

Risk and reward compete in brain

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That familiar pull between the promise of victory and the dread of defeat – whether in money, love or sport – is rooted in the brain's architecture, according to a new imaging study.

Neuroscientists at the USC Brain and Creativity Institute have identified distinct brain regions with competing responses to risk.

Both regions are located in the prefrontal cortex, an area behind the forehead involved in analysis and planning.

By giving volunteers a task that measures risk tolerance and observing their reactions with functional magnetic resonance imaging (fMRI), the researchers found that activity in one region identified risk-averse volunteers, while activity in a different region was greater in those with an appetite for risk.

The study appeared online Oct. 8 in the journal *Cerebral Cortex*.

"We can see risk as a battle between two forces," said Antoine Bechara, professor of psychology at USC. "There is always a lure of reward. There's always a fear of failure. These are the two forces that are always battling each other."

In his previous research, Bechara had used the same task to measure risk tolerance in brain-damaged patients. He and other researchers showed that the prefrontal cortex is critical for proper risk assessment.

But because brain lesions differ in every patient and affect multiple areas, lesion-based studies usually cannot pinpoint the role of smaller brain regions.

So Bechara's group at the institute decided to repeat the experiment with fMRI.

"We were interested in how normal people perform this task. What's going on in their brain?" asked first author Gui Xue, a postdoctoral research associate at the institute.

Bechara called his group's study the first to frame a person's risk profile in terms of the interaction between two brain regions.

Co-author Zhong-Lin Lu, professor of psychology at USC, said: "What this study has done is essentially localize two separate centers for the fear of risk and the lure of reward."

Source: University of Southern California

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