A Spatial-Temporal Analysis of a Visual Working Memory Task with EEG and ECoG

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Abstract: In this study, we investigated the neural correlates of a visual working memory task. Two experiments were carried out using scalp electroencephalography (EEG) and Electrocorticography (ECoG), respectively. In each trial, participants judged whether a test face had been among a small set of recently studied faces. We used a combination of hidden semi-Markov models (HSMMs) and multi-variate pattern analysis (MVPA) to decompose the neural signal into a sequence of latent stages. Analyzed separately, EEG and ECoG data yielded converging results on the durations of recovered stages. Combining these stages with the high spatial resolution of ECoG suggested that activity in the temporal cortex reflected item familiarity in the retrieval stage; and that once retrieval is complete, there is active maintenance of the studied face set in the medial temporal lobe (MTL). During this same period, the frontal lobe guides the decision by means of theta coupling with the MTL.