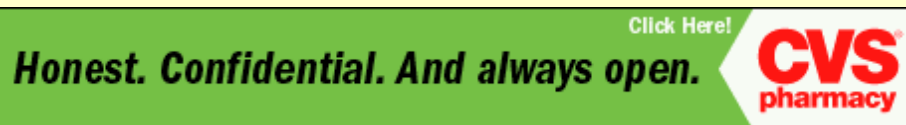




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What Do We Want? Rewards! When Do We Want 'Em? Now!

Instant Gratification, Addictive Behaviors May Lie in Specific Brain Area

By [Neil Osterweil](#)

WebMD Medical News

May 25, 2001 -- Good things may come to those who wait, but people who act impulsively simply can't wait for their rewards, and settle for whatever they can get NOW. A new study suggests that impulsive behavior -- a feature of addictions, attention-deficit hyperactivity disorder, and some personality disorders, may be caused by a brain defect.

In the study, reported in the May 25 issue of the journal *Science*, rats trained to understand that they can have one sugar pellet now or four later soon catch on to the idea that waiting can bring sweet rewards.

But when the same rats have damage to an area of the brain called the nucleus accumbens, they appear to lose their ability to make wise choices and always go for the quick and easy fix, something like look-before-you-leap behavior, report Rudolf Cardinal, PhD, and colleagues in the department of experimental psychology at the University of Cambridge, England.

A naturally-occurring substance called dopamine may help explain this phenomenon. Dopamine is one of the chemicals that allow communication between nerves in the brain. It is also known to be involved in the sensation of reward we experience from something we enjoy. Cardinal tells WebMD it's been known for a long time that natural rewards, like food and sex, as well as artificial ones, like nicotine and cocaine, act on dopamine to activate the nucleus accumbens.

The conclusion that the nucleus accumbens is at the center of our reward system is bolstered by a second study published in the May issue of the journal *Neuron*. In it, researchers report that the regions of the brain -- including the nucleus accumbens -- that become activated in the anticipation and experience of winning at gambling, in a sense another type of addictive, impulsive behavior, are the same regions that appear to respond in cocaine addicts.

Hans Breiter, PhD, co-director of the Motivation and Emotion Neuroscience Center in the department of radiology at Massachusetts General Hospital, and colleagues used a high-power, real-time brain imager to look at brain activity in 12 men taking part in a computer-controlled game of chance.

The subjects were given a \$50 stake and were told that they could lose some or all of it, keep it, or increase it. The volunteers were first shown how much they could win by watching where the spinner landed on a wheel-of-fortune; this part of the test was called the expectancy phase. In the second or "outcome" phase, participants found whether they had actually lost or won.



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The researchers found that as the prospect of winning more money increased, so did activity in the parts of the brain previously seen to respond to other types of rewards, such as drugs. The level of activity in the nucleus accumbens and two other nearby regions grew as the potential jackpot increased in the expectancy phase, and similar changes were seen during the outcome phase.


A researcher who has studied the genetics of addictive behaviors tells WebMD that certain people have genetic abnormalities in their reward systems. The nucleus accumbens, he says, sits at the center of the reward system when it's stimulated by gambling. Defects in this system, "can lead not only to potential problems with addictive behaviors but with impulsivity in general," like that which occurs in attention-deficit hyperactivity disorder, says David Comings, MD, director of medical genetics at City of Hope Medical Center in Duarte, Calif.

Comings points out that the drug Zyban, which is sometimes prescribed to help people quit smoking, is an antidepressant that acts on dopamine in the brain, and that Ritalin, widely prescribed for children with ADHD, also acts to normalize dopamine levels. These observations are suggestive of an underlying defect common to addiction, ADHD and other forms of impulsive behavior.

Medically Reviewed

By [Dr. Jacqueline Brooks, MBBCH, MRCPsych](#)

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