

The bright and dark sides of knowledge

Knowledge enhances both true and false memories

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One of the main goals of education is to provide the best opportunities for children to acquire knowledge and skills. As the saying goes, knowledge is power. This idea aligns with the well-established finding that prior knowledge helps people remember new information, because it provides a structure into which that information can be integrated. As children tend to possess less knowledge than adults, their memories have been found to be worse than those of adults and to show less benefit from knowledge.

Together with Garvin Brod and Ulman Lindenberger, I investigated whether a child's memory can benefit from prior knowledge to the same extent as an adult's, if knowledge levels are held constant. Indeed, this is the case. After providing child and adult participants with the same level of certain kinds of artificial knowledge (involving hierarchies of cartoon stimuli) and ensuring its activation, we found that the memories of children and adults benefit equally from existing knowledge.

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However, when examining the participants' brain activation during the task (using functional magnetic resonance imaging), we found that neural activation in an area of the brain called the ventromedial prefrontal cortex (vmPFC) is lower in children than in adults. The vmPFC is important for detecting congruence between new information and prior knowledge. This led us to speculate that the relative immaturity of the vmPFC may prevent children from making full use of their prior knowledge, even when that knowledge is clearly available in their brains.

This underscores the need to structure learning environments, such as classroom settings, in keeping with students' development. This can be achieved, for example, by providing varying amounts of support or cues to activate prior knowledge in students' systems. New information can then be processed in a way that maximizes the durability of its memory representations.

At the same time, we should keep in mind that knowledge is a double-edged sword, as it enhances both true and false memories. This is because our memories do not faithfully store our experiences. Rather, we often construct and reconstruct memories based on our knowledge about the world, which renders human memories susceptible to error. Research with older adults (above 65 years of age) shows strikingly high rates of memory error that are correlated with their prior

knowledge.

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In a recent [study](#), Garvin Brod and I compared the advantages and disadvantages of knowledge for memory in children, younger adults, and older adults. Using stimuli that are highly familiar to all age groups, we found that the benefits of prior knowledge for memory were similar for all age groups. However, older adults and, to a lesser extent, children relied too much on their prior knowledge and showed more false memories than did young adults. vmPFC activation was associated with better memory for knowledge-congruent information, but also with a greater tendency toward falsely reconstructing knowledge-congruent memory errors.

This finding nicely demonstrates that knowledge is both a boon and a bane, in terms of its effects on memory. Therefore, the acquisition of knowledge is only one of many goals in education. We need to prepare children to work with knowledge, enabling them to integrate new information and make inferences when there are commonalities, but they must also be able to detect contradictions between their knowledge and the constant flood of information from their surrounding environments.

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