Mindfulness and the Brain Resources

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Research is based on the following workshop proposal

We know that prolonged stress can have a negative impact on our physical and mental health. While there are many different ways to cope with stress, some positive and some negative, Mindfulness has emerged as an evidence-based technique that can benefit many. Mindfulness is a straightforward practice that can be done in short periods of time and can have a powerful impact on the brain, from reducing stress to improving attention.

Published Research Studies

Search terms: fMRI Mindfulness

- https://pubmed.ncbi.nlm.nih.gov/23563850/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4109098/
- https://www.frontiersin.org/articles/10.3389/fnhum.2018.00541/full

Search Terms: Mindfulness Meditation fMRI

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4471247/
- https://www.frontiersin.org/articles/10.3389/fnhum.2019.00473/full

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YouTube Videos

Search term: mindfulness and changes in the brain) – results are from the scientific perspective (Note: these videos are all less than 5 or so minutes)

1. How mindfulness changes our brain to prevent mental illness (in particular, starting at the 49 second mark): https://www.youtube.com/watch?v=nfLlIfUzi-I
2. How does mediation change the brain: https://www.youtube.com/watch?v=q0DMYs4b2Yw
3. Mind the Bump – Mindfulness and how the brain works (neuroplasticity): https://www.youtube.com/watch?v=aNCB1MZDgQA
4. What happens in our brain when we practice mindfulness (in particular, starting at the 2:25 mark): https://www.youtube.com/watch?v=8bxw4IYW1eE
5. The science of mindfulness: https://www.youtube.com/watch?v=vE6_YDUrwTs
6. The science of mindfulness: https://www.youtube.com/watch?v=8GVwnxkWmSM
7. The neuroscience of mindfulness: https://www.youtube.com/watch?v=GUqMHy7isSw
8. Neuroscience of mindfulness: https://www.youtube.com/watch?v=OyTENWXKc7A
    - Studies referenced in the item 8 video:
        - 8-week Mindfulness Based Stress Reduction induces brain changes similar to traditional long-term meditation practice-A systematic review
        - Meditation experience is associated with differences in default mode network activity and connectivity

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This is Your Brain on Mindfulness (this short article has some good graphics of the brain): http://www.uphs.upenn.edu/pastoral/events/Baime_SHAMBHALA_2011.pdf. A link to the original research is here: Psychiatry Research - Neuroimaging

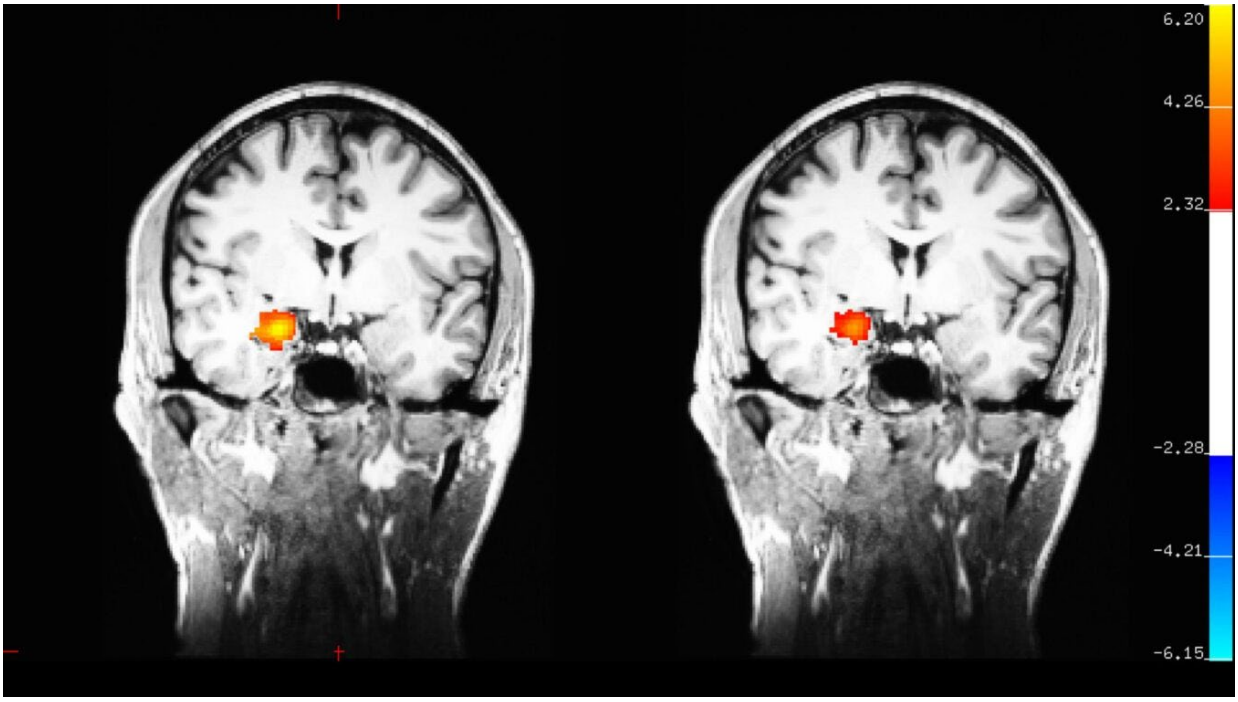
How can mindfulness change the brain and improve your health?
https://www.bupa.co.uk/newsroom/ourviews/mindfulness-my-brain

Scientists have used MRI scans to see how the brain changes when people practise mindfulness. This has highlighted some fascinating results. Evidence suggests that certain areas of the brain may either shrink or grow in response to regular mindfulness practice. Here are a few examples.

- Mindfulness and stress. After practising mindfulness, the grey matter in your brain's amygdala – a region known for its role in stress – can become smaller. Studies have also shown similar brain changes in people who meditate.
- Mindfulness and creativity. The pre-frontal cortex is the area of your brain responsible for things like planning, problem solving, and controlling your emotions. The grey matter in this area can become thicker after practising mindfulness, showing increased activity in these areas of thought.
- Mindfulness and memory. An area of the brain known as the hippocampus helps your memory and learning. This area can also become thicker after practising mindfulness.

Mindfulness Can Literally Change Your Brain (Harvard Business Review): The research has stated that practicing mindfulness increases the density of the gray matter in the brain.

When Science Meets Mindfulness: https://news.harvard.edu/gazette/story/2018/04/harvard-researchers-study-how-mindfulness-may-change-the-brain-in-depressed-patients/



Functional MRI (left) showing activation in the amygdala when participants were watching images with emotional content before learning meditation. After eight weeks of training in mindful attention meditation (right) note the amygdala is less activated after the meditation training. (Courtesy of Gaelle Desbordes)

The Neuroscience of Mindfulness (Please scroll to The Neuroscience of Mindfulness: A Look Inside): https://positivepsychology.com/mindfulness-brain-research-neuroscience/

- By applying **neuroplasticity**, you can essentially "re-wire" and "hardwire" the brain helping you achieve greater levels of peace, health, happiness, and joy.

**Please continue to scroll to: How Mindfulness Affects and Changes the Brain:

The exact ways in which these different brain regions changed did vary from study to study since different studies use different neuroimaging measurements. However, consistent changes were seen across the board including:

- Changes in brain density
- Changes in thickness of brain tissue
- An increase in the number of neurons, fibers, and glia in a given region
- Changes in cortical surface area
- Changes in white matter fiber density

Additional Resources on Mindfulness:

https://home.csulb.edu/~cwallis/482/fmri/fmri.html:

What is Functional Magnetic Resonance Imaging or FMRI?

Functional Magnetic Resonance Imaging or FMRI is a non-invasive technique for imaging the activation of brain areas by different types of physical sensation (sight, sound, touch, taste, smell) or activity such as problem solving and/or movement (limited by the machine). Thus, FMRI scans are an increasingly common tool for "brain mapping" in cognitive science.

What's the Difference Between MRI and FMRI?

FMRI scans use the same basic principles of atomic physics as MRI scans, but MRI scans image anatomical structure whereas FMRI image metabolic function. Thus, the images generated by MRI scans are like three dimensional pictures of anatomic structure. The images generated by FMRI scans are images of metabolic activity within these anatomic structures.

Mindfulness and Student Success: https://files.eric.ed.gov/fulltext/EJ1072925.pdf

The Oxford dictionary (2014) defines mindfulness as "a mental state achieved by focusing one's awareness on the present moment while calmly acknowledging and accepting one's feelings, thoughts, and bodily sensations". Mindfulness often refers to specific practices used to focus a person's attention – meditation, yoga, breathing, single-pointed concentration on an object – and is characterized by intentionality and nonjudgmental observation of experience (Broderick & Jennings, 2012).

Reptilian Brain: https://neurotray.com/why-is-the-brainstem-sometimes-called-the-reptilian-brain/

The phrase "reptilian brain" derives from the fact that a reptile's brain is dominated by the brainstem and cerebellum, which control instinctual thinking and behavior for survival.

Functions of the reptilian brain according to psychology: once we know what the reptilian brain and its parts are, it is important to know the functions of the reptilian brain.

The reptilian brain fulfills different functions in our daily life, then we are going to mention in more detail what they are exactly.

- **Survival.** As we have seen previously, the main function of the reptilian brain is to keep us protected from any threat that may arise and also ensure our survival.

Fight, Flight, Freeze: What this Response Means: https://www.healthline.com/health/mental-health/fight-flight-freeze

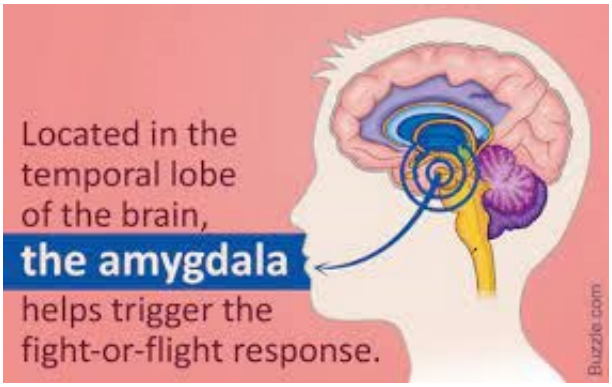
The fight-flight-freeze response is your body's natural reaction to danger. It's a type of stress response that helps you react to perceived threats, like an oncoming car or growling dog.

The response instantly causes hormonal and physiological changes. These changes allow you to act quickly so you can protect yourself. It's a survival instinct that our ancient ancestors developed many years ago.

Specifically, fight-or-flight is an active defense response where you fight or flee. Your heart rate gets faster, which increases oxygen flow to your major muscles. Your pain perception drops, and your hearing sharpens. These changes help you act appropriately and rapidly.

Why Do We Have a Fight-Flight-Freeze Response, and What Triggers It?
https://www.goodrx.com/health-topic/mental-health/what-is-fight-flight-response-with-examples

- You may experience the fight-flight-freeze response when faced with a highly stressful or traumatic situation.
- Some fight-flight-freeze responses can help you escape safely from a dangerous situation; other responses are less helpful in modern life.
- Certain techniques may help you release lingering distress triggered by a fight-flight-freeze response.



https://www.starsdorset.org/blog/how-the-brain-works-in-response-to-a-traumatic-event-fight-flight-freeze-flop-friend

https://cfsregina.ca/stress-our-fight-flight-or-freeze-response-and-covid-19/

Benefits of Mindfulness: https://www.verywellmind.com/the-benefits-of-mindfulness-5205137

- Decreased depression
- Increased emotional regulation
- Reduced anxiety and stress
- Better memory
- Cognitive improvements
- Stronger relationships
- Better physical health

What are the benefits of mindfulness? https://www.apa.org/monitor/2012/07-08/ce-corner

Empirically supported benefits of mindfulness:

- Reduced rumination (the habit of obsessing over negative events that happened in the past)
- Stress reduction
- Boosts to working memory
- Focus
- Less emotional reactivity
- More cognitive ability
- Relationship satisfaction

What is mindfulness? 5 Easy Mindful Exercises: https://jour.com/blog/what-is/5-mindfulness-exercises

1. Journaling
2. Deep breathing
3. Body scan
4. Stretch
5. Narration

Mental Health Benefits:

- Improve confidence
- Help you feel calmer
- Reduce anxiety
- Improve focus
- Cause more gratitude & fulfillment

Physical Health Benefits:

- Lower blood pressure
- Reduce chronic pain
- Improve sleep

Benefits of Mindfulness in the Workplace: https://www.niagarainstitute.com/blog/benefits-mindfulness-workplace

1. Increases focus
2. Improves communication
3. Reduces conflict
4. Increases helpfulness
5. Improves emotional intelligence
6. Reduces burnout and increases productivity
7. Contributes to one's physical health