

# To profit or explore -- it seems that is the question

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People are constantly pulled between profiting from the things they know will reap rewards and exploring new options – but it is exploration that uses high-level regions of the brain, according to a study by UCL (University College London) scientists published in *Nature* on 15th June.

By analysing how people's brains work while gambling, the team led by Dr Nathaniel Daw and Dr John O'Doherty, have found that trying out new things uses the human frontopolar cortex and intraparietal sulcus, whereas falling back on familiar territory involves areas of the brain associated with reward and pleasure. This brain activity may reflect the fact that exploring new options requires overriding the desire for immediate profit.

Dr Daw, UCL Gatsby Computational Neuroscience Unit, said: "Whether you are a stockbroker, a gambler choosing between slot machines or an animal trying to forage for food, the desire to select what seems the richest option is always balanced against the desire to choose a less familiar option that might turn out to serve better. This exploration is often critical to survival.

"Most people switch between exploring and exploiting seamlessly and this has always made it hard to distinguish between someone who is doing something they know will offer the highest pay-out and a person who is testing out new options. By using some of the systems used to program robots to learn and make decisions, we have now found which areas of the brain are responsible for these different behaviours."

The team studied the behaviour of 14 subjects while they were gambling for money using on-screen slot machines. To find out whether the subjects were using exploitative or exploratory gambling strategies, the team compared the human behaviour with the decisions made by intelligent robots. fMRI scans were used to measure brain activity to show which brain areas were activated when exploring or exploiting.

After the task, subjects were asked to describe their choice of strategies. The majority of subjects reported occasionally trying the different slot machines to work out which had the highest payoffs (exploring) and at all other times choosing the slot they thought had the highest payoffs (exploiting).

Source: University College London

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