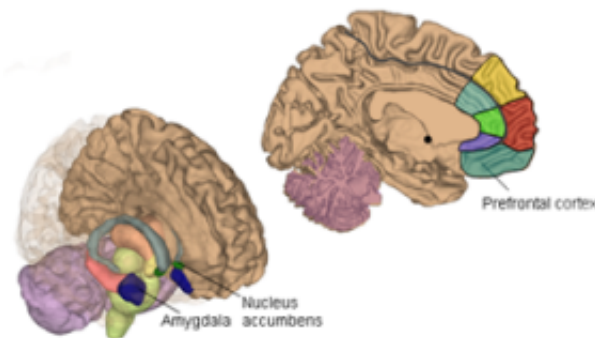


Neuroscientists Identify Brain Regions Responsible for Warding off Negative Emotion

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Negative emotions are regulated by pathways from the prefrontal cortex to the nucleus accumbens and to the amygdala. Image: Professor Tor Wager

(PhysOrg.com) -- A team of cognitive neuroscientists from Columbia University has identified the brain pathways responsible for the body's emotional defense against gruesome and other aversive forms of imagery. The study, published today in the journal *Neuron*, could lead to better understanding of psychological diseases, improve behavioral therapies and spawn new federal policies for hospitals and treatment centers.

"We've known for a long time that certain cognitive strategies are effective in regulating emotions; now we know which regions in the

brain work to make those strategies successful," said Tor Wager, psychology professor and the lead author of the study.

The study showed that negative emotions are regulated through two distinct neurological pathways. The first pathway connects the prefrontal cortex, the brain's emotional command center, to the nucleus accumbens, a region linked primarily to positive emotion; the second connects it to the amygdala, which is linked primarily to negative emotion.

Thirty healthy subjects were recruited into the study, conducted inside an MRI lab at Columbia's Neurological Institute of New York. Participants' brains were monitored while they wore video goggles showing a series of 48 aversive photographs, such as a mutilated human hand and a malnourished child. Participants viewed each image for eight seconds.

Moments before viewing half of the photographs, participants were instructed by a researcher to use cognitive "reinterpretation" techniques that protect the body from adverse visceral reaction. Each subject practiced these techniques during a training session beforehand. If a subject viewed an image of a sick man in a hospital bed, for example, he could prevent a negative reaction by telling himself the bedridden man wasn't sick, but resting. After viewing each photograph, subjects evaluated the intensity of their emotions.

Researchers found that subjects most successful in warding off negative emotions activated the nucleus accumbens and amygdala regions of the brain more than unsuccessful subjects. They hypothesize that the nucleus accumbens is used to suppress the negative emotional response generated by the amygdala.

"Successful participants turned up the former and turned down the latter," said Wager. "The study will lead to greater understanding of

psychiatric disorders, such as schizophrenia, post-traumatic stress disorder and depression. In turn, suffering patients will learn how to better regulate their emotions.

"The study allows us to see why certain therapies work for some and not for others," added Wager, whose previous work explores the way cognitive functions like belief and expectation influence other emotions, as well as pain.

The research team spent more than two years developing the statistical-analysis software able to cull brain-activation information directly from the digitized MRI scans.

The study was conducted by Wager, associate professor of statistics Martin Lindquist, assistant professor of psychology Kevin Ochsner, graduate student Matthew Davidson and research assistant Brent Hughes.

Provided by Columbia University

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