

# Mindfulness-Based Relapse Prevention: A Dialogue Between Clinical Science and Neuroscience in the Treatment of Addictive Behavior.

Presented at the Western Psychological Association Meeting, April 2010, Cancun, Mexico

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## Health & Science

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### Why Falling Off the Wagon Isn't Fatal

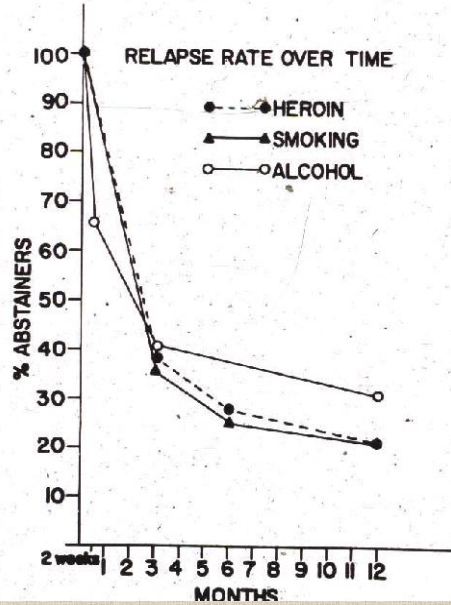
By MAIA SZALAVITZ Tuesday, Dec. 30, 2008



Bay Hipsley / Getty

WILLIAM A. HUNT, L. WALKER BARNETT AND LAURENCE G. BRANCH

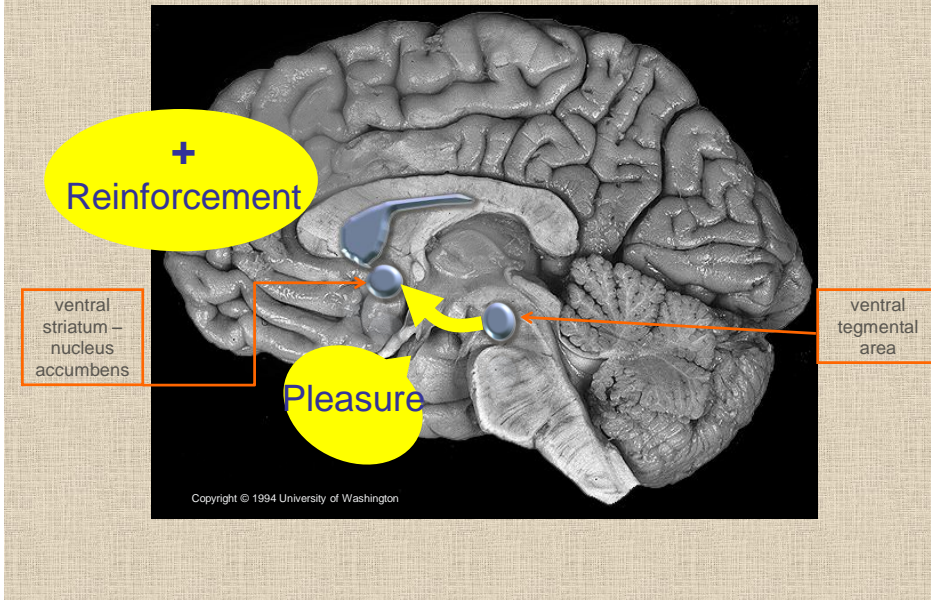
FIG. 1. RELAPSE RATE OVER TIME FOR HEROIN, SMOKING AND ALCOHOL.



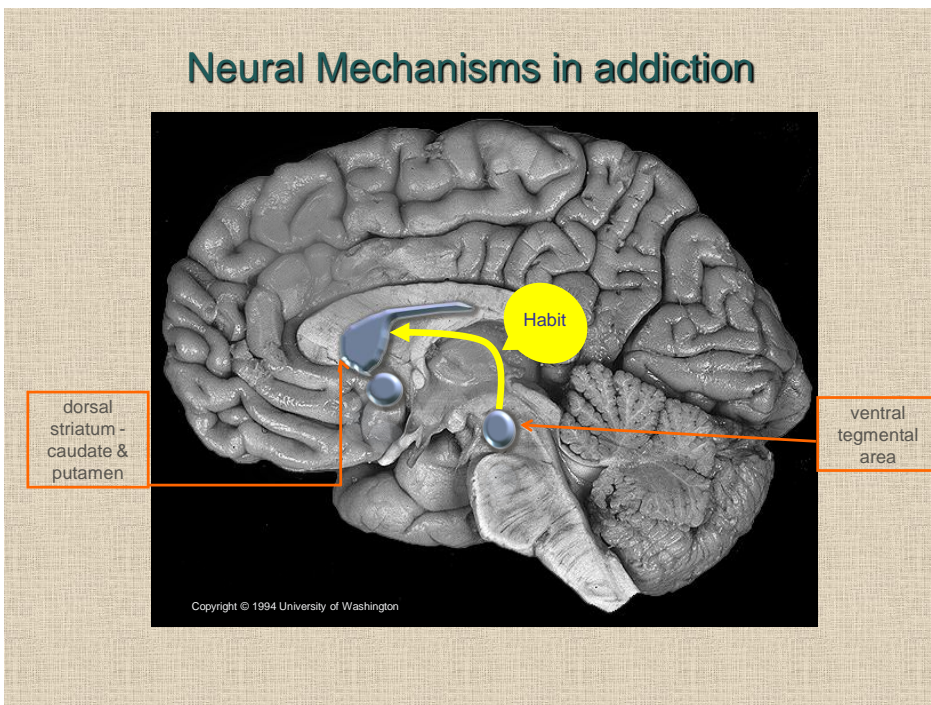
## Brickman's Model of Helping & Coping Applied to Addictive Behaviors

		Is the person responsible for changing the addictive behavior?	
		YES	NO
Is the person responsible for the development of the addictive behavior?	YES	<b>MORAL MODEL</b> (War on Drugs) Relapse = Crime or Lack of Willpower	<b>SPIRITUAL MODEL</b> (AA & 12-Steps) Relapse = Sin or Loss of Contact with Higher Power
	NO	<b>COMPENSATORY MODEL</b> (Cognitive-Behavioral) Relapse = Mistake, Error, or Temporary Setback	<b>DISEASE MODEL</b> (Heredity & Physiology) Relapse = Reactivation of the Progressive Disease

### Neural Mechanisms in addiction



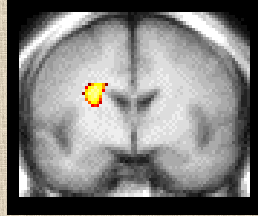
### Neural Mechanisms in addiction





**Rajita Sinha et al. at Yale showed stress increases activity in the dorsal striatum of cocaine addicts**

Positive  
Correlation  
 $p < .005$



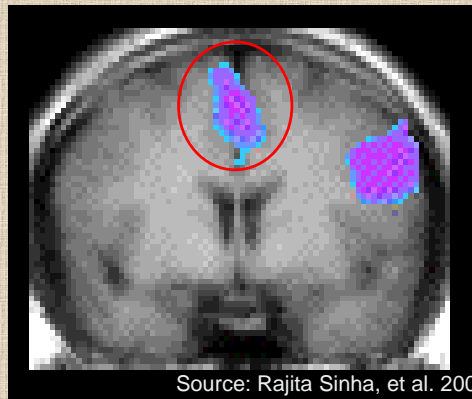
R L

“habit brain”

Sinha et al., *Psychopharmacology* (2005)



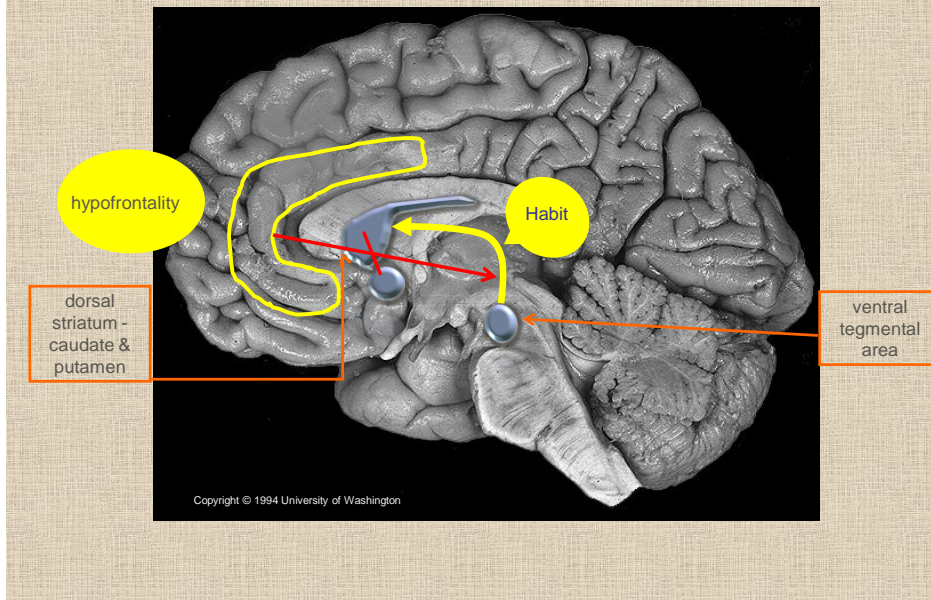
**Rajita Sinha et al. at Yale studied brain function under stress** (From: Sinha, R., Lacadie, C., Skudlarski, P., & Wexler, B. E. (2004). *Annals of the New York Academy of Science*, 1032, 254-257).



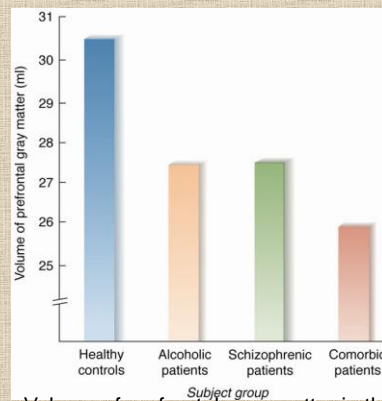
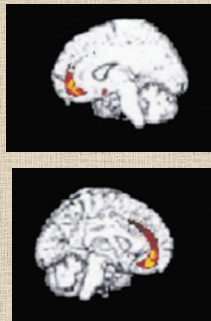
Source: Rajita Sinha, et al. 2004

**Inverse Correlations with Subjective Distress ~ the higher the distress ratings, the lower the activation in the anterior cingulate (ACC).**

## Neural Mechanisms in addiction



## Decreased gray matter volume in substance abusers.

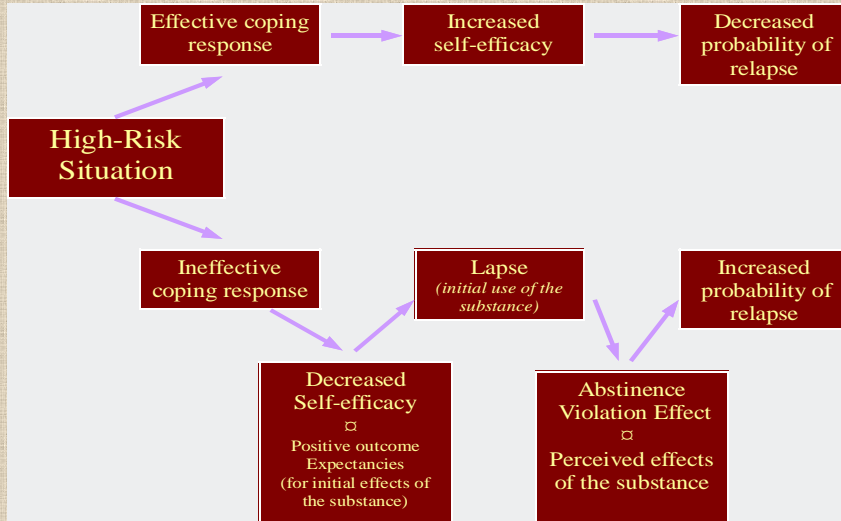


Decreased gray matter volume relative to that of control subjects in the brains of chronic cocaine abusers.

From Franklin et al. *Biological Psychiatry*, 2002, 51, 134-142.

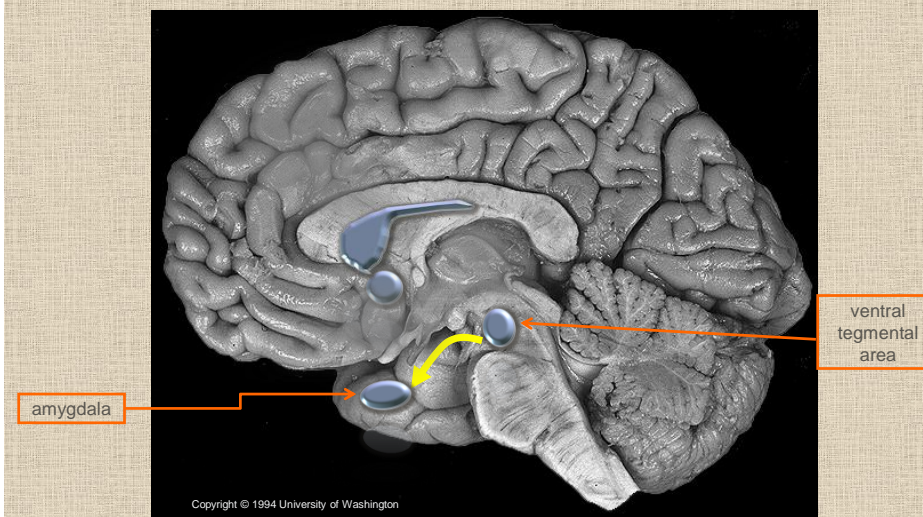
Volume of prefrontal gray matter in the prefrontal cortex of healthy controls, alcoholic patients, schizophrenic patients, and patients co-morbid for both disorders. From Mathalon et al., *Archives of General Psychiatry*, 2003, 60, 245-252.

## A Cognitive Behavioral Model of the Relapse Process



Marlatt &amp; Gordon 1985

## Neural Mechanisms in addiction



## So what would be helpful?

Something to reduce stress

Something to increase PFC inhibition over habit behaviors

Something to temper negative emotion – perhaps by toning down activity in the amygdala

## Mindfulness Meditation

Mindfulness is a way of paying attention:  
on purpose, in the present moment, &  
non-judgmentally



(adapted from Kabat-Zinn, 2005)

## Results: Vipassana vs. TAU 3-Months Post-Release



- N = 173
- Significant reductions in substance use
  - Marijuana
  - Crack cocaine
  - Alcohol
  - Alcohol-related negative consequences
- Significant changes in psychosocial outcomes
  - Decreased psychiatric symptoms
  - Increased internal drinking-related locus of control
  - Increased optimism

(Bowen et al, 2006)

## Mindfulness-Based Relapse Prevention (MBRP)



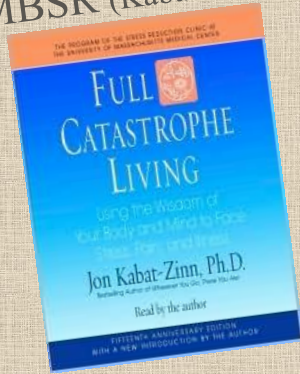
(Witkiewitz, Marlatt & Walker, 2005; Bowen,  
Chawla & Marlatt, 2008)

NIDA Grant # R21 DA010562; PI Marlatt

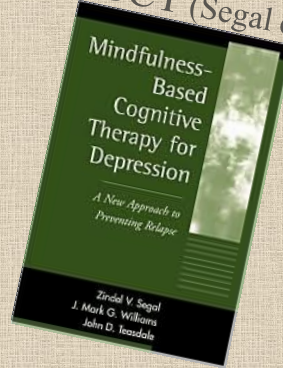
# MBRP Structure

- Integrates mindfulness practices with Relapse Prevention
- Patterned after:

MBSR (Kabat-Zinn)



MBCT (Segal et al.)



8 weekly 2 hour sessions; daily home practice

## “Formal” Practices



Body Scan



Sitting Meditation

Mindful Movement/Walking Meditation



“Lovingkindness” or “metta”



Mountain Meditation

## “Informal” Practices

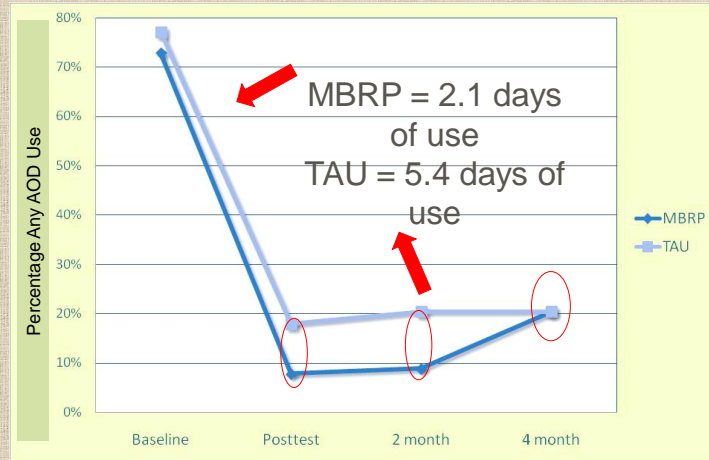
Mindfulness of daily activities



“SOBER” breathing space



## Results: Substance Use

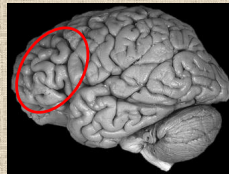


Time x group interaction:  $p = .02$   
 Time<sup>2</sup> x group interaction:  $p = .01$

## Mindfulness Meditation and the Brain


Focus on the PFC

Executive Functions



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 Sara Lazar et al. at Harvard studied brain activity during meditation.

**Tasks in Scanner**


cow, duck, lion, zebra...

**Effects?**

Meditators showed increased activity in the PFC, responsible for executive functions

Source: Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *Neuroreport*, 11, 1581-1585.

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 Britta Hölzel et al. at the U of Giessen Germany studied brain activity during meditation.

**Groups**

**Tasks in Scanner**

vs

Non-meditators

VS

2
5
11
6
19
2
8
20
1
16

90 86 94

Meditators showed stronger activity in the PFC, particularly in the ACC (attention) & dmPFC (impulse control) with breath awareness than controls

Source: Hölzel, B. K., et al. (2007). Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neuroscience Letters*, 421, 16-21.

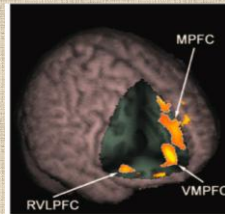
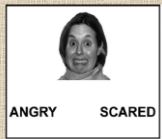
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David Creswell et al. at UCLA studied brain activity during an affect labeling task and correlated those changes with dispositional mindfulness.

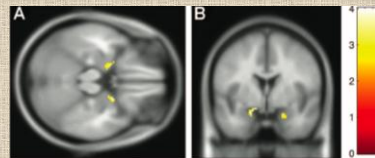
Mindful Attention Awareness Scale  
MAAS

+



+ correlation

&

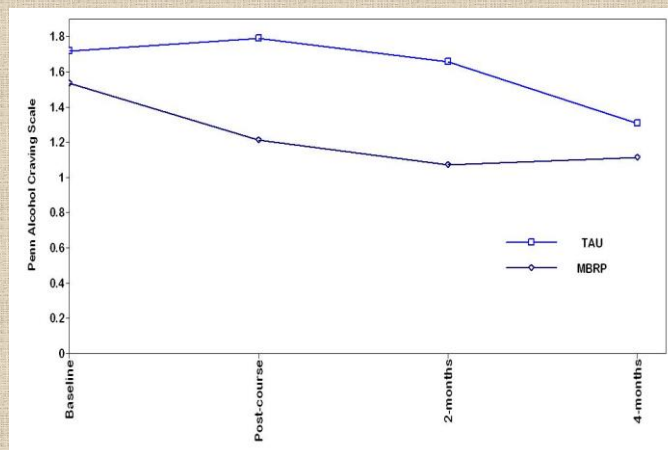


- Correlation with amygdala activity

Source: Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural Correlates of Dispositional Mindfulness During Affect Labeling. *Psychosomatic Medicine*, 69, 560-565

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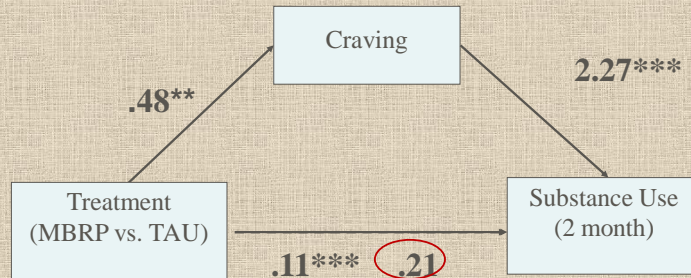
## MBRP Results: Craving



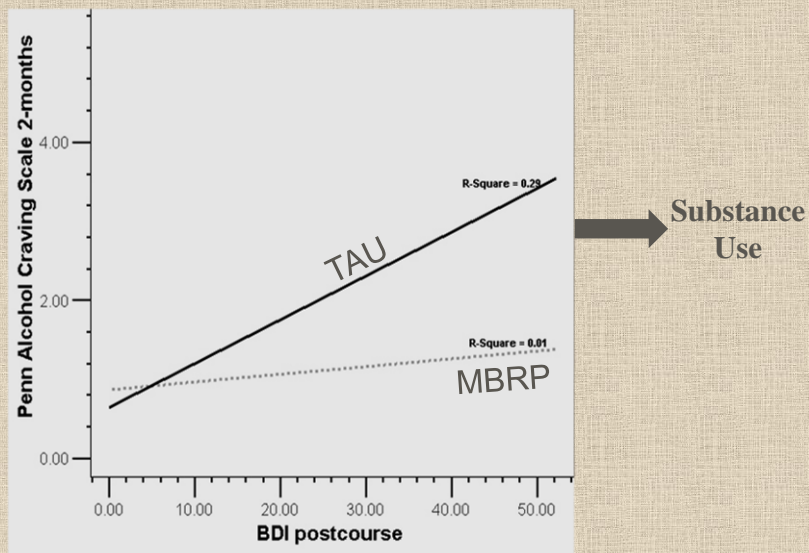
Time x treatment:  $p = .02$   
Time<sup>2</sup> x treatment:  $p = .02$

PACS, Flannery et al., 1999


## MBRP Results: Mediating Effect of Craving



## MBRP Results: Depression and




## Mindfulness Training (MT) and ANS Tone in Addicts

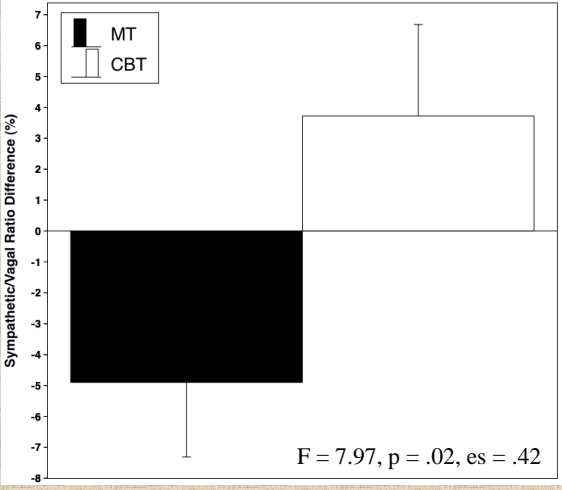


Judson Brewer et al. at Yale studied mindfulness training (MT) effects on reactivity in substance abusers.

Stress imagery script

+





Group	Mean Difference (%)
MT	-5.5
CBT	3.8

$F = 7.97, p = .02, es = .42$

Source: Brewer, J. A., Sinha, R., et al. (2009). Mindfulness training and stress reactivity in substance abuse: Results from a randomized, controlled Stage I Pilot Study. *Substance Abuse*, 30: 306-317


## Antoine Lutz et al., at U of Wisc. Madison studied fMRI responses during compassion meditation.

2 groups



Image source:  
<http://images.imagine.com/img/photoalt/opaar138/paar138000015.jpg>


or




LKM

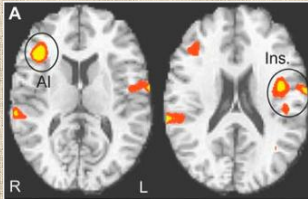
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task in scanner

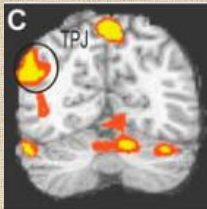


or





**A**



**C**

Greater increases in Insula (emotional arousal & empathy) activity to negative sounds for experts.

Activity in the mPFC (attending) & temporal-parietal junction (TPJ; attuning) increased to both sounds in experts.

Source: Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R. J. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLOS One*, 3, 1-10.

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Norman Farb, et al. used fMRI to study two aspects of self-awareness: the narrative “me” and the experiential “I”.

1  
wait-list controls

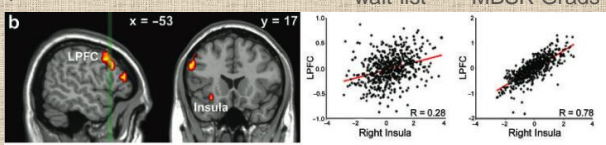
or

2  
MBSR grads

Trait-related adjective task in scanner:  
*charming – lively – hopeful – greedy – indecisive*

Narrative Focus: “me” & my story  
or  
Experiential Focus: current moment “I”  
(mindful practice)

wait-list MBSR Grads



Activity pattern associated with detached or objective modes of self-focus.

Farb et al. (2007). Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reference. *SCAN*, 2, 313-322.

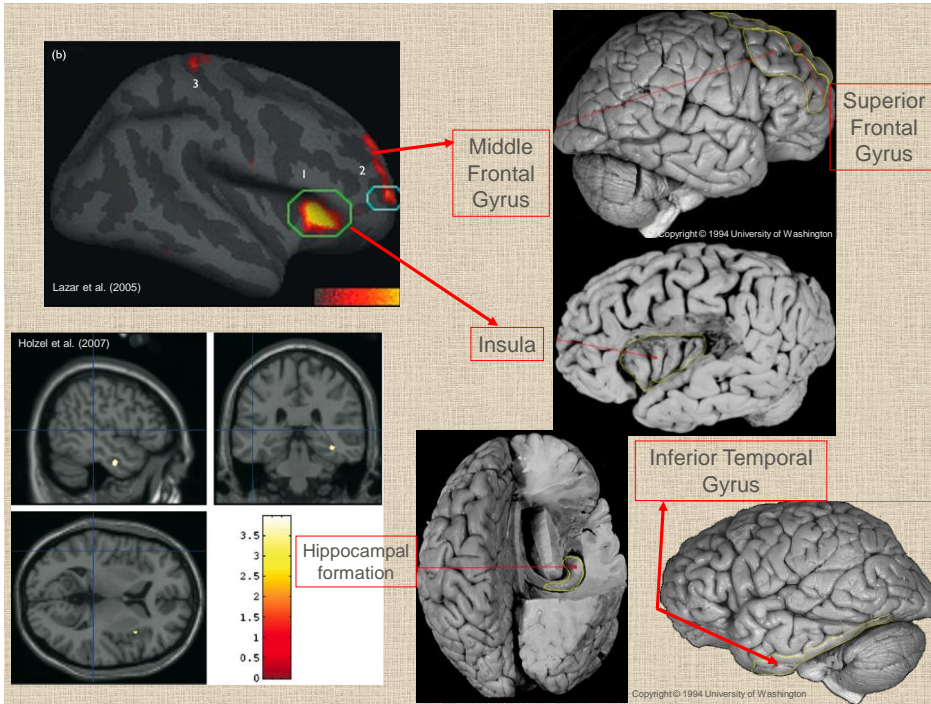
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## State (fMRI) vs. Trait (MRI)



2 studies that assess structural changes in the brain in response to MM are:

1. Lazar, S.W. et al. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport*, 16, 1893-1897.
2. Holzel, B. K. et al. (2008). Investigation of mindfulness meditation practitioners with voxel-based morphometry. *SCAN*, 3, 55-61.




# Where do we go from here?


**Psychophysiological effects of MBRP**




NIH-ITHS Grant # UL1RR025014;  
PI Lustyk



**fMRI**



**All with a focus on gender differences**



[www.spu.edu/LustykLab](http://www.spu.edu/LustykLab)