

The Neuroscience of Mindfulness

Carl Fulwiler

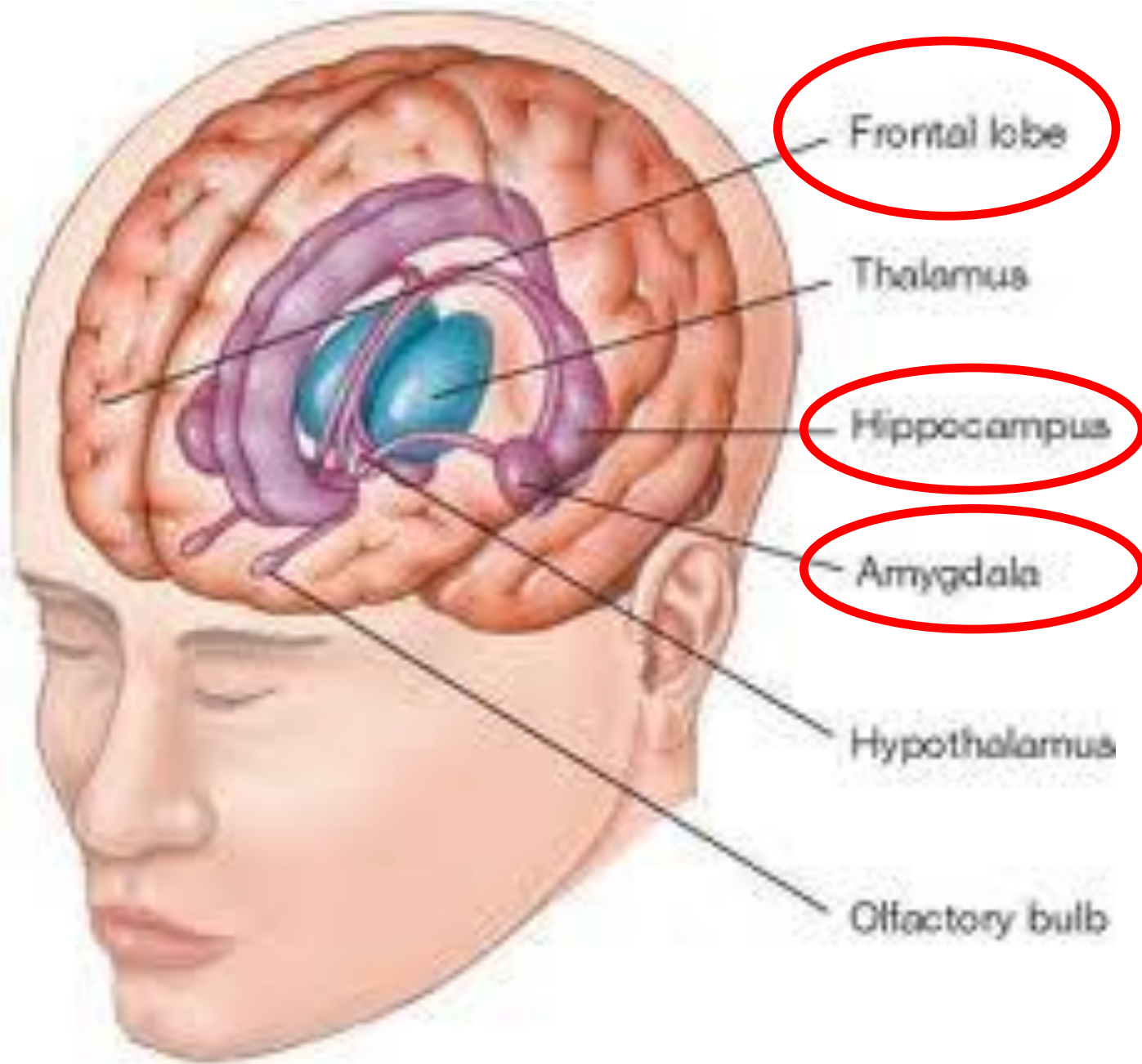
Center for Mental Health Services Research

Department of Psychiatry

UMass Medical School

Public Sector Conference

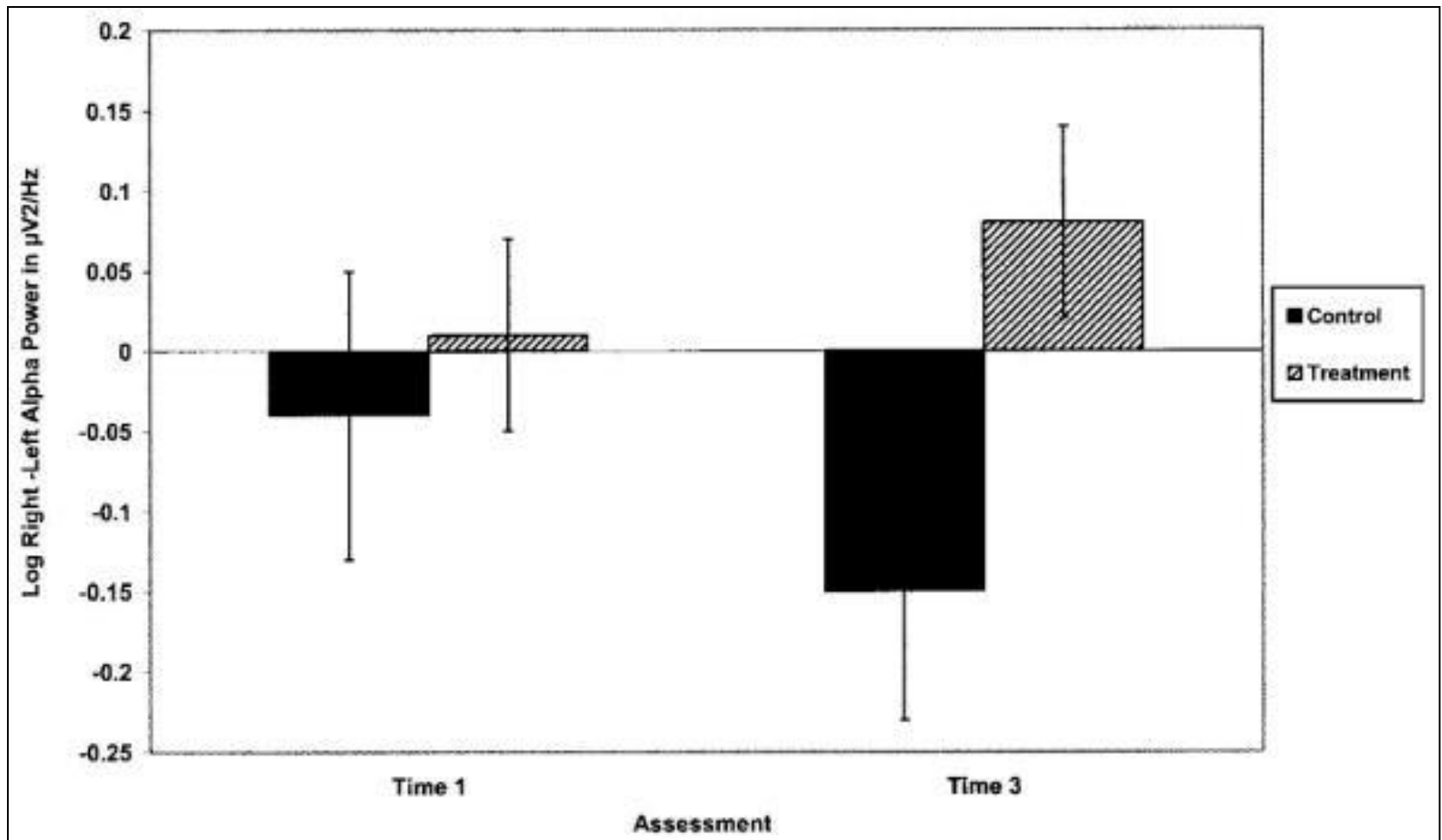
June 16, 2011



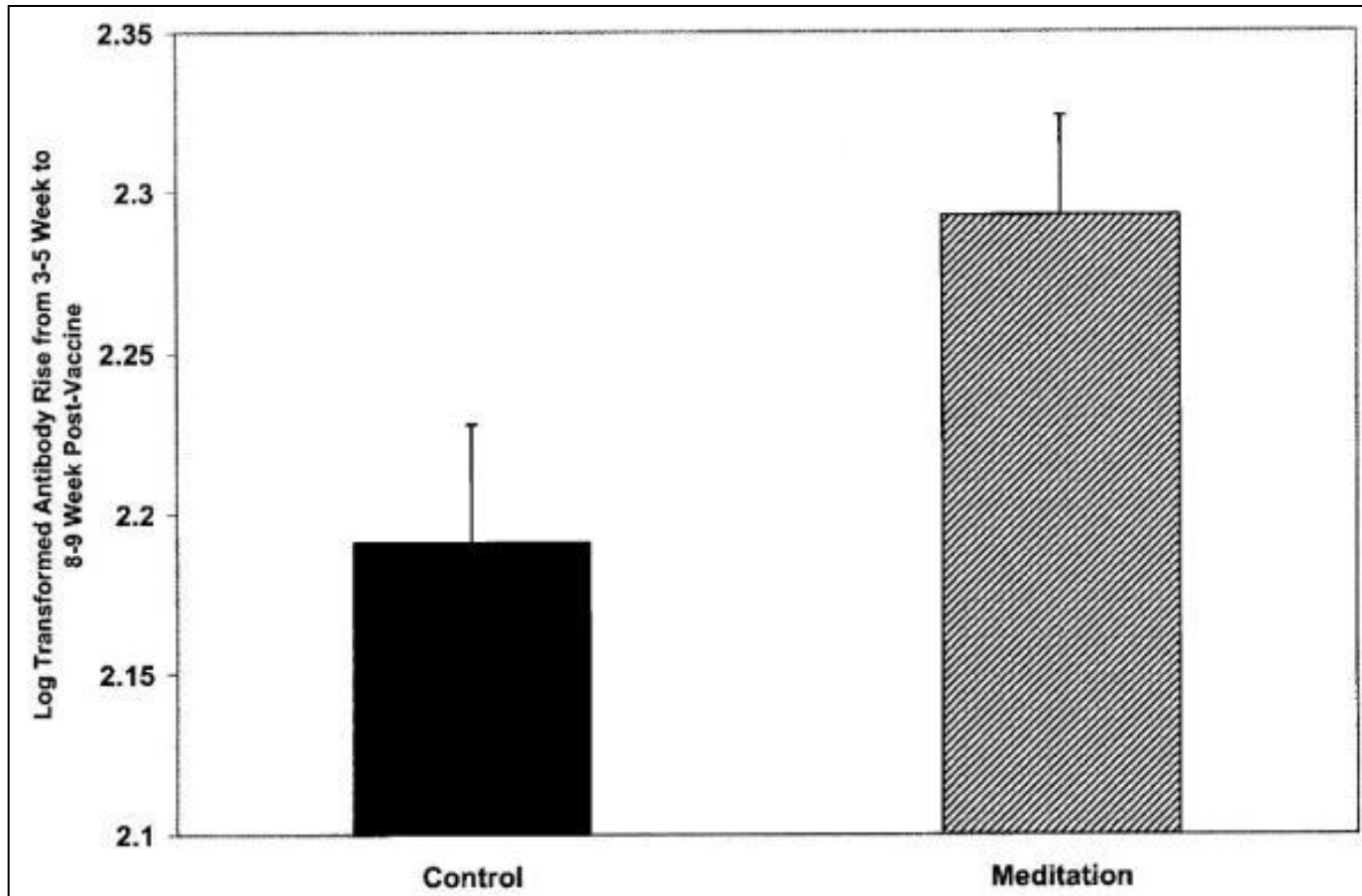
Stress response and wellness

- Amygdala is the fight or flight center
- Activation triggers cascade of neural, neuroendocrine, neuroimmune and behavioral responses
- Chronic activation of this circuitry responsible for effects of stress on health outcomes

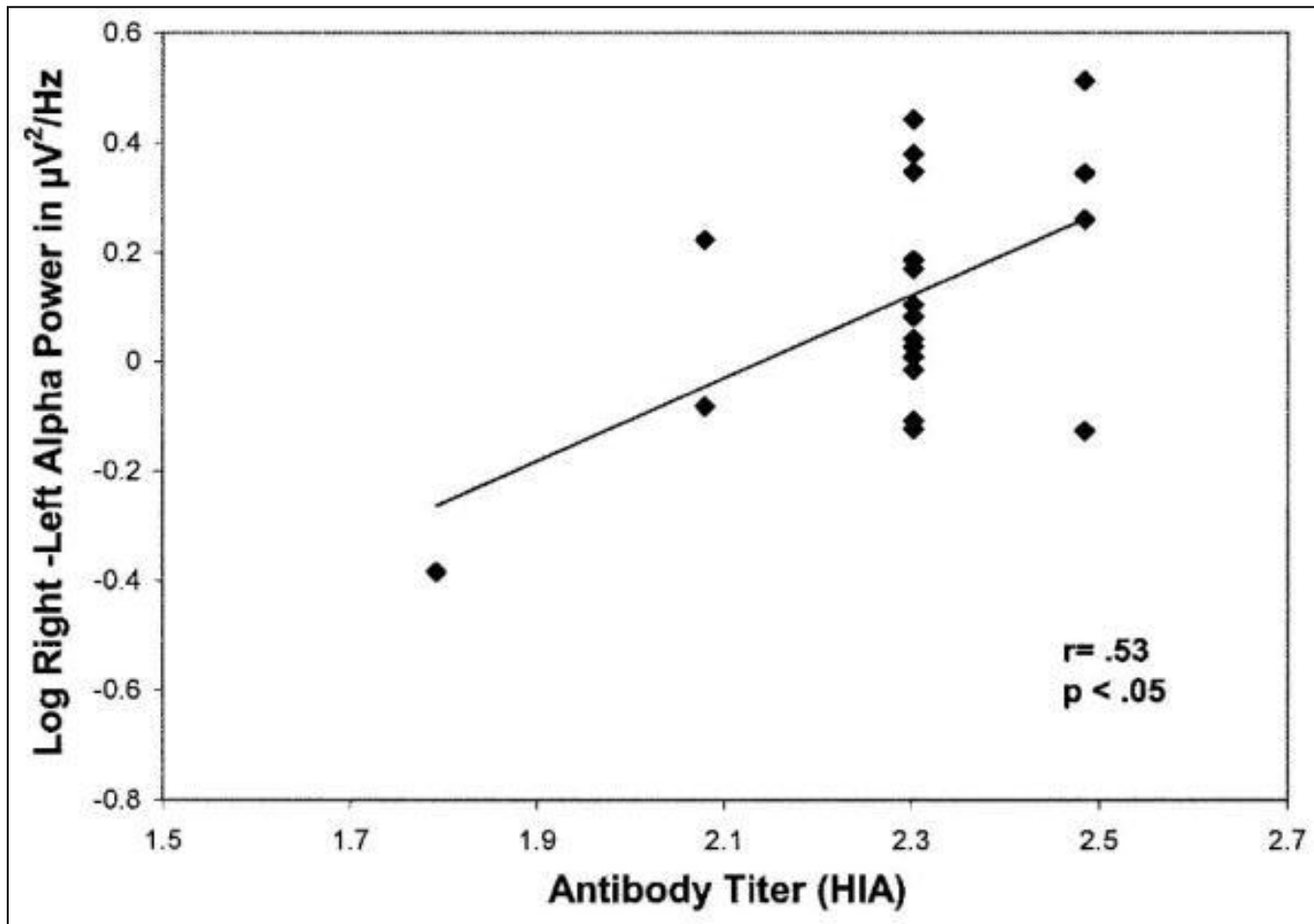
MBSR increases left-sided cortical activation



Increased immune response



Immune changes correlate with shift in prefrontal activation

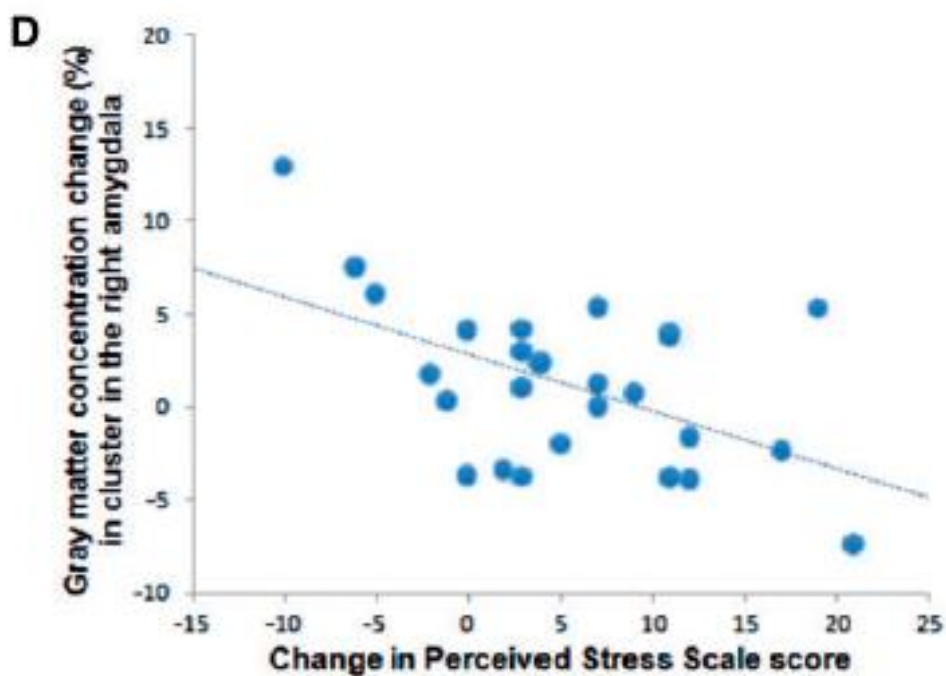
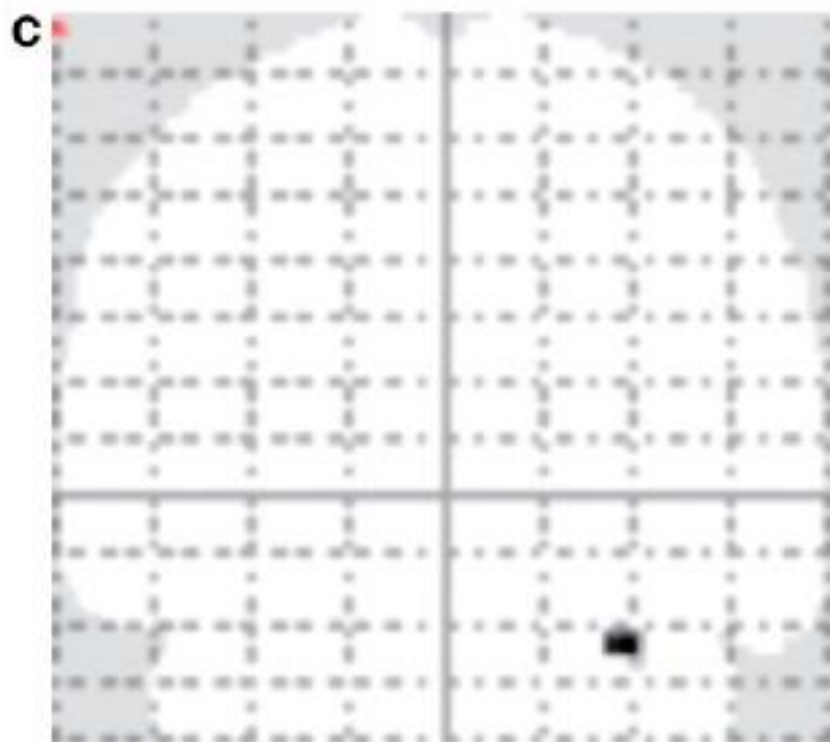
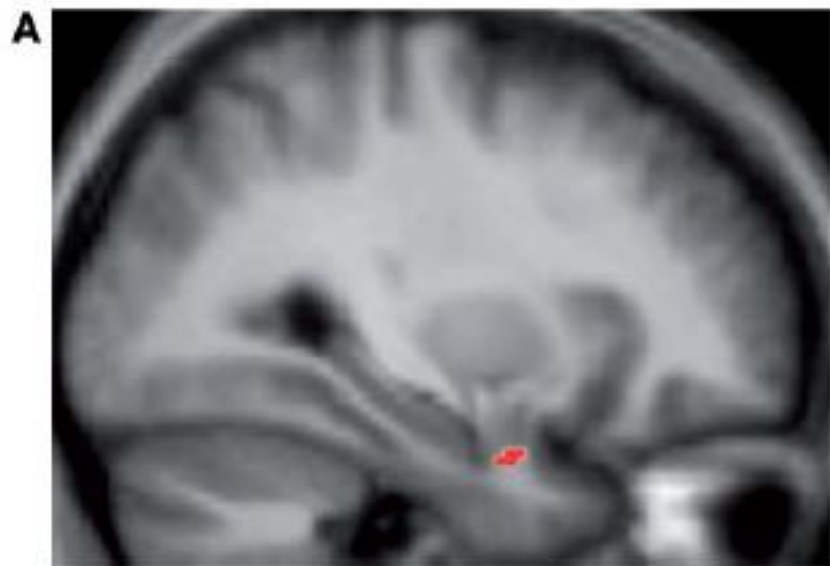


Stress reduction correlates with structural changes in the amygdala

Britta K. Hölzel,^{1,2} James Carmody,³ Karleyton C. Evans,¹ Elizabeth A. Hoge,⁴ Jeffery A. Dusek,^{5,6} Lucas Morgan,¹ Roger K. Pitman,¹ and Sara W. Lazar¹

¹Massachusetts General Hospital, Charlestown, MA 02129, USA, ²Bender Institute of Neuroimaging, Justus-Liebig Universität Giessen, 35394 Giessen, Germany, ³University of Massachusetts Medical School, Worcester, MA 01605, ⁴Massachusetts General Hospital, Boston, MA 02114 and ⁵Abbott Northwestern Hospital, Penny George Institute for Health and Healing, Minneapolis, MN 55407, USA,

⁶Benson-Henry Institute for Mind Body Medicine at Massachusetts General Hospital, Boston, MA 02114, USA



Emotion regulation

- Amygdala is also the fear center
- Input from prefrontal cortex and anterior cingulate modulate emotional responses
- Disorders of emotional regulation exhibit abnormal activation patterns in these regions

Neural Correlates of Dispositional Mindfulness and Affect Labeling

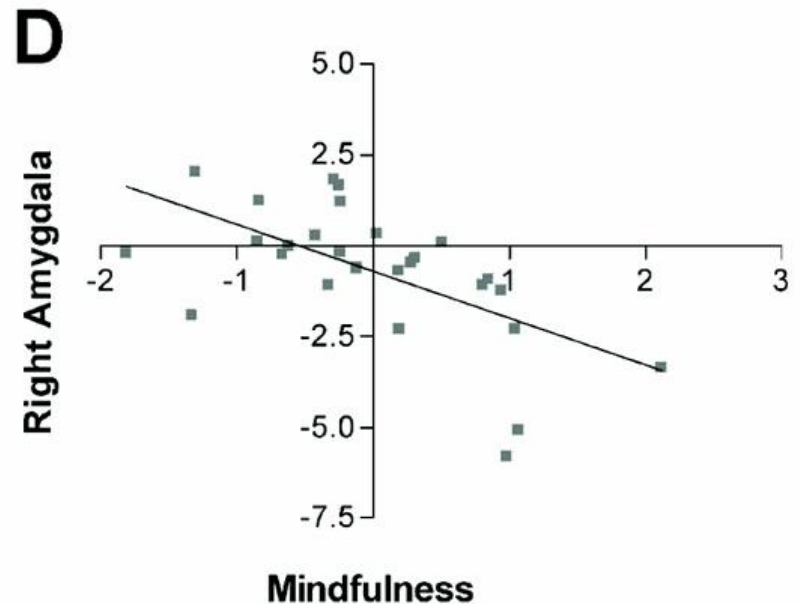
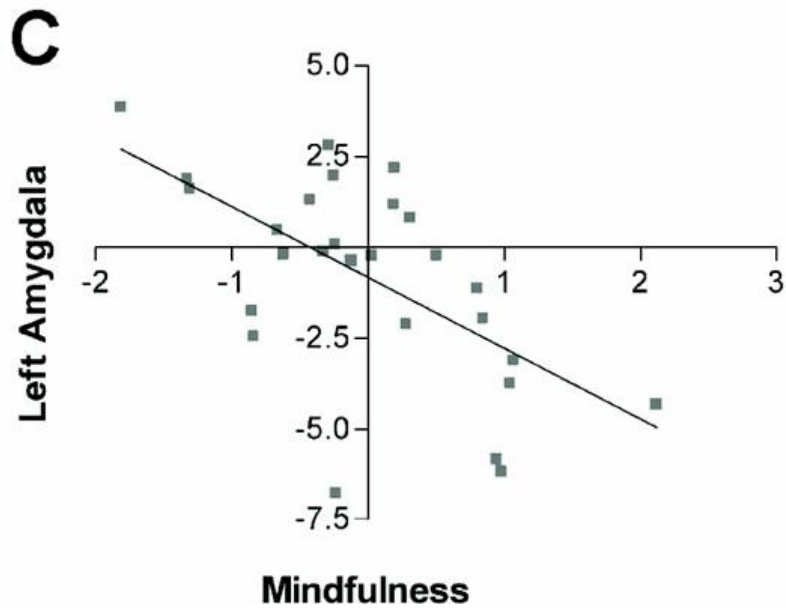
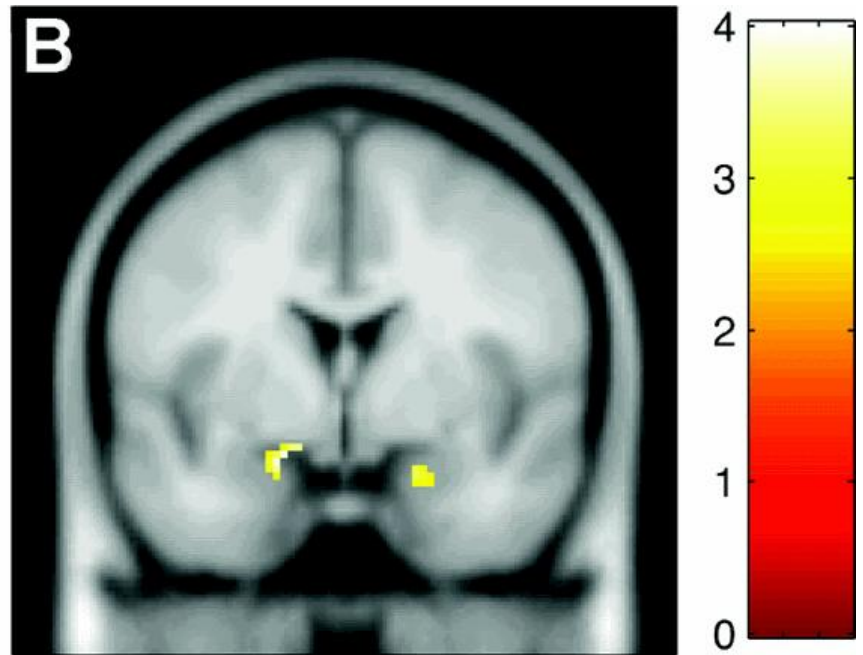
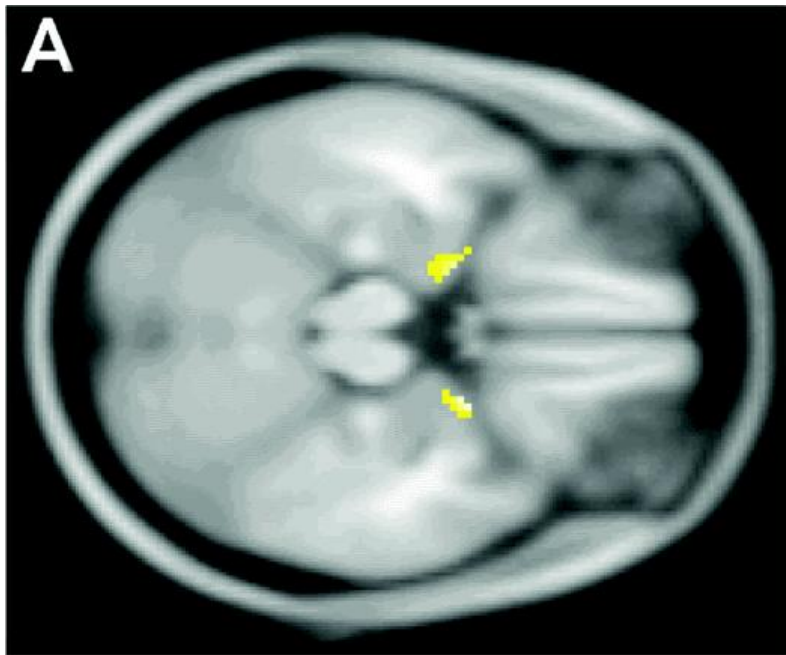
Creswell et al. (2007) Psychosomatic Medicine

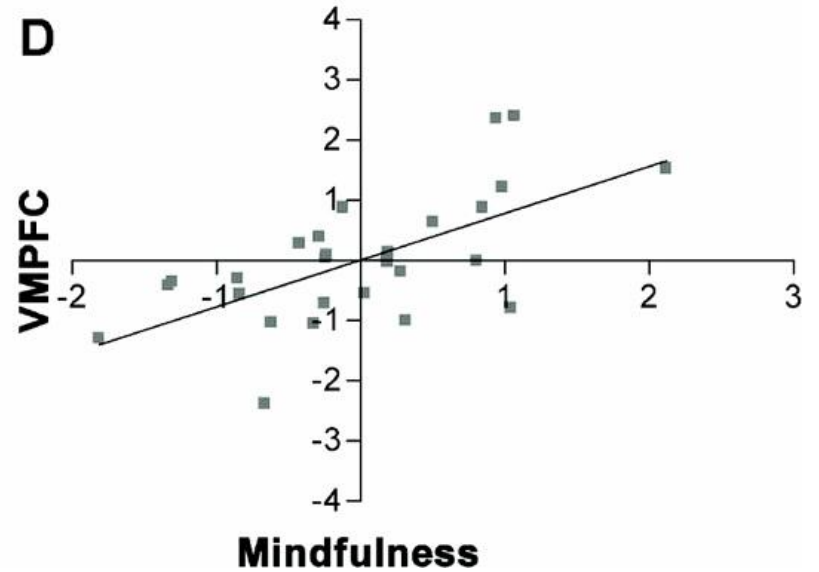
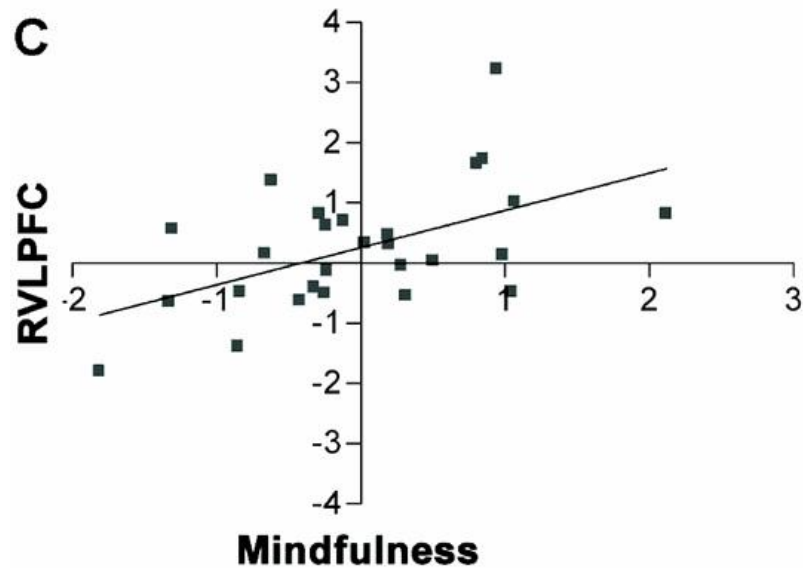
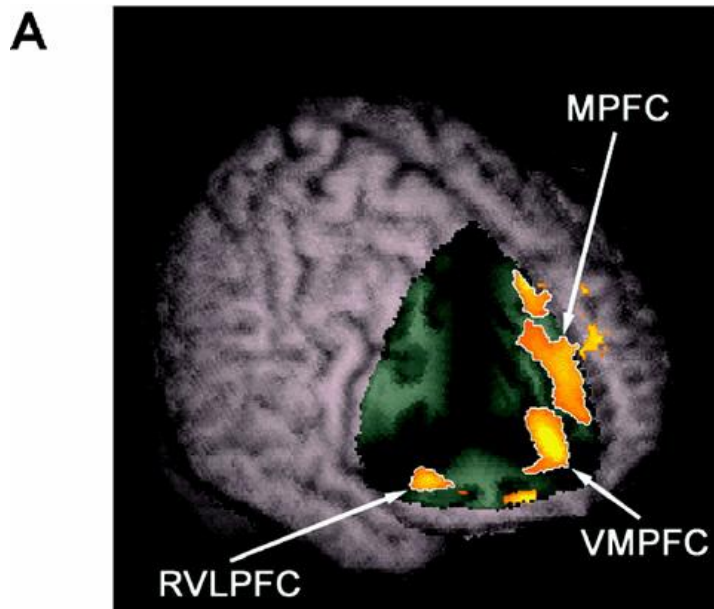


Emotion Detection

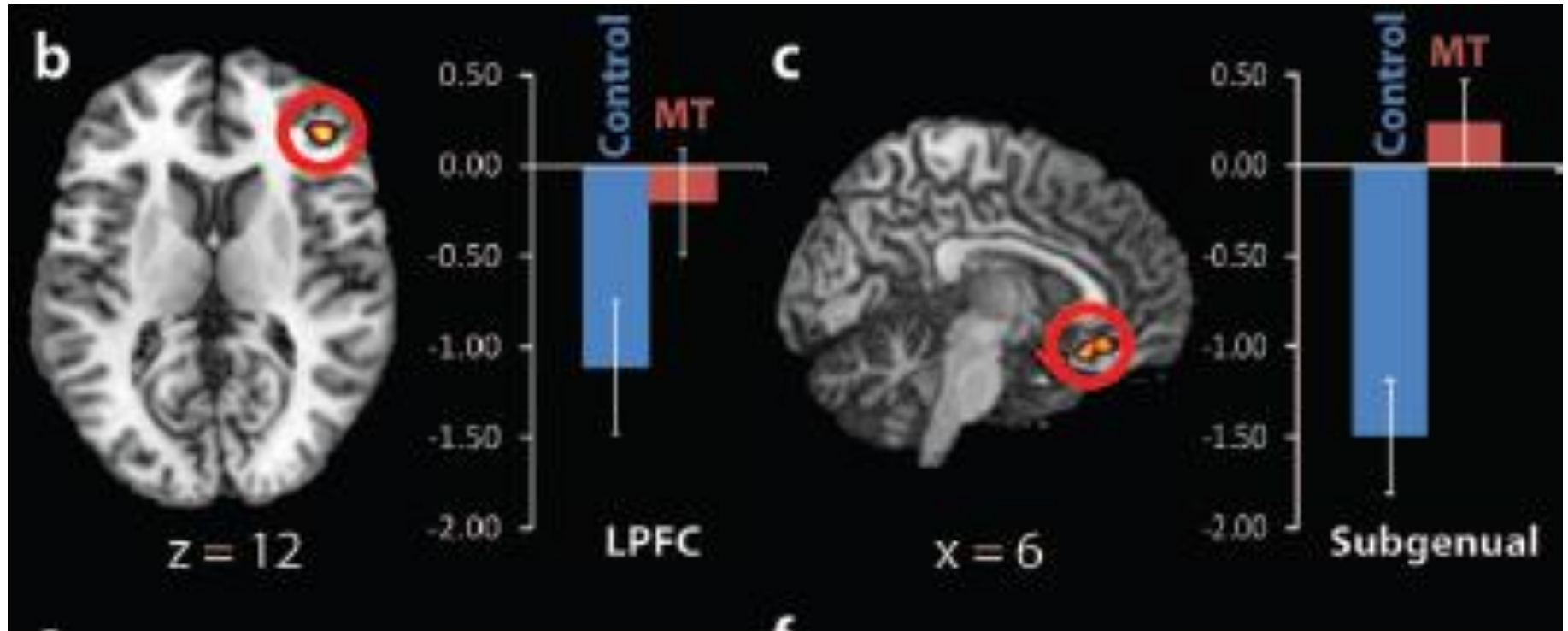


Gender Detection





Neural deactivation to sadness provocation





Contents lists available at ScienceDirect

Psychiatry Research: Neuroimaging

journal homepage: www.elsevier.com/locate/psychresns



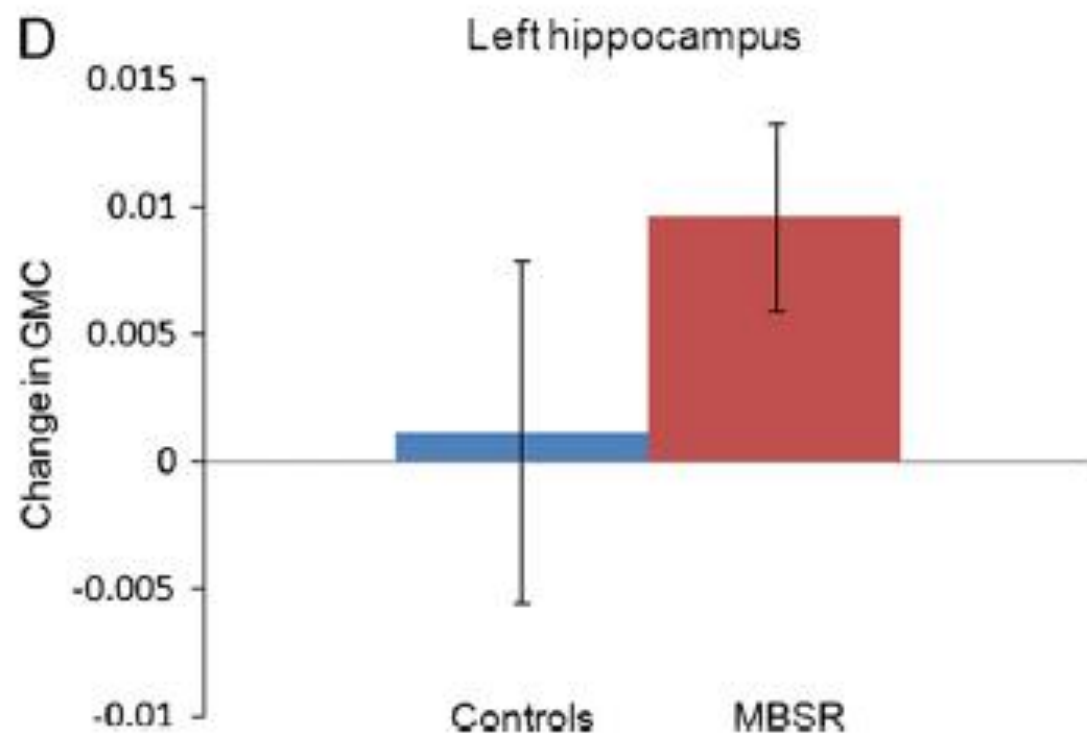
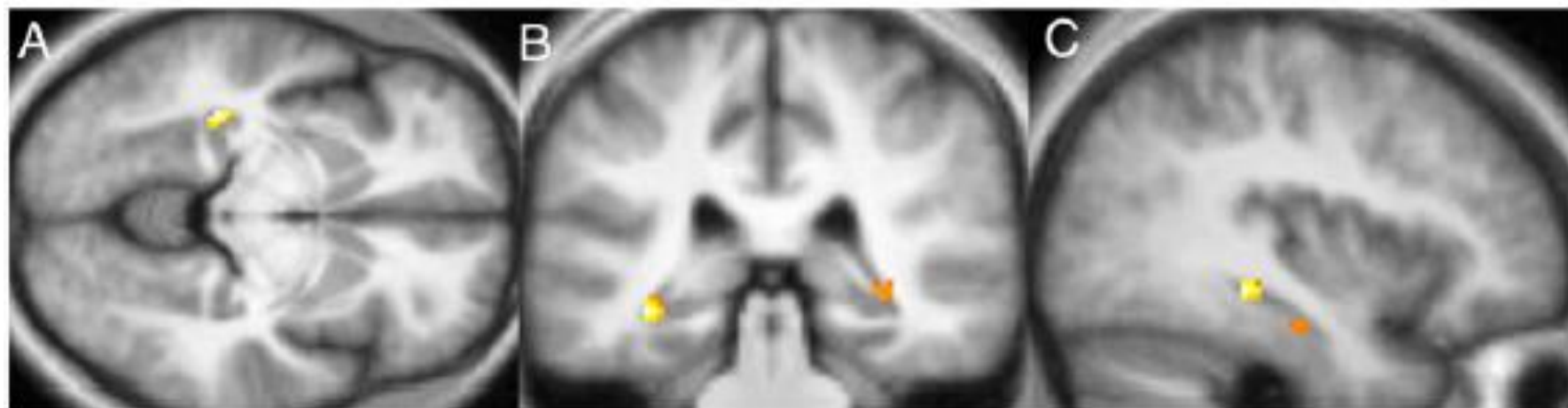
Mindfulness practice leads to increases in regional brain gray matter density

Britta K. Hölzel^{a,b,*}, James Carmody^c, Mark Vangel^a, Christina Congleton^a, Sita M. Yerramsetti^a,
Tim Gard^{a,b}, Sara W. Lazar^a

^a Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

^b Bender Institute of Neuroimaging, Justus Liebig Universität Giessen, Germany

^c University of Massachusetts Medical School, Worcester, MA, USA



References

- Davidson, R. J., J. Kabat-Zinn, et al. (2003). "Alterations in brain and immune function produced by mindfulness meditation." *Psychosom Med* 65(4): 564-570.
- Creswell, J. D., B. M. Way, et al. (2007). "Neural correlates of dispositional mindfulness during affect labeling." *Psychosomatic Medicine* 69(6): 560-565.
- Farb NA, Anderson AK, Mayberg H, et al. (2010). Minding one's emotions: Mindfulness training alters the neural expression of sadness. *Emotion*, 10(1), 25-33
- Holzel, B. K., J. Carmody, et al. (2010). Stress reduction correlates with structural changes in the amygdala. *Soc Cogn Affect Neurosci* 5(1): 11-17.
- Hölzel, B.K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S.M., et al. (2011). Mindfulness Practice Leads to Increases in Regional Brain Gray Density Matter. *Psychiatry Research: Neuroimaging*, 191, 36-43.