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### The Hard Science of Meditation

Meditation is defined as emptying the mind of thoughts, or concentrating the mind on just one thing. While being a practitioner requires practice and effort, there is medical proof of physical and mental benefits that it yields. Harvard Medical School researchers using functional magnetic resonance imaging (fMRI) have identified active brain regions during meditation. Significant signal increases were observed in the prefrontal cortex (attention), hippocampus (memory), and cingulate cortex (affects autonomic nervous system regulating blood pressure and heart rate). Here are several types of meditation that are widely practiced:

#### Transcendental Meditation

Transcendental meditation is a technique of Hindu origin used to promote relaxation that utilizes the mantra method. (mantra - a verbal phrase or declaration that is repeated continuously to focus one concentration.) Transcendental meditation technique is the most thoroughly researched program in the field of human development. The National Institutes of Health (NIH) has provided grant funding in excess of \$21 million for conducting research on the effects of TM on disease prevention – the majority focusing on heart disease and associated risk factors. The New York Times reports that a 5-day training class today cost \$2,500.

#### Concentrative Meditation

Concentrative Meditation is a universal, traditional method where the practitioner focuses their attention on following their breathing cycle. This method is used to calm the mind and thus provide for an increase of clarity and awareness. Since there is a direct connection to one's breathing pattern and their mental state, this process provides a way to both monitor one's breathing cycle and also to influence the observer to slowly guide their breathing from shallow, rapid breaths (produced when one feels anxiety, anger or fear) to slower, deeper and more rhythmical breaths (inducing the mind to be more peaceful and open to greater awareness).

#### Mindful Meditation

Mindful meditation is a method where the practitioner becomes aware of the subtle changes in the environment around them (hearing sounds, smelling fragrances, feeling a gentle breeze), while remaining only the observer. By staying in the detached observer role, one's mind is guided to not react to whatever is heard, felt or sensed and is freed to experience a calm, inner peace.

#### Scientific Studies: Lowering Heart Rate

Generally speaking, most studies of calming meditation processes have shown performing meditation produces a lower of heart rate. Though different studies yield a variety of results, most show a slowing of heart rates ranging from 2 to 7 beats per minute. Studies of very experienced practitioners have found a reduction as high as 15 beats per minute. (Bagga, O.P., and A. Gandhi. [1076] "A Comparative Study of the Effect of Transcendental Meditation and Shavasana Practice on the Cardiovascular System." *Indian Heart Journal* 35, no. 1 (1983): 39-45.)

So when you see claims that meditation lowers heart rate more effectively than biofeedback, progressive relaxation or calming techniques, remember that the effectiveness of the practitioner is a major factor in the outcome, e.g. Throll, D.A. [2459] "Transcendental Meditation and Progressive Relaxation: Their Physiological Effects." *Journal of Clinical Psychology* 38, no. 3 (1982): 522-530). In this study, Throll found that a Transcendental Meditation group displayed a more significant decrease in heart rate than a group using Jacobson's progressive relaxation.

### Lowering Stress Hormones

Research studies have shown that meditation also lowers levels of stress hormones. While meditating, cortisol levels drop and may remain low for hours afterward. This dramatic lowering of stress hormones is confirmed by electroencephalograph (EEG) studies of the brain showing that meditation boosts the intensity of alpha waves – associated with quiet, receptive states. Emotional calmness brings with it greater patience, having the capacity for more accurate judgment and enhanced problem-solving skills.

### Lowering of Blood Pressure

While chronic stress does cause long-term elevations in blood pressure, meditation has proven to yield positive results in reducing BP levels. Here are some studies with such results:

At the Medical College of Georgia, researchers gathered 150 people with elevated blood pressure (an average of 142/95 mm Hg), and assigned them to practice transcendental meditation or progressive muscle relaxation (tensing and relaxing muscles) twice daily for twenty minutes, or to participate in a health education program. At the conclusion of a 12-month period, researchers reported in the *American Journal of Hypertension* that the meditation group showed greater decreases in blood pressure (average declines of 3/6 mm Hg) than the two other groups, which showed an average decrease of 0.5/3 mm Hg. And while the two other groups had to increase their medications, the meditation group actually reduced their blood pressure medications.

The *American Journal of Cardiology*, in 2005, published a report studying the effect on stress reduction on death rates for 202 individuals that were 55 and older. All the participants had a history of mild hypertension. Once again, one group performed transcendental meditation; while others performed relaxation techniques such as progressive muscle relaxation, mindfulness training, and mental relaxation and a third group were the control group. After eight years of tracking the participants, the meditation group showed a 30% decline in cardiovascular deaths, plus a 23% reduction in death rates from all causes compared to the control group. The meditation group also scored better than the relaxation techniques group with a 32% lower rate of cardiovascular deaths, and a 27% reduction in death from all causes.

### Aiding Recovery From Congestive Heart Failure

Another study, sponsored by the National Institutes of Health - National Center for Complementary and Alternative Medicine (NIH-NCCAM) and published in *Ethnicity & Disease* (Winter 2007), showed TM meditation technique benefited 23 African American men and women, average age 64, who were recently hospitalized with New York Heart Association class II or III congestive heart failure. Headed by doctors from the University of Pennsylvania Department of Medicine, the TM group significantly improved on the six-minute walk test after both three and six months of TM practice compared to the control group. In addition, the TM group had more improvements in quality of life measurements, depression, and had fewer rehospitalizations.

### Boosting the Immune System

Medical researchers published their findings of their study in the July/August 2003 edition of *Psychosomatic Medicine* where two groups were formed. The first was the control group and the second were individuals who performed eight weeks of meditation training. At the end of the 8-week period all were inoculated with a flu vaccine. The meditation group produced more antibodies in response to the flu vaccine.

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### Improving Mental Attention

Harvard Medical School researchers examined individuals who meditated for about 20 minutes every day, but didn't necessarily believe in the tenets of Buddhism. MRI (magnetic resonance imaging) was used to examine the brain areas connected with memory and attention, revealing that the thickness of those regions had increased. These brain areas usually shrink as people get older, but the older participants in the study evidently avoided some of that shrinkage. These results suggest that regular meditation practice might help people maintain their ability to remember and focus on details.

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**Sources: Impact of Regular Meditation Practice on EEG Activity at Rest and During Evoked Negative Emotions** *International Journal of Neuroscience* 2005 Jun;115(6):893-909  
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**Meditation's Impact on Chronic Illness** *Holistic Nursing Practice* 2003 Nov-Dec;17(6):309-19  
**Meditation Experience is Associated with Increased Cortical Thickness** *Neuroreport* 2005 Nov 28;16(17):1893-7  
**Long-term Meditators Self-induce High-amplitude Gamma Synchrony During Mental Practice** *Proceedings of the National Academy of Sciences* 2004 Nov 16;101(46):16369-73