

Neurophysiology of self-boundarilessness and loving-kindness

For a long time, the topic of “Self” or “Me” was the exclusive domain of philosophy and only recently has it begun to attract the interest of brain researchers and neuroscientists. The accumulated evidence so far suggests that the core of the experiential self is produced by self-referential processes, that are neurophysiologically represented through a special integrated network in the brain, called default mode network (DMN). The DMN maintains a first-person perspective for any information or stimuli for perceiving, interpreting, responding to, remembering and even predicting or envisioning the future.

Since the practice of meditation aims to reduce the prevalence of narrative thought chains and bring a dissolution of ego borders, it is commonly hypothesized that meditation should reduce or disrupt the integrity within the DMN.

Recently it has been shown that the DMN is not a uniform system, but rather it is a heterogeneous brain system composed of at least three separable yet interacting components or subnets. Therefore one could predict that the anterior and posterior subnets comprising the DMN should show differences in their integrity as a function of meditation training.

Our study using non-invasive electroencephalography technology has shown that four months of meditation training resulted in a marked decrease of integrity of the right and left posterior subnets of DMN, whereas the frontal DMN subnet on the contrary increased its integrity. These changes in the integrity of different subnets of DMN may give a neural explanation to the well-known subjective experiences of meditation training such as diminished stream of intruding unintended thoughts with simultaneous unconditional feeling of loving-kindness and compassion, and the sense of self-boundarilessness. This is so because the brain structures participated in the frontal DMN subnet have been shown to be involved in a sense of self–agency, where one feels directly present as the center of an externalized multimodal perceptual reality. Furthermore, a number of neuroimaging studies have demonstrated the crucial role of the frontal brain areas in empathy, joy, and feeling of loving-kindness. On the contrary, the brain areas comprising the left and right posterior DMN subnets have been shown to be involved in the body self-consciousness as well as bodily sensory processing and reflection upon oneself; and the dysfunctions in such areas have been causally associated with out-of-body experiences. This is why it is not surprising that in the acute intensive meditation some meditators have reported achieving a state of complete loss of body ownership, where the body is no longer being perceived as belonging to the “self”.

Publication

[Long-term meditation training induced changes in the operational synchrony of default mode network modules during a resting state.](#)

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Cogn Process. 2015 Nov 2