

Mindfulness

“Purposefully paying attention to experiences in the present moment in a non-judgmental way”

(Kabat-Zinn 1990)



Mind Full, or Mindful?

Non-judging = Equanimity



Caring and open yet non-reactive

Scientifically Validated Benefits

Decreased stress (self report, cortisol, etc.)

Reduced symptoms associated with:

- Depression

- Anxiety disorders

- Pain

- Insomnia

Increased self-reported quality of life (satisfaction with work, family, health, etc.)



Suggests Neuroplasticity!

**Change in the nature of connections
between neurons**

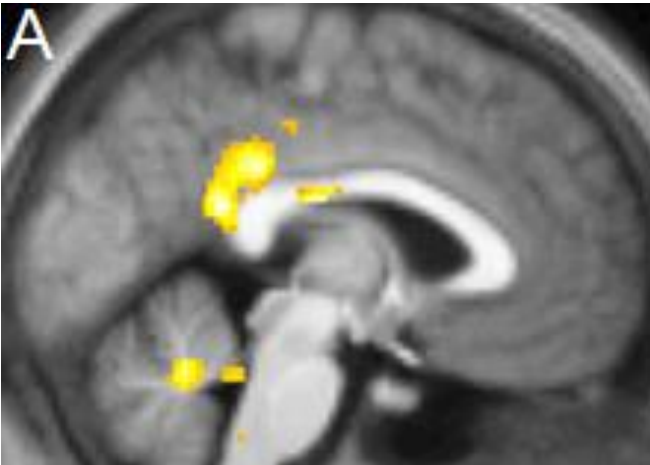
**Gray matter changes with
training**

Increase in gray matter concentration

Posterior Cingulate

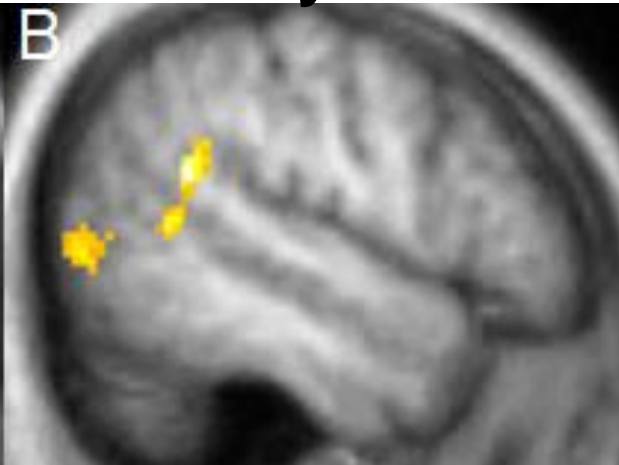
Supramarginal Gyrus

Hippocampus



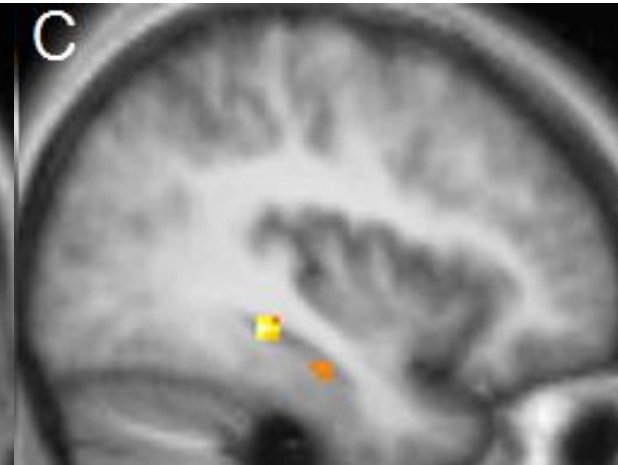
P = 0.004

Self-related processes
Memory



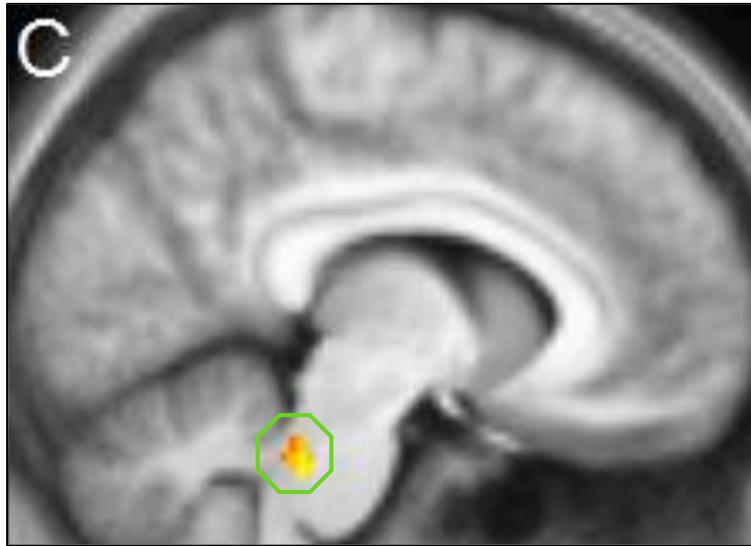
P = 0.036

Perspective
taking, attention

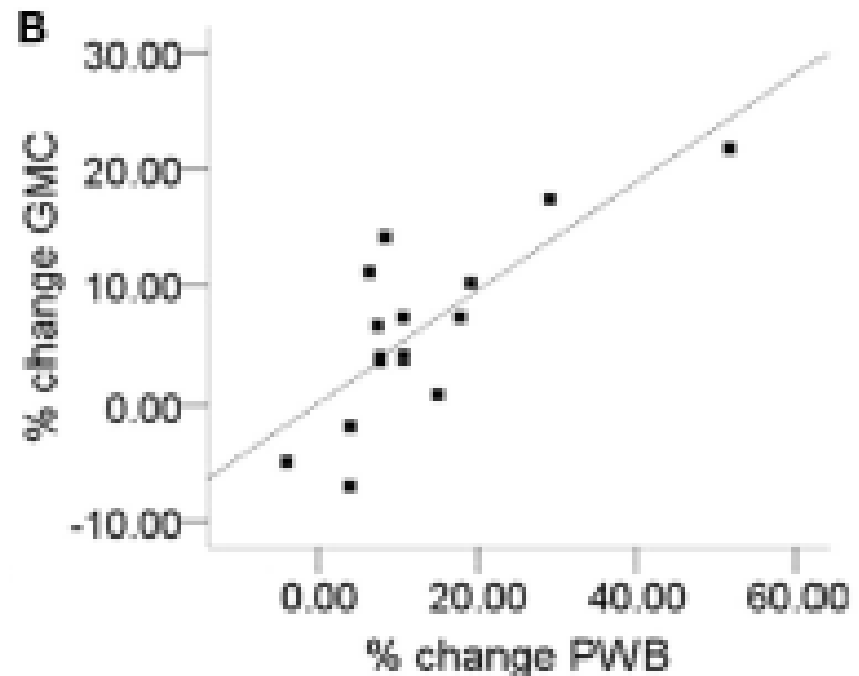


P = 0.001

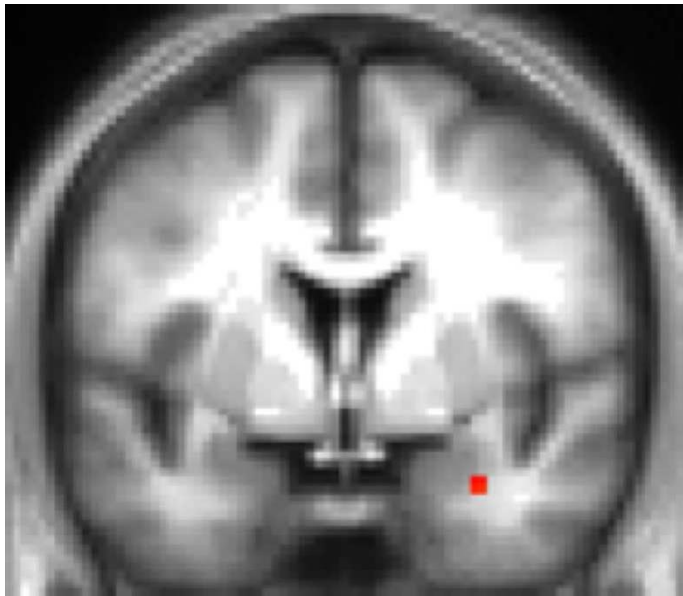
Correlation between changes in brain stem and well-being



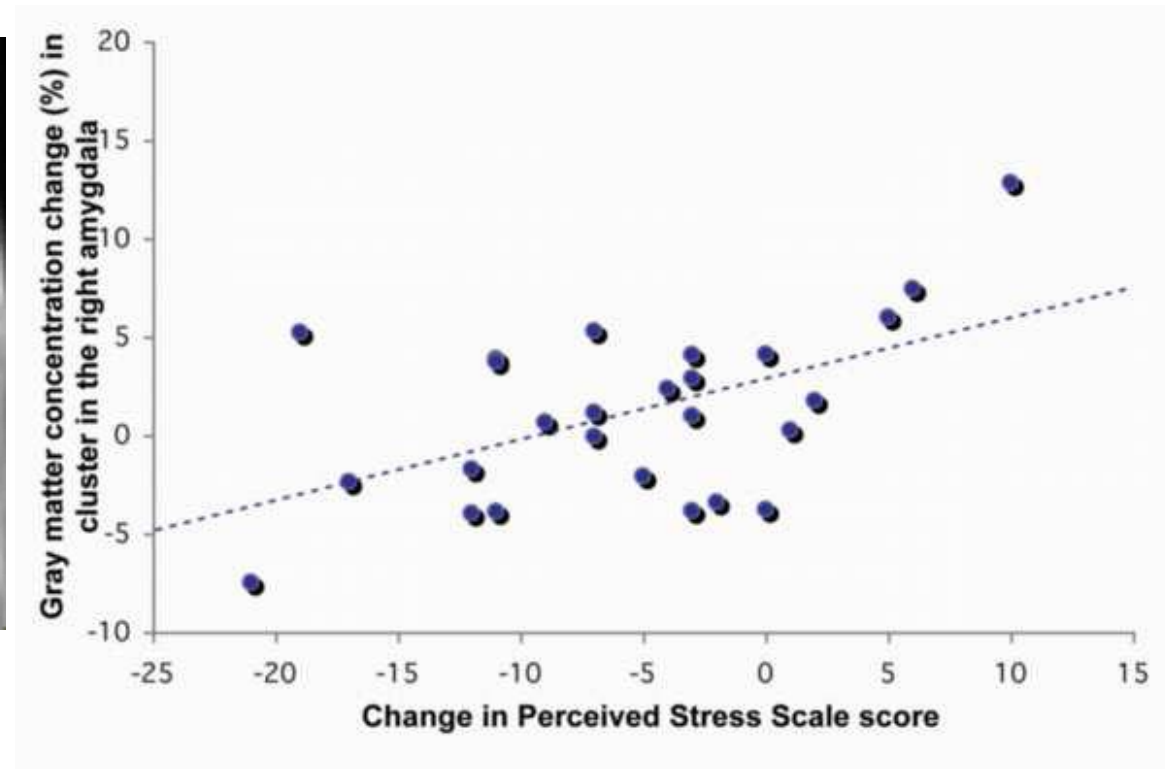
p=0.024



Change in perceived stress is correlated with change in amygdala gray matter



$r=0.53$; $p = 0.049$; 2-tailed



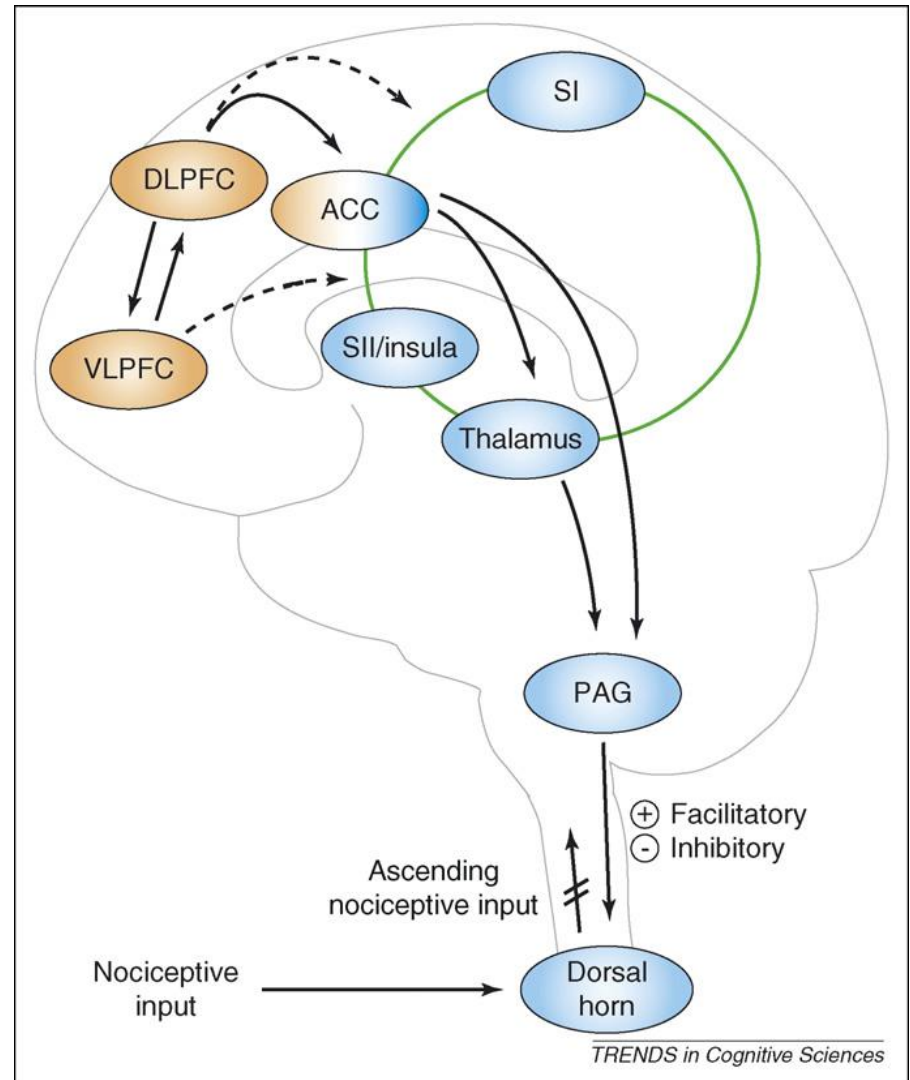
Pain coping

Cognitive strategies to modulate pain

Attention / distraction

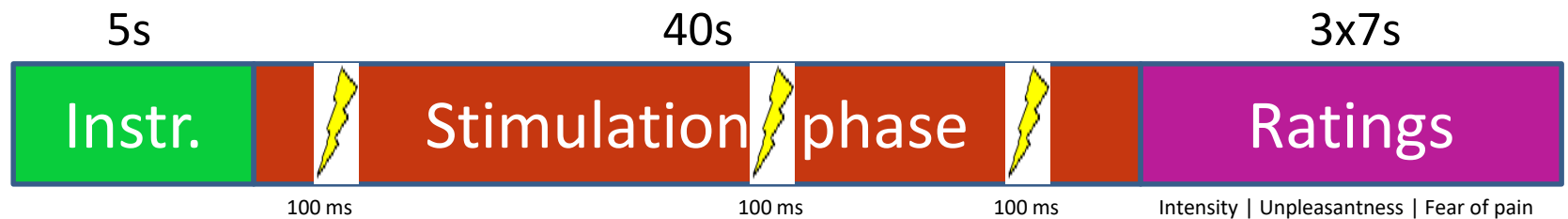
Expectation

Placebo

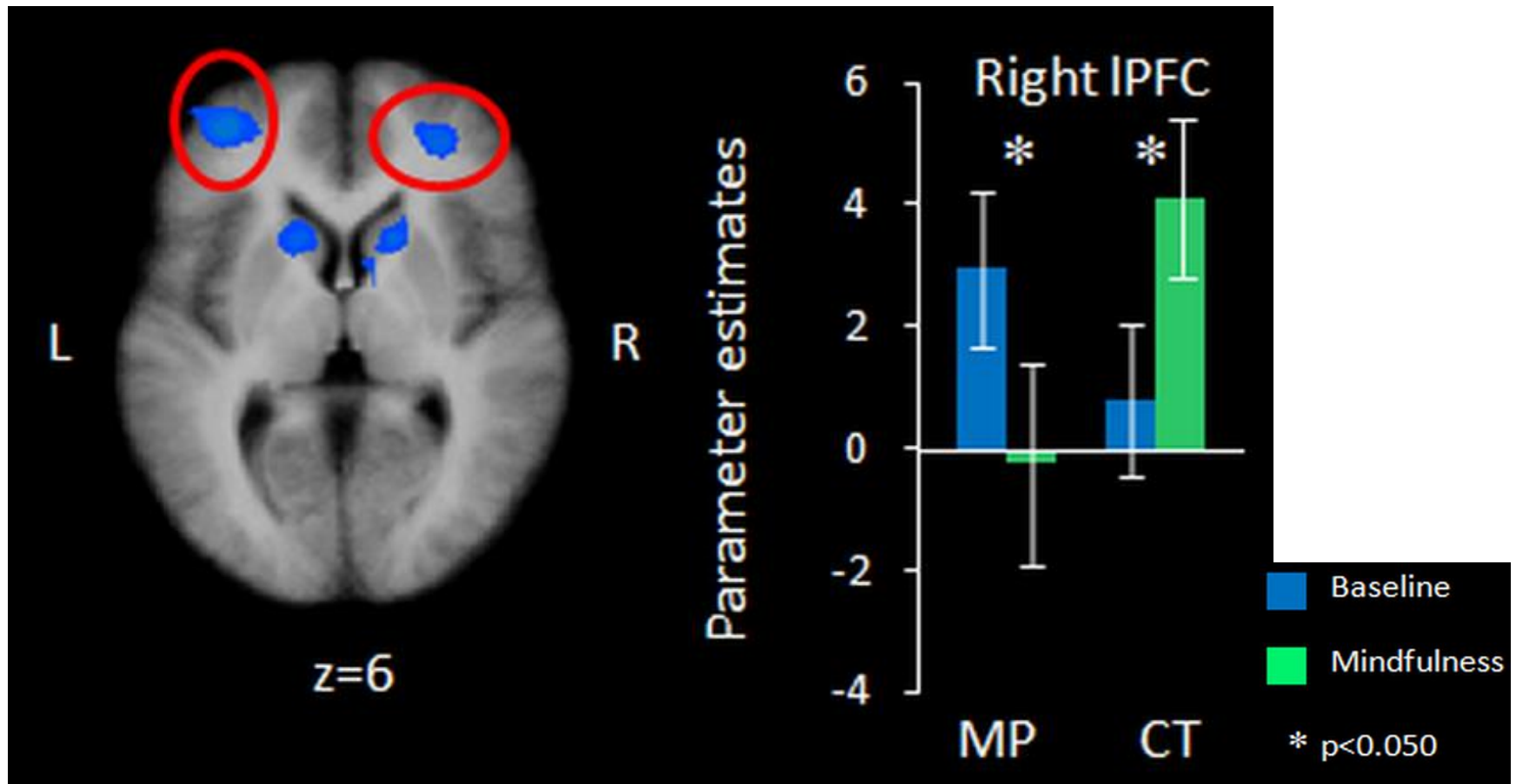




Repeated 12 times: 6 times while being mindful, 6 times normal attention.

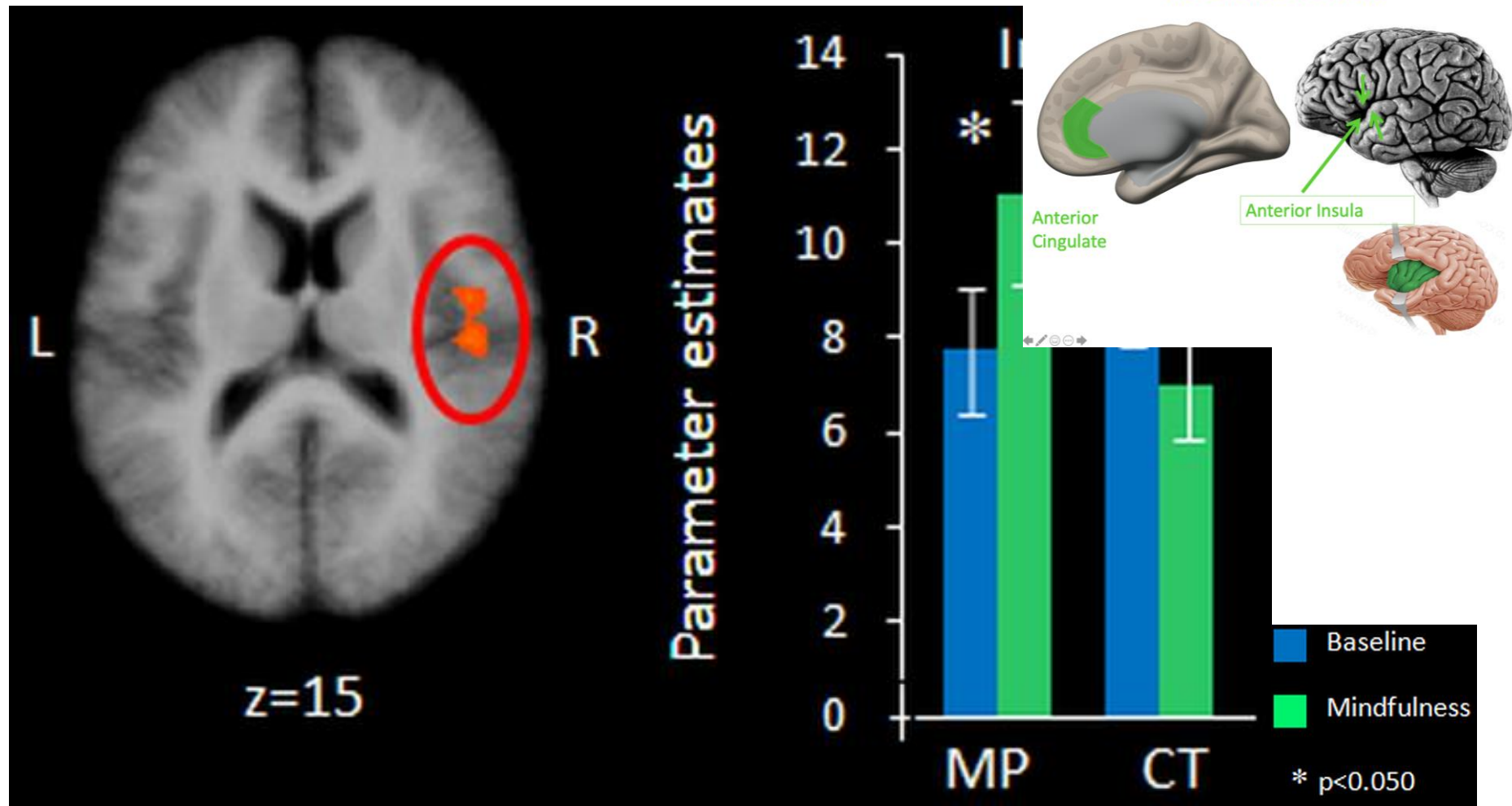


Decreased cognitive control



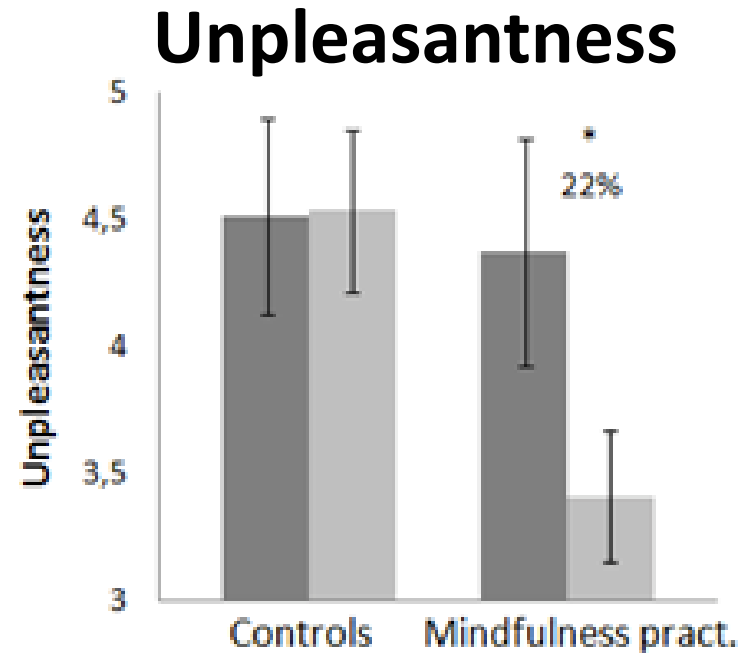
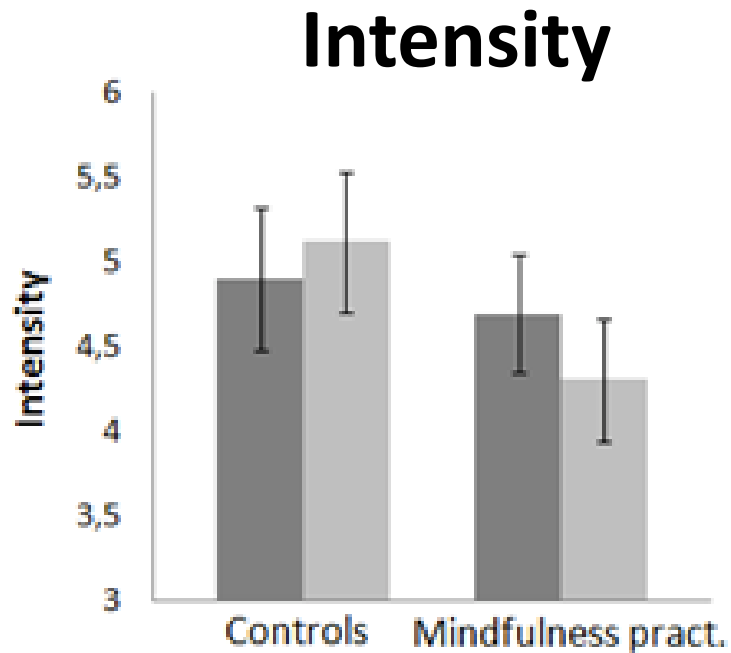
Meditators > Controls, Mindfulness > Baseline

Increased sensory activation

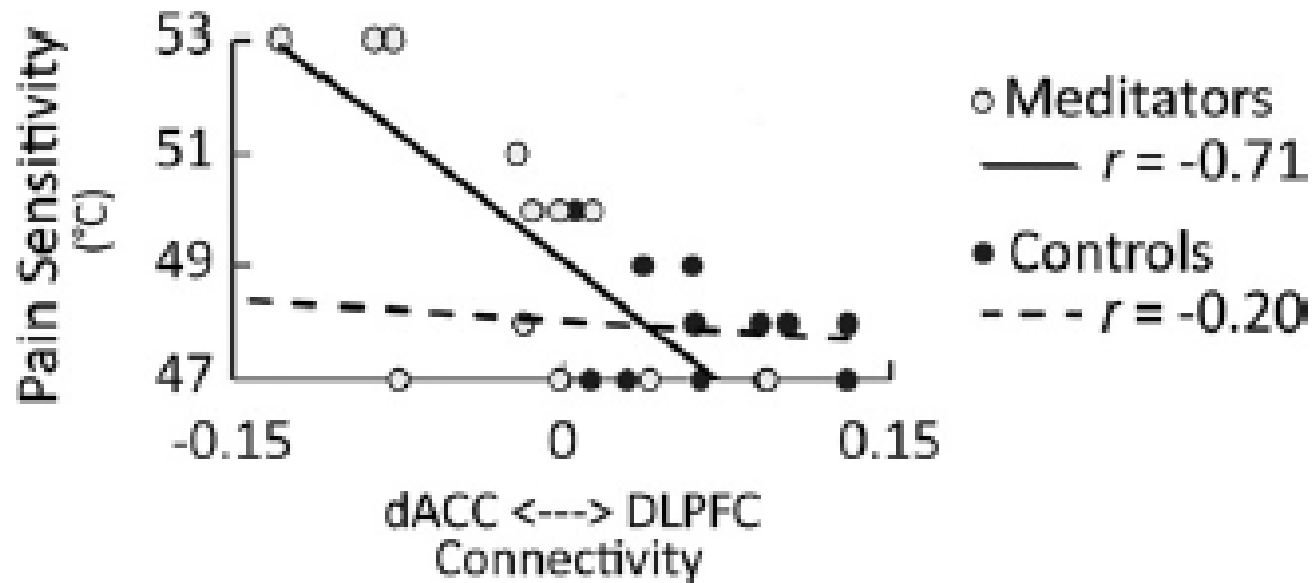


Meditators > Controls, Mindfulness > Baseline

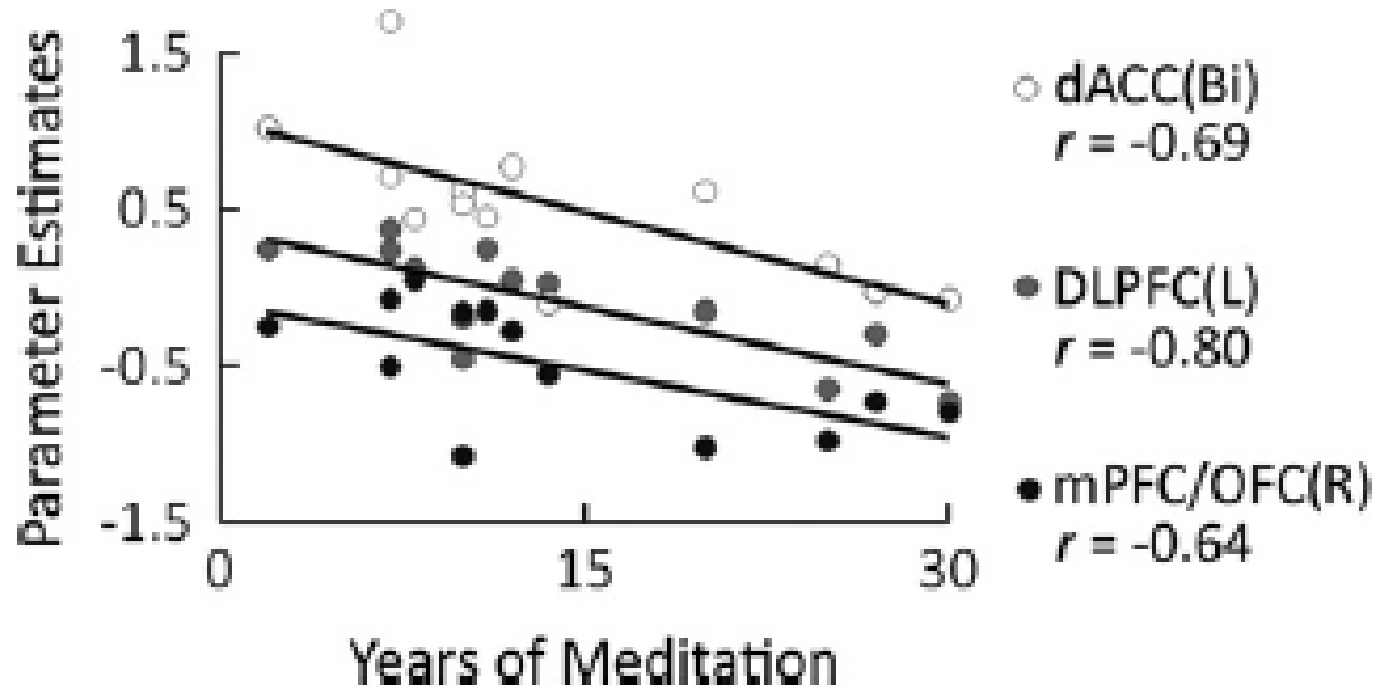
Impact on pain ratings



Decoupling of executive and sensory areas



Correlation with amount of experience



Life is painful, suffering is optional

Sylvia Boorstein



Learning not to fear

Mindfulness and Anxiety

Mindfulness based interventions effective for reducing symptoms of anxiety (general, social, phobias, PTSD)

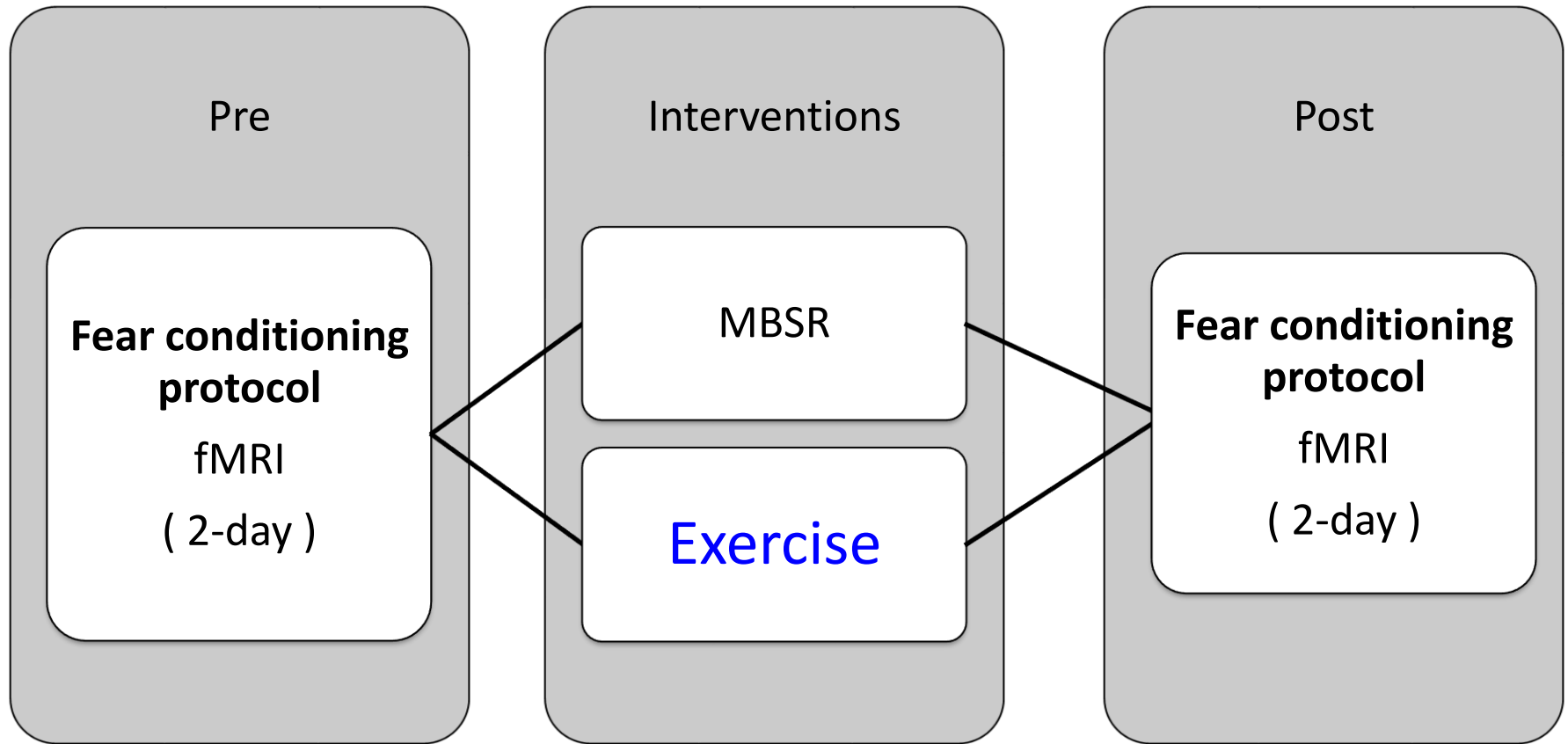
Exposure therapy – individual is exposed to fear-inducing stimuli until the fear response declines.

Mindfulness involves observing present moment experiences with open, inquisitive, non-judging attitude, while refraining from cognitive avoidance

Mindfulness may provide optimal conditions for “exposure” to aversive stimuli.

How does meditation help?

Study design

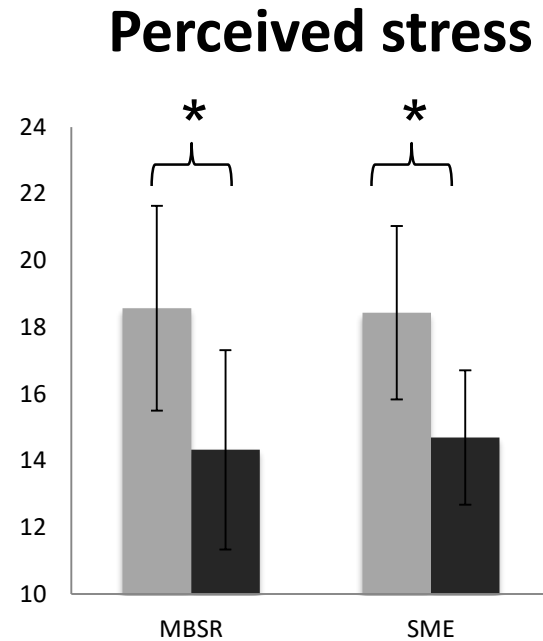


All subjects were told that there was no 'control' group, both interventions beneficial

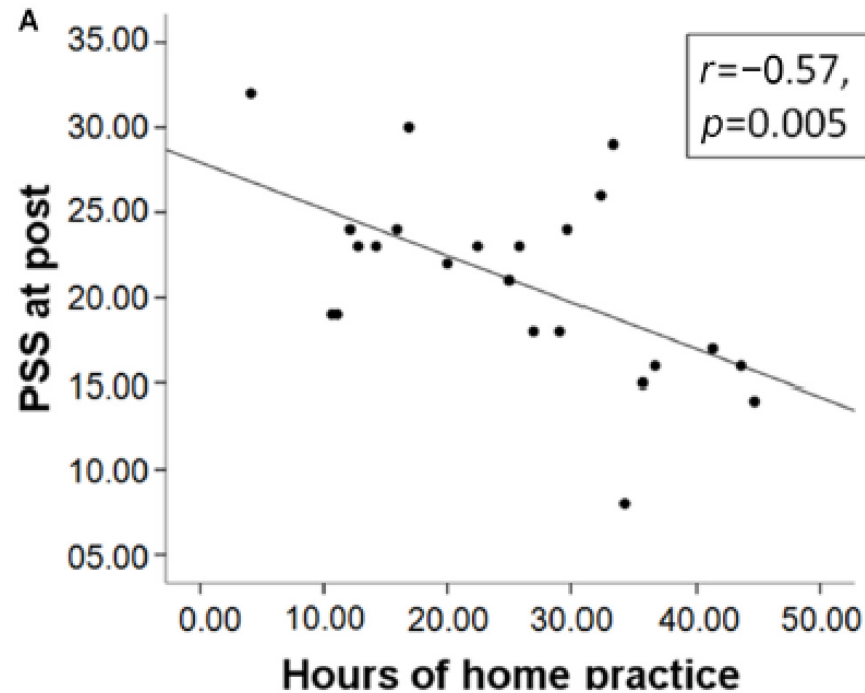
Exercise group also got information about diet, sleep hygiene, positive attitude and humor

Both groups instructed to practice 40 min per day at home

Both groups decrease stress



Home practice relates to change in stress



Before conditioning

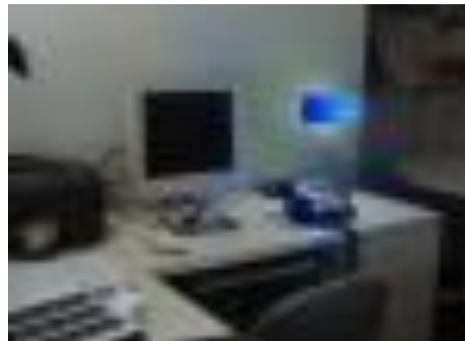
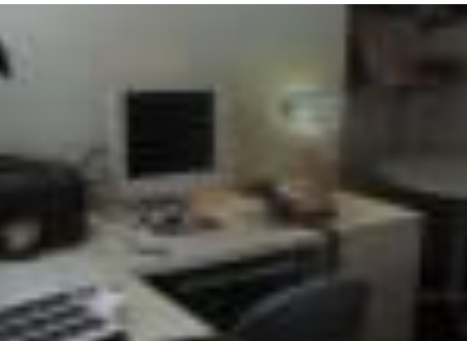
Salivate



No response



Fear conditioning in the MRI scanner

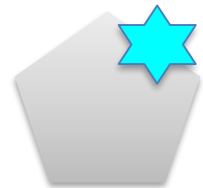
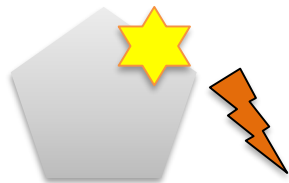


Day 1

Fear Learning

Fear Conditioning and Extinction Paradigm

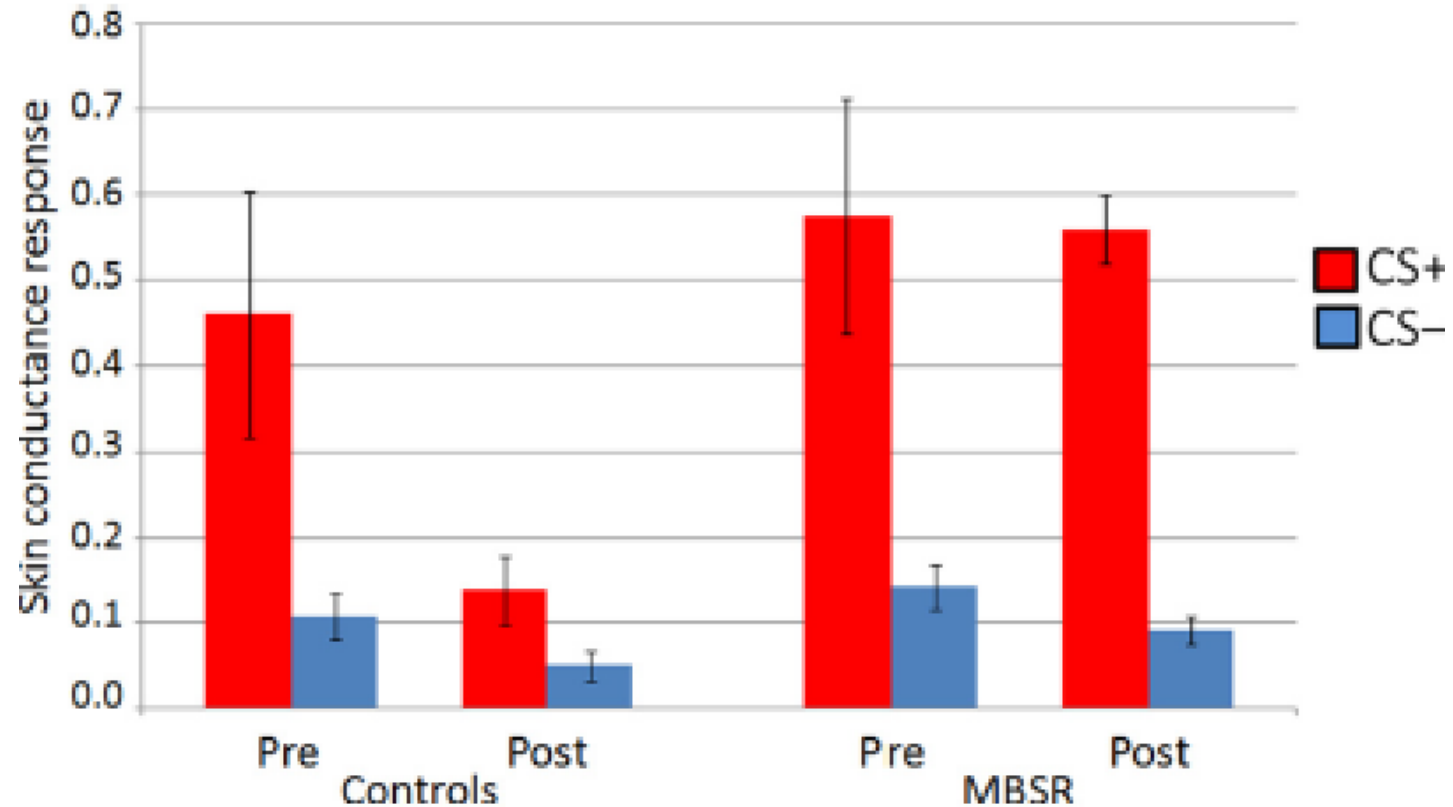
Conditioning



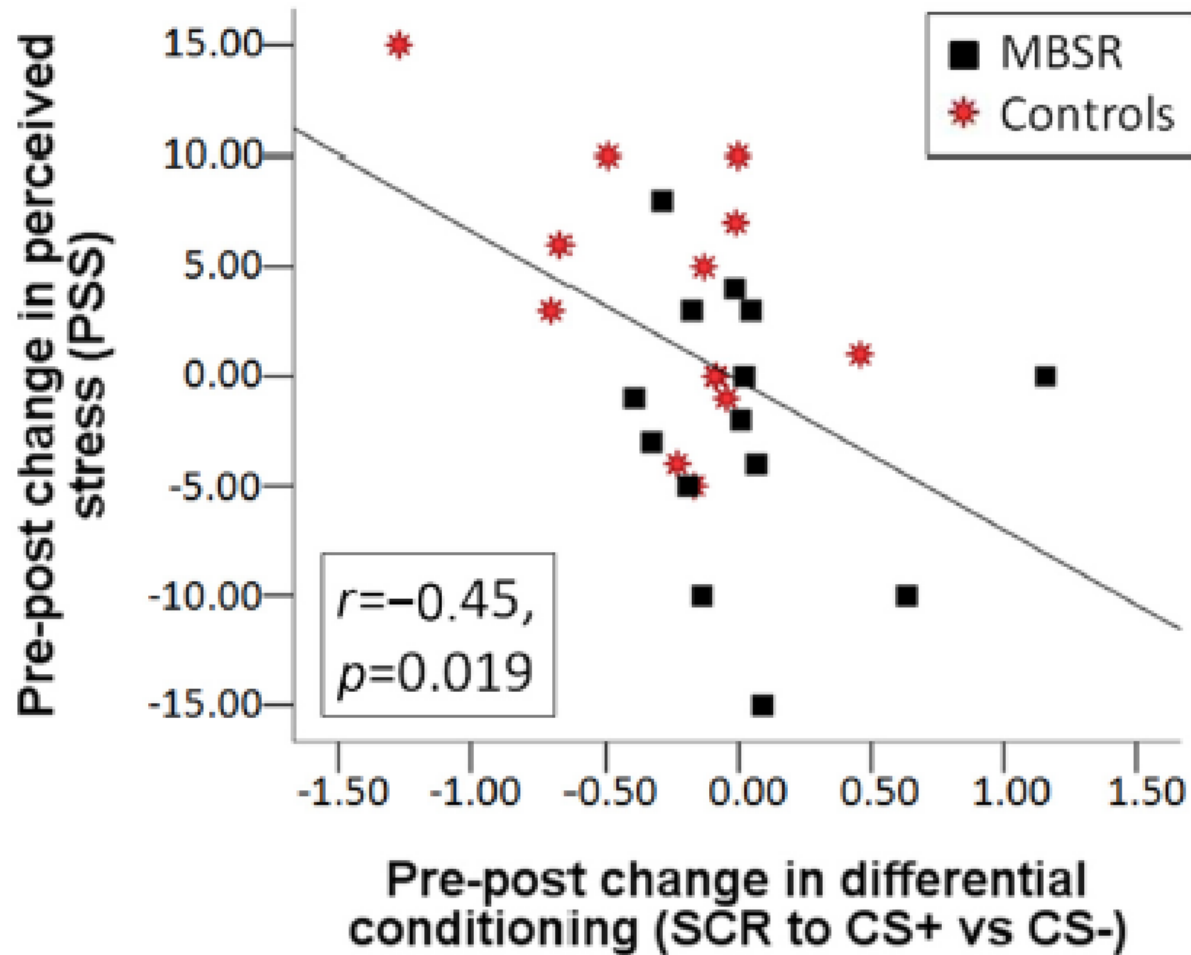
Extinction

Recall

Impact on fear learning



Relationship with stress

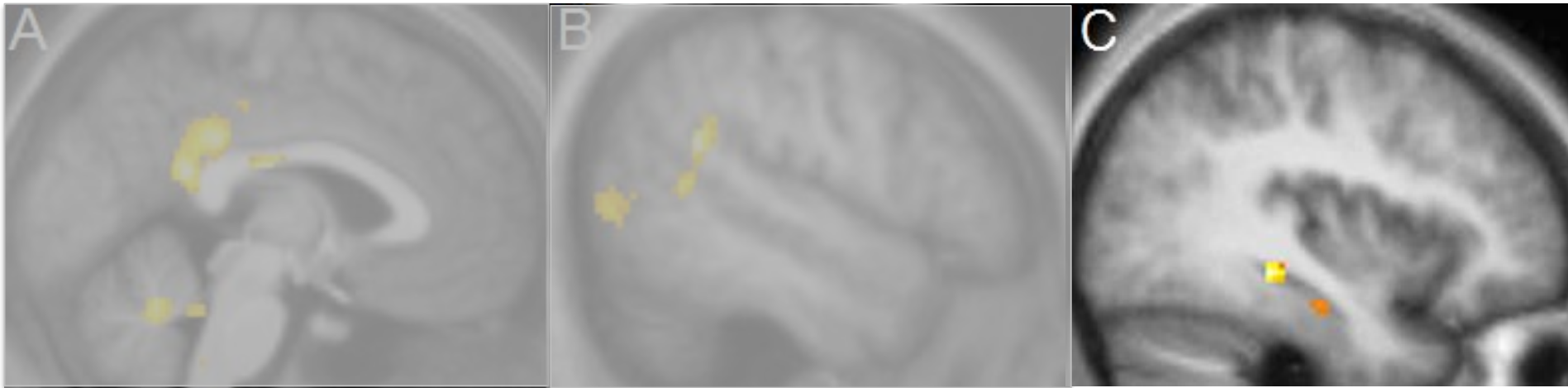


Day 2

Recall of extinction learning

Increase in gray matter concentration

Hippocampus



Role of memory & the hippocampus

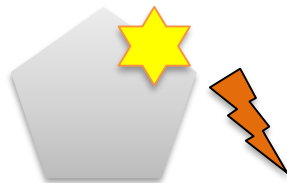
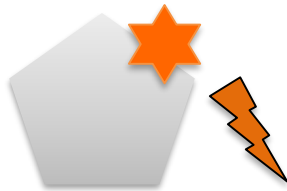
Extinguished memories must be remembered!

Individuals with anxiety disorders have difficulties updating stimulus-response associations and typically have poor retrieval of extinguished memories.

Hippocampus is crucial for episodic memory - retrieves the extinction memory.

Fear Conditioning and Extinction Paradigm

Conditioning



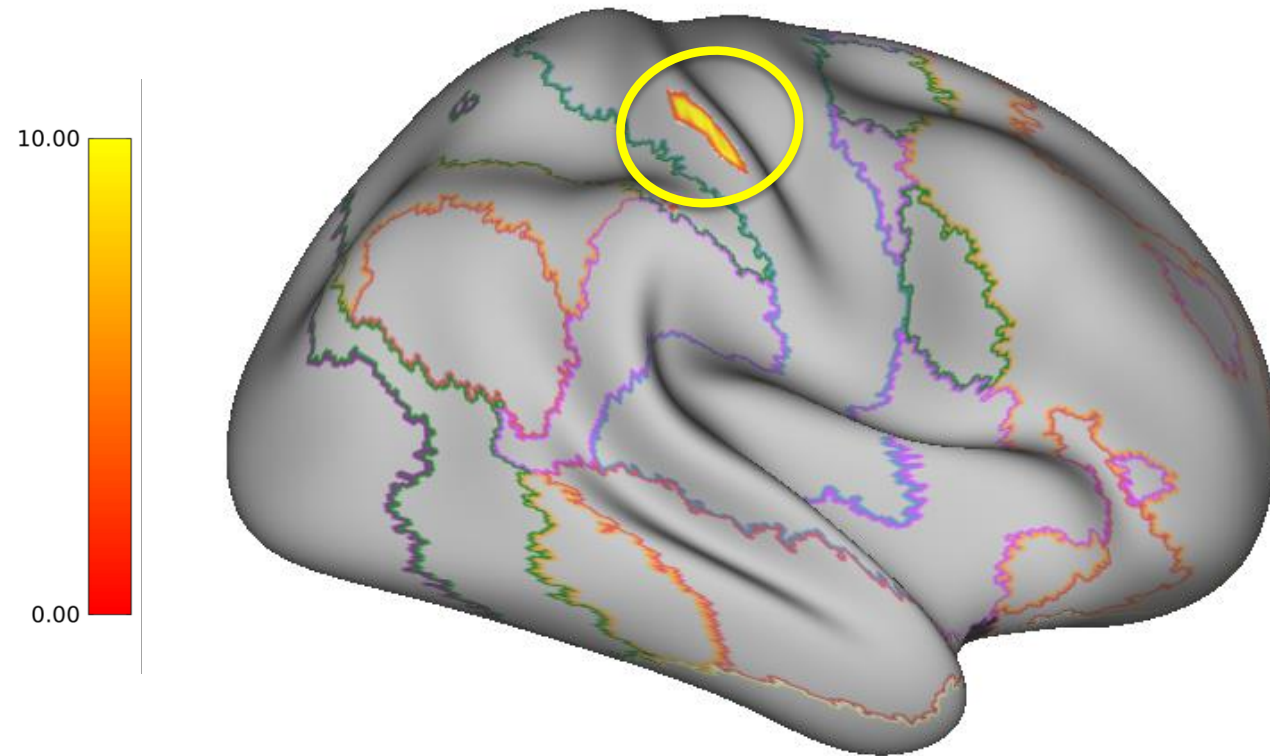
Extinction



Recall



Connectivity between hippocampus and sensory cortex increases following MBSR



CS+E

MNI coordinates

cluster size

p FWEc

**MBSR within group increase
post > pre**

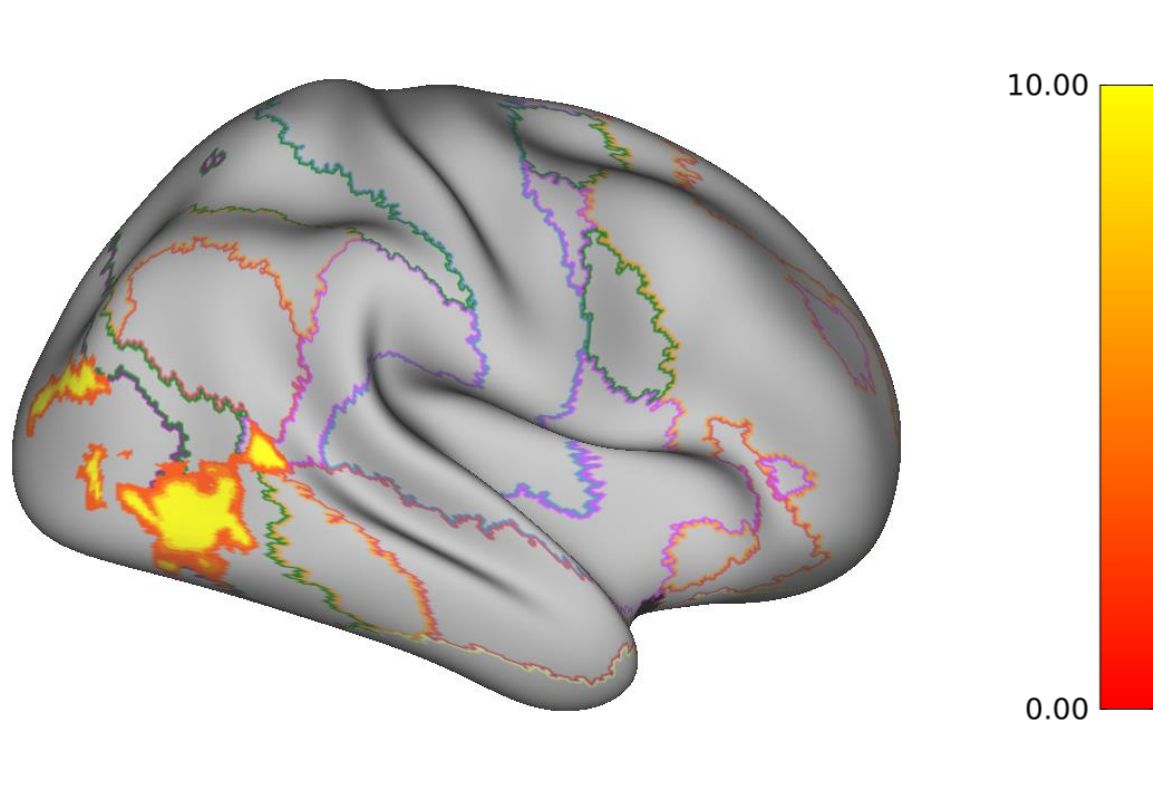
52, -28, 56

139

< 0.05

Sevinc Lazar et al 2019

Increased subiculum gray matter **inversely** correlated with hippocampal-lateral occipital cortex functional connectivity

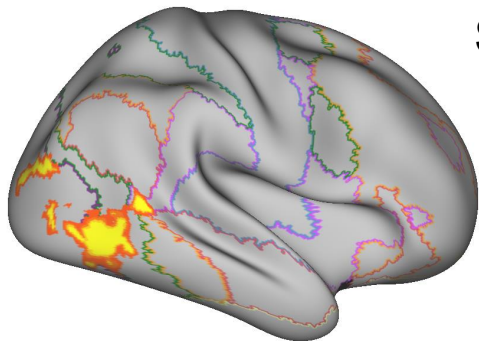
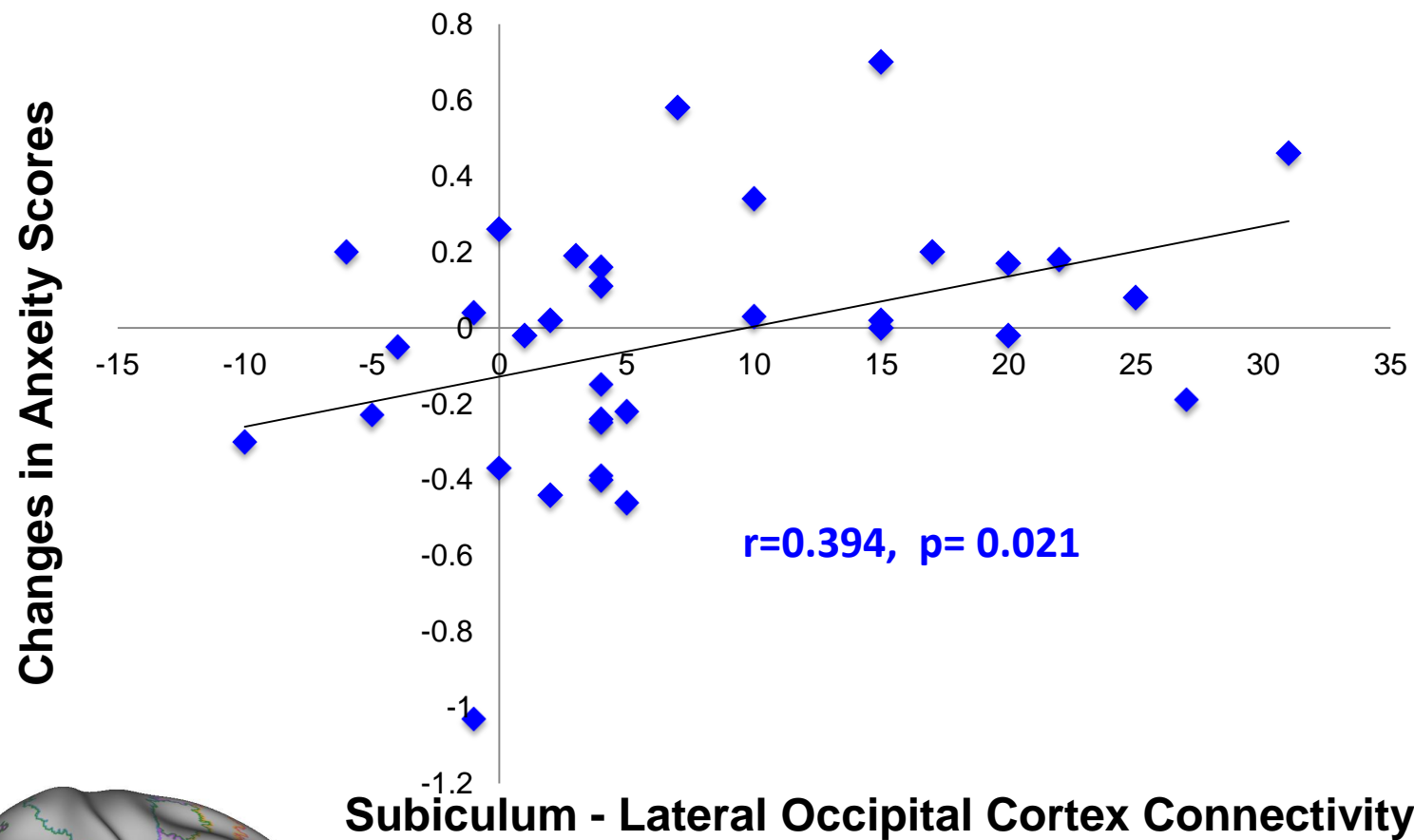


MNI coordinates
48, -60, 00
BA 37

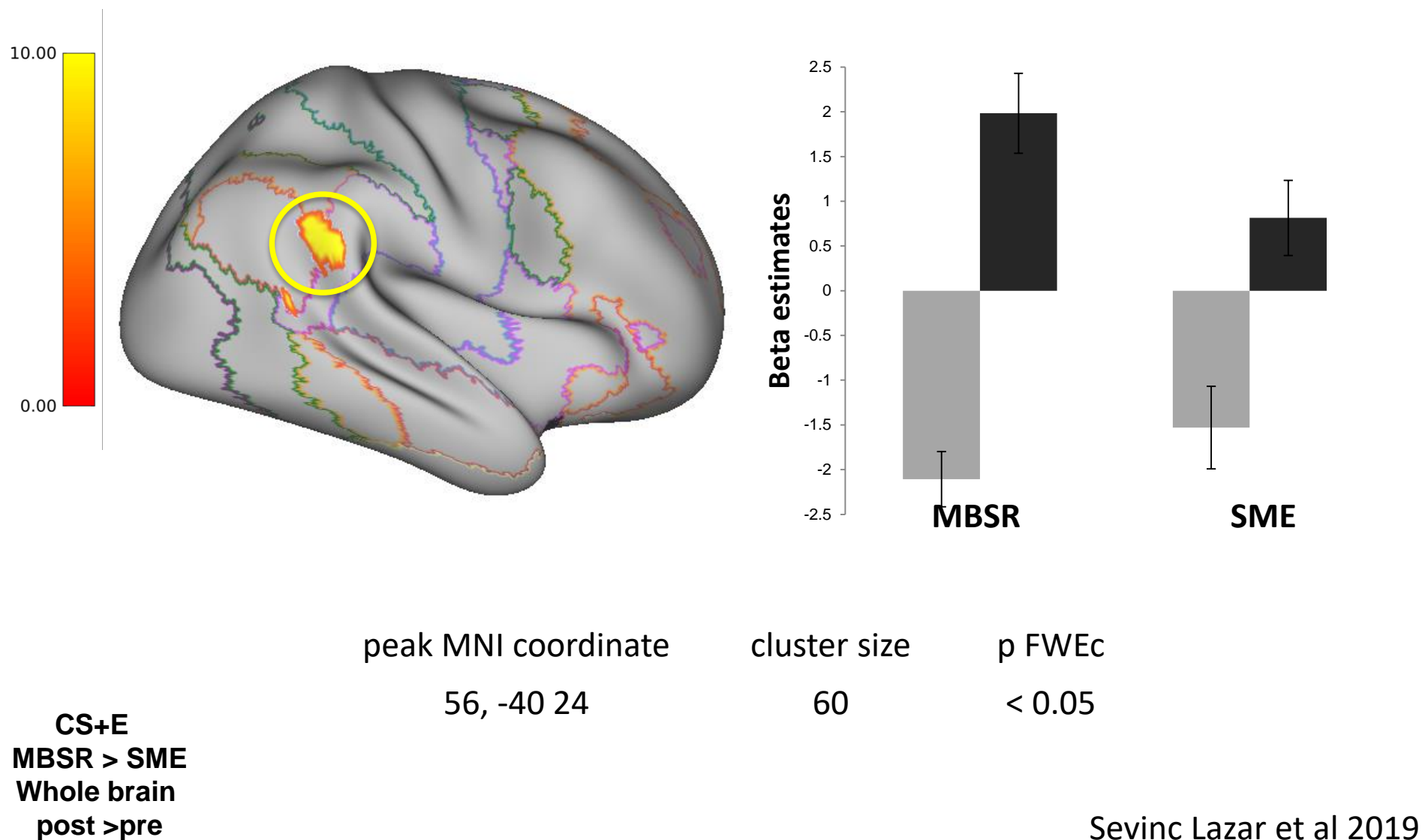
Cluster size
606

p FWEc
 $p < 0.05$

Decreased connectivity correlates with lower anxiety

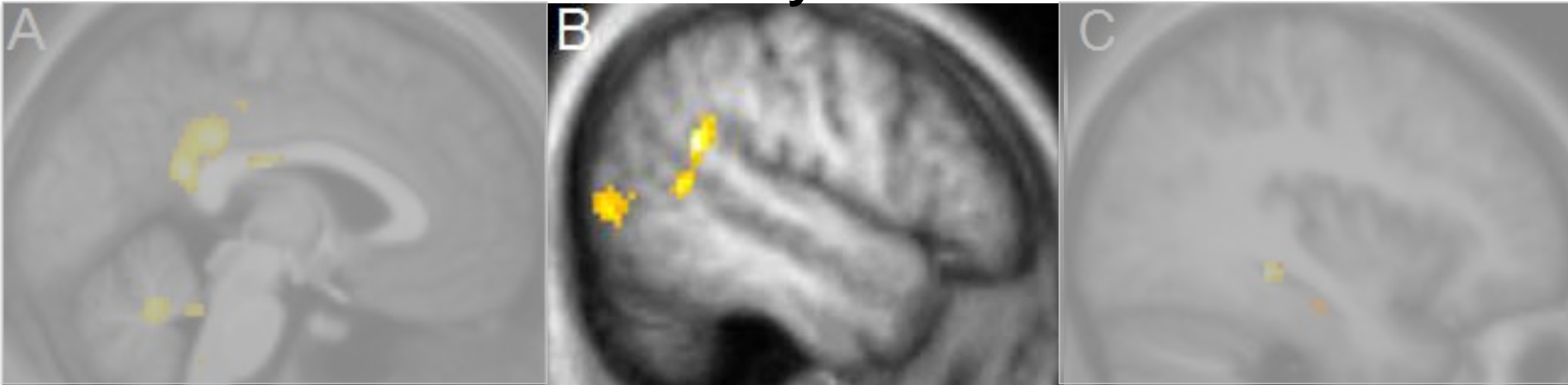


Enhanced activation in the supramarginal gyrus during recall of extinguished stimuli

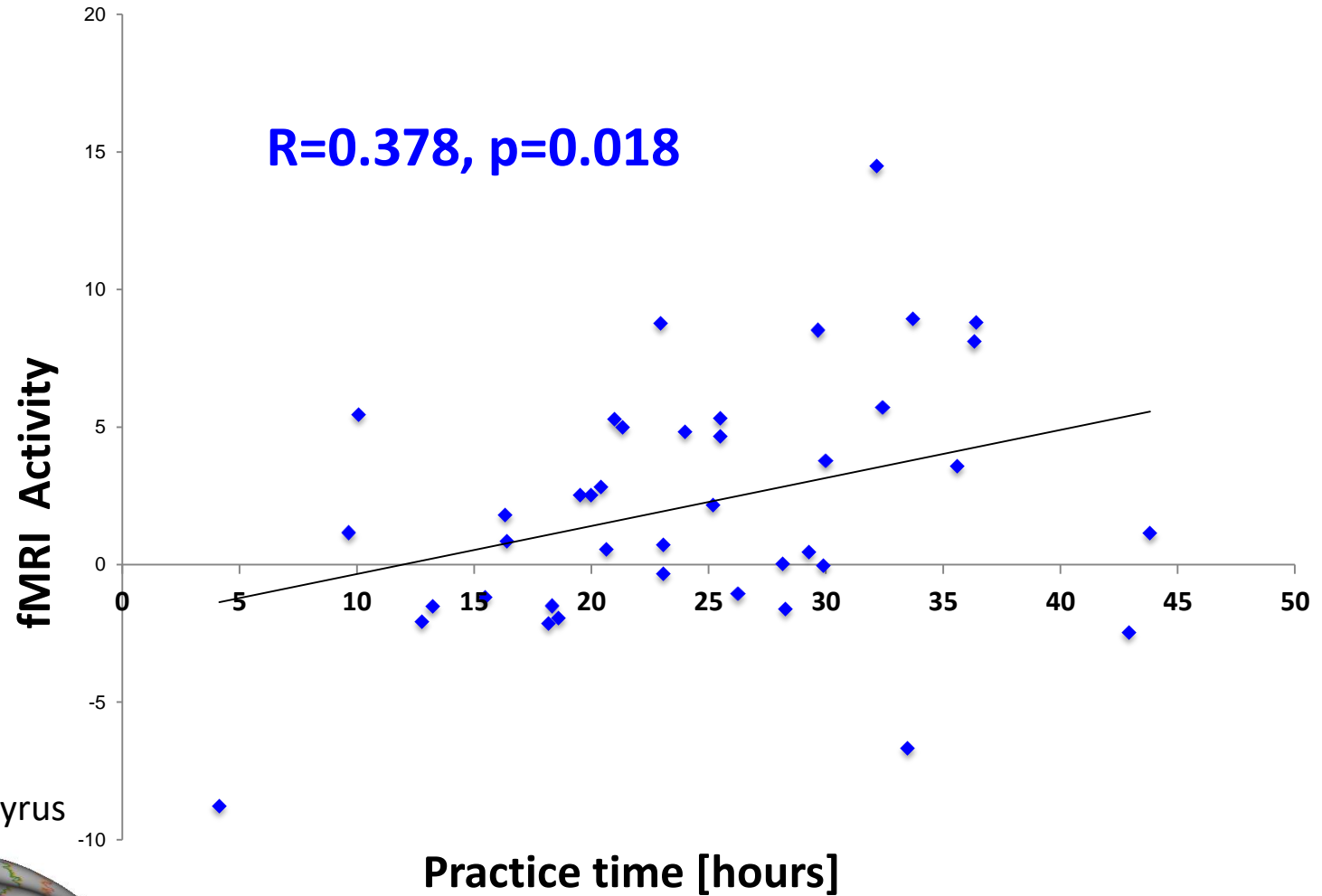


Increase in gray matter concentration

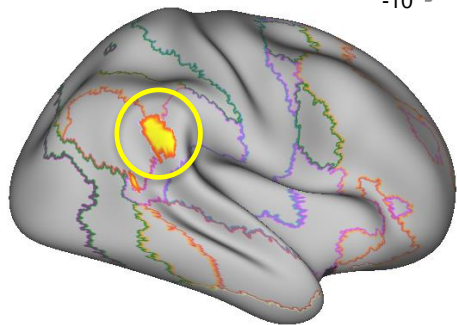
Supramarginal
Gyrus



Correlation with practice time

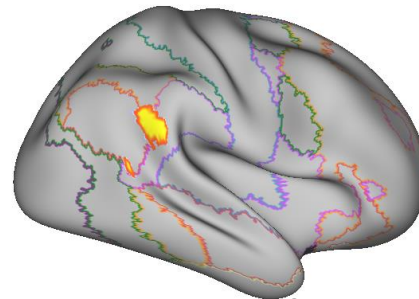


supramarginal gyrus

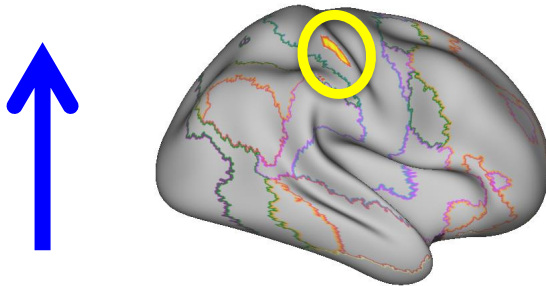


MODEL – Recall of safety memory

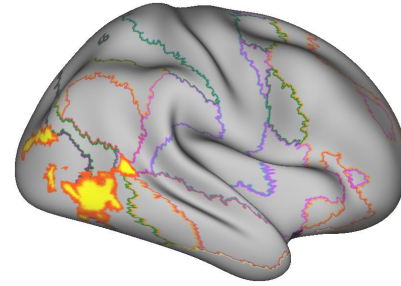
Active, sustained focus on primary somatosensory cortex and decreased focus on visual content



Supramarginal gyrus



Primary somatosensory cortex



Visual stream

Conclusions

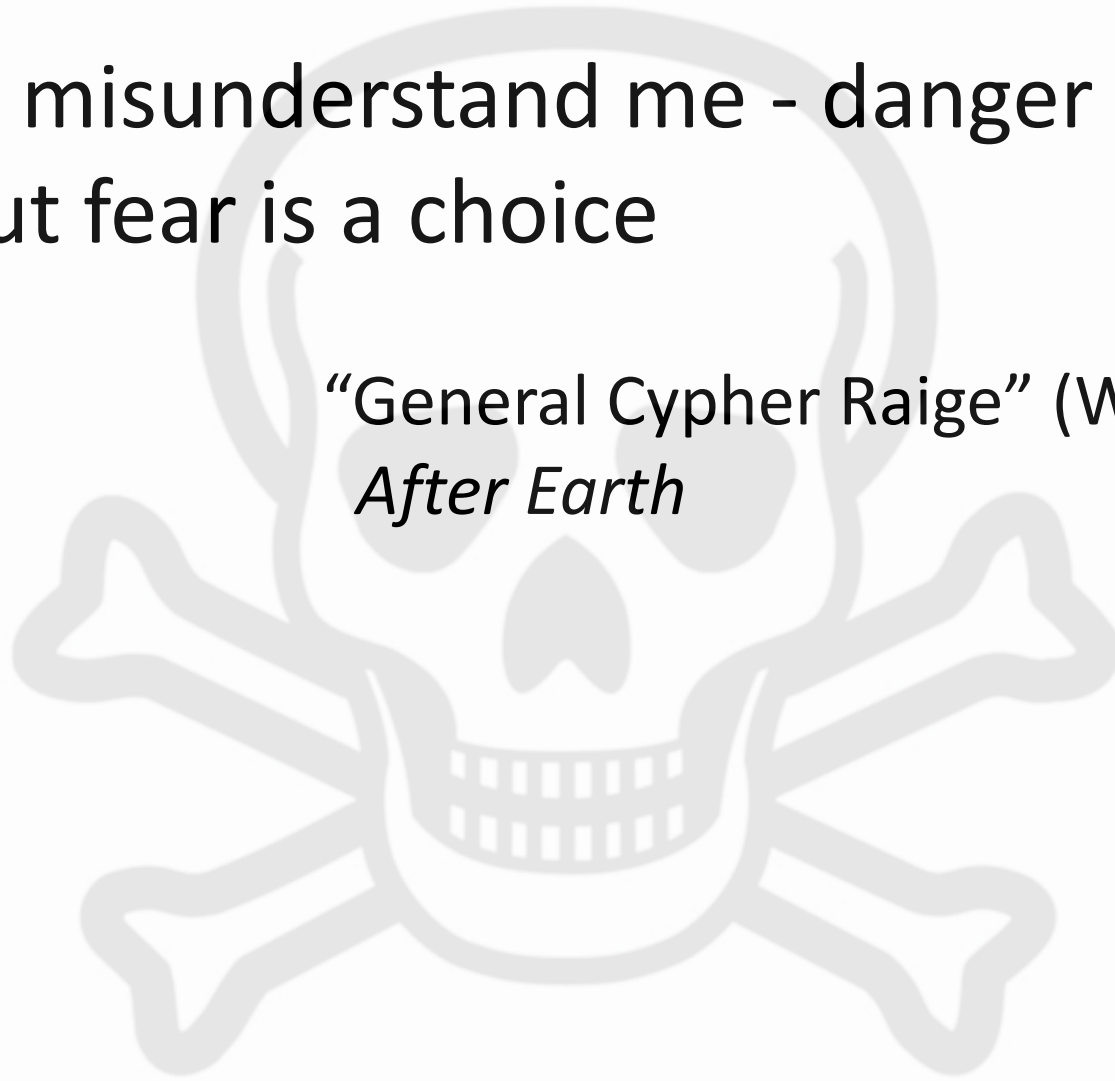
Mindfulness of the body is key both for pain and fear coping

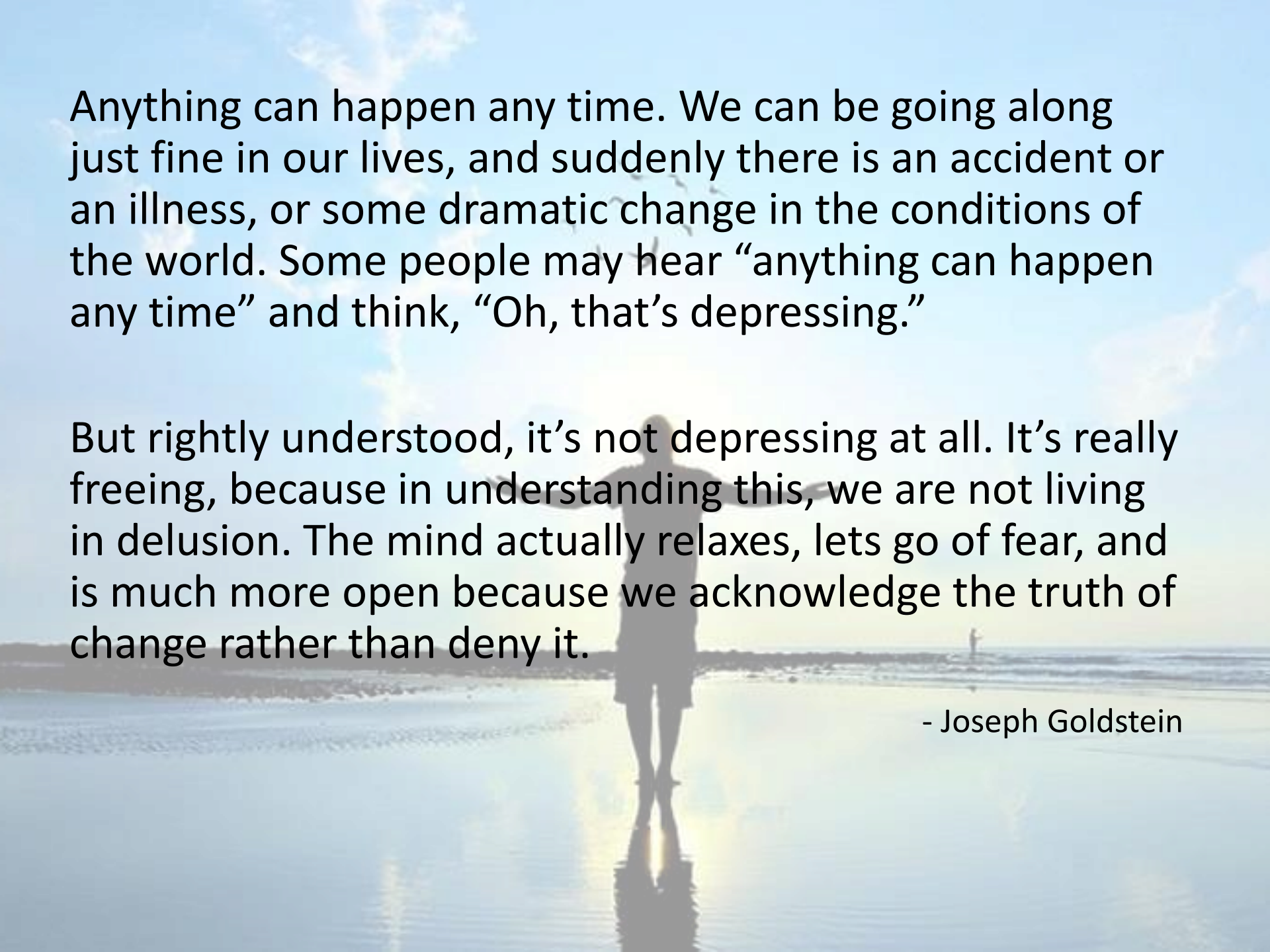
Shift from thinking about/defending against threat to experiencing it openly with equanimity.



Do not misunderstand me - danger is very real, but fear is a choice

“General Cypher Raige” (Will Smith)
After Earth



A person stands on a beach at sunset, their silhouette reflected in the calm water. The sky is a mix of blue and orange, with soft clouds. The person is facing away from the camera, looking out at the ocean. The overall mood is peaceful and contemplative.

Anything can happen any time. We can be going along just fine in our lives, and suddenly there is an accident or an illness, or some dramatic change in the conditions of the world. Some people may hear “anything can happen any time” and think, “Oh, that’s depressing.”

But rightly understood, it’s not depressing at all. It’s really freeing, because in understanding this, we are not living in delusion. The mind actually relaxes, lets go of fear, and is much more open because we acknowledge the truth of change rather than deny it.

- Joseph Goldstein

Thank you!

