Medical Xpress

Novelty aids learning

August 3 2006

Exposure to new experiences improves memory, according to research by UCL psychologists and medical doctors that could hold major implications for the treatment of memory problems. The study, published in *Neuron* on 3 August, concludes that introducing completely new facts when learning, significantly improves memory performance.

Researchers have long suspected that the human brain is particularly attracted to new information and that this might be important for learning. They are now a step closer to understanding why.

A region in the midbrain (substantia nigra/ventral tegmental), which is responsible for regulating our motivation and reward-processing, responds better to novelty than to the familiar. This system also regulates levels of dopamine, a neurotransmitter in the brain, and could aid learning. This link between memory, novelty, motivation and reward could help patients with memory problems.

Dr Emrah Düzel, UCL Institute of Cognitive Neuroscience, said: “We hope that these findings will have an impact on behavioural treatments for patients with poor memory. Current practice by behavioural psychologists aims to improve memory through repeatedly exposing a person to information – just as we do when we revise for an exam. This study shows that revising is more effective if you mix new facts in with the old. You actually learn better, even though your brain is also tied up with new information.

“It is a well-known fact amongst scientists that the midbrain region

regulates our levels of motivation and our ability to predict rewards by releasing dopamine in the frontal and temporal regions of the brain. We have now shown that novelty activates this brain area. We believe that experiencing novelty might, in itself, have an impact on our dopamine levels. Our next project will be to test the role of dopamine in learning. These findings could have implications for drug development."

Subjects took part in a series of tests. The first experiment assessed whether the brain prefers novel stimuli over familiar stimuli even when the familiar images are made significant because they are either rare or depict emotionally negative content. Subjects were shown images of indoor and outdoor scenes and faces, while their brain activity was analysed using an fMRI scanner. Some images rarely popped up and some were emotionally negative, such as an angry face or a car accident. Even the rare and emotional images did not activate the midbrain. It responded only to new images.

The second experiment, using fMRI, made some of the images more or less familiar to test how this relativity affected brain activity. It did not – only completely new images produced activity in the midbrain area.

Dr Düzel said: "We thought that less familiar information would stand out as being significant when mixed with well-learnt, very familiar information and so activate the midbrain region just as strongly as absolutely new information. That was not the case. Only completely new things cause strong activity in the midbrain area."

Separate behavioural experiments were also conducted without the use of a scanner to test the subjects' memory. Their memory of the novel, familiar and very familiar images they had studied was tested after 20 minutes and then a day later. Subjects performed best in these tests when new information was combined with familiar information during learning. After a 20 minute delay, subjects' memory for slightly familiar

information was boosted by 19 per cent if it had been mixed with new facts during learning sessions.

Dr Düzel said: “When we see something new, we see it has a potential for rewarding us in some way. This potential that lies in new things motivates us to explore our environment for rewards. The brain learns that the stimulus, once familiar, has no reward associated with it and so it loses its potential. For this reason, only completely new objects activate the midbrain area and increase our levels of dopamine.”

Source: University College London

Citation: Novelty aids learning (2006, August 3) retrieved 7 May 2024 from https://medicalxpress.com/news/2006-08-novelty-aids.html