

# How our environment affects what we remember

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It is a common experience that, when you share memories with a friend, you can recount some events in much more detail than others, while other times, you mix up memories. But why do our memories change? It

is all about the spatial context, says clinical psychologist Vanessa van Ast. When successive experiences take place in the same environment, they become more deeply imprinted in our memory. But when an experience takes place in a new context, the memory of this experience pushes earlier memories to the background.

Our episodic [memory](#) enables us to recount things that we personally experienced. For example, when reminiscing with a friend about seeing a film together in the cinema, people are able to share all kinds of funny details of things that happened that evening. When people think back to watching a film that made them emotional, this may even cause their heart to start racing again. That is because we relive experiences much more physically when our emotional memory is triggered. However, memories can change. We sometimes forget certain details, our memory starts to incorporate details from other experiences, or the evoked emotion of an experience becomes stronger when our memory of it is repeatedly triggered.

Clinical psychologist Vanessa van Ast does research into episodic and emotional memories and under what conditions they change. Van Ast, who was awarded a Veni grant from the Dutch Research Council (NWO), explains that one of the key findings of her research is that the environment in which people recall an experience has a big impact on how they remember it: 'We already knew that spatial context affects memory recollection, but we did not have a good understanding of what happens to memories afterwards.'

## **Researching memory in the lab**

But first, how do you research the workings of human memory? 'A personal memory can be influenced by a million things,' says Van Ast. 'It is impossible to identify all those factors as a researcher, so we will never be able to determine exactly what happened during an experience.'

To address this, Van As did [experimental research](#) in a psychology laboratory where she isolated core elements of experiences, in order to manipulate them and test how they were remembered.

For this purpose, she used materials made up of different elements, such as a background, foreground images and sound. Participants were shown variations of those elements at different times while they recollected an original memory. This method made visible which associations the brain makes and why the memory of an experience changes. 'Because the way memory works is very associative,' Van Ast explains. 'At times, we also used distressing images, such as a picture of a broken leg accompanied by cracking noises, to simulate emotional experiences and measure physical responses, such as an elevated heart rate.'

## **Environment is critical to what you remember**

Van Ast was particularly interested in the impact of environment on how our memory works: 'We already knew that the environment is the strongest trigger for the recollection of a memory. Every experience takes place in a specific environment, so the environment is a strong memory trigger. But we did not have a good understanding of what happens to memories afterwards.'

To find out, she did an experiment where participants saw a number of words in a particular context and had to come up with a story based on those words (the original 'experience'). The next day, the participants were exposed to similar 'experiences', but the original words were successively linked to new words. 'Crucially, we sometimes presented new words in the same context as before and sometimes presented them in a new context.' On the third day, a memory test was used to determine to what extent participants could still remember the linked words.

'We found that context was critical,' says Van Ast. 'When two

experiences took place in the same context, both memories, as well as the associations between them, were imprinted much more deeply. But when they occurred in different contexts, the second experience was remembered at the expense of the original experience. And the associations between them were also more poorly remembered.'

How would this work in real life? Van Ast uses an example of having gone to the cinema with a friend. 'Some time later, you watch another film with that friend in the same cinema. The following day, you and your friend share memories about your visits to the cinema. You will find that your first and second visit to the cinema have both been reinforced in your memory. You will remember which film you saw and which drinks and snacks you had. But if you had watched the second film with the same friend in a different cinema, the original memory would have faded enormously, whereas you would have had a strong recollection of the new experience.'

## **Different contexts do not reinforce memories**

Van Ast concludes that, when the spatial context changes, our memory is triggered to switch to this new context. 'Our brain apparently prioritizes the new context over the original memory. This finding goes against many theories that hold that different contexts actually make memories more unique and stronger and therefore lead to less interference between memories.'

## **Focus on emotional memories**

Van Ast now wants to delve more deeply into our [emotional memory](#). In her research, she discovered that, when an experience is followed by a negative or emotional experience, this reinforces the memory of the original experience. 'In this experiment, the emphasis was on recounting episodic details. But it's still unclear what factors can cause emotional

responses to change.' That is why Van Ast now wants to research how emotional responses to past experiences can change and how context can be used to influence emotional memories: 'To reinforce positive effects of therapy, for instance. This is still uncharted territory, but we do know that context can play a big role when you want to change memories.'

The research was published in *PNAS*.

**More information:** Wouter R. Cox et al, Episodic memory enhancement versus impairment is determined by contextual similarity across events, *Proceedings of the National Academy of Sciences* (2021). [DOI: 10.1073/pnas.2101509118](https://doi.org/10.1073/pnas.2101509118)

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