

If you make impulsive choices you should blame your parents—it's genetic

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"Would you rather have \$20 now, or can I mail you \$40 in a few weeks?" Research led by Andrey Anokhin, Ph.D., indicates that some people prefer immediate rewards to bigger rewards later. Anokhin's lab has identified genes that appear to be involved in that preference for immediate rewards. Credit: Robert Boston

Opting for smaller rewards immediately instead of waiting for bigger payoffs later is associated with problems such as impulsivity and addiction to food, drugs and alcohol. Now, new research indicates that such decision-making tendencies have a genetic link to brain pathways that underlie these disorders.

The researchers, at Washington University School of Medicine in St. Louis, report their findings Tuesday, Dec. 8, at the annual meeting of the American College of Neuropsychopharmacology, in Hollywood, Fla.

Studying adolescent twins, the researchers found that genes linked to the brain's serotonin and kappa opioid receptors—neuronal receptors associated with mood, depression and addiction—also play a role in whether a person will choose an immediate reward over a more sizeable payoff later. The scientists also learned that adolescents become slightly more likely to accept delayed rewards as they age but that those who prefer immediate rewards tend to continue choosing quick payoffs.

"Every day we make decisions about obtaining immediate gains, which come at the cost of delayed but larger advantages," said principal investigator Andrey Anokhin, PhD, associate professor of psychiatry. "We found that many such decisions are explained by genetic factors that also are related to mood and impulsivity."

Anokhin's team studied 310 adolescent identical or fraternal twin pairs and asked them questions about money. At 12 years of age, and again at age 14, they were given the choice of receiving \$7 immediately or \$10 in the mail two weeks later. At age 12, 35 percent decided to take \$7 right away instead of more money later. That number fell to 27.5 percent when the same kids were presented the scenario at age 14.

In subsequent experiments at ages 16, 18 and 20, the same subjects were offered hypothetical monetary rewards, \$80 now or \$100 six months from now, for example.

"We vary the amount of the reward available immediately, the amount of the delayed reward and the time they would have to wait," Anokhin said. "If you offer someone the choice between \$95 today or \$100 in six months, most people would rather have the cash immediately. But what

if the choice is between \$85 today or \$100 in three months? At that point, some people prefer delaying the reward to make an extra \$15."

Because the adolescent study subjects were twins, the researchers were able to use mathematical formulas to analyze the impact of genetic factors on their decisions. The scientists looked at several genes previously linked to impulsivity and substance use.

First, they found that serotonin genes were involved. But a closer look indicated that genes related to kappa opioid receptors on brain cells appeared to be even more crucial in making these decisions, Anokhin explained.

"The top three genes we've identified so far are linked to those receptors," he said.

Serotonin genes and kappa opioid receptor genes are connected to mood. In animal studies, both types of receptors have been linked to behaviors associated with depression and addiction, and Anokhin said the new research indicates they also appear linked to whether a person chooses immediate over delayed rewards.

When an individual doesn't want to wait for a larger reward, that could be an indication that the person is impulsive, Anokhin said. Impulsivity increases the risk for problems such as alcoholism, drug addiction and obesity.

As twins in the study have aged, Anokhin and his colleagues have begun looking for possible connections between this sort of decision-making and binge drinking, drug use and nicotine dependence.

"We need to look more closely before drawing conclusions, but we want to see what the consequences of the differences we've identified are for

real-life behaviors," he said.

More information: Anokhin A., et al. Genetics of delay discounting in humans: Heritability and preliminary evidence for genetic association. American College of Neuropsychopharmacology, abstract presented Dec. 8, 2015.

Provided by Washington University School of Medicine

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