The Meeting of Meditation and Science
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Studies on Benefits of Meditation

1. Meditation brings about changes in the brain in 8 weeks

Science Daily, “Mindfulness Meditation Training Changes Brain Structure in Eight Weeks”
http://www.sciencedaily.com/releases/2011/01/110121144007.htm

Participants in an eight-week Mindfulness-Based Stress Reduction course with average of 27 minutes a day of meditation showed:

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- Increased gray-matter density in hippocampus (important for memory) and in structures associated with self-awareness, compassion, and introspection.

- Participant-reported reductions in stress also were correlated with decreased gray-matter density in the amygdala, which is known to play an important role in anxiety and stress.

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2. Meditators have less activity in brain’s default-mode network (associated with mind-wandering and introspection and most often focusing on negative subjects).

CNN Health, “How Meditating May Help Your Brain”,
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A study of experienced and novice meditators doing three kinds of meditation (concentration, loving-kindness, and choiceless awareness) showed less activity from experienced meditators in default-mode and less mind wandering.

- The main nodes of the default-mode network (medial prefrontal and posterior cingulate cortices) were relatively deactivated in experienced meditators.

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- Functional connectivity analysis revealed stronger coupling in experienced meditators between the posterior cingulate, dorsal anterior cingulate, and dorsolateral prefrontal cortices (regions previously implicated in self-monitoring and cognitive control), both at baseline and during meditation.

- “Our findings demonstrate differences in the default-mode network that are consistent with decreased mind-wandering… [and] provide a unique understanding of possible neural mechanisms of meditation.”

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3. Meditation helps with decision-making.

Buddhist meditators use different areas of the brain than other people when confronted with unfair choices, enabling them to make decisions rationally rather than emotionally.


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- Brain processes of 26 Buddhist meditators and 40 control subjects were compared using fMRI while subjects played the “ultimatum game” in which the first player proposes how to divide a sum of money and the second can accept or reject the proposal.

- Buddhist meditators were twice as likely to accept whatever was offered than the control group.
• Anterior insula activity—linked to emotion of disgust—was higher in the control group in response to unfair offers and predicted likelihood of rejection of offer.

• In meditators, the anterior insula showed no significant activation for unfair offers. Meditators appeared able to uncouple the negative emotional response to an unfair offer by attending to internal bodily states (interoception).

4. Adults who practiced mindfulness meditation or moderately intense exercise for eight weeks suffered less from seasonal ailments during the following winter than those who did not exercise or meditate.


• 150 study participants were divided into three groups—one group trained in mindfulness meditation for eight weeks; another did eight weeks of brisk walking; the control group did neither.

• Monitoring of study subjects over following nine months showed meditators missed 76 percent fewer days from work than did the control subjects; those who exercised missed 48 percent fewer days of work than controls.

• The severity of the colds and flus also differed between the two groups. Those who had exercised or meditated suffered for an average of five days; colds of participants in the control group lasted an average of eight days.

• Lab tests confirmed that self-reported length of colds correlated with the level of antibodies in the body, which is a biomarker for the presence of a virus.
5. Eighty minutes of meditation training brought about a significant reduction in the experience of pain and pain-related brain activation.


The study used arterial spin labeling magnetic resonance imaging to study the brains of participants when a pain-inducing heat device was placed on the participants’ right legs.

• Meditation significantly reduced brain activity in the primary somatosensory cortex, an area that is crucially involved in creating the feeling of where and how intense a painful stimulus is.

• Scans taken before meditation training showed activity in this area was very high. However, when participants were meditating during the scans, activity in this important pain-processing region could not be detected.

The study found a 40 percent reduction in pain intensity and a 57 percent reduction in pain unpleasantness. Meditation produced a greater reduction in pain than even morphine or other pain-relieving drugs, which typically reduce pain ratings by about 25 percent.

The research showed that meditation increased brain activity in areas including the anterior cingulate cortex, anterior insula and the orbito-frontal cortex—areas that shape how the brain builds an experience of pain from nerve signals that are coming in from the body.

6. Meditation may ward off the effects of aging


• Telomeres play a key role in the aging of cells, acting like a clock that limits their lifespan. Every time a cell divides, its telomeres get shorter, unless an enzyme called telomerase builds them back up. When telomeres get too short, a cell can no longer replicate, and ultimately dies.
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• People with shorter telomeres are at greater risk of heart disease, diabetes, obesity, depression and degenerative diseases such as osteoarthritis and osteoporosis—and they die younger.

• A study of experienced meditators on a three-month retreat found that at the end of the retreat they had significantly higher telomerase activity than a control group, suggesting that their telomeres were better protected. Researchers believe meditation may slow or even reverse cellular ageing.

7. Meditation helped lower blood pressure in 40 of 60 patients in a Massachusetts study.

“To Lower Blood Pressure, Open Up And Say ‘Om.’”
http://www.npr.org/2008/08/21/93796200/to-lower-blood-pressure-open-up-and-say-om

Researchers found that meditation increases the formation of nitric oxide, which causes blood vessels to open up. This in turn lowers blood pressure.

8. Meditation slows the progression of HIV, according to a UCLA study.

“Mindfulness Meditation Slows Progression of HIV, Study Suggests,”
Science Daily, July 27, 2008,
http://www.sciencedaily.com/releases/2008/07/080724215644.htm

• Stress accelerates the decline of CD4 T cells that protect the immune system. Meditation prevented the decline of these cells and slowed the progression of HIV.

• HIV-positive adult participants in an eight-week mindfulness-based stress-reduction (MBSR) meditation showed no loss of CD4 T cells, indicating that mindfulness meditation training can buffer declines.

• In contrast, a control group showed significant declines in CD4 T cells, which represents a characteristic hallmark of HIV progression.
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• Researchers found a “dose-response” relationship between MBSR class attendance and CD4 T cells: the more mindfulness meditation classes people attended, the higher the CD4 T cells at the study's conclusion.

9. Meditation helped chronically depressed patients, reducing their relapse rate by half.


10. Meditation training showed measurable effect on brain functions even when not actively meditating.

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• Study participants took an eight-week mindfulness course that included training in mindful attention and compassion meditation. Control group took an eight-week health education course.

• Brain scans were performed as participants viewed positive, negative, or neutral images.

• Meditation group showed decrease in activation in right amygdala in response to all images, supporting hypothesis that meditation can improve emotional stability and response to stress.

• Among participants who practiced compassion meditation most often, right amygdala activity increased in response to negative images of suffering.

• Researchers concluded: “We think these two forms of meditation cultivate different aspects of mind… Since compassion meditation is designed to enhance compassionate feelings, it makes sense that it could increase amygdala response to seeing people suffer. Increased amygdala activation was also correlated with decreased depression scores in the compassion meditation group, which suggests that having more compassion towards others may also be beneficial for oneself.”

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11. Smiling helps in responding to stress.

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• Study participants were given stressful tasks while maintaining particular facial expressions—a genuine smile (‘Duchenne’ smile including activation of muscles around eyes); regular smile; and neutral-expression.

• Findings revealed that all smiling participants had lower heart rates during stress recovery than the neutral group; and Duchenne/genuine smilers had strongest response to stress.