THE DYNAMIC NATURE OF INTERNALLY ORIENTED COGNITION AND HALLUCINATION PRONENESS: INSIGHTS FROM HIDDEN SEMI-MARKOV MODELLING

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Grant 102/22

Background: The resting brain dynamically transitions between periods of internally- and externally oriented cognition subserving individual variability in sensory and perceptual sensitivity. Switching between different cognitive and attentional states correlates with sub-second spatio-temporal dynamics in resting state (RS) electroencephalography (EEG) data. Hallucination-like experiences (HLEs) and mind wandering are two examples of untriggered (i.e., spontanous) and transitory mental states, characterized by the dynamic switching of attentional resources from external to internal physiological sensations. Evidence further suggests that the subjective vividness of internally generated sensory percepts during mind wandering and (un-)successful cognitive and attentional control may play a key role in the emergence of HLEs.

Aims: We investigate the sub-second electrophysiological signatures of heightened perceptual sensitivity to internal sensory events with a specific focus on hallucination proneness and vivid thought propensity. We also aim to uncover the effect of data recording characteristics (e.g., length of data recording) on externally- versus internally oriented cognition.

Method: We use a Hidden Semi-Markov Model (HsMM) to model the temporal variability of RS EEG. The HsMM is a novel state allocation method that characterizes continuous time series as a sequence of district and recurrent quasi-stable activity patterns, i.e., brain states, reflecting the electrophysiological signatures of underlying neural networks.

Preliminary results: First results indicate that HsMM brain state dynamics can reveal highly differentiated and temporally resolved electrophysiological correlates of hallucination proneness. Specific data recording characteristics and the (lack of) external constraints on internally oriented cognition highlight the sensitivity of HsMM brain state dynamics to individual differences in HLEs. Based on the current findings, we currently develop a more nuanced perspective on traditionally used self- report measures of hallucination proneness and sensory and perceptual sensitivites to uncover robust predictive neural markers of HLEs.

Keywords: Internally oriented cognition, Spontaneous brain dynamics, Hallucinatory vulnerability, Vivid thoughts, EEG

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