

Aware Mind-Brain: Bridging insights on the mechanisms and neural substrates of human awareness and meditation

ABSTRACT:

Background

Research on meditation and mindfulness on one side, and investigations of consciousness and its neural correlates on the other side, have mostly proceeded independently. Both lines of research have developed remarkably over the last decades, though with a limited cross-reference.

Aims

The project aimed to bridge mindfulness meditation and consciousness investigations with a particular focus on long-term meditators (Theravada Buddhist monks), and on related neuroplasticity, by investigating both meditation states and traits. Phenomenological reports were emphasized in the project, with their electrophysiological correlates, in experiments with pain and emotional stimuli. The main meditation styles, Focused Attention Meditation (FAM), Open Monitoring Meditation (OMM) and Loving Kindness Meditation (LKM) were investigated in the project, as contrasted with a non-meditative Rest condition. Mind wandering and visual consciousness were also investigated in the project by combining behavioral and subjective report measures. Finally, theoretical developments took place in the project bridging mindfulness meditation and consciousness research lines.

Method

Behavioral, phenomenological, electroencephalographic (EEG), magnetoencephalographic (MEG), functional Magnetic Resonance Imaging (fMRI) and dispositional self-report measures were used in the project. Cross-sectional investigations with long-term virtuoso meditators and a matched group of novice meditators, as well as longitudinal studies with 8 week mindfulness training and pre-post measures also involving a control group, were performed.

Results

The project has found novel neural correlates of the three main forms of meditation FAM, OMM and LKM, in terms of both differential and shared brain activity and functional connectivity patterns. State and trait-related effects with pain and emotion stimuli were also found, in correlation with different dimensions of experience. Pain intensity was found to depend on aversion and identification dimensions of experience, in line with Buddhist psychology. The investigations with long-term meditators revealed a prominent involvement of a widespread alpha rhythm and coherence in the brain, with particular reference to anterior sites of the brain, which can be interpreted as a key neurophysiological marker of consciousness states developed in long-term meditators. Specific effects of mindfulness training on the reduction of mind wandering, and on the time course of perceptual awareness, were also found in the project.

Conclusions

The project has led to novel insights bridging dimensions of conscious experience with mindfulness meditation training, and on their neural correlates, also leading to new theoretical advances.

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Keywords

Meditation, Consciousness, Mindfulness, Neurophenomenology, Electroencephalography, Neuroplasticity

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