Predicting Addiction

By Tina Adler for MSN Health & Fitness
Brain & Body

These days, it seems everyone from our parents to our presidents have a confession related to "experimentation" with drugs. But relatively few people who try drugs—only about 1 in 7, according to national surveys—actually become addicted. Thanks to new imaging devices and sophisticated computer tests, scientists hope to have techniques within the next few years that will help individuals determine if they are at high risk of addiction, or of relapse if they are trying to quit.

"Some people progress to dependence and addiction, and some people can exercise controlled drug use, which we generally don't talk about very much," said neuroscientist Steven Grant of the National Institute on Drug Abuse (NIDA). "There is a whole hidden strata of people who do not progress to addiction even with illicit drugs."

"People differ in how quickly and how irreversibly drugs become a habit versus just something that gives them pleasure," agrees Martin Paulus, a psychiatrist at the University of California.

A person's risk of addiction increases with the frequency of use. The greater the quantity, the faster the ride to dependence. But why do some people stop using before addiction sets in, or use drugs only occasionally?

A person's home and community life contribute, but studies show that an individual's genetic makeup accounts for 40 percent to 60 percent of his or her vulnerability to addiction. So researchers are taking a close look at brain activity, to see how genetic differences may be playing out.

How badly do you want it?

NIDA defines addiction as "compulsive drug seeking and use, despite harmful consequences." What's driving that compulsion is a powerful craving for the drug, yet people differ greatly in the strength of their cravings, says Grant.

"Nobody has quite figured out what these individual differences are due to ... it has always been a mystery," he says. "But we are beginning to get some clues."

One of those clues comes from studies on the effects of varying levels in the brain of dopamine, the brain's bearer of good feelings. Dopamine, along with the many neurons and receptors that enable it to strut around the brain, reward us with sensational sensations, such as for experiencing good sex and eating good food. But give the brain drugs, and eventually they hijack this vulnerable reward system.

Imaging the differences

Neuroscientist Teri Franklin and her colleagues used an imaging technique to watch how the reward centers of 19 smokers, who want to quit but haven't yet, responded to two brief movies. One featured people talking and looking happy, and the other showed smokers talking about and smoking cigarettes.

The smoking movie is so seductive it even "makes people who don't smoke want a cigarette," said Franklin, of the Addiction Treatment Research Center at the University of Pennsylvania.

Franklin screened all of the study participants for genetic variations that may influence their levels of dopamine in the brain. About half of the 19 smokers had a common genetic variation that may cause the dopamine that is released in response to cues—such as a movie of someone smoking—to linger longer in certain regions of the brain. Their brains reacted strongly to the movie, showing a lot of activity in the reward-related regions. However, how the smokers ranked the intensity of their cravings didn't match up with what was going on in their brain, the team reported in the online version of Neuropsychopharmacology in August.

Franklin thinks that this group of study participants' brains may respond very actively to a lot of different types of tempting cues. But because they aren't aware of how their brain is "feeling," and therefore don't know to avoid such cues, "they have a greater risk—vulnerability—to get addicted," Franklin said. However, these are preliminary findings that need to be further investigated, she noted.

In the other study participants, the smoking movie triggered less brain activity, compared to the movie of people just talking. However, their ratings of their cravings while watching the movie matched up with how their brain reacted, said Franklin. These individuals may be less vulnerable to relapse, for example, when they actually do quit smoking.

Monitoring the mini-movements of the addiction-prone mind

Researchers are also looking for the weak spots in brain functioning that may predispose people
to addiction. Paulus' team asked 24 college students to play a computer game that required them to change their strategies throughout the game to keep winning. Half of the group had occasionally used stimulants (without a prescription), but they were not on drugs at the time of the test.

As a group, the study participants who had tried stimulants did worse on the test compared to those who had never used them, Paulus and his colleagues reported this year in *Biological Psychiatry*. In the real world, this lack of mental flexibility may show up as an inability to stop using drugs in the face of negative outcomes, such as not enjoying the high, going broke, losing friends, or other stressors, Paulus asserts.

Imagine a computer game in which you have to click on a red color every time you see the word "red." Then the rules change and you have to click on the word "green" instead. Scientists use such games to test how well people can control or inhibit their actions. For some individuals, including those with Attention Deficit Disorder, it's very difficult indeed, and this deficit may lead to a vulnerability to drug dependence.

In a new, unpublished study of 170 college students, Paulus' team found that students who became drug dependent (despite the researchers' efforts to educate them on the dangers of drug use) had a really hard time at this task even before they became addicts. They could do it, but their brains had to work a lot harder at it, compared with students who didn't become dependent.

While many students may initially use drugs to help them perform better on tests, those whose brains are working the hardest are the most motivated to keep using the drugs, Paulus says.

Paulus hopes that their research tools will eventually find their way to the general public. "If we can give individuals a quantitative tool that says, 'This is the situation—this puts you at risk—now you can make a more informed decision,' I think we've done a great service to the person."

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**About Tina Adler**

Health and science writer Tina Adler recently coauthored the Alzheimer's Action Plan, a book for families and friends of people with Alzheimer's disease. She writes for magazines and Web sites, reporting on health, including environmental health issues, and behavior. Places she has published include *Environmental Health Perspectives, Additude magazine, The Washington Post* and *National Geographic World*. Before becoming a freelancer, she was a staff writer at *Science News* magazine, where she covered animal behavior, biology and ecology. She lives outside Washington, D.C.

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