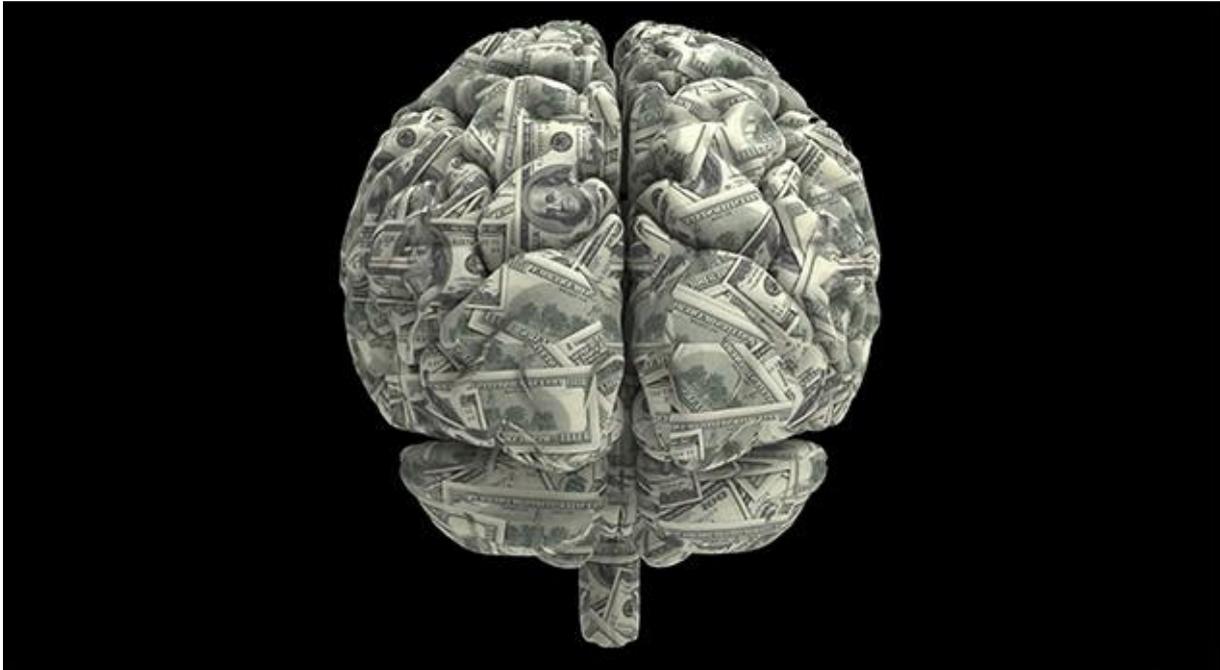


## Study finds truth and lies decided by areas of prefrontal cortex



A team of scientists from the Virginia Tech Carilion Research Institute and the University of California at Berkeley used advanced imaging techniques to study how the brain makes choices about honesty.

What's the price on your integrity? Tell the truth; everyone has a tipping point. We all want to be honest, but at some point, we'll lie if the benefit is great enough. Now, scientists have confirmed the area of the brain in which we make that decision.

The result was published online this week in [Nature Neuroscience](#).

“We prefer to be honest, even if lying is beneficial,” said Lusha Zhu, the study's lead author and a postdoctoral associate at the Virginia Tech Carilion Research Institute, where she works with Brooks King-Casas and Pearl Chiu, who are assistant professors at the institute and with Virginia Tech's Department of Psychology. “How does the brain make the choice to be honest, even when there is a significant cost to being honest?”

Previous studies have shown that brain areas behind the forehead, called the dorsolateral prefrontal cortex and orbitofrontal cortex, become more active during functional brain scanning when a participant is told to lie or to be honest.

But there's no way to know if those parts of the brain are engaged because an individual is lying or because he or she prefers to be honest, King-Casas said.

This time, researchers asked a different question.

“We asked whether there's a switch in the brain that controls the cost and benefit tradeoff between honesty and self-interest,” Chiu said. “The answer to this question will help shed light on the nature of honesty and human preferences.”

Researchers compared the decisions of healthy participants with decisions made by participants with damaged dorsolateral prefrontal cortices or orbitofrontal cortices.

The team, including scientists from the Virginia Tech Carilion Research Institute and the University of California at Berkeley, had volunteers decide between honesty and self-interest in an economic “signaling game,” which has been extensively studied in behavioral economics, game theory, and evolutionary biology.

In one game, the researchers presented participants with an option that gave them more money at a cost to an anonymous opponent, and an option that gave the opponent more money at a cost to the participant. Unsurprisingly, participants chose the option that filled their own pockets.

In a different game, the researchers presented participants with the same options and but asked the participants to send a message to their opponents, recommending one option over the other. The participants either lie and reap the reward, or tell the truth and suffer a loss.

“The average person usually shows lie aversion,” Zhu said. “If they don’t need to send a message, they prefer the option that gives them more money. If they do need to send a message, they’re more likely to send a message that will benefit the other person even at a loss to themselves. They want to be honest, at the cost of their own wallet.”

Participants with damage in the dorsolateral prefrontal cortex were not as averse to lying as the two comparison groups. They were more likely to pick the practical option and were less concerned about the potential cost to self-image.

In the game where no message was required, however, participants with dorsolateral prefrontal cortex damage showed the same pattern of decision-making as the comparison groups, suggesting that for each group, the baseline tendency to give to others is the same.

“These results suggest that the dorsolateral prefrontal cortex, a brain region known to be critically involved in cognitive control, may play a causal role in enabling honest behavior,” Chiu said.

“People feel good when they’re honest and they feel bad when they lie,” King-Casas said. “Self-interest and self-image are both powerful factors influencing a person’s decision to be honest.”

Previous studies, according to King-Casas, were unable to control for an important distinction.

“In past studies, participants are typically instructed by the experimenter to lie or be honest. There’s no consequence for lying; the subject is just complying,” said King-Casas. “One of the real strengths of our study is that we’re able to see how a person’s tradeoffs change when we add in responsibility.”

Another strength is the measurable tradeoff – when will an honest person decide the benefit is worth the lie?

“We manipulated the costs and benefits of honesty to quantify the tipping point for each person,” said Chiu. “We picked tough dilemmas where, for example, telling a lie might harm the other player one cent, whereas being honest will cost you \$20. And you might decide that being seen as an honest person is worth more than \$20, so you won’t lie even though it costs you, or you might decide that one cent of harm isn’t so bad.”

The study sheds light on the neuroscientific basis and broader nature of honesty. Moral philosophers and cognitive psychologists have had longstanding, contrasting hypotheses about the mechanisms governing the tradeoff between honesty and self-interest.

The “Grace” hypothesis, suggests that people are innately honest and have to control honest impulses if they want to profit. The “Will” hypothesis holds that self-interest is our automatic response.

“The prefrontal cortex is key to controlling our behavior and helps to override our natural impulses to be either honest or self-interested,” King-Casas said. “Knowing this, we can test whether ‘Grace’ or ‘Will’ is dominant. By including participants with lesions in the prefrontal cortex, we were able to test whether honesty requires us to actively resist self-interest – in which case disrupting the prefrontal cortex would reduce the influence of honesty preferences – or whether we are automatically predisposed toward honesty, in which case disrupting the prefrontal cortex would instead enhance honest behavior. And our results show a necessary role for prefrontal control in generating honest behavior by overriding our tendencies to be self-interested.

“Our next step will be to combine functional brain imaging with economic modeling to understand how the brain computes the tradeoff between the costs and benefits of lying,” King-Casas added. “Then we can begin to understand the nature of honesty.”

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<http://research.vtc.vt.edu/news/2014/sep/02/price-honesty/>