How the brain builds on prior knowledge

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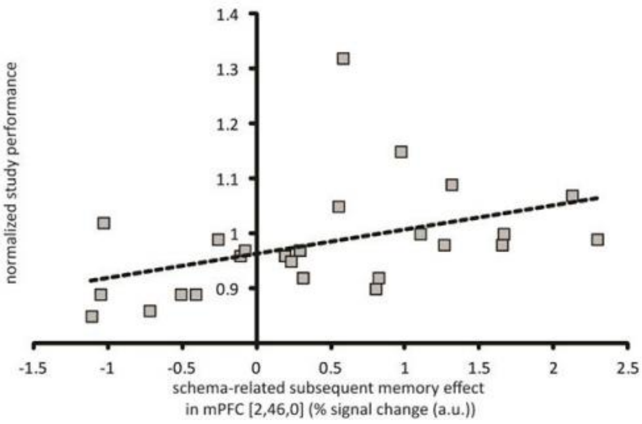

Figure 1. Correspondence between the activity of the medial prefrontal cortex and study results in the second year versus the first year. Horizontal axis shows the degree of activity in the medial prefrontal cortex of various students; vertical axis shows performance improvement in the second academic year compared with the first.

It is easier to learn something new if you can link it to something you already know. A specific part of the brain appears to be involved in this process: the medial prefrontal cortex. The *Journal of Cognitive Neuroscience* has published these findings, from research by neuroscientists at Radboud university medical center and Radboud University, as an Early Access paper. The findings further enhance our understanding of the brain mechanisms that underlie effective learning.

Neuroscientist Marlieke van Kesteren tested two groups of students who had just started on their second-year of biology or pedagogy studies. While an MRI scanner was registering their brain activity, the students learned short sentences containing new information that expanded on their own or the other study programme. The following day, the students were tested on the information they had learned. As expected, they had retained the information that was related to their own programme better than the unrelated information.

In practice

During the successful retention of related information, a different part of the brain was active than when unrelated information was memorised. 'The brain area we found, the medial prefrontal cortex, probably linked new information directly to prior knowledge', Van Kesteren said. 'In previous studies this brain area came to the fore as well, but only during simple tests. We have specifically shown that this area also plays a role in the neural basis of learning in educational practice.'

Link to study results

To her amazement, Van Kesteren also discovered that the activity in the medial prefrontal cortex corresponded with how well students performed in their second year, compared with the first. So is it possible to predict a student's future academic success by placing him or her in a scanner? 'No, certainly not, the links we found were not strong enough', Van Kesteren explained. 'We're mostly talking here about differences of not more than 10% (Figure 1). What's more, we can't tell from a simple correlation like this what the chief reason is, and whether a whole lot of other factors are playing a role. But if we know exactly how our brain uses prior knowledge, we could try to address that knowledge more selectively before we start learning new information. For example, you could consider how the new information is related to what you already know.'

Van Kesteren added a tip for secondary school students taking their final exams: 'If you don't immediately know the answer to a question, you could first try recalling what you already know about that topic. This might help you to come up with the right answer after all.'

More information: "Building on Prior Knowledge: Schema-dependent Encoding Processes Relate to Academic Performance." Marlieke T. R. van Kesteren, Mark Rijpkema, Dirk J. Ruiter, Richard G. M. Morris, and Guillén Fernández. *Journal of*

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