Neuro-computational models of memory posit that successful episodic retrieval is accompanied by reactivation of the cortical representations that were active during encoding. Several fMRI and EEG studies have shown that such reactivation effects are strongly related to conscious retrieval (recollection), consistent with the idea that this phenomenon relies on the hippocampus. The involvement of reactivation during weak and unconscious memory retrieval, however, is yet to be fully explored. One exception is a recent EEG study by Wimber, Maab, Staudigl, Richardson-Klavehn, and Hanslmayr (2012) in which words were encoded in the context of background visual flicker entrainment (at 6 and 10 Hz) and then presented at retrieval in the absence of flicker. Neural measures of the effects of the visual flicker, often referred to as phase-locking, were observed at the corresponding entrained frequencies during retrieval, consistent with the notion that the encoding representations were reactivated. Given the important implications of unconscious reactivation to established memory theories, the current study attempted to provide a direct replication of the Wimber et al. (2012) findings.

Additionally, we tested whether a final memory test, in which EEG was acquired while subjects were explicitly asked to make judgments about the frequency of visual flicker present at encoding, provided further evidence for reactivation under more-ideal, intentional retrieval conditions. Our study failed to replicate the findings of Wimber et al., indicating that neural modulation due to visual frequency entrainment is reactivated neither under unconscious nor intentional retrieval conditions.