

How Meditation Affects the Gray Matter of the Brain

by David R. Hamilton, Ph. D.

I like to meditate. It makes me feel at ease and I am convinced that the sense of calm it produces helps me to handle the daily challenges of my life. There are, of course, times when I don't keep up my daily practice of sitting quietly for 10 or 15 minutes, but these are the times in my life when I experience more stress.

Stress affects everyone. I don't know a single person who doesn't get stressed. But unfortunately, it plays a major role in illness. According to the Centers for Disease Control and Prevention, in fact, up to 90 percent of doctor visits in the U.S. may be stress related. Meditation is an antidote to stress, just as an aspirin can counter a headache. A regular practice can be a major boost to health.

It calms the nervous system. It's good for the immune system. It's also good for the heart; it helps produce nitric oxide (not nitrous oxide -- that's laughing gas!) in the arteries, dilating them and reducing blood pressure. It also smooths heart rhythms.

But thanks to an explosion of brain research we now know that it also physically impacts our gray matter.

One study to show this was led by scientists at the Center for Functionally Integrative Neuroscience at Aarhus University in Denmark. Comparing MRI scans of the brains of meditators with the brains of non-meditators, they showed that meditation causes actual physical changes in the gray matter of the lower brain stem. Meditation makes the gray matter grow.

In another study, scientists Giuseppe Pagoni and Milos Celic, from the Department of Psychiatry and Behavioral Sciences at Emory University in Atlanta, compared the volume of gray matter in the brains of people performing Zen meditations with another group who were not meditators.

The volume of our gray matter normally reduces as we get older and this is what the scientists found in the group of non-meditators. But for the meditators, their gray matter hadn't reduced at all with age. According to the scientists, meditation had a 'neuroprotective' effect on the meditators: It protected the brain from some of the effects of aging.

This mirrors some 2008 Harvard research that analyzed the genes of meditators against non-meditators. It was the first study of its kind to measure the genetic impact of meditation and found that 2,209 genes were differently activated in long-term meditation practitioners compared with non-meditators. And even looking at novice meditators, they found that 1,561 genes were affected after only eight weeks of meditation practice. They concluded that the genetic effects of meditation may have long-term physiological consequences, one of which was a slowing down of the rate of aging.

We have all heard the stories of people under extreme stress whose hair turns white in a matter of weeks. We know that stress can speed up aging. So why should it be a surprise to us that a technique to combat stress should be able to slow aging?

There are many different forms of meditation. A study at Massachusetts General Hospital examined the impact of the Buddhist 'Insight' meditation on the brain. Insight meditation is a technique of moving our attention over the body or focusing on our breathing. The study found that it caused an increase in thickness of the prefrontal cortex in the brain, the part just above the eyes and associated with attention.

Several areas of the brain are active when we meditate, but most pronounced is the prefrontal cortex because when we meditate we are focusing our attention on something -- whether that be the

body, our breathing, a word, a candle or even a spiritual ideal. When this area is active, just like a muscle being exercised, it grows.

Neuroscientists use this analogy to describe the way the brain changes. When we exercise a muscle it becomes larger and denser with muscle mass. In a similar way, when we exercise any part of the brain, which we do when we meditate, it becomes larger and denser with neural mass -- gray matter. The phenomenon is known as neuroplasticity and describes how the brain actually changes throughout life.

When I attended university I learned that the brain is hardwired once we reach young adulthood. The analogy used is that when we are young, the brain is a bit like dough, which can be kneaded into various forms, but when we reach young adulthood we put the dough in the oven and it comes out with a bread crust on it. The brain is then 'hardwired,' we were taught.

But this analogy has since been abandoned. We now know that we never put the dough in the oven. Our gray matter is ever-changing as we experience life; as we learn, walk, run, dance, and when we concentrate, as we do when we meditate.

Our gray matter is changing until the last seconds of our life. It grows even with our last breath.

References:

For the study where meditation caused changes in the gray matter of the lower brain stem, see:
P. Vestergaard-Poulsen, M. van Beek, J. Skewes, C. R. Bjarkam, M. Stubberup, J. Bertelsen, and A. Roepstorff, 'Long-Term Meditation is Associated with Increased Gray Matter Density in the Brain Stem', *Neuroreport*, 2009, 20(2), 170-174.

For the study where Zen meditation impacted gray matter, see:
G. Pagoni and M. Cekic, 'Age Effects on Gray Matter Volume and Attentional Performance in Zen Meditation', *Neurobiology of Aging*, 2007, 28(10), 1623-1627.

For the study where meditation produced effects at the genetic level, see:
J. A. Dusek, H. H. Otu, A. L. Wohnhueter, M. Bhasin, L. F. Zerbini, M. G., Joseph, H. Benson, and T. A. Liberman, 'Genomic Changes Induced by the Relaxation Response', *PLoS ONE*, 2008, 3(7), e2576, 1-8.

For the effect of the Buddhist Insight meditation on the prefrontal cortex, see:
S. W. Lazar, C. A. Kerr, R. H. Wasserman, J. R. Craig, D. N. Greve, M. T. Treadway, M. McGarvey, B. T. Quinn, J. A. Dusek, H. Benson, S. L. Rauch, C. I. Moore, and B. Fischi, 'Meditation Experience is Associated with Increased Cortical Thickness', *Neuroreport*, 2005, 16(17), 1893-1897.

© 2010, Huffington Post

source: http://www.huffingtonpost.com/david-r-hamilton-phd/how-meditation-affects-th_b_751233.html