

## **How memories form: Does consistency in neural activity promote successful learning?**

### **ABSTRACT:**

Typically, studies of the neural correlates of successful memory encoding present each to-be-remembered item just once, despite the fact that repeated exposure can aid encoding considerably. In the present project, we employed the subsequent memory paradigm and representational similarity analysis (RSA) to investigate neural similarity patterns across multiple encoding episodes and between encoding and recognition. Electrophysiological and haemodynamic response data were obtained in three experimental paradigms investigating effects of encoding modality and encoding context. The first set of experiments examined the effects of encoding modality on source memory processes and repetition during study and test phases. Representational similarity analysis (RSA) of the fMRI data revealed modality-independent and modality-dependent source memory effects, suggesting that reactivation of different stimulus features predicted source memory performance when stimuli are repeatedly presented. Overall, the results provide evidence for pattern reactivation to benefit source memory formation and retrieval. The second set of experiments investigated the effects of encoding items repeatedly in the same context or across multiple contexts. Pattern reactivation in the same task condition was shown to enhance source memory for the encoding context. However, lower levels of reactivation were associated with successful source memory performance when stimuli were associated with multiple contexts. Together, the EEG and FMRI results provide evidence for distinct mechanisms to underlie successful context encoding when items were either repeatedly encoded in the same context or in different contexts. Moreover, results from the EEG analyses suggested that repetition effects predict subsequent source memory performance when they occur in a similar time window as the late parietal component, which is commonly related to recollection. Taken together, the present research advances our understanding of repeated encoding of item and source memory information and leads to novel directions for future research.

### **Keywords**

Memory formation, Declarative memory, Repetition, Representational Similarity Analysis (RSA)

### **Published Work:**

Debrulle, J. B., Touzel, M., Segal, J., Snidal, C., & Renoult, L. (2019). A central component of the N1 event-related brain potential could index the early and automatic inhibition of the actions systematically activated by objects. *Frontiers in Behavioral Neuroscience*, 13:95. doi: 10.3389/fnbeh.2019.00095

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