

# To bet or not to bet: How the brain learns to estimate risk

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Researchers from EPFL and Caltech have made an important neurobiological discovery of how humans learn to predict risk. The research, appearing in the March 12 issue of the *Journal of Neuroscience*, will shed light on why certain kinds of risk, notably financial risk, are often underestimated, and whether abnormal behavior such as addiction (e.g. to gambling or drugs) could be caused by an erroneous evaluation of risk.

Planning entails making predictions. In an uncertain environment, however, our predictions often don't pan out. And erroneous prediction of risk often leads to unusual behaviour: euphoria or excessive gambling when risk is underestimated, and panic attacks or depression when we predict that things are riskier than they really are. To understand these anomalous reactions to uncertain situations, we need to look to the neurobiological mechanisms that underlie how we learn to predict risk. Surprisingly little research has been done in this topic, and we do not yet know precisely how the brain is involved in our estimation of risk.

Using functional imaging in a simple gambling task in which risk was constantly changed, the researchers discovered that an early activation of the anterior insula of the brain was associated with mistakes in predicting risk. The time course of the activation also indicated a role in rapid updating, suggesting that this area is involved in how we learn to modify our risk predictions. The finding was particularly interesting, notes lead author and EPFL professor Peter Bossaerts, because the anterior insula is the locus of where we integrate and process emotions.

"This represents an important advance in our understanding of the neurological underpinnings of risk, in analogy with an earlier discovery of a signal for forecast error in the dopaminergic system," says Bossaerts, "and indicates that we need to update our understanding of the neural basis of reward anticipation in uncertain conditions to include risk assessment."

Contrary to what Descartes held dear, the finding that risk prediction and processing of emotions are related suggests that emotions may be intimately involved in rational decision making -- they may help us to correctly assess risk in an uncertain world.

Source: Ecole Polytechnique Fédérale de Lausanne

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