

Desire and dread: Brain's computer has separate keyboard to control powerful emotions

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(PhysOrg.com) -- Controlling powerful emotional reactions is often difficult because the brain's computer has a separate "keyboard" that controls feelings within extreme emotions like desire and dread, according to University of Michigan psychologists.

A new study by U-M researchers Kent Berridge, Jocelyn Richard and Alexis Faure (now at the University of Paris-Sud in France) found that a "surprising limitation of top-down signals to penetrate emotion may restrict the voluntary efforts by people to effectively regulate their emotions."

Appearing in the scientific and biomedical research journal [PloS One](#), the research built on previous work by Berridge showing that the chemical dopamine (commonly known to motivate animals and people to seek rewards) cooperates with the chemical glutamate to induce both desire and dread in adjacent regions of the brain. That work broke new ground by showing how dopamine can be involved in negative feelings such as fear in schizophrenia and other phobias, when it also is involved in [drug addiction](#), which involves excessive desire.

The current study compares the generation of desire and dread in the nucleus accumbens by such glutamate signals (which come mostly from the cortex) to the generation of the same emotions by different GABA [chemical signals](#) (which come mostly from deep subcortical brain

structures). GABA is the chief inhibitory neurotransmitter in the [central nervous system](#).

Berridge and colleagues in their newest work show that the highest levels of the brain's cortex have only limited abilities to influence pleasure, compared to the deeper levels. Only the deep GABA signals were able to create a pleasure during generation of the desire or to create displeasure during the generation of the fear.

"This might help explain why some intense or pathological emotions are difficult to control," said Berridge, the James Olds Collegiate Professor of Psychology and Neuroscience. "Deeper levels of the brain generate pleasures and displeasure in a way that seems resistant to influence by higher levels. The subcortical pleasure generators resist even when the higher levels are having success at regulating the expression of desire or fear."

The U-M team tapped the brain's "emotional keyboard" using painless microinjections of drugs in rats that disrupted either fast glutamate from the cortex or GABA signals from deeper levels. The drug "taps" caused intense emotions, including hunger-like desire in front locations in the nucleus accumbens or fear in back locations. The GABA drug taps also caused sensations to become more pleasant during desire and to become unpleasant during fear, but the glutamate drug taps did not.

"We conclude that the nucleus accumbens contains two functional affective keyboards for amino-acid signals: a motivation-generating keyboard and a hedonic-generating keyboard," Berridge said. "Both are organized along gradients but they impact different aspects of emotion."

Provided by University of Michigan

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