

Understanding the Temporal Compression of Continuous Events in Memory

Our past experiences are represented in episodic memory as sequences of experience units (EUs)—each unit representing a moment of the past experience—that are separated by temporal discontinuities (i.e., moments that are not remembered). Because of these discontinuities, the time taken to mentally re-experience everyday activities is typically shorter than their actual duration (i.e., the unfolding of events is temporally compressed in memory). However, the cognitive mechanisms underlying this structure of episodic memories are not fully understood, especially the factors that might explain temporal discontinuities.

A consistent body of work suggests that EUs are constructed in working memory during perception and integrated into episodic memory when an event boundary (i.e., the end of one event and the beginning of another) is perceived. Based on this view, we hypothesized that temporal discontinuities within episodic memories could be a byproduct of working memory's limited capacity: when too much time elapses before the perception of an event boundary, the EU formed at the end of the ongoing event only partially represents its unfolding, thereby leading to temporal discontinuities in the long-term memory representation into which this EU is integrated.

We tested this hypothesis across a series of studies ($N = 50\text{--}90$ per study) in which participants viewed short video clips (3–18 s) depicting individuals performing continuous actions (i.e., actions without event boundaries; e.g., turning a car jack in an uninterrupted manner). For each clip, participants were instructed to watch the action carefully and then mentally replay its unfolding as accurately and precisely as possible. We measured remembering duration by asking participants to press a key at the beginning and at the end of their mental replay, which allowed us to compute temporal compression indices by comparing mental replay duration with actual event duration.

Across studies, results showed that temporal compression was not systematic but emerged when individuals remembered continuous events exceeding a certain duration. Overall, our results support the view that, in the absence of event boundaries, the time during which the flow of experience can be integrated into memory is limited, leading to the formation of temporally compressed EUs once this limit is exceeded.