

## Tackling the electrotopography of Self through the Sphere Model of Consciousness

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**Introduction:** EEG studies are a good way to explore cognitive functioning, including self-referential process and embodied sense of Self. Different models of the conscious Self focused on alpha activity (1, 2). Yet, based on cognitive and contemplative studies which consistently emphasize the role of additional frequencies bands, we hypothesized that the hierarchy of Self can be electrophysiologically represented by faster-to-slower frequency bands. In order to examine our hypothesis, we examined relevant EEG studies considering all frequency bands within the framework of the Sphere Model of Consciousness (SMC; 3). In particular, SMC posits three types of Self: Narrative Self, involving self-referential processes; Minimal Self, the consciousness of oneself as an immediate and embodied subject of experience in the “here and now”; and Overcoming of the Self, in which the sense of Self disappears.

**Methods:** We performed a mini review of the literature regarding states of Self in association with meditation focusing on electrophysiological findings. A total of 257 papers were identified through database search, 222 papers were excluded according to exclusion criteria (behavioural or fMRI results without EEG; ERP or other EEG analyses outside of frequency domain). 35 papers were examined.

Our proposed hypotheses were that:

- Gamma (30-100 Hz) and Beta (13-30 Hz) should be associated with Narrative Self.
- Alpha (8-12 Hz) and Theta (4-7 Hz) should be associated with Minimal Self.
- Delta (1-3 Hz) should be associated with Overcoming of the Self.

**Results:** In line with our hypotheses, we found that the Narrative Self is related to higher frequency bands (i.e., Gamma and Beta), while the transition towards the centre of the SMC can be represented by lower frequency bands. More specifically, shifting from the Narrative Self to the Minimal Self is, indeed, associated with slower frequency bands, namely Alpha and Theta. Finally, Delta is strongly linked to Overcoming of the Self. In particular, Alpha appears to be critical in switching between states of Self. This is not surprising given its inhibiting role of conflicting processes and task-irrelevant areas.

**Discussion:** To our knowledge, this is first attempt to formulate a topographic map combining Self and electrophysiological results across frequency bands. Thus, it is important to advise caution in interpreting the model, due to complex processes involved in different states of Self a clear-cut topography it is not always possible. Nonetheless, SMC and the proposed electrotopography showed their usefulness as a framework in which investigate current issues and its consistency with cognitive and contemplative literature. This model can contribute to several open issues in cognitive and contemplative neuroscience, including the differentiation between higher and altered states of consciousness, their relationship with executive functions and the broadening of the sleep-wake boundary.

**References:** Fingelkurts AA et al. ConsciousCogn (2020) 86:103031

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**Keywords:** Other; normal population; not relevant; Literature review, electrophysiological (e.g. EEG).