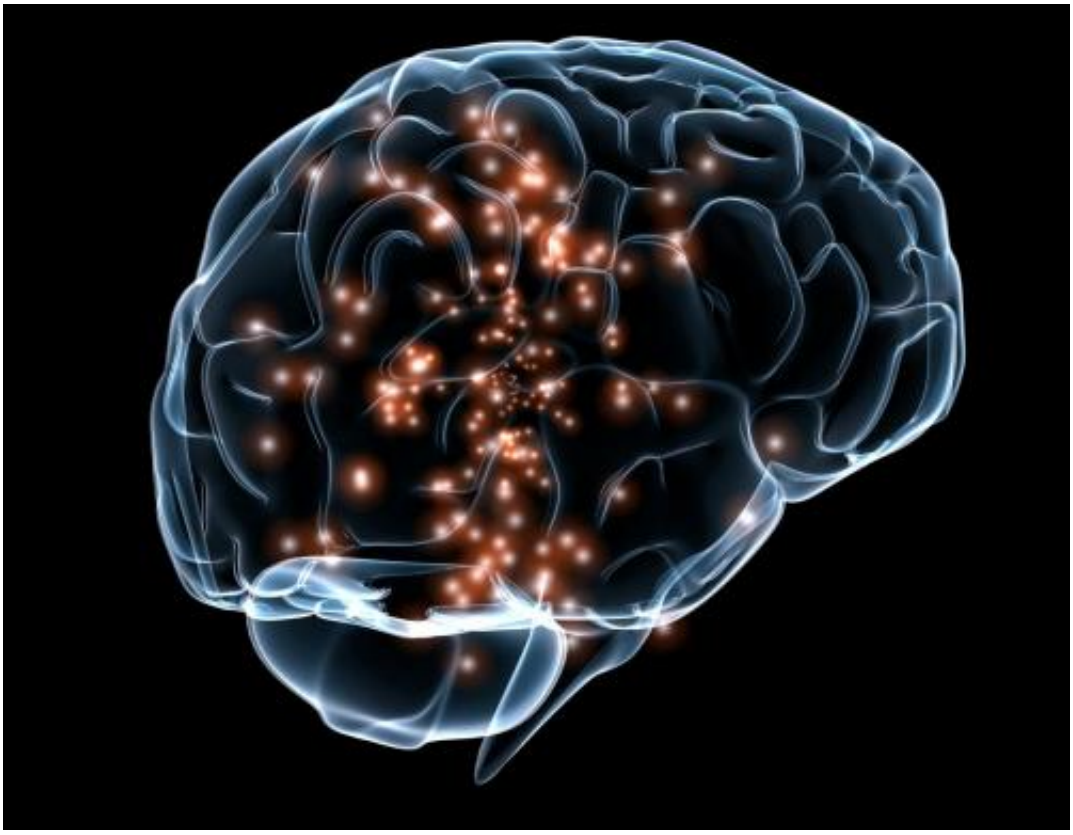
Why does the teen brain value reward over risk?

June 30 2015, by Joe Miksch



Credit: Wikimedia Commons

Why does the promise of a reward—basically any kind of fun—cause teens to hurl caution into the wind?

Contemporary scientific theory suggests that teenagers are risk takers

because they crave the feel-good rush of dopamine, a neurotransmitter that helps control the brain's reward and pleasure centers. That theory, however, has been based on a long line of studies on the adult brain.

The University of Pittsburgh's Bita Moghaddam and her research group have taken a look at the teen brain—the teen rat's brain, specifically—and found that scientists' presumptions may be off base.

"The adolescent brain doesn't work the way we think it does," she says. "We have a set of predictions about it that keep proving to be wrong, that they seek pleasure because dopamine is more active. This study shows that may not be the case."

Moghaddam, professor of neuroscience in Pitt's Kenneth P. Dietrich School of Arts and Sciences, recently published a paper in the journal *Biological Psychiatry* showing that when adolescents are faced with the prospect of a reward, their dopamine neurons are actually activated less than in adults.

This may seem counterintuitive, but, to Moghaddam, it makes perfect sense. The study shows that adult rats get a small dopamine rush from simply anticipating a reward, while adolescent rats don't get the same level of dopamine-based satisfaction. In humans, this is reflected in teenagers needing to do something, even a risky something, to get that dopamine rush. Anticipation isn't enough for teens.

"The study also shows that preactivation [of the dopamine neurons]—pausing for a millisecond or two before doing something—is missing in the adolescents," Moghaddam adds. "So they actually go into action and start seeking reward without that sort of pause that the adult brain may have."

Moghaddam's study also sheds some light on why adolescents seem

prone to doing the same thing again and again even if it ends badly every time.

"When adults learn that there will be no reward, their dopamine cells stop responding. But adolescent dopamine cells retain memories of past rewards," she says.

Evolutionarily speaking, this may have been a useful survival trait. "At that age, 'This did something good, and maybe it will again,' is very important," Moghaddam says. "Those years were very critical for [ancient] humans, an important time to secure food and to find a mate, to be proactive. 'Maybe I can go back to find food where I found it once even though it wasn't there the last time.' That memory is there and helps motivate a person to look for a reward where they found it before." But that property of adolescents' brains can also make them vulnerable to drug seeking and disadvantageous risk taking, Moghaddam says.

More information: "Reward Anticipation Is Encoded Differently by Adolescent Ventral Tegmental Area Neurons." DOI: dx.doi.org/10.1016/j.biopsych.2015.04.026

Provided by University of Pittsburgh