

Cortical Oscillations and Altered States of Consciousness: The Study of Meditative States and Functional Brain Connectivity

Results:

The purpose of our research is to study the coordinated collective cortical activity derived from magnetoencephalographic (MEG) recordings during the practice of meditation. Some publications demonstrated an enhancement of synchronization of brain signals (scalp electroencephalographic recordings) during meditation. However other results have cast some doubt in these observations; specifically, studies that showed that gamma activity inferred from scalp EEG recordings is largely the result of increased tone in head muscles that closely associates with brain function. MEG recordings were taken of participants during a control period and during one-pointed (samatha) and insight (vipassana) meditation. In addition, simultaneous electromyographic (EMG) recordings were taken to assess scalp muscle activity. The neurophysiological activity (MEG signals) is analysed in terms of phase synchronization at different frequency bands from 4 to 35 Hz. The EMG signals of scalp sensors showed that there was no increase in power at any frequency during meditation in the expert group, hence these results do not support our hypothesis of a possible enhancement of muscle activity during meditation practice. No significant change in synchronization amongst the MEG sensor signals during meditation was noted, thus we could not reproduce previous published results. This could be due to several factors: we used MEG and not EEG (EEG uses a common reference and that poses problems when assessing synchrony); our subjects performed other types of meditation; and finally, other studies used monks with a level of expertise probably higher than that of our participants.

Published work:

Perez Velazquez, J. L., & Frantseva, M. (2011). *Brain-behavior continuum: The subtle transition between sanity and insanity*. London, UK: World Scientific.

Areas of interest:

Meditation; brain synchronization; scalp muscle activity

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