

Measuring the brain's 'rich switch'

April 4 2007

Economists have postulated that people's perception of the value of financial gains decreases as they become richer, but scientists have not really been able to measure this change in "marginal utility" in the laboratory... until now.

Neurobiologists Philippe Tobler, Wolfram Schultz, and colleagues have found that richer people are slower to learn to associate a stimulus with a financial reward than are poorer people, and this slower learning is reflected in slower response in the brain areas associated with reward and reward-directed learning.

The researchers reported their findings in the April 5, 2007, issue of the journal *Neuron*, published by Cell Press.

In their experiments, the researchers used a Pavlovian conditioning approach to study how people's wealth affects their ability to learn to associate a stimulus with a financial reward. However, instead of the bell and food Pavlov used in his experiments with dogs, Schultz and colleagues used a reward-predicting stimulus image followed by the reward image of a coin. The subjects were told to press a button to signal when they saw the stimulus image, versus a different image that would be followed by a nonreward scrambled picture of the coin. To quantify their learning speed, the subjects were told to indicate their confidence in their choices by the duration of their button press. And to motivate the volunteers, the researchers told them that they would receive all the coins they saw at the end of the experiments.

While the subjects were learning, and unlearning, to associate the reward-predicting image with the coin, the researchers used functional magnetic resonance imaging to measure the activity in their brains' reward centers. This brain-scanning technique uses harmless radio waves and magnetic fields to measure blood flow in brain regions, which reflects brain activity.

The researchers found that the richer the subjects were—both in terms of assets and income—the slower they learned or unlearned the association between the conditioning image and the coin. The researchers found the same inverse association between wealth and their neural response in reward areas. In contrast, the subjects' education or age did not correlate with the speed of learning.

The researchers also measured the marginal utility of money by asking the subjects how often they would be likely to pick up a coin from the street. They also found that the greater a subject's wealth, the lower the chance the subject would retrieve the coin.

Tobler, Schultz, and colleagues wrote that “the progressively smaller gain with increasing wealth would provide decreasing reward value that could lead to the reduced learning speed. Thus, individuals for whom a financial unit has lower marginal utility would show slower acquisition and extinction than individuals for whom the same unit has higher marginal utility. Or, put differently, ‘The rich are different from you and me.’”

Source: Cell Press

Citation: Measuring the brain's 'rich switch' (2007, April 4) retrieved 18 April 2024 from <https://medicalxpress.com/news/2007-04-brain-rich.html>

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