

Impulsiveness linked to activity in brain's reward center

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A new imaging study shows that our brains react with varying sensitivity to reward and suggests that people most susceptible to impulse -- those who need to buy it, eat it, or have it, *now* -- show the greatest activity in a reward center of the brain. The study appears in the December 20 issue of *The Journal of Neuroscience*.

In their study of 45 subjects, Ahmad Hariri, PhD, and colleagues at the University of Pittsburgh and collaborators at Mount Sinai School of Medicine and the University of Chicago showed that activity in the ventral striatum, a core component of the brain's reward circuitry, correlated with individuals' impulsiveness.

"These data are exciting because they begin to unravel individual differences in brain organization underlying differences in complex psychological constructs, such as 'impulsivity,' which may contribute to the propensity to addiction," says Terry E. Robinson, PhD, of the University of Michigan biopsychology program.

The Hariri team tested the subjects on two computer-based tasks. First, participants indicated their preferences in a series of immediate-versus-delayed, hypothetical monetary rewards. They chose between receiving an amount from 10 cents to \$105 that day and receiving \$100 at one of seven points up to five years in the future. "Switch points"—the value at which they were equally likely to choose getting money today as getting \$100 at a future point in time—were calculated for each person.

Seven months later, subjects were told they could win money if they correctly guessed numbers on a series of cards while scientists used blood oxygenation-level dependent (BOLD) functional magnetic resonance imaging (fMRI) to measure brain activity in response to correct and incorrect guesses. These images reflected participants' reactions to positive and negative "reward" feedback. After matching images to the subjects' switch points on the index of impulsiveness, the researchers looked for patterns.

Individuals indicating the strongest preference for immediate over delayed rewards showed the most ventral striatum activity associated with positive and negative feedback for a monetary reward.

"Our findings suggest that the ventral striatum plays a key role in striking a balance between gratification and delay, impulsive action and prudent choice, that can have far-reaching implications for our current and future well-being," says Hariri.

The team aims to examine the role of specific factors that drive the sensitivity of the ventral striatum next. One target of future research will be genes that regulate levels of the neurotransmitter dopamine and how they vary among individuals, Hariri says.

Source: Society for Neuroscience

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