



Neural Tiebreakers

That tough choice you're mulling over? Don't give it another thought. Your decision might hinge on unconscious brain processes that took place before you even began deliberating, according to a new study led by Uri Maoz, a postdoctoral scholar in biology and biological engineering.

The researchers first trained monkeys to associate particular on-screen cues with being given either a smaller amount of fruit juice right away or more juice a little later. The researchers then repeatedly offered the monkeys a choice between the two, randomizing the cue locations and delay durations to make sure the monkeys didn't know which cues to expect. The scientists then tried to predict, based solely on brain activity that took place before cue onset, which target the monkeys would choose.

"It turns out that if a monkey had a harder time choosing between the options—when the two choices were of similar value—we were able to predict which option it would choose before rational deliberation could begin," Maoz says.

Looking at two areas of the brain—the dorsolateral prefrontal cortex and the striatum—the researchers identified populations of neurons that were predictive of behavior even before the monkeys were shown their choices. Activity in one class of these so-called bias neurons predicted whether a monkey would choose the cue on the right side of the screen or the left, while a separate class predicted whether a monkey would select the larger or smaller reward.

Maoz says when the decision is easier—for example, when the monkey is given a choice to receive a large amount of juice right away—the bias activity gets overridden. The researchers, who published their findings in the journal *Frontiers in Neuroscience*, hypothesize that these bias neurons may exist essentially to help break ties. Imagine being faced with an obstacle in the middle of the road. A decision to swerve to the left or to the right to avoid it might be similarly good, Maoz says. "It may be better to make a choice quickly—even a slightly worse one—than to make no choice at all. That is where neural tiebreaking comes in handy." —*KF*