

Brain Electric Activity in Meditation: Extension of Earlier Work and Hypotheses Testing

Results:

Brain functional connectivity (FC) (computed via EEG LORETA cortical source modeling) in experienced meditators (13 Tibetan Buddhists, 15 QiGong, 14 Sahaja Yoga, 14 Ananda Marga Yoga, 15 Zen) was lower (no increases at all!) during deep meditation than during rest in all EEG frequencies (1.5 – 45 Hz) and all 5 meditation traditions. Into and out of meditation showed different FC topography. These results suggest that during meditation interaction between self process functions is minimized, and constraints on the self process by other processes is minimized, resulting in experienced non-involvement, detachment and letting go, and all oneness and dissolution of ego borders. - FC during breath counting (as used in meditation, but given as task without referring to meditation) in meditation-naïve participants showed reduced FC in breath counting compared to rest, similar to the findings in experienced meditators. - During rest, EEG LORETA cortical source activity in Qigong meditators versus controls showed inhibition of frontal appraisal areas (increased EEG delta), while posterior areas (detection / integration of internal /external sensory information) were activated (decreased EEG delta). Apparently, neuroplasticity effects of long-term meditation practice (increased awareness and detachment) are carried over into non-meditating states. - Qigong meditators doing Thinking of Nothing (TN) and Qigong (QG) had stronger EEG alpha-2 frequency during QG than TN in a single right parietal cluster of LORETA sources, and stronger beta-1 frequency in TN than QG in a single left prefrontal cluster, suggesting self-reference, attention, input-centered processing in QG, and control-centered processing in TN.

Published works:

Full Papers in Peer-Reviewed Journals:

Tei S, Faber PL, Lehmann D, Tsujiuchi T, Kumano H, Pascual-Marqui RD, Gianotti LRR, Kochi K. Meditators and non-meditators: EEG source imaging during resting.
Brain Topography 22[3]: 158-165, 2009.
doi: 10.1007/s10548-009-0107-4.

Faber PL, Lehmann D, Tei S, Tsujiuchi T, Kumano H, Pascual-Marqui RD, Kochi K.
EEG source imaging during two Qigong meditations.
Cognitive Processing 13[3]: 255–265, 2012.
doi: 10.1007/s10339-012-0441-4.

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Lehmann D, Faber PL, Tei S, Pascual-Marqui RD, Milz P, Kochi K.

Reduced functional connectivity between cortical sources in five meditation traditions detected with lagged coherence using EEG tomography.

Neuroimage 60[2]: 1574–1586, 2012.

doi: 10.1016/j.neuroimage.2012.01.042.

Area(s) of interest:

Meditation; Functional brain electrical tomography LORETA; Functional intracortical electrical connectivity; Breath counting exercise.

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