

Memory over Time: Evidence from Event-Related Potentials that Recollection and Familiarity Represent Separate Neural Systems in the Brain

Abstract

The question of whether the biological systems that support the memory retrieval processes of recollection and familiarity are independent was tested using the technique of event-related brain potentials (ERPs) in human subjects. These biological systems include a hippocampal system, which has been shown to support recollection, or a person's ability to retrieve contextual details of memory, and a parahippocampal system, which has been associated with familiarity, or recognition in the absence of contextual memory. Subjects were shown 300 words, half presented once and half thrice, in a study session, following which there was either a break of less than an hour (short-delay group) or of about twenty-four hours (long-delay group). The test phase consisted of 300 Studied and 300 unstudied words. During the test phase ERPs were recorded as subjects performed an Old/New judgment, followed by a Remember/Know judgment if they first responded Old. The Remember/Know judgment allowed subjects to rate the subjective experience of the memory retrieval process - recollection or familiarity - they experienced for items they recognized. To analyze the ERP data, waves were divided into three epochs corresponding with the three modulations that have been shown to correlate with familiarity, recollection, and post-retrieval processes. We found that ERP components that correlate with these three processes are spatiotemporally distinct and each responds differently to the different item types, suggesting that these processes indeed have separate generators. Furthermore, these correlates, and consequently the underlying biological systems, are not affected by a delay but do change with study repetition. This study concludes that the process employed for memory retrieval is independent of the recency of study, and that such process are associated with different subjective experiences.