

Effects of the number and duration of events in the temporal compression of experience in memory

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We remember episodes from our past as sequences of experience units—each representing a moment of the past experience—separated by temporal discontinuities (i.e., moments that are not remembered). Because of these temporal discontinuities, the time taken to mentally relive past episodes is typically shorter than their actual duration: episodic memories are temporally compressed. However, the cognitive mechanisms underlying this compression remain unclear.

In daily life, we segment the continuous flow of experience into meaningful units (i.e., events) based on the perception of event boundaries (EBs; Zacks, 2020). Between EBs, working memory enables us to construct and maintain a mental model of the ongoing situation (i.e., an event model). When an EB is perceived, the current event model is updated and is integrated in a long-term memory representation of the ongoing sequence of events—as an experience unit (EU). We hypothesized that the temporal compression with which we remember past episodes depends on the number and duration of events composing their unfolding.

The maximal duration of an event model that can be fully maintained in mind should be limited by the length of time that information can be held in working memory without rehearsal. When this temporal capacity is exceeded before the perception of an EB, the EU formed at the end of the current event would only partially represent its unfolding, leading to temporal discontinuities in the long-term memory representation into which this EU is integrated.

However, some authors consider temporal compression as a feature of episodic simulation that allows us to mentally simulate the central elements of an episode while minimizing cognitive and temporal costs of the simulation (Arnold et al., 2016). According to this view, the level of temporal resolution at which we are able to mentally replay EUs composing past episodes is modulated by the total amount of EUs that we have to remember.

To evaluate the contribution these two mechanisms in the temporal compression phenomenon, we asked 72 healthy young adults to watch and mentally replay short movies depicting 1, 2, or 3 continuous events (i.e., without EBs), each lasting 3, 6, 9, or 12 seconds. For each movie, we computed event remembering duration (ERD) by dividing participants' total remembering duration by the number of events composing the movie. When events were presented alone, ERD was close to the actual stimuli duration for short events (3-6 s), but smaller for longer ones (9 or 12 s). We also observed an effect of the number of events, showing that ERD was lower when multiple events had to be remembered. Taken together, these results suggest that both the number and duration of events have a specific influence on the temporal compression of past experience in memory.

References:

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