

How our brains remember things depends upon how we learn them

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Oxford University researchers have discovered that learned knowledge is stored in different brain circuits depending on how we acquire it.

The researchers from the Department of Experimental Psychology, the Wellcome Centre for Integrative Neuroimaging (WIN) and the Nuffield

Department of Clinical Neurosciences, used an MRI scanner to observe changes in parts of the brain associated with learning and learned experiences while volunteers completed tasks that involved a reward.

Participants also attended two sessions prior to scanning to compare their individual associations between stimulus sequences and reward.

They found that the changes seen in the participants' neural pathways associated with learning were different depending upon how each person had learned the new skill.

Miriam Klein-Flugge of the Department of Experimental Psychology, said: "We know that humans can learn in different ways. Sometimes we learn simply by observing relationships in the world, such as learning the layout of a new town, or relationships between people. But another way to learn is by setting particular goals, like children learning to operate toys by trial and error.

"This research shows that we have multiple networks in the brain that help us store learned knowledge or associations, which means that damage to one part of the brain will still leave alternative mechanisms available for learning.

"We also learned that some of this knowledge is very persistent, and the brain does not forget about it even when it becomes irrelevant, while knowledge acquired through an alternative learning mechanisms is more flexible and can more easily be changed to new knowledge."

As well as showing that the brain can learn in different ways and that these multiple mechanisms for learning rely on the concerted effort of multiple different [brain](#) networks, the study also showed that unlearning associations can be easier when they were acquired by observation compared to a goal-directed manner.

Miriam Klein-Flugge added: "It is well known that it is good for our brains to continue to learn new things throughout life, which is why understanding the different ways in which we learn and store [knowledge](#) could be beneficial and help each of us to find out which way of learning suits us best."

The full article, "Multiple associative structures created by reinforcement and incidental statistical learning mechanisms," is published in *Nature Communications*.

More information: Miriam C. Klein-Flügge et al. Multiple associative structures created by reinforcement and incidental statistical learning mechanisms, *Nature Communications* (2019). [DOI: 10.1038/s41467-019-12557-z](#)

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