

Study: Meditation changes the brain's electrical pattern

Nov. 16, 2004

by Lisa Brunette

In the first scientific article to come from its pioneering studies of long-term Buddhist meditation practitioners, a UW-Madison team has found that long-term meditators (or "adepts") show markedly different patterns of brain electrical oscillations compared to a group with no previous meditative experience, when both of them generated a standard meditative practice.

The researchers, led by psychology and psychiatry professor Richard Davidson and Waisman Center scientist Antoine Lutz, say the findings suggest that mental training of the sort involved in meditation relies on mechanisms in the brain — called neural synchrony — involved in the global coordination of brain activity and could induce both short-term and long-term change in the brain.

The findings appeared in the Proceedings of the National Academy of Sciences.

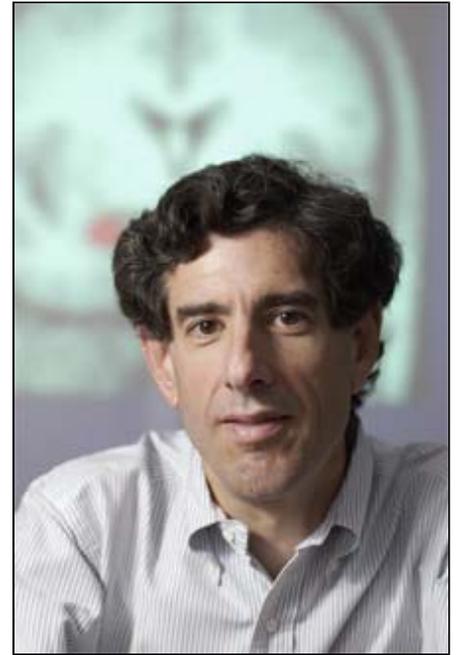
The study focused on a comparison of brain-oscillation patterns, reflecting neural synchrony, between a group of eight long-term Buddhist practitioners of traditional Tibetan meditation and a group of 10 healthy student volunteers who had no experience in meditation but who were taught meditation before the experiment.

Neural synchrony is a mechanism by which groups of neurons, oscillating at different frequencies, fire in phase. The transient coordination of these neural circuits across the brain is comparable to the coordination of jazz musicians who are playing and improvising together.

The UW team focused on the "gamma-band" rhythms, a range of fast-frequency oscillations that is associated with higher mental activity such as attention, learning and conscious perception.

The subjects in the study were asked to generate a standard meditation state several times, alternating with a resting state. The type of meditation each group pursued involves the voluntary generation of compassion and loving kindness. It does not involve concentration on particular objects, memories or images, but instead, encourages the practitioner to generate loving kindness and compassion toward all feeling beings without thinking about anyone in particular. This "nonreferential" meditative state is designed to permeate the mind without focusing on any one person or being.

Three findings emerged from the study. First, the research team found that the two groups had



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significantly different baseline brain-wave patterns in the resting state before the meditation began. Compared to the control group, the Buddhist monks had a higher ratio of "gamma-band" rhythms to slower oscillatory rhythms. This suggests that long-term meditation practice changes the baseline state of the brain.

Second, the difference between the two groups increased sharply during meditation and remained higher than the baseline after meditation. Third, following each period of meditation in the post-meditation baseline state, the practitioners continued to display high-amplitude gamma synchrony compared with the controls.

These findings indicate that mental training to increase compassion and loving kindness has profound effects on brain function. The results further suggest that these qualities are not fixed characteristics of people, but rather can be improved through practice and training.

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