

# Hedging your Bets by Learning Reward Correlations in the Human Brain

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Human subjects are proficient at tracking the mean and variance of rewards, and updating these via prediction errors. Here, we addressed whether humans can also learn about higher order relationships between distinct environmental outcomes, a defining ecological feature of contexts where multiple sources of rewards are available. By manipulating the degree to which distinct outcomes are correlated we show that subjects implemented an explicit model-based strategy to learn the associated outcome correlations, and were adept in using that information to dynamically adjust their choices in a task that required a minimization of outcome variance. Importantly, the experimentally generated outcome correlations were explicitly represented neuronally in right mid-insula with a learning prediction error signal expressed in rostral anterior cingulate cortex. Thus, our data show that the human brain represents higher order correlation structures between rewards, a core adaptive ability whose immediate benefit is optimized sampling.