Medical Xpress

Shock and recall: Negative emotion may enhance memory, study finds

June 20 2011, By Tony Fitzpatrick

(Medical Xpress) -- Picture a menacing drill sergeant, a gory slaughterhouse, a devastating scene of a natural disaster. Researchers at Washington University in St. Louis have found that viewing such emotion-laden images immediately after taking a test actually enhances people's retention of the tested material.

The data the researchers gathered in recent studies are the first to show that negative arousal following successful retrieval of information enhances later recall of that information.

The finding is counterintuitive. One would think that viewing a negative scene would tend to blot out anything learned before seeing the image.

Instead, learning is enhanced by the (negative) emotion, says Bridgid Finn, PhD, postdoctoral researcher in psychology in Arts & Sciences. "Memory is labile and dynamic – after you retrieve something, you're still engaged in processing that information in some way," Finn says.

"Having a picture of a gun pointed at you just after you've just been tested on something probably isn't the best situation for learning, but because there is an intricate relationship between areas involved in emotion and remembering, the amygdala and the hippocampus, we find that the negative picture can enhance later retention."

Finn and Henry L. Roediger III, PhD, James S. McDonnell Distinguished University Professor and dean of academic planning, published their findings in the June 2011 issue of *Psychological Science.*

The researchers tested 40 undergraduate WUSTL students who studied ten lists of ten pairs of Swahili-English vocabulary items (lulu/pearl; ubini/forgery). Participants were given a cued recall test after studying each set of ten pairs, and then given a final test on all 100 pairs.

On the initial test, following each correct answer, they were shown a picture either of a negative emotional image such as a pointed gun; a neutral image, such as a chair, or a blank screen.

They then did a one-minute multiplication test, a sort of mental palette cleansing to remove the effects of short-term memory, like a serving of sherbet in a multiple course meal.

A final cued-recall test on all 100 Swahili-English items revealed that participants did best on items that had been followed by the negative pictures.

This initial experiment showed that the process involved in retrieving an

item does not end when that item is retrieved. In a second experiment designed to explore the limits of the enhancement effect, the researchers tested a second group of students who viewed the images two seconds after successful retrieval. The question: Does the retrieval process persist during those two seconds?

“The answer appears to be yes, the students continue to process the information during the two second pause,” Finn says.

A third study of 61 students was intended to rule out the possibility that arousing images simply made certain pairs of words seem more distinct, and thus made them easier to remember. This experiment was very similar to the other two with one major distinction: Instead of taking the initial tests, participants restudied the items.

“For negative emotion to enhance later retention of something, this experiment shows that you have to retrieve that information,” Finn says. “That is, you have to go get it. In the absence of retrieval, the negative pictures do not enhance later performance. That’s critical.”

The study revealed no gender differences in participants’ success rates. Finn and Roediger did not measure the effects of physiological parameters such as adrenaline or hormonal responses in connection with the negative arousal.

Importantly, other studies Finn and Roediger are doing thus far show that positive images do not enhance retrieval or retention. For instance, preliminary data on a study of participants who were tested on items that were followed by sexually arousing images show no learning enhancement. While the pictures were arousing, they weren’t linked to enhanced retrieval on the later test.

“Positive content, so far, doesn’t seem to be doing the trick,” Finn says.

The researchers believe that their results mark the first step in understanding the kinds of things that might be beneficial to enhance memory after retrieval.

"We've established that the period after retrieval is key in retaining information," Finn says. "We want to build on that foundation and explore it in depth. We want to see what kinds of manipulations can possibly be introduced in the post-retrieval phase to understand when enhancement or impairment of retention might occur."

Provided by Washington University in St. Louis

Citation: Shock and recall: Negative emotion may enhance memory, study finds (2011, June 20) retrieved 23 April 2024 from
https://medicalxpress.com/news/2011-06-recall-negative-emotion-memory.html

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