

Grow more brain¹

Proven benefits of meditation. Over the last two decades, scientific researchers from various universities have noted how meditation brings about structural changes in brain tissue. An important discovery they made is that, those experienced in Buddhist meditation had more brain tissue in the prefrontal cortex. These regions play a role in processing attention, sensory information and internal bodily sensations. Newer studies further confirm these vital discoveries.²

One of the great benefits of meditation, neuroscientists are discovering, is that the adult brain can still be deeply transformed through experience. Whenever we learn something new, like playing a musical instrument or learning a new language, the brain changes through a process called neuroplasticity.³ That part of the brain controlling our finger movements or remembering words grows progressively larger with the mastery of the instrument or language.

A similar process happens with meditation. Although nothing may change in the world outside, the meditator works with an inner enrichment that improves his mind and the brain's structure. Scientific researches repeatedly show how meditation can rewire brain circuits to produce benefits not just on the brain and the mind, but on the entire body.

What is meditation? Meditation has roots in the contemplative practices of nearly every major religion, the most ancient and best known of which is Indian Buddhism. Essentially, Buddhist meditation refers to the cultivation of basic human qualities, such as a more stable and clear mind, emotional balance, a sense of caring mindfulness, even love and compassion. All this contribute to a more serene, flexible, even creative, being.

In practice, meditation is quite simple and can be done anywhere. No special tool or dress is needed. We begin by sitting comfortably, with a desire for self-betterment, for others' well-being and the alleviation of their difficulties. In due time, we must stabilize the mind, which is too often disorderly and tugged in all directions by a stream of inner chatter. Mastering the mind requires us to free it from automatic reactivity, mental conditioning and inner confusion.

Three well known meditation methods developed through Buddhism are now practised in non-religious programmes in hospitals and schools worldwide. The first one, focused-attention meditation, aims to tame and anchor our mind in the present moment while we train to be vigilant against distractions.

The second, mindfulness or open-monitoring meditation, trains us to be less reactive towards thoughts, feelings and emotions, as they arise, to prevent them from spiraling out of control and creating mental distress. In this practice, we remain attentive, moment by moment, to any experience without focusing on anything specific.

The third is the cultivation of lovingkindness to foster an unconditional perspective of self and others. This is a healing meditation that teaches us to begin by accepting ourselves just as we are, by accepting others just as they are, and working on a vision of a better self and other, empowered by a sense of all-embracing spacious joy.

¹ This reflection is inspired by M Ricard, A Lutz & R J Davidson, "Mind of the meditator," *Scientific American*, November 2014: <http://www.investigatinghealthyminds.org/ScientificPublications/2014/RicardMindSciAm.pdf>.

² Sara W Lazar, Catherine E Kerr & Bruce Fischl, "Meditation experience is associated with increased cortical thickness," *Neuroreport* 16,17. 28 Nov 2006:1893-1897, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1361002/>.

³ A simple explanation by Senti: <http://www.youtube.com/watch?v=ELpfYZa87g>. E Chudler, "Brain plasticity: What is it? Learning and memory," 2013: <https://faculty.washington.edu/chudler/plast.html>.

Focused attention. During focused attention practice, such as breath meditation, we would initially notice that our mind wanders away from an object, and we simply recognize this and restore our attention to the gradual rhythm of in-breathing and out-breathing. We would progressively notice four aspects or phases of this meditation: (1) a period of the mind wandering, (2) a moment of becoming aware of the distraction, (3) a re-asserting of attention, and (4) continuing our focused attention.

Neuroscientists now know that each of the four aspects or phases involves particular brain networks. The first part, when a distraction occurs, increases activity in the wide-ranging default-mode network (DMN) (that seems to relate to daydreaming and non-focused thought). This network includes areas of the medial prefrontal cortex, the posterior cingulate cortex, the precuneus, the inferior parietal lobe and the lateral temporal cortex.⁴

The DMN is activated when the mind wanders and generally builds and reinforces our own models of the world conditioned by long-term memories about the self or others.⁵ Experienced meditators generally have less DMN activity, implying that the mind wanders less during meditation. With more training, we can develop a new type of “default mode,” a greater ability to control thought and emotion, and to stay focused on the present.

The second phase, becoming aware of a distraction, occurs in other brain areas such as the anterior insula and the anterior cingulate cortex, regions of what is called the salience⁶ network. This network regulates subjective feelings, which might, for instance, distract us from a task. Scientists think that the salience network plays a key role in detecting changes (such as that caused by a noise we hear or a strong emotion), shifting away from the default-mode network.⁷

The third phase engages additional areas – such as the dorsolateral prefrontal cortex and the lateral inferior parietal lobe – that retrieve our attention by detaching it from any distracting stimulus.

In the fourth and last phase, the dorsolateral prefrontal cortex continues to retain a high level of activity, as our attention remains directed toward an object, such as the breath.⁸

Mindfulness. In mindfulness or open-monitoring meditation, or non-directive mindfulness, we note every sight, sound, bodily feeling, or inner talk. We stay aware of what is happening without becoming overly preoccupied with any one of them, returning to this detached focus each time the mind strays. As awareness of our surroundings grows, daily disruptive events -- an angry co-worker, a worried call from home -- become less disruptive, and we develop a sense of mental well-being.⁹

Studies have documented the benefits of non-directive mindfulness on symptoms of anxiety and depression, and its ability to improve sleep patterns. By deliberately observing and monitoring our

⁴ For brain-parts, see <http://serendip.brynmawr.edu/bb/kinser/Structure1.html>. For more details, see http://en.wikipedia.org/wiki/List_of_regions_in_the_human_brain.

⁵ Susan L Smalley, “Mind-wandering and mindfulness” 31 Jan 2012: <http://www.psychologytoday.com/blog/look-around-and-look-within/201201/mind-wandering-and-mindfulness>.

⁶ On salience, see [http://en.wikipedia.org/wiki/Salience_\(neuroscience\)](http://en.wikipedia.org/wiki/Salience_(neuroscience)).

⁷ More on “salience network”: Jennifer Ouellette, “Inside a brain circuit, the will to press on,” *Quanta Magazine*, 5 Dec 2013. <http://www.quantamagazine.org/20131205-inside-a-brain-circuit-the-will-to-press-on/>.

⁸ On the breath meditation, see **Ānāpāna,sati Sutta** (M 118), SD 7.13: [link](#).

⁹ Jian Xu et al, “Nondirective meditation activates default mode network and areas associated with memory retrieval and emotional processing,” *Frontiers in Human Neuroscience* 8,86, 26 Feb 2014: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3935386/>.

thoughts and emotions when we feel sad or worried, we can use meditation to manage them as they arise and so lessen rumination and alleviate depression.¹⁰

Lovingkindness. This meditation cultivates attitudes and feelings of unconditional acceptance and kindness toward others, whether they are close relatives, friends, or strangers, even enemies. Here, we become aware of someone else's needs and then experiencing a sincere, compassionate desire to help that person or to alleviate his suffering by shielding him from self-destructive behaviour.

To be lovingkind, we sometimes need, as it were, to feel what another person is feeling. This is only a start. We must also be driven by an unselfish desire to help someone who is suffering. This form of meditation on love and compassion has proven to be more than just a religious exercise. It has shown potential to benefit health-care-workers, teachers and others who run the risk of emotional burnout linked to the distress experienced from a deeply empathetic reaction to others' needs and troubles.

We begin by showing an unconditional feeling of benevolence and love first for oneself, silently repeating: "May I be well. May I be happy. I accept myself fully just as I am." Then, we direct this lovingkindness to others, with such thoughts (or rather feelings) as, "May all beings be happy. May the suffering be suffering-free."

This meditation produces more activity in areas such as the temporoparietal junction, the medial prefrontal cortex and the superior temporal sulcus, all typically activated when we put ourselves in the place of another. This practice also helps to reduce negative emotions, and increase positive ones, which are accompanied by corresponding changes in the areas of several brain networks associated with compassion, positive emotions and maternal love, including the orbitofrontal cortex, the ventral striatum and the anterior cingulate cortex. Researchers have also shown a week of training in lovingkindness increased prosocial behavior in a virtual game specially developed to measure the capacity to help others.¹¹

A door to consciousness. In a broader perspective, meditation has finally provided mind scientists with the tool for studying one of the last frontiers of science, human consciousness. With the scientists themselves meditating, they become their own experiments with first-person experiences of their research. As more scientists compare and corroborate their findings, our scientific understanding of the human mind will help improve our mental health and general wellbeing.

For practitioners of Buddhist meditation, all this may be exciting discoveries and affirmation of what the Buddha teaches and a contemplative tradition of over 2,500 years. The scientific approach to Buddhist meditation clearly promises a more open understanding of humanity itself, one that cuts across all races, cultures and religions, and that sees the human race as one rooted in similar mental processes and their related issues.

All this in no way makes Buddhist meditation outmoded or obsolete (unless we have been trying to change or modernize Buddhism to suit our whims or to keep up with the world). Early Buddhist meditation is a tool for mental cultivation that must be solidly based on the cultivation of moral virtue, the wholesomeness of our body and speech. With a healthy mind in a healthy body, it is easier for us to cultivate insight wisdom that frees us from our dark and negative emotions to enjoy the free space of a joyful mind. The scientists are today helping to show that the Buddha's meditation methods work, and in a very significant way for humankind.

¹⁰ D M Davies & J A Hayes, "What are the benefits of mindfulness?" *American Psychological Assn*, Jul-Aug 2012: <http://www.apa.org/monitor/2012/07-08/ce-corner.aspx>. Mindfulness meditation course: www.marc.ucla.edu.

¹¹ Emma Seppala, "18 science-based reasons to try loving-kindness meditation," *Huffington Post*, 12 Nov 2014: http://www.huffingtonpost.com/emma-seppala-phd/18-sciencebased-reasons-t_b_5823952.html.

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