



Studies of meditation and yoga report changes in brain activation and chemistry.

Meditation and yoga associated with changes in brain

Neuroscientists describe improvements in cognition and mood at AAAS event

By **Michaela Jarvis**

Brain researchers have detected improvements in cognition and emotional well-being associated with meditation and yoga, as well as differences in how meditation and prayer affect the brains of those who believe in God and those who do not.

At a 28 September Neuroscience & Society event cosponsored by AAAS and the Dana Foundation, neuroscientist Sara Lazar said that not only were the brain images in a study of people who meditated different from those who did not, other research showed that certain changes in performance such as improved scores on the Graduate Record Exam (GRE) occurred in controlled experiments involving mindfulness training.

"This suggests neuroplasticity to me," said Lazar, associate researcher in the psychiatry department at Massachusetts General Hospital and an assistant professor in psychology at Harvard Medical School, "the ability of your brain to change, to grow and adapt" in correlation with meditation.

AAAS and the Dana Foundation have collaborated on the Neuroscience & Society lecture series since 2012, with 20 events so far reaching 3400 attendees. The purpose of the series is to provide a public forum for experts to share the latest advances in brain research and what they might mean for individuals and society.

In another presentation at the event, Chris Streeter, associate professor of psychology and neurology at Boston University School of Medicine, reported that the brain chemical GABA, a neurotransmitter associated with control of anxiety, peaked in experienced yoga practitioners after they executed 60 minutes of postures.

"That was the first time people could say there was a change in brain chemistry associated with yoga," Streeter said.

In order to test whether yoga improved mood and lessened anxiety

more than other physical exercise, study subjects were tested before and after a 12-week intervention in which they did yoga or walked. The activities were metabolically matched to involve the same amount of physical exercise.

The yoga group consistently felt better, according to various markers of mood and anxiety, Streeter said. An hour after the yoga, acute changes—revitalization, tranquillity, positivity, and increases in GABA levels—were reported.

In depressed patients, even those already on antidepressants, yoga was associated with improved sleep, increased positivity, and decreased suicidal ideation (although none of the participants had shown intent to commit suicide). All the measurements indicating mood began "moving in the right direction," Streeter said.

In contexts involving meditation and prayer, brain scans show differences in how the brain reacts depending on whether a subject believes in God, said Andrew Newberg, director of research at the Marcus Institute of Integrative Health and a physician at Thomas Jefferson University Hospital.

According to one of Newberg's studies, when nuns contemplated God, activation was detected in images of the prefrontal cortex, the center of cognitive control, but there was no such activation in the brains of atheists.

Newberg also discussed brain chemistry changes associated with retreat experiences involving prayer, meditation, and silence. Tests from before and after the retreat experience showed decreases in dopamine and serotonin transporter levels, which would allow the neurotransmitter chemicals to be stored in the brain for later use.

Finishing his presentation, Newberg said the work of all three researchers could be seen as interconnected.

"All of this work is coalescing and helping us to understand the overall nature of these experiences," he said.

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