Disgusting videos key to first-ever brain imaging study comparing ways of controlling emotions

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"Control yourself!" Most of us haven't heard that admonition since our last childhood tantrum. Nonetheless, it's something we often tell ourselves, consciously or not, as we deal with life's daily ups and downs. The ability to regulate one's emotions is critical to successfully interacting with others. How we go about achieving that self-control has an equally important effect on our own well-being.

Now, researchers at Stanford have conducted the first-ever brain imaging study that directly contrasts two different techniques for emotion regulation. Functional magnetic resonance imaging (fMRI) was used to observe neural activity in people's brains as they employed each of the two methods in coping with one of the most visceral of human emotions: disgust.

The researchers found that while one method, cognitive reappraisal, reduced the intensity of negative emotions the participants experienced when exposed to videos of disgusting images, the other, expressive suppression, actually increased it.

Philippe Goldin, a Stanford research associate in psychology and the lead author of a paper describing the research in the March 15 issue of *Biological Psychiatry*, said that the value of the findings lies in "knowing what are the different choices that I have in working with my emotions, and what are the different types of impact and outcome, both internally

and interpersonally, for each of these strategies."

"Cognitive reappraisal is similar to one of the skills we teach in cognitive-behavioral therapy," Goldin said. "It's using thinking strategies to modulate emotional reactivity by changing the meaning of something." For example, if you were watching a doctor stitch up a wound in someone's arm, rather than just being horrified by all the blood, you might instead focus on the fact that the patient was being helped and would recover.

The other technique, expressive suppression, does not involve rethinking what you are experiencing. Instead, you simply suppress displaying any outward signs of what you are feeling; you grit your teeth and bear it.

Both reappraisal and suppression are commonly used to regulate emotions in everyday life.

The participants in the study were taught both techniques. During the experiment they would lie down in an MRI scanner, which depicted the neural activity in their brains while they viewed various 15-second video clips on a screen 6 inches from their face. A camera poised next to the video screen recorded their facial expression, capturing their every twitch and grimace. Participants also rated how they felt immediately after viewing each clip.

The researchers played forty 15-second video clips. Ten were of neutral images, such as landscapes and nature scenes, and 30 were "disgust-inducing"—scenes of "surgical procedures, vomiting and animal slaughter," said James Gross, associate professor of psychology and senior author of the paper. "It's pretty awful stuff." But, he emphasized, necessary.

"In order to understand what happens when people control intense

emotions in everyday life," Gross said, "we needed to induce potent emotions in the scanner so that we could see what parts of the brain are activated both by the emotion itself and by the efforts to regulate that emotion."

The vision of a lone patient in a medical laboratory, lying stock still on a table poised in a narrow tunnel through the center of a huge cube of a machine, smooth-sided and whitely sterile, with head held in place as disgusting videos unfold on a screen 6 inches from her eyeballs, may seem a little reminiscent of the reprogramming scenes in A Clockwork Orange. But the researchers actually took great care to avoid traumatizing anyone.

They screened their test subjects to keep the pool to those who would not be overwhelmed by the disgusting imagery (and excluded those who claimed they would be emotionally unmoved by it). Participants were free to exit the study at any time.

During each run, an instruction would briefly appear on the monitor prior to each video, telling the volunteers whether to rethink the meaning of what they were seeing; to suppress their facial expression but not their feelings; or to react naturally.

The fMRI images revealed that regardless of the strategy employed, two areas of the brain that are associated with emotional reactivity—the amygdala and the insula—lit up. But the degree of neural activity in each of the two regions, and the timing of it, were markedly different depending on whether cognitive reappraisal or expressive suppression was used.

By the end of each 15-second video, cognitive reappraisal, the reinterpretation strategy, led to reduced negative emotion as measured by subjects' facial expressions, by fMRI images of neural excitation and

by the participants' self-report of how they felt. The technique affected the participants' feelings relatively quickly.

Cognitive reappraisal "comes on early and then you kind of ride the wave of having implemented that strategy," Goldin said.

That was not the case with facial expression suppression.

"Keeping your face still while watching these disgusting film clips actually resulted in an increase in neural activity in the amygdala and insula," Goldin said. "During the 15-second film clip, the emotional reactivity is increasing and billowing while you're watching the film clip, and the time when it becomes hardest to implement the 'keep your face still' instruction, the suppression, is at the end of each clip when the emotional intensity is really increasing."

In short, only reappraisal was effective at decreasing subjects' physiological responses, and suppression actually led to increased stress levels.

"These two forms of regulation work quite differently," Gross said. "Early forms of regulation, such as reappraisal, effectively shut down the emotion at relatively little cost." As for suppression, he said, "Although you can look cool as a cucumber, you actually get physiologically even more activated than you would have been if you had just let the emotion play itself out."

Both Gross and Goldin emphasized that although rethinking the meaning of something is a better strategy in many situations, it is not always best.

"If a person is in an abusive relationship and uses reappraisal to justify the behavior of the person who is hurting him or her, that could lead them to stay in that dangerous situation far too long," Gross said.

"Similarly, suppression is often crucial in, for example, an interaction with an angry superior or boss at work. One simply doesn't have time to think or reappraise the situation differently and so one might, for the good of one's job, in that moment, choose to suppress so that the boss doesn't see what you really think of him or her."

For this study, all the participants were women, because, as Goldin said, "In general women tend to demonstrate greater emotional reactivity compared to men." But future work will include both women and men as participants, he said.

This most recent study is part of an ongoing effort by Gross's lab to develop a better understanding—and eventually better therapies—for a host of disorders that involve poor control of emotion, from social anxiety to post-traumatic stress disorder.

Source: Stanford University

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