

Brain waves and meditation

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"Given the popularity and effectiveness of meditation as a means of alleviating stress and maintaining good health, there is a pressing need for a rigorous investigation of how it affects brain function," says Professor Jim Lagopoulos of Sydney University, Australia. Lagopoulos is the principal investigator of a joint study between his university and researchers from the Norwegian University of Science and Technology (NTNU) on changes in electrical brain activity during nondirective meditation.

Constant brain waves

Whether we are mentally active, resting or asleep, the brain always has some level of electrical activity. The study monitored the frequency and location of electrical brain waves through the use of EEG (electroencephalography). EEG electrodes were placed in standard locations of the scalp using a custom-made hat

Participants were experienced practitioners of Acem Meditation, a nondirective method developed in Norway. They were asked to rest, eyes closed, for 20 minutes, and to meditate for another 20 minutes, in random order. The abundance and location of slow to fast electrical brain waves (delta, theta, alpha, beta) provide a good indication of brain activity.

Relaxed attention with theta

During meditation, theta waves were most abundant in the frontal and middle parts of the brain.

"These types of waves likely originate from a relaxed attention that monitors our inner experiences. Here lies a significant difference between meditation and relaxing without any specific technique," emphasizes Lagopoulos.

"Previous studies have shown that theta waves indicate deep relaxation and occur more frequently in highly experienced meditation practitioners. The source is probably frontal parts of the brain, which are associated with monitoring of other mental processes."

"When we measure mental calm, these regions signal to lower parts of the brain, inducing the physical relaxation response that occurs during meditation."

Silent experiences with alpha

Alpha waves were more abundant in the posterior parts of the brain during meditation than during simple relaxation. They are characteristic of wakeful rest.

"This wave type has been used as a universal sign of relaxation during meditation and other types of rest," comments Professor Øyvind Ellingsen from NTNU. "The amount of alpha waves increases when the brain relaxes from intentional, goal-oriented tasks. This is a sign of deep relaxation, -- but it does not mean that the mind is void."

Neuroimaging studies by Malia F. Mason and co-workers at Dartmouth College NH suggest that the normal resting state of the brain is a silent current of thoughts, images and memories that is not induced by sensory input or intentional reasoning, but emerges spontaneously "from within."

"Spontaneous wandering of the mind is something you become more aware of and familiar with when you meditate," continues Ellingsen, who is an experienced practitioner. "This default activity of the brain is often underestimated. It probably represents a kind of mental processing that connects various experiences and emotional residues, puts them into perspective and lays them to rest."

Different from sleep

Delta waves are characteristic of sleep. There was little delta during the relaxing and meditative tasks, confirming that nondirective meditation is different from sleep.

Beta waves occur when the brain is working on goal-oriented tasks, such as planning a date or reflecting actively over a particular issue. EEG showed few beta waves during meditation and resting.

"These findings indicate that you step away from problem solving both when relaxing and during meditation," says Ellingsen.

Nondirective versus concentration

Several studies indicate better relaxation and stress management by meditation techniques where you refrain from trying to control the content of the mind.

"These methods are often described as nondirective, because practitioners do not actively pursue a particular experience or state of mind. They cultivate the ability to tolerate the spontaneous wandering of the mind without getting too much involved. Instead of concentrating on getting away from stressful thought and emotions, you simply let them pass in an effortless way."

Take home message

Nondirective meditation yields more marked changes in electrical brain wave activity associated with wakeful, relaxed attention, than just resting without any specific mental technique.

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1. Lagopoulos et al. **Increased Theta and Alpha EEG Activity During Nondirective Meditation**. *The Journal of Alternative and Complementary Medicine*, 2009; 15 (11): 1187 DOI: [10.1089/acm.2009.0113](https://doi.org/10.1089/acm.2009.0113)

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