

## Graphic Evidence

### SHOULD I OR SHOULDN'T I?

"Go ahead, do it. It'll feel good."

"Stop—remember what happened last time, and all the other times."

The contending parties in the perennial debate between temptation and willpower are two brain systems, according to a theory put forward by Dr. Antoine Bechara of the University of Southern California. Dr. Bechara suggests that, whether the lure is an attractive sex object, a luxury, or heroin, the internal struggle is resolved when either the "impulsive" system (in red) or the "reflective" system (in blue) prevails.

A pivotal structure in the impulsive system is the amygdala (A). The amygdala recognizes environmental features that are potential sources of pleasure or satisfaction of needs and triggers excitatory responses in other brain areas. These responses favor feelings of desire, anticipation, muscular tension, and urges to act.

A key structure in the reflective system is the ventromedial prefrontal cortex (VMPC). The VMPC interprets the same environmental features as the amygdala, but it does so with input from brain structures that store recollected or imagined associations from past experience. The VMPC, like the amygdala, triggers responses in the striatum (S)—but, to the degree that the associative input is negative, its signals are inhibitory.

The signals from the amygdala and the VMPC converge in the striatum, a structure whose functions include translating motivation into bodily action. The decision hangs in the balance while feedback loops adjust the strengths of the conflicting signals. Ultimately, one overwhelms the other. We act, if the impulsive system dominates, or abstain, if the reflective system's restraining signals win out.

Dr. Bechara has marshaled evidence from psychological and brain imaging studies to indicate that addicted individuals' reflective systems perform relatively weakly. Dr. Bechara suggests that some individuals have innately weak reflective systems that heighten their susceptibility to drug abuse and addiction. Whether or not a person's reflective system is weak to begin with, chronic exposure to addictive drugs has been shown to degrade signaling in the VMPC.

Source: Bechara, A., 2007. Decision-making, impulse control and loss of willpower to resist drugs: A neurocognitive perspective. *Nature Neuroscience* 8(11):1458-1463.

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