

Study shows how using mental strategies can alter the brain's reward circuitry

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The cognitive strategies humans use to regulate emotions can determine both neurological and physiological responses to potential rewards, a team of New York University and Rutgers University neuroscientists has discovered. The findings, reported in the most recent issue of the journal *Nature Neuroscience*, shed light on how the regulation of emotions may influence decision making.

Previous research has demonstrated these strategies can alter responses to negative events. However, less understood is whether such strategies can also efficiently regulate expectations of a future reward or a desired outcome. Scientists have already determined that the expectation of a potential reward brings about positive feelings and aids recognizing environmental cues that predict future rewards. Central to this process is the role of the striatum, a multi-faceted structure in the brain that is involved in reward processing—and which is especially engaged when potential rewards are predicted or anticipated.

However, the striatum signal is not always beneficial. Its activity also correlates with drug-specific cravings, most likely increasing urges to partake in risk-seeking behavior in the pursuit of rewards that are detrimental. Therefore, understanding how to regulate or control the positive feelings associated with reward expectation is an important line of inquiry.

The NYU study was conducted by a team of researchers from the laboratory of NYU Professor Elizabeth Phelps, who co-authored the work with Mauricio R. Delgado, now a professor at Rutgers University, and M. Meredith Gillis, an NYU graduate student. They sought to better understand the influence of emotional regulation strategies on the physiological and neural processes relevant to expectations of reward.

The study's subjects were presented with two

conditioned stimuli, a blue and a yellow square that either predicted or did not predict a potential monetary reward. Prior to each trial, participants were also given a written cue that instructed them to either respond to the stimulus ("think of the meaning of the blue square, such as a potential reward") or regulate their emotional response to the stimulus ("think of something blue in nature that calms you down, such as the ocean").

Skin conductance responses (SCRs) of the participants were taken at the beginning of each conditioned stimulus. These served as a behavioral measure of physiological reaction potentially related to reward anticipation.

The results showed that the participants' emotion regulation strategies could influence physiological and neural responses relevant to the expectation of reward. Specifically, results from the SCRs revealed that the subjects' emotion regulation strategies decreased arousal that was linked to the anticipation of a potential reward.

"Our findings demonstrated that emotion regulation strategies can successfully curb physiological and neural responses associated with the expectation of reward," said Delgado. "This is a first step to understanding how our thoughts may effectively control positive emotions and eventual urges that may arise, such as drug cravings."

Source: New York University

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