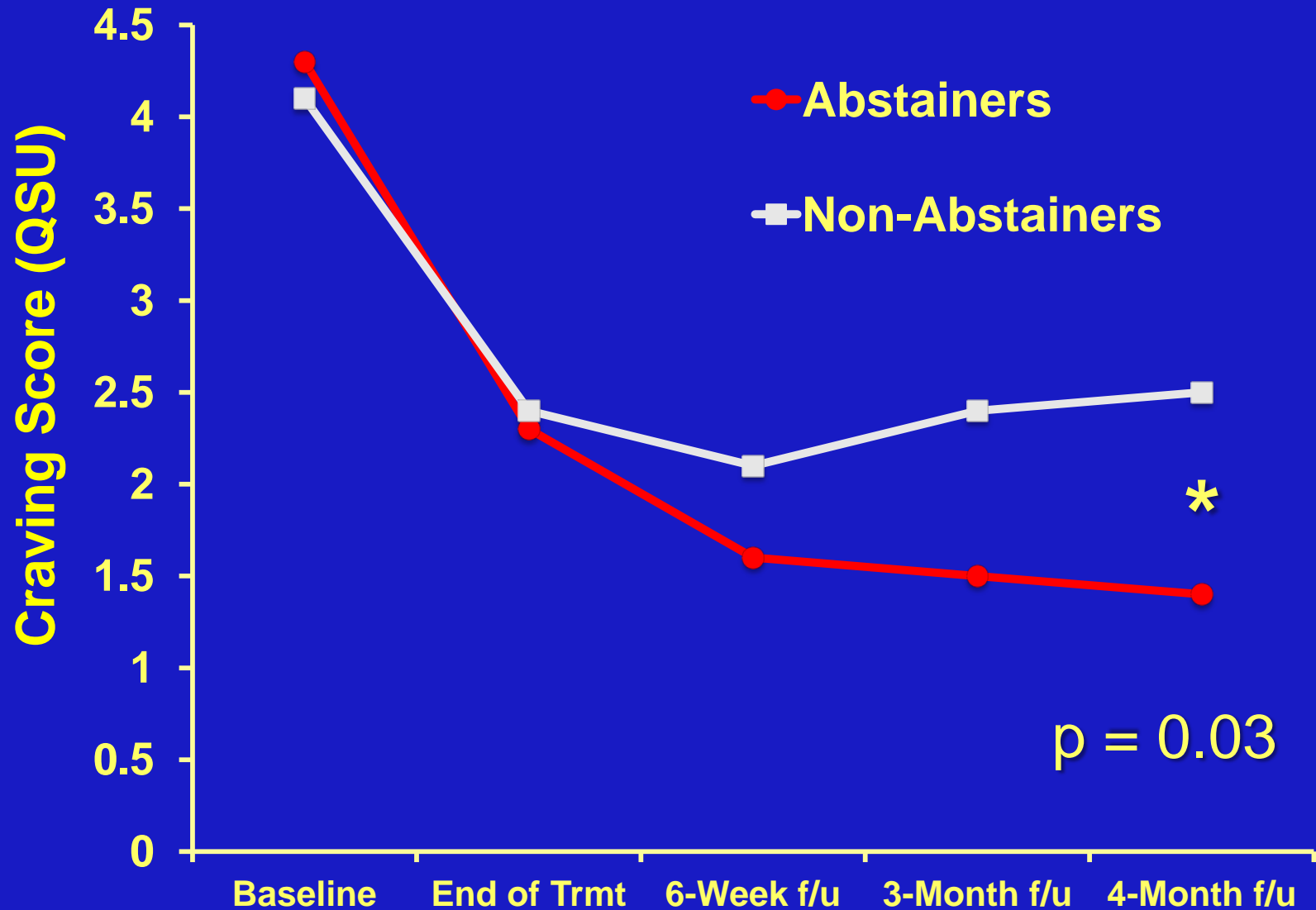
* $p = .063$
** $p = .012$

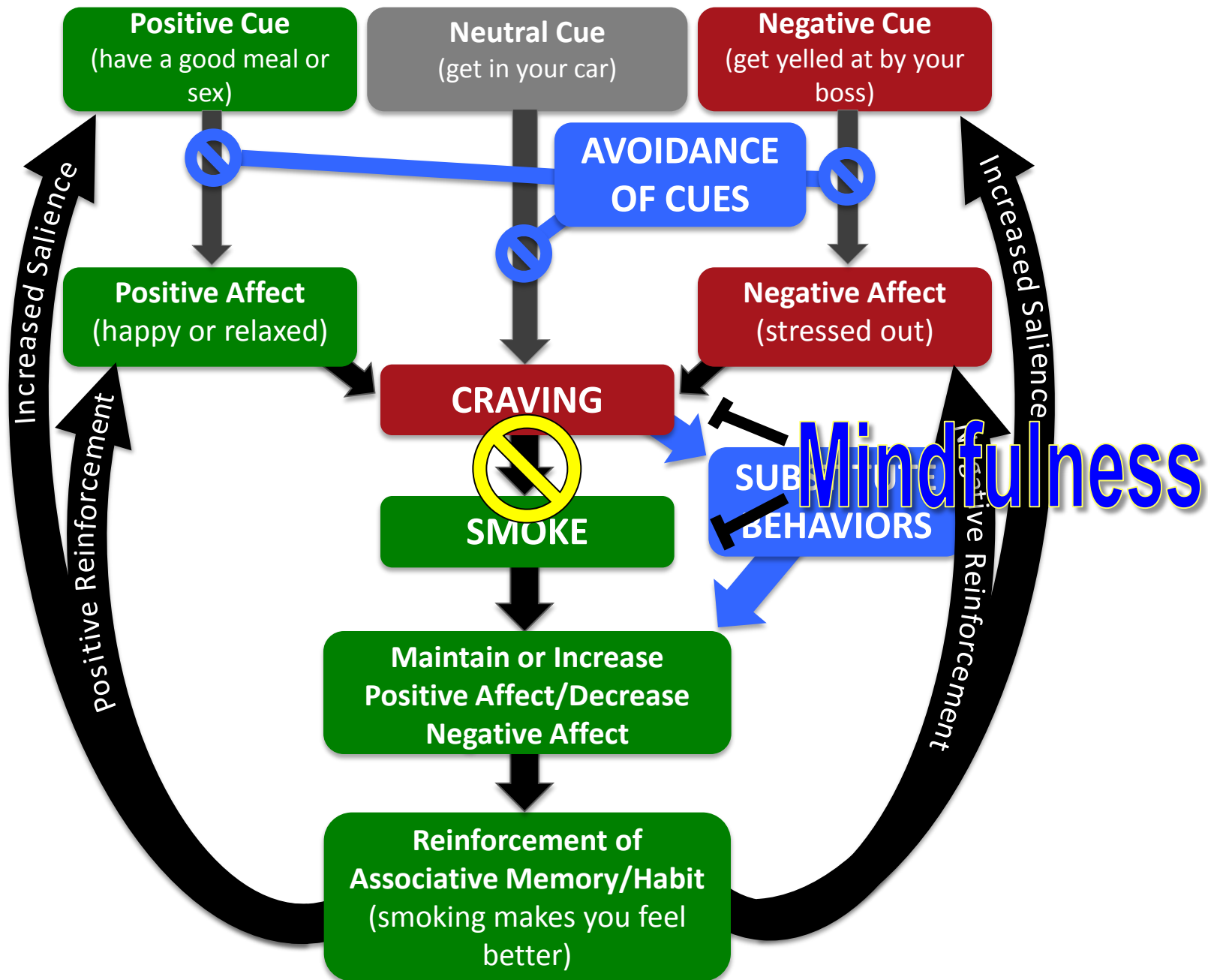
Craving and cigarette use become dissociated during treatment

	Baseline (Week 0)	End of Treatment (Week 4)	6-Week Follow-Up	3-Month Follow-Up	4-Month Follow-Up
Craving (QSU) X Cigarette Use	r = 0.582 p < 0.001 N = 32	r = 0.126 p = 0.491 N=32	r = 0.474 p = 0.020 N = 25	r = 0.788 p < 0.00001 N=28	r = 0.768 p < 0.00001 N=29

p = .04

Reduction of craving scores with MT



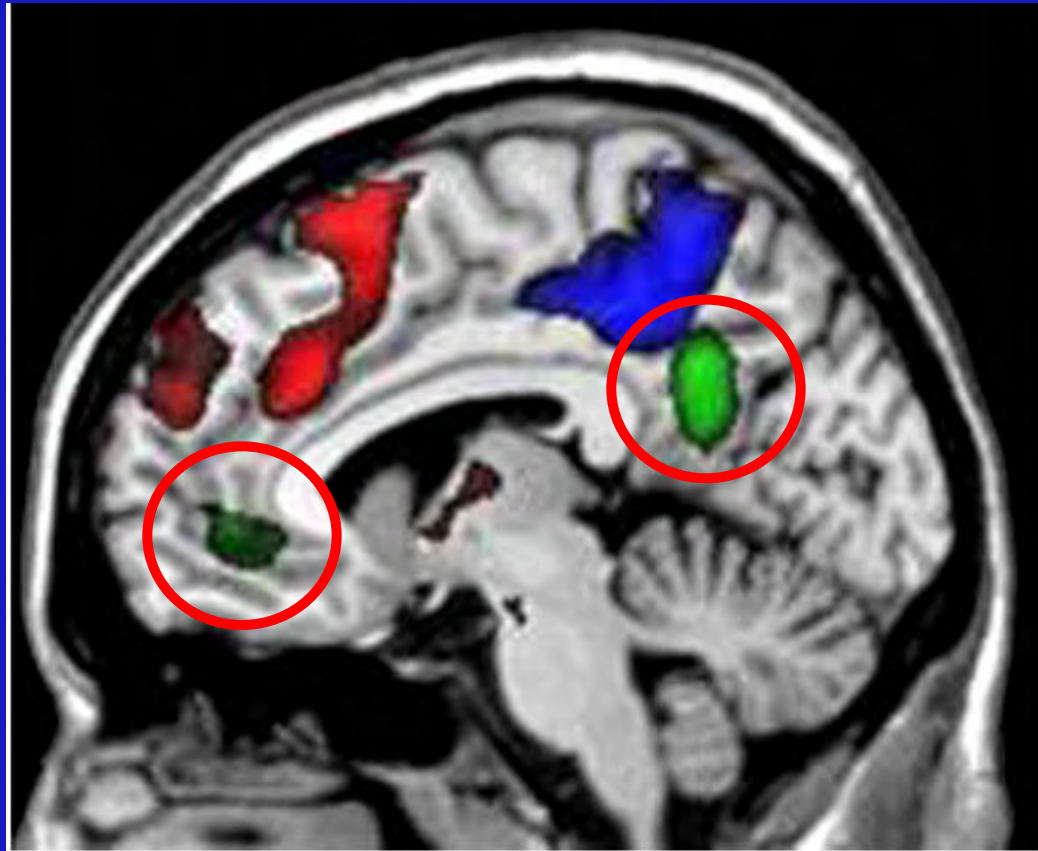


Craving to Quit (Smartphone App)

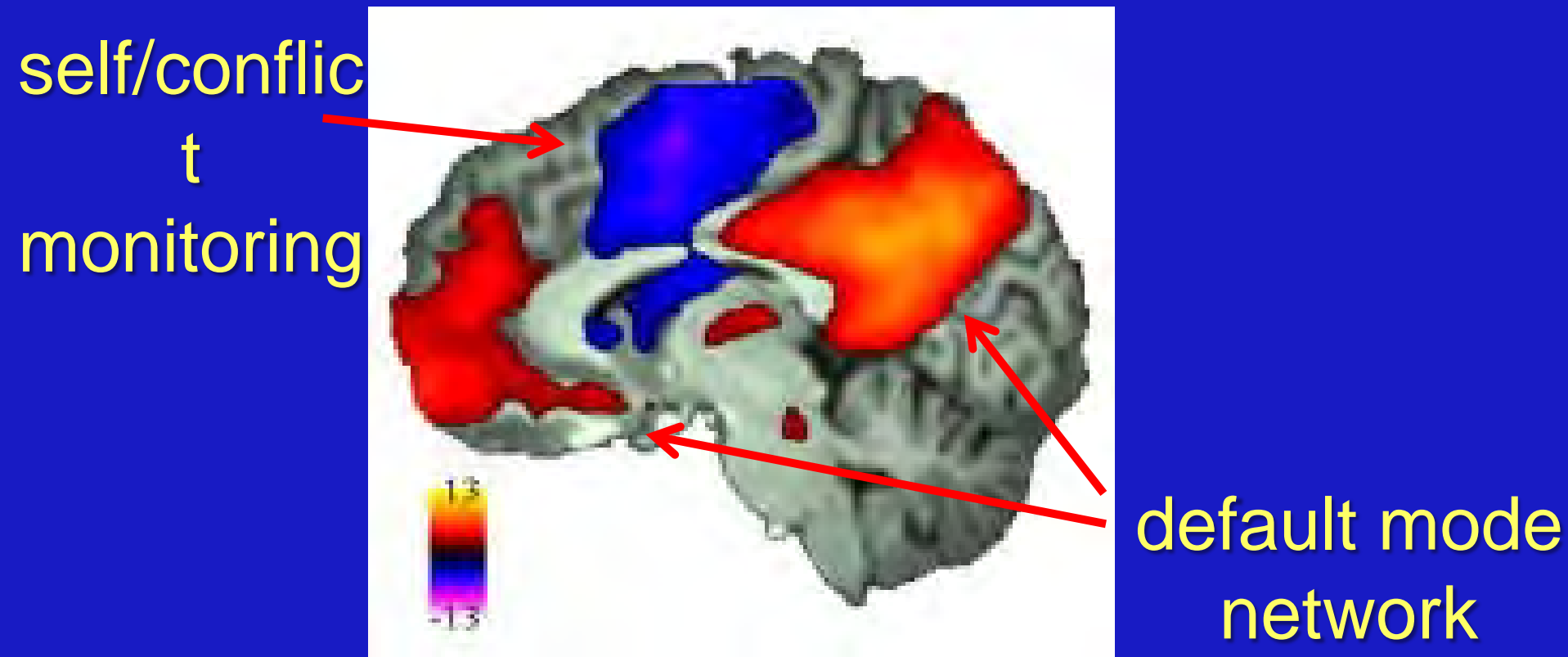
- 21 day training for smoking cessation
- Daily modules
 - animations
- In vivo exercises
- Experience Sampling
 - Test efficacy



Overlap between DMN and Self-referential processing

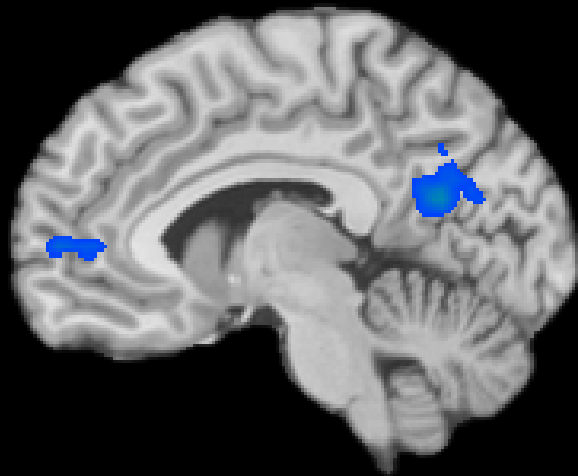


Resting state anti-coupling between monitoring (dACC) and default mode network

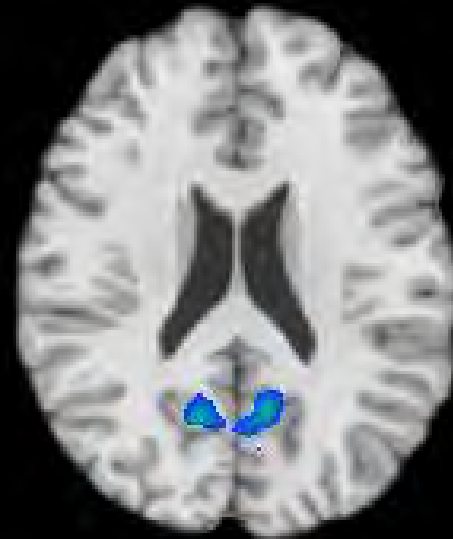


Decreased DMN activity during meditation in experienced meditators

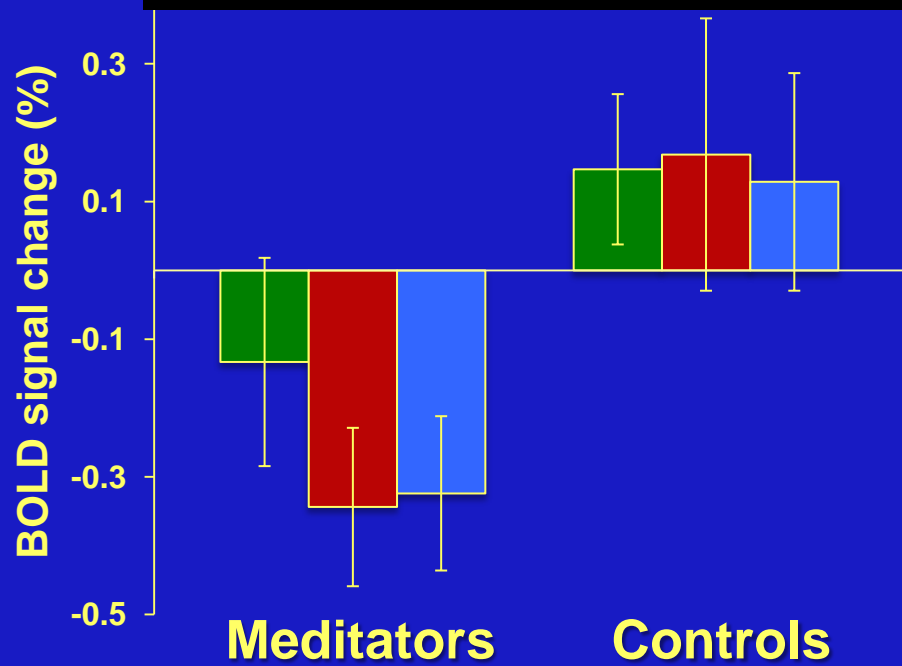
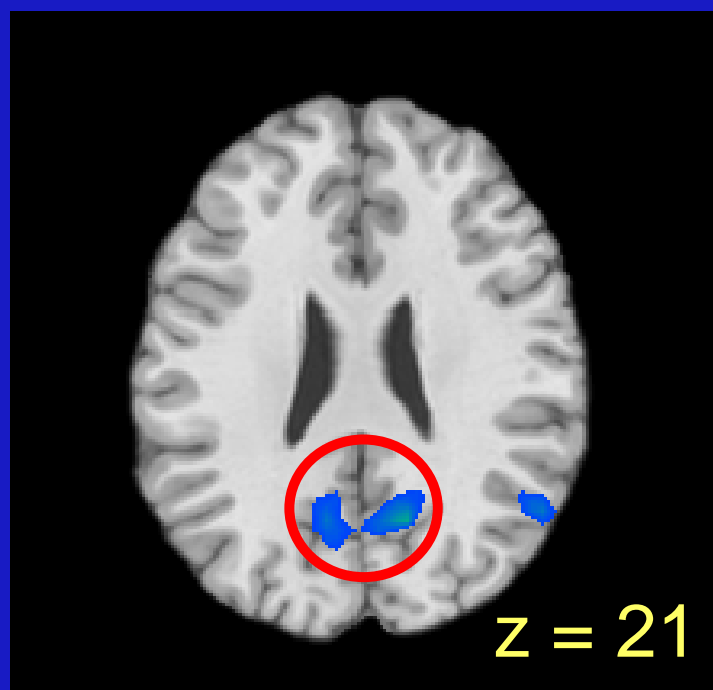
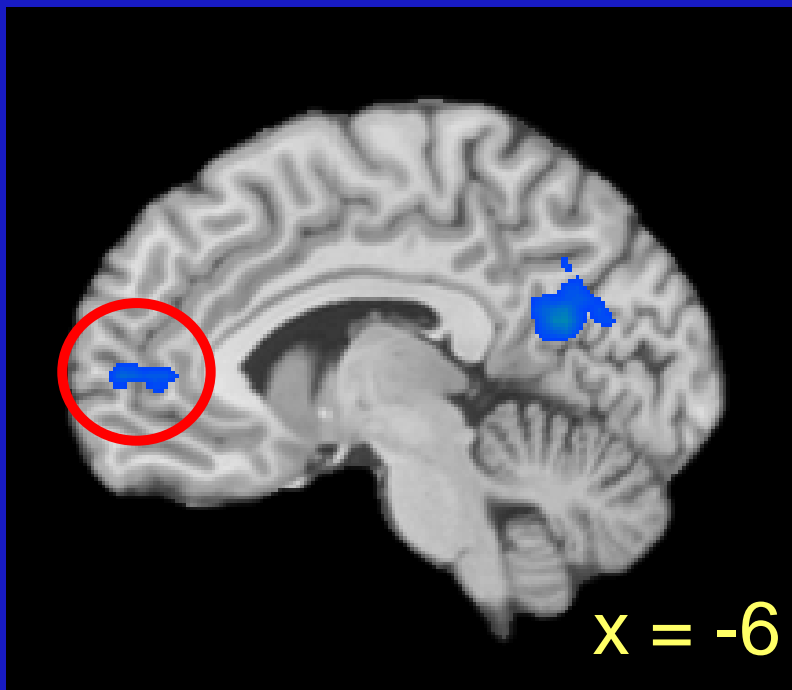
(all meditations, Experienced > Novice)



$x = -6$



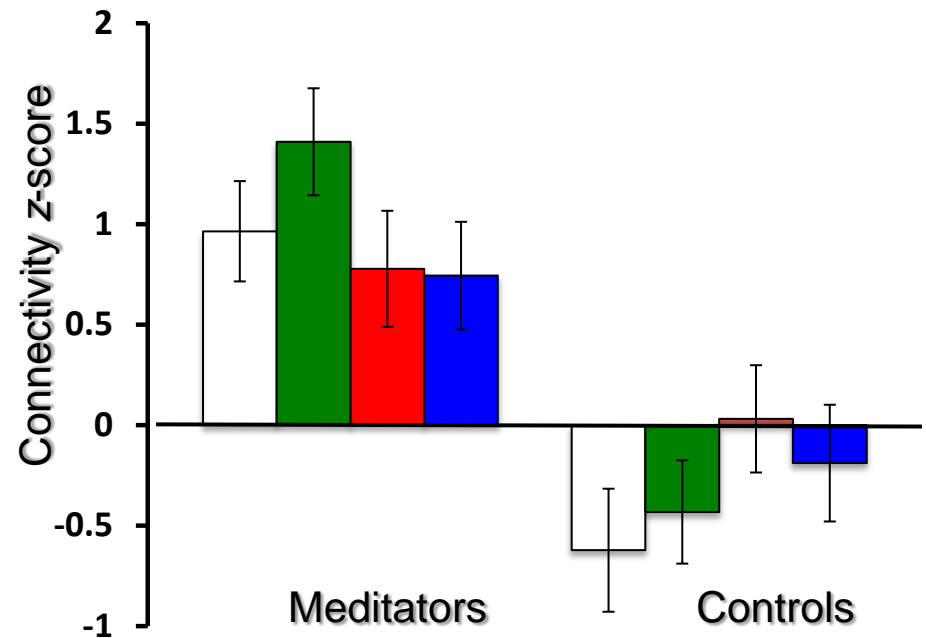
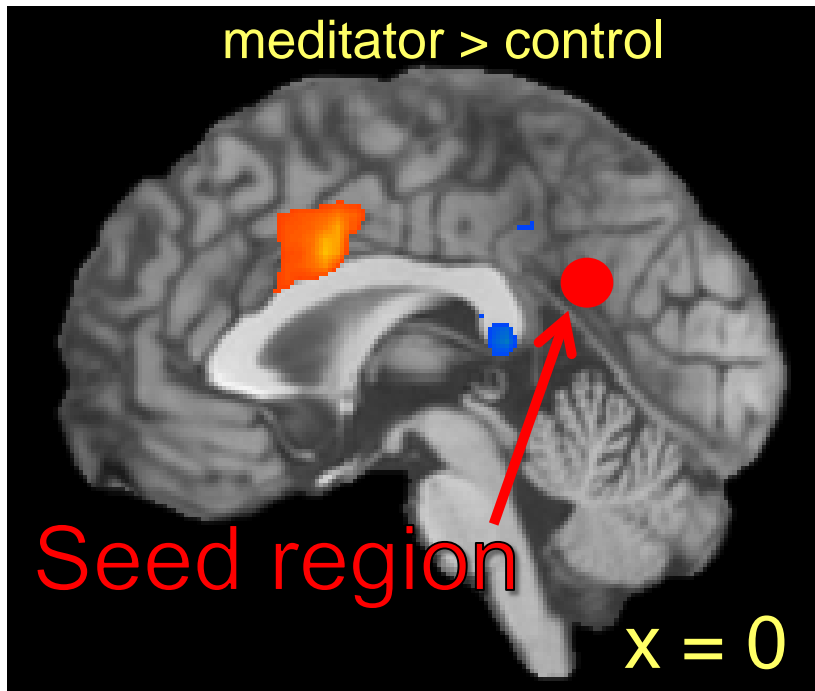
$z = 21$



Does practice make perfect?

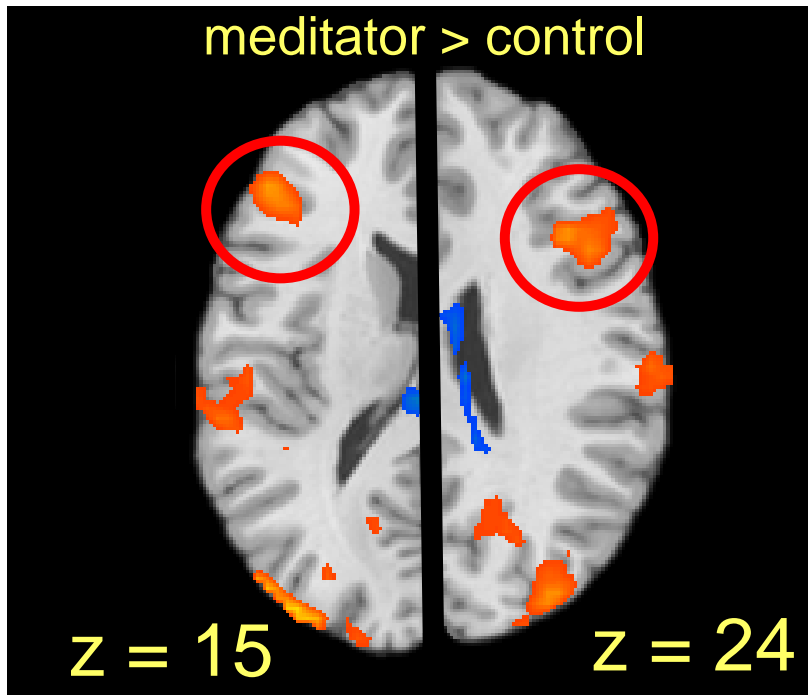
- Relatively specific deactivation of DMN during meditation
 - Common to all 3 meditation types
 - Reproducible
- Do state changes during meditation correlate with changes in default brain activation patterns after (a lot of) practice?
- Functional connectivity
 - Seed-based using DMN (Andrews-Hanna 2010)
 - Helps to control for control state (i.e. what if experienced meditators are meditating during baseline)

Altered DMN connectivity in experienced meditators

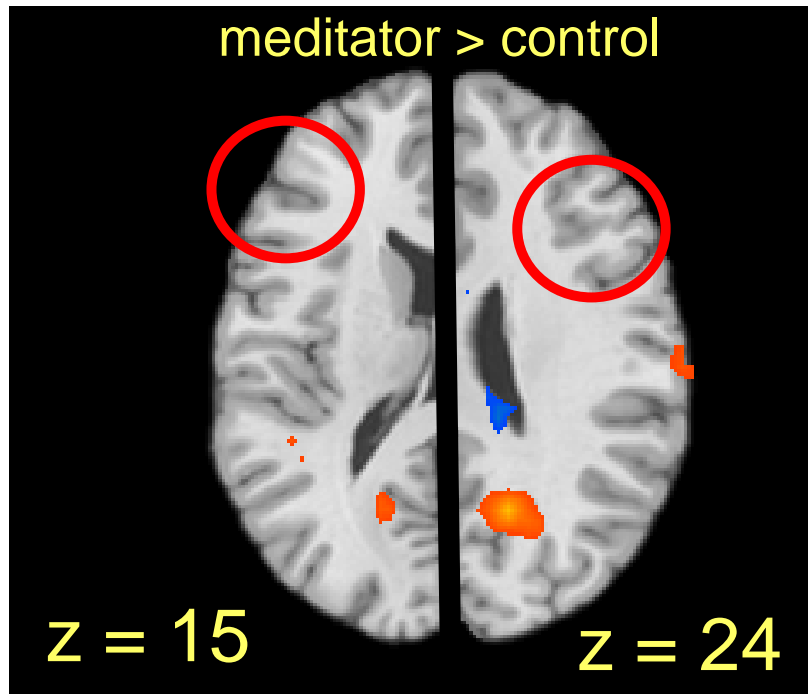


(PCC seed region)

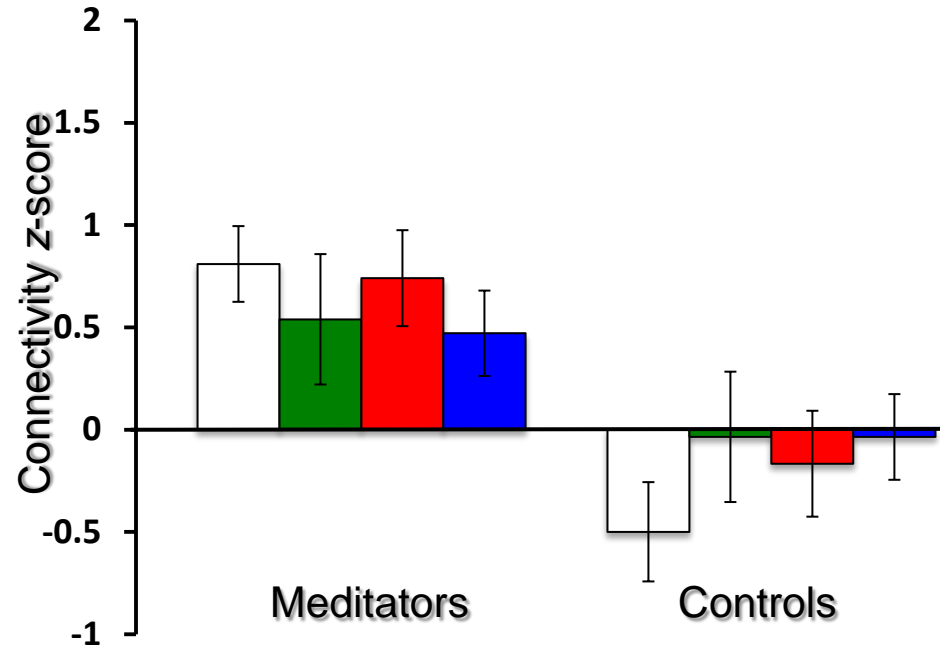
Baseline



Meditation



(PCC seed region)



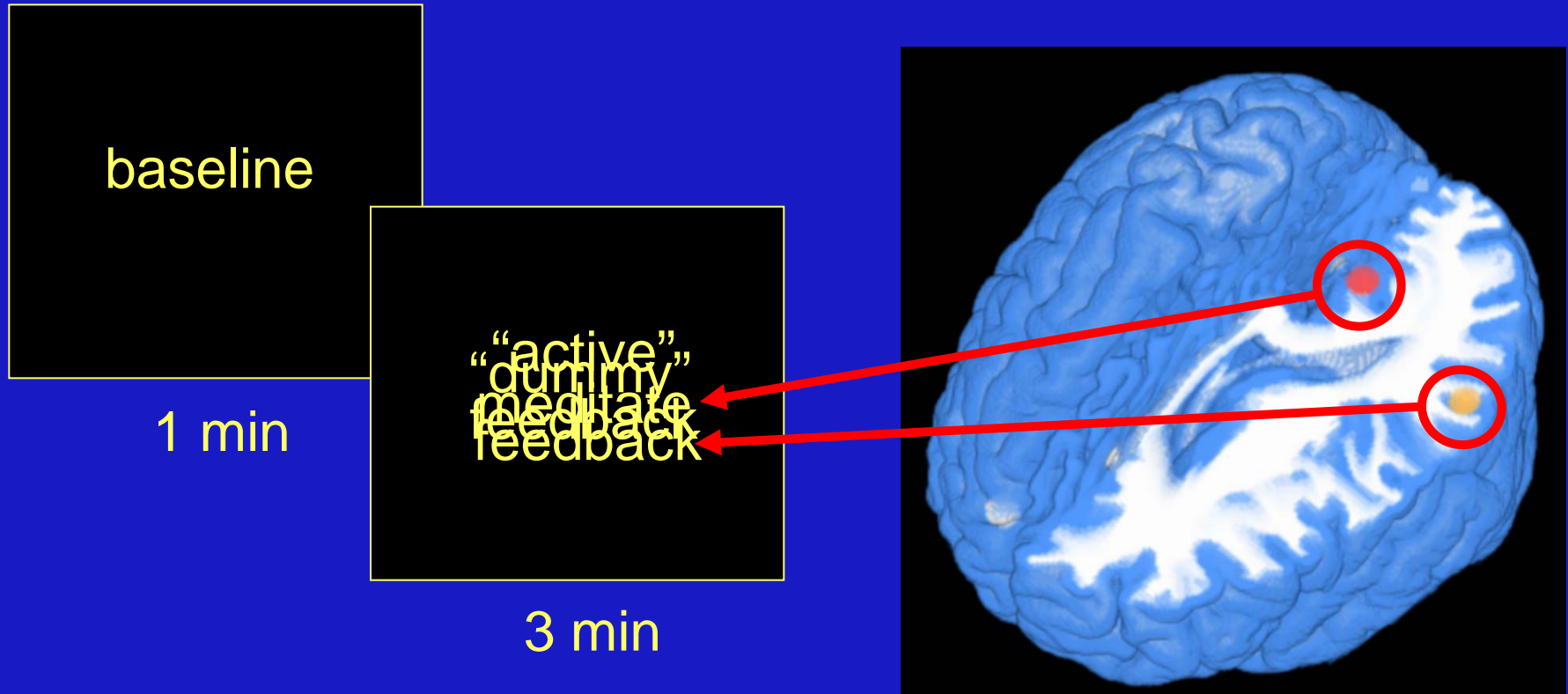
State to trait?

Meditators have a different
Default Mode!

“Science is a way of trying not to fool yourself. The first principle is that you must not fool yourself, and you are the easiest person to fool.”

-Richard Feynman

Real-time meditation feedback



Garrison et al *NeuroImage* (2013)

Real-time Neurofeedback (PCC ROI, n=22/group)

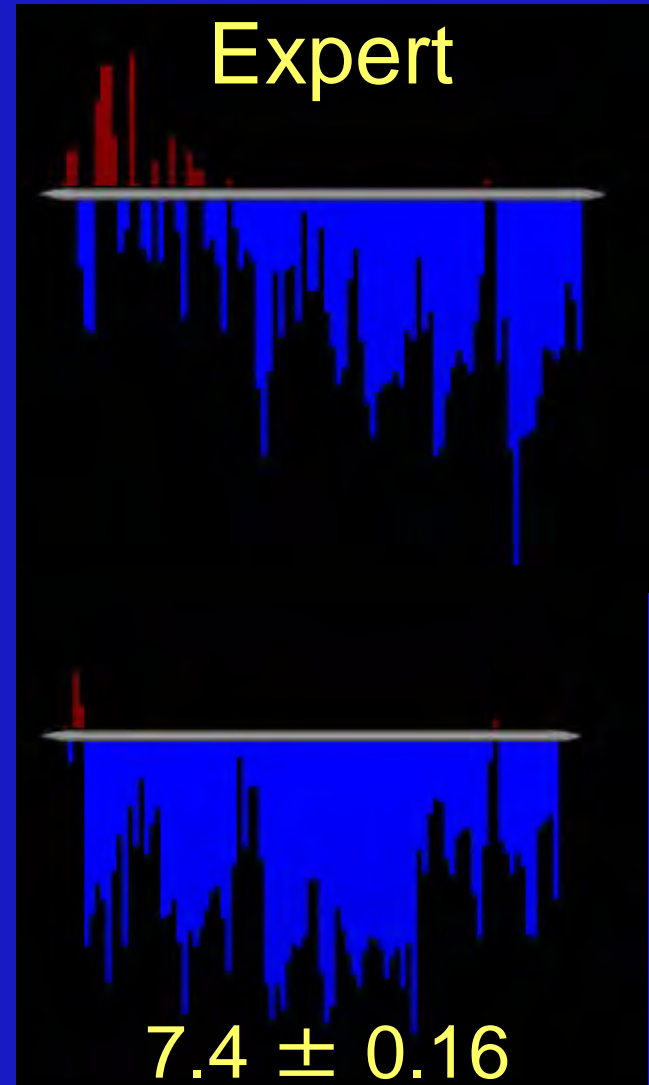
Novice

Run 1



Run 4

Expert



Being mindful is not difficult. But it's difficult to be continuously aware. For that you need right effort. But it does not require a great deal of energy. It's relaxed perseverance in reminding yourself to be aware. When you are aware, wisdom unfolds naturally, and there is still more interest.

- Sayadaw U Tejaniya, "The Wise Investigator"



"NO!

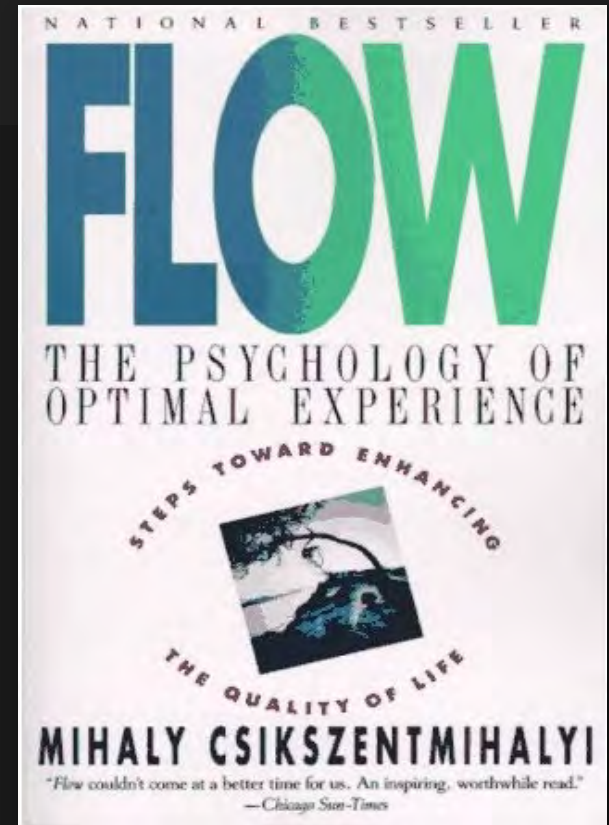
Try not!

DO or DO NOT,

There is no try!"

Flow

a mental state
when a person is
fully immersed
in the present in
a feeling of
energized focus.





“

There was a sense of flow,
being with the breath...flow
deepened in the middle.

”

-Experienced Meditator

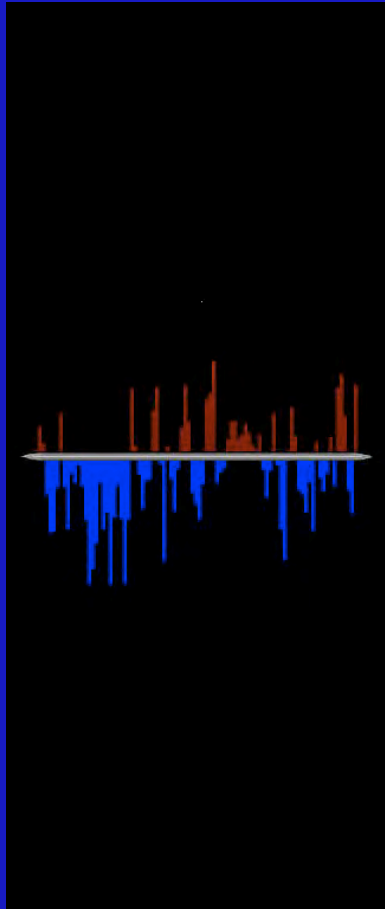
Are you kidding?

I have to practice 10,000 hours
to change my default mode?

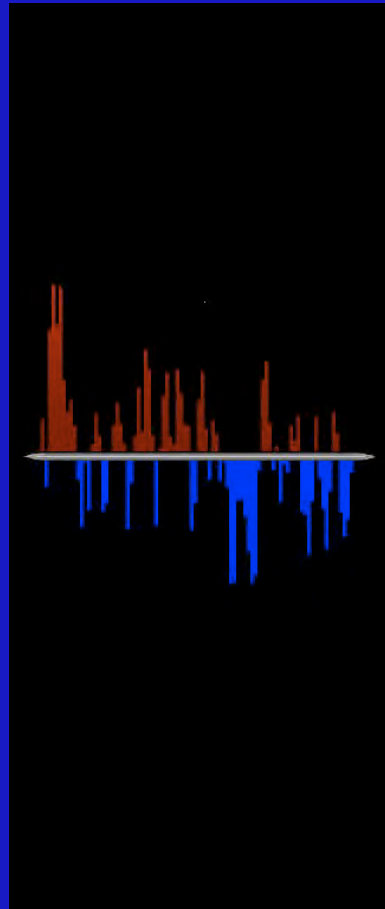
*"Practice does not make perfect.
Only perfect practice makes
perfect."*

-Vince Lombardi

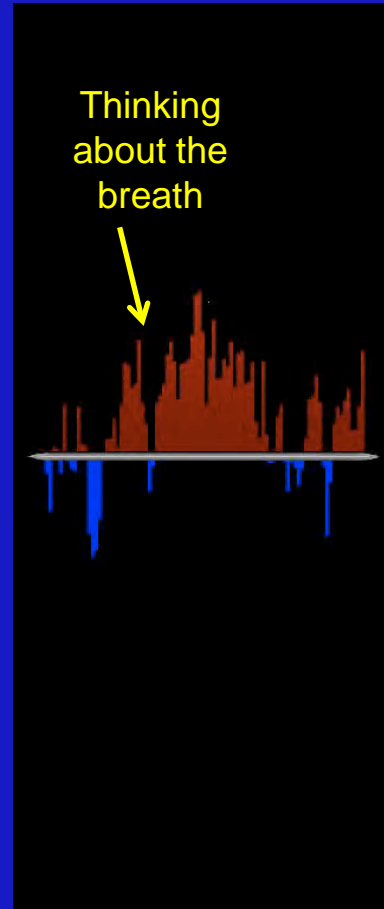
NOVICE MEDITATOR



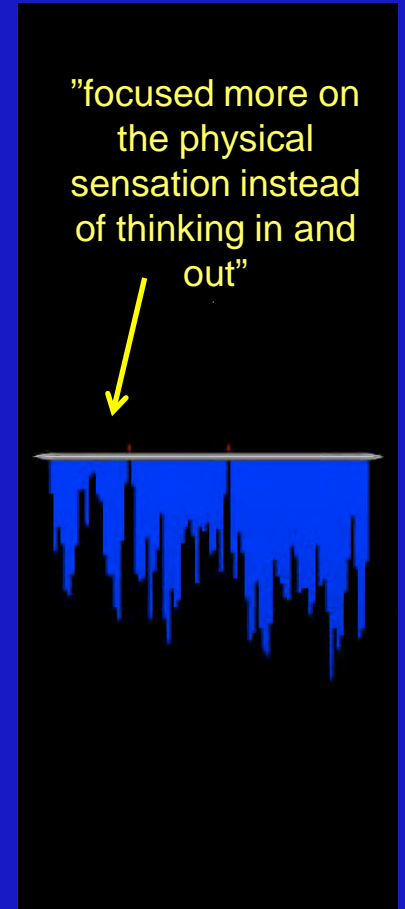
RUN 1



RUN 2



RUN 3

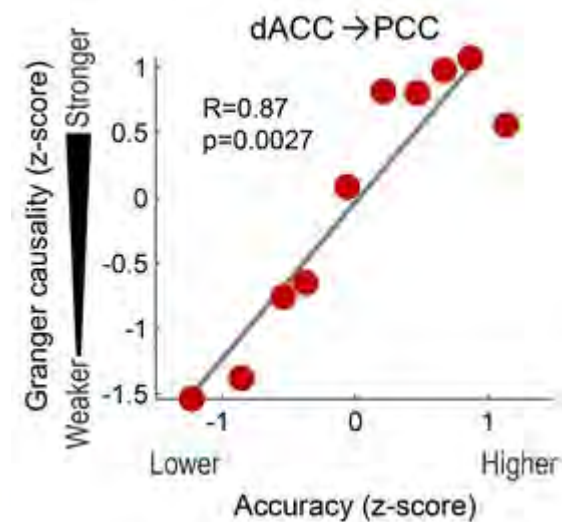
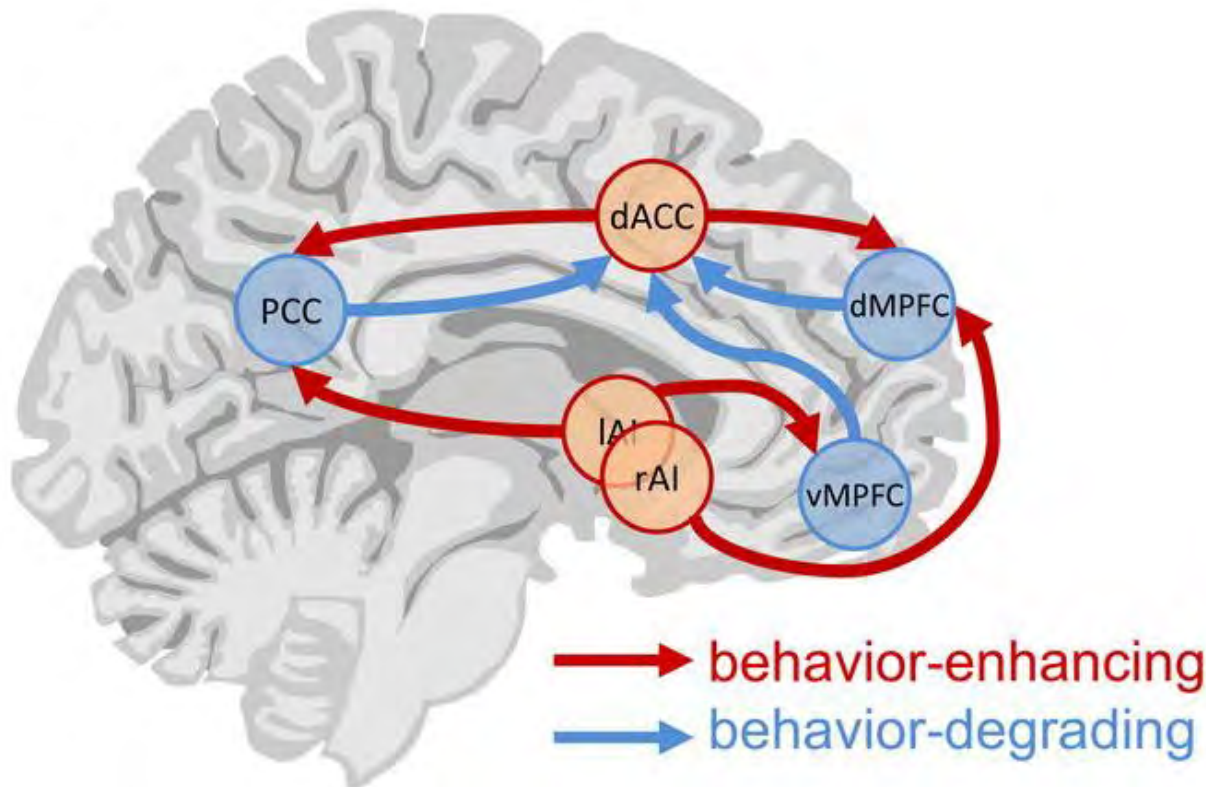


RUN 4

Mindfulness may increase cold while decreasing hot processing



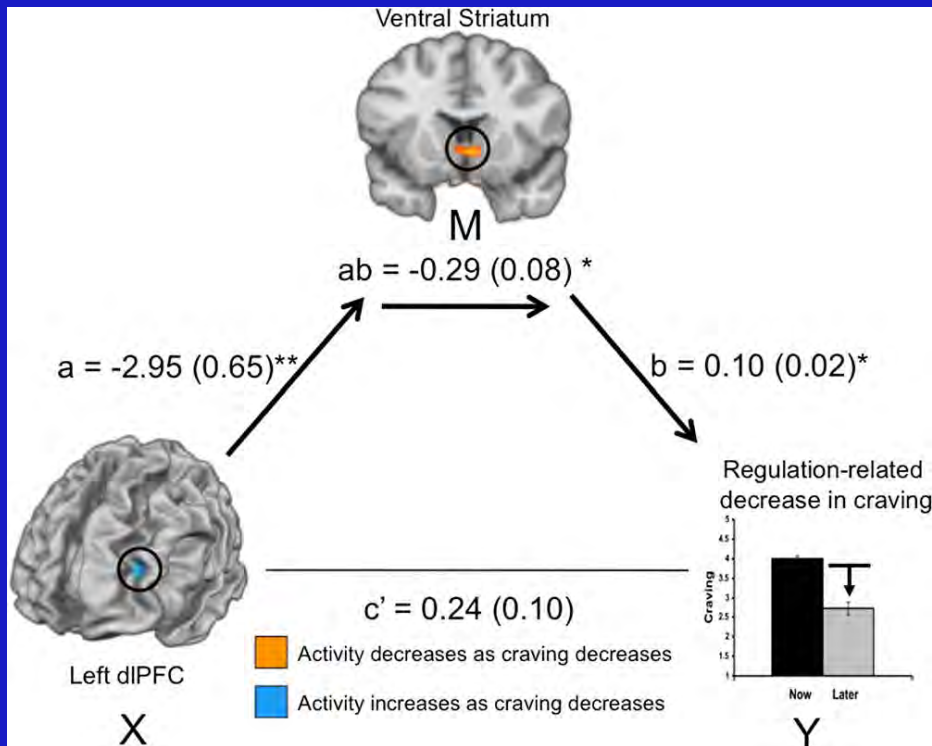
Relation between Granger causal influences and behavioral performance during visual spatial attention task.



Wen X et al. *J. Neurosci.* 2013

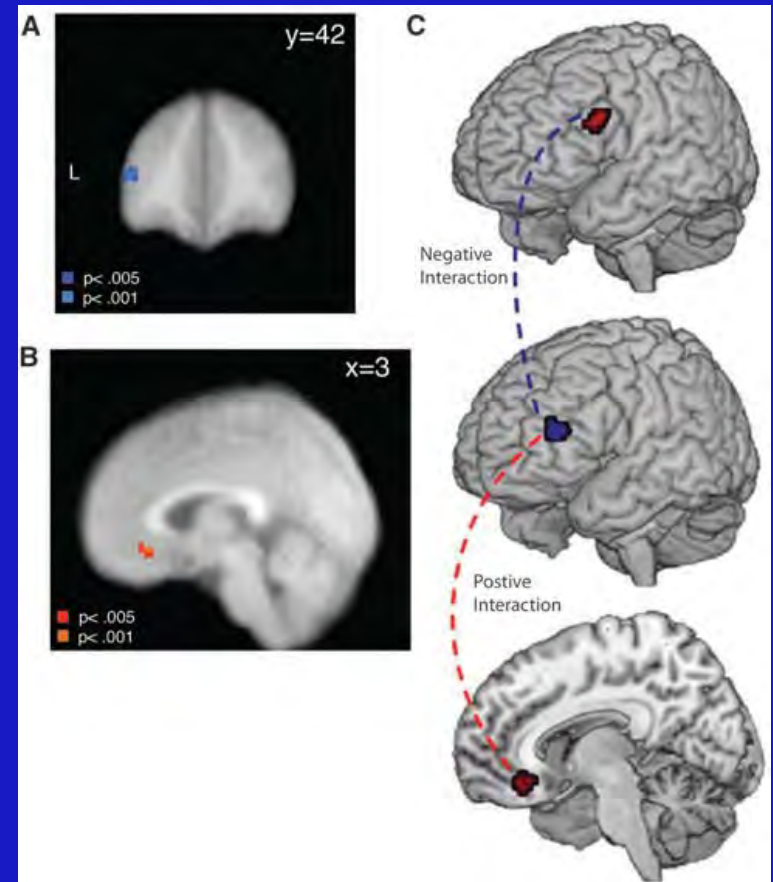
Cognitive control of behavior

Cigarette craving



Kober *PNAS* (2010)

Food craving



Lu *Science* (2009)

Next steps to move into
clinical utility:

EEG source-estimated
neurofeedback from the
PCC



Center for Mindfulness
in Medicine, Health Care, and Society

Thanks!

Subjects



Keri Bergquist (Yale)

Sarah Bowen (UW)

Willoughby Britton (Brown)

Kathy Carroll (Yale)

Neha Chawla (UW)

Todd Constable (Yale)

Michael Crowley (Yale)

Jake Davis (CUNY)

Gaëlle Desbordes (MGH)

Cameron Deleone (Yale)

Susan Druker

Hani Elwafi

Kathleen Garrison

Jeremy Gray (Yale)

Sean (Dae) Houlihan

Catherine Kerr (Brown)

Hedy Kober (Yale)

Cheryl Lacadie (Yale)

Sarah Mallik

G. Alan Marlatt (UW)

Linda Mayes (Yale)

Candace Minnix-Cotton

Stephanie Noble

Alex Ossadtchi (SSI)

Prasanta Pal

Xenios Papademetris

(Yale)

Lori Pbert

Mark Pflieger (SSI)

Marc Potenza (Yale)

Maolin Qiu (Yale)

Rahil Rojiani

Bruce Rounsaville (Yale)

Juan Santoyo (Brown)

Cliff Saron (UC Davis)

Dustin Scheinost (Yale)

Rajita Sinha (Yale)

Yi-Yuan Tang (Texas Tech)

Evan Thompson (Toronto)

Tommy Thornhill

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Grey matter volume associated with mindfulness scale (MAAS)

