# CLOSING THE LOOP: USING REAL-TIME EEG TO MUTUALLY ENLIGHTEN FIRST AND THIRD-PERSON PERSPECTIVES ON THE SELF

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**Background:** Ordinary human experience is characterized by a sense of being an embodied entity differentiated from an external world, which we refer to as sense of boundaries (SB). A series of neurophenomenological studies has characterized meditative states of SB dissolution, involving comprehensive suspension of processes enacting self-world distinctions accompanied by high beta band power reductions in the parietal cortex (reviewed in Berkovich-Ohana et al., 2020, Front Psychol).

**Aims:** Here we built on these findings using real-time neurofeedback (NF) in parallel with meditation to scrutinize the relationship between these neural processes and subjective experience, and to develop technical setups that can support meditative processes.

**Method:** In a staged procedure, the experiment lets meditators explore the feedback signal during short meditative states. A combination of self-report questions and phenomenological interviews is used to assess perceived correspondence between the NF signal and meditative experience.

**Preliminary results:** A neurofeedback application and experimental protocol was developed and piloted. Unexpectedly, initial results from four long-term meditators indicated that these participants were not able to detect a reliable relationship between the feedback signal and their meditative experience, which is a requirement of the neurophenomenological neurofeedback design. Therefore, the scope of the investigation was broadened to include other known EEG markers of meditative states in order to establish conditions under which a correspondence between meditative experience and real-time feedback can be detected. In sixteen EEG sessions with four long-term meditators, we obtained a significant correspondence for feedback based on gamma power in the posterior medial cortex ($p = 0.046$), but not in three other conditions (beta power from posterior medial cortex, theta power from anterior cingulate cortex, alpha power from visual cortex) ($p > .11$).

**Keywords:** Self, Neurophenomenology, Neurofeedback, Meditation

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