

What Triggers Spontaneous Memories of Emotional Events?



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Whether we like it or not, sometimes distant memories of past events pop into our heads for no apparent reason. Study after study has found that memories associated with high emotions are more likely to spontaneously come to the surface than non-emotional ones. But these memories may lack specific details – cued by familiar surroundings and events rather than rooted in specific recollection – according to new research.

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Credit: Oarabile Mudongo;

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Scientists are working to identify what happens in the brain when we unintentionally remember emotional moments to better help people who are depressed, suffer from PTSD, or otherwise have traumatic memories that encroach on everyday life. But studying involuntary memory is a relatively new area of study, says [Mathias Weymar of the University of Greifswald in Germany](#), and only in the last few years have researchers looked more closely at the underlying neural mechanisms.

Recent work has been able to trigger spontaneous remembering in the laboratory after short testing intervals of an hour or less, but Weymar and colleagues wanted to test what happens after a week or longer – to get closer to understanding how emotional autobiographical (or “episodic”) memories work. They turned to a technique using ERPs (event-related potentials) that measures electrical activity in the brain to gauge whether a person has encountered an object before.

“It is very unique that we studied brain dynamics – ERPs – associated with spontaneous remembering following a long retention interval,” Weymar says. “Longer retention intervals have been used before in diary studies assessing the occurrence of involuntary autobiographical memories, but studying the neural networks involved using a laboratory setting is a novel approach.”

[Past studies](#) have established a distinct ERP pattern that occurs when people correctly remember an old stimuli; the pattern is essentially an electrophysiological brain signature of memory. When we consciously recollect an object in detail, the electrical pattern shows up in the centro-parietal region of the brain about 400 milliseconds after the seeing the stimulus. When something is simply familiar to us (think: remembering a person’s face but not their name or where you met them), the ERP pattern shows up right after the stimulus but over a different part of the brain, the frontal region.

Research by [Weymar and others](#) has found that the ERP effect in the parietal region occurs when we consciously remember something after a long interval, and that effect is much greater when the objects are emotional versus neutral. So in this new study of involuntary remembering of emotional images, they were examining whether and where the same ERP signature occurred.

In the new study, led by Anna Jaworek and [published in the journal *Cognitive Neuroscience*](#), participants viewed pictures that were either associated with emotion (e.g. depicting diseases, romance, adventure, etc.) or neutral. One week later, researchers put people into groups where they were either asked to identify whether they had seen a picture before (conscious remembering) or to categorize whether the picture had one or more people in it (involuntary remembering condition).

As expected, the participants asked to identify whether they had seen an object before, showed a greater ERP signature when they correctly remembered emotional pictures compared to neutral ones, and this signature occurred over the frontal and parietal regions. Those who performed the categorization task – who were not asked to remember anything – showed the ERP memory signature for emotional images as well, but only over the frontal region.

“It was exciting to find that in contrast to [previous studies using short retention intervals](#), spontaneous retrieval occurred over frontal and not over parietal regions,” Weymar says. Based on past research, this ERP brain pattern indicates that the people in the categorization task were remembering the emotional pictures but only at the level of familiarity, not in

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specific detail.

“In our study, we found that emotionally evocative cues spontaneously trigger familiarity-based episodic retrieval on a delayed categorization task, when no memory search is instructed,” Weymar says.

The exact mechanisms for this process are still unknown, but [recent fMRI studies](#) including a [recent study in the Journal of Cognitive Neuroscience](#), suggest that both spontaneous and intentional memories [share the same structures important for episodic memory retrieval](#). “Further research is needed to clarify the role of emotion on these memory networks,” Weymar says.

The present work nonetheless adds important insight into differences between spontaneous and emotional memories. “For experiences that happened a week ago, explicit and spontaneous retrieval are more likely for emotionally arousing events,” Weymar says.

“The more arousing and the more salient an event is, the higher is probability that the same event can be intentionally or automatically be reactivated at a later time – which might explain why intrusions of unpleasant memories can be so disturbing,” he says. But compared to conscious remembering, spontaneously reactivated emotional memories are qualitatively different – less detailed and specific.

Scientists are still at the early phases of being able to apply the work to PTSD and other clinical disorders. “Our finding that spontaneous long-term memories for emotional events might be more based on familiarity might help to develop new models explaining the mechanisms underlying involuntary remembering in healthy and clinical populations,” Weymar says. More work is necessary, he says, to pinpoint the neural basis of spontaneous emotional memories and to understand how variables like age, sex, and personality are related to involuntary memories.

-Lisa M.P. Munoz

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