

Unexpected rewards

Animals (including humans) predict the outcome of their behavior, and change their behavior based on the possible rewards they receive. When the rewards are different than predicted, there are long-term changes in behavior, but when rewarded exactly as predicted, we do not change our behavior. On page 304, Jeffrey Hollerman and Wolfram Schultz examine the role of dopamine neurons in reward-based learning. Monkeys were simultaneously presented with two pictures (shown here), but rewarded with liquid only when they touched a lever below one of the pictures (marked 'rewarded'). Dopamine neurons in the substantia nigra and ventral tegmental area were activated during early trials when the monkeys had not yet learnt to associate the correct picture with the reward. However, as the monkeys predicted the rewards more accurately with successive trials, activation was reduced. Moreover, the dopamine neurons were activated when rewarded at unexpected times, and depressed when not rewarded as predicted. The authors suggest that because dopamine neurons are activated more strongly by unpredicted rather than predicted rewards, they may play a role in reward-dependent learning.

