Medical Xpress

Researchers show risk-averse teens sway peers to make safer choices

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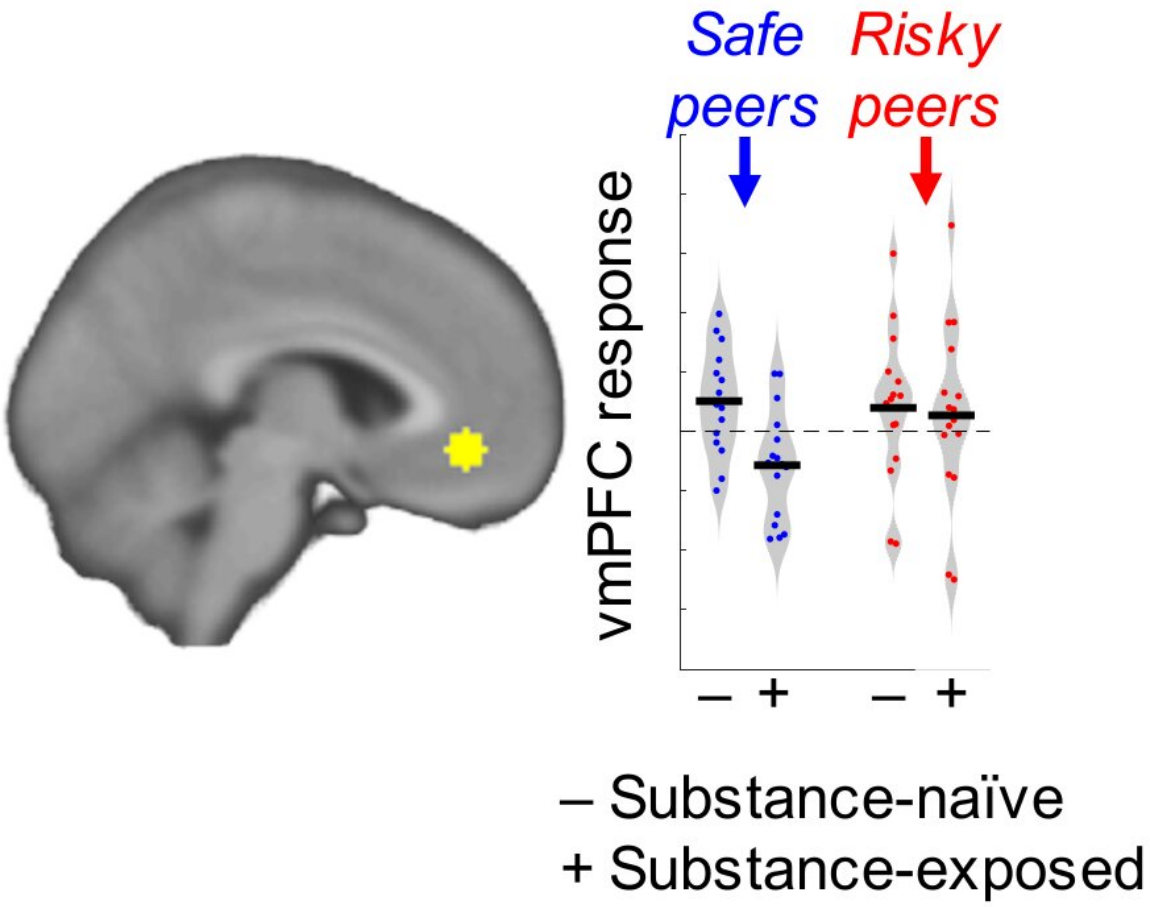

Pearl Chiu and Brooks King-Casas, both associate professors at the Fralin Biomedical Research Institute, combined brain scans and computational modeling to understand how social peers sway decision-making in teenagers. They examined neural activity in the ventromedial prefrontal cortex and found a notable difference between how substance-naïve and substance-exposed teens

responded to safe and risky peers' choices. Teens who had not used illicit substances showed significantly more activity in the ventromedial prefrontal cortex, particularly when they viewed their peers' safe choices, which indicates a greater social reward signal. Credit: Virginia Tech

Your high school friends may have had a bigger influence on your behavior than you once thought.

Prior studies about peer pressure have focused on why adolescents are likely to experiment along with friends who use drugs and alcohol. But do friends who avoid risks have similar influential power? Could observing a peer making a safe choice encourage someone to follow their lead?

In a new study published today in the *Proceedings of the National Academy of Sciences*, Virginia Tech neuroscientists at the Fralin Biomedical Research Institute at VTC show that observing peers making sound decisions may help young people play it safe. The discovery may one day inform measures to help teens make healthy decisions.

"This finding was surprising, because we were expecting to understand brain mechanisms of negative peer pressure. What we found in the brain and behavioral data is that positive social peers are even more important," said Pearl Chiu, an associate professor with the Fralin Biomedical Research Institute and the Department of Psychology in Virginia Tech's College of Science. "Watching social peers making safe choices—positive peer pressure—may lead some teens to make safer choices than they would otherwise."

Risky decision-making in adolescence can have long-term consequences. Research has shown that teens who start using substances are more likely

to develop a substance use disorder later in life, according to the Centers for Disease Control and Prevention.

"Our hope is that this work will help explain decision-making processes underlying risky decisions during this critical period of brain development and habit-forming in adolescence. More long term, this might help researchers develop effective interventions to prevent substance use disorders," said Brooks King-Casas, an associate professor with the Fralin Biomedical Research Institute and the Department of Psychology in Virginia Tech's College of Science.

The research team, led by Chiu and King-Casas, recruited 91 adolescent research participants for the study. The teens fell into two categories: substance-naïve adolescents who had never tried illicit substances, and teens who reported that they had consumed alcohol, marijuana, or tobacco before.

The volunteers, who were strangers before the study, met each other briefly before participating in a decision-making game while the scientists monitored their brain activity using functional magnetic resonance imaging (fMRI) machines. These scanners use powerful magnets to detect blood oxygen levels—an indirect measure of neural activity that helps the researchers see which brain regions are engaged during decision-making tasks.

While in the scanners, the teens were presented with a decision-making game that required choosing between a series of safer and riskier options. For example, they could pick option A, which guaranteed earnings of about $25, or option B, which touted a slim chance of paying $55, but most often produced earnings of just $1.

The teens made these gambling choices on their own and also after seeing what their peers picked. Meanwhile, the research team recorded

the decisions and later used computational modeling to identify which brain regions were most active. Teens were paid based on the outcome of one of their choices.

Some of the research findings weren't a surprise to Chiu and King-Casas. For example, the teens who had tried illicit substances were overall more likely to pick the riskier option, and their choices didn't waver much when they saw what their peers picked.

Yet teens who had never tried illicit substances were more likely to follow their safe peers' choices, and therefore also made safer choices for themselves.

The substance-naïve group's scans also revealed significantly more activity in a brain region responsible for encoding social rewards: the ventromedial prefrontal cortex. Located just behind the eyebrows and spanning roughly one cubic centimeter, this brain region plays a role in determining whether we will conform to others' choices or ignore them, according to the research team's 2015 study in *Nature Neuroscience*.

"Our results suggest that information from safer peers is processed in the brain like a reward. The reward signal might guide teens toward making the same choices as their safer social peers," said King-Casas.

During adolescence, the brain's reward structures swiftly develop. Yet the prefrontal cortex—a brain region responsible for executive functioning that helps reign in risky impulses—does not completely mature until roughly age 25.

"When there is a rapid change in brain development, even a slight interruption can induce a big change," said Dongil Chung, the study's co-first author and an assistant professor in the Department of Biomedical Engineering at the Ulsan National Institute of Science and Technology in

South Korea. Chung previously worked as a postdoctoral researcher at the Fralin Biomedical Research Institute and was mentored by Chiu and King-Casas during the study.

Building on their previous work from 2015, the research team revealed that the availability of social information alone does not guarantee conformity.

"The individuals who value or care more about the value of social information are the ones who will be swayed to conform," said Chung.

Among the research collaborators is Mark Orloff, the study's co-first author and a graduate student in Virginia Tech's Translational Biology, Medicine, and Health Graduate Program, who is mentored by Chiu. Orloff, who previously studied psychology, chose this topic for his doctoral dissertation because it links the neuroscientific study of decision-making processes and health behaviors.

"By using computational modeling, we can start to understand why decisions are being made," Orloff said. "This technique allows us to tease apart the different underlying mechanisms of adolescent decision-making and isolate the contribution of safe social influence."

Nina Lauharatanahirun, an assistant professor of biobehavioral health at PennState, also contributed to the study while she was a Virginia Tech graduate student being mentored by King-Casas.

Chiu and King-Casas intend to launch a study that follows a group of adolescents over a period of three to five years.

"One next step will be to follow adolescents over time and identify better models of how brain responses to safer and riskier social peers change. These developmental trajectories might further explain how peer

pressure can be both protective and disruptive," Chiu said.

More information: Dongil Chung el al., "Valuation of peers' safe choices is associated with substance-naïveté in adolescents," *PNAS* (2020). www.pnas.org/cgi/doi/10.1073/pnas.1919111117

Provided by Virginia Tech