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Psychologists compare learning achievement with and without stress

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Stressed and non-stressed persons use different brain regions and different strategies when learning. This has been reported by the cognitive psychologists PD Dr. Lars Schwabe and Professor Oliver Wolf from the Ruhr-Universität Bochum in the *Journal of Neuroscience*. Non-stressed individuals applied a deliberate learning strategy, while stressed subjects relied more on their gut feeling. "These results demonstrate for the first time that stress has an influence on which of the different memory systems the brain turns on," said Lars Schwabe.

The data from 59 subjects were included in the study. Half of the participants had to immerse one hand into ice-cold water for three minutes under video surveillance. This stressed the subjects, as hormone assays showed. The other participants had to immerse one of their hands just in warm water. Then both the stressed and non-stressed individuals completed the so-called weather prediction task. The subjects looked at playing cards with different symbols and learned to predict which combinations of cards announced rain and which sunshine. Each combination of cards was associated with a certain probability of good or bad weather. People apply differently complex strategies in order to master the task. During the weather prediction task, the researchers recorded the brain activity with MRI.

Both stressed and non-stressed subjects learned to predict the weather according to the symbols. Non-stressed participants focused on individual symbols and not on combinations of symbols. They consciously pursued a simple strategy. The MRI data showed that they

activated a brain region in the medial temporal lobe - the hippocampus, which is important for long-term memory. Stressed subjects, on the other hand, applied a more complex strategy. They made their decisions based on the combination of symbols. They did this, however, subconsciously, i.e. they were not able to formulate their strategy in words. The result of the brain scans was also accordingly: In the case of the stressed volunteers the so-called striatum in the mid-brain was activated - a brain region that is responsible for more unconscious learning. "Stress interferes with conscious, purposeful learning, which is dependent upon the hippocampus," concluded Lars Schwabe. "So that makes the brain use other resources. In the case of stress, the striatum controls behaviour - which saves the learning achievement."

More information: L. Schwabe, O. Wolf (2012): Stress modulates the engagement of multiple memory systems in classification learning, *Journal of Neuroscience*, doi: 10.1523/JNEUROSCI.1484-12.2012

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