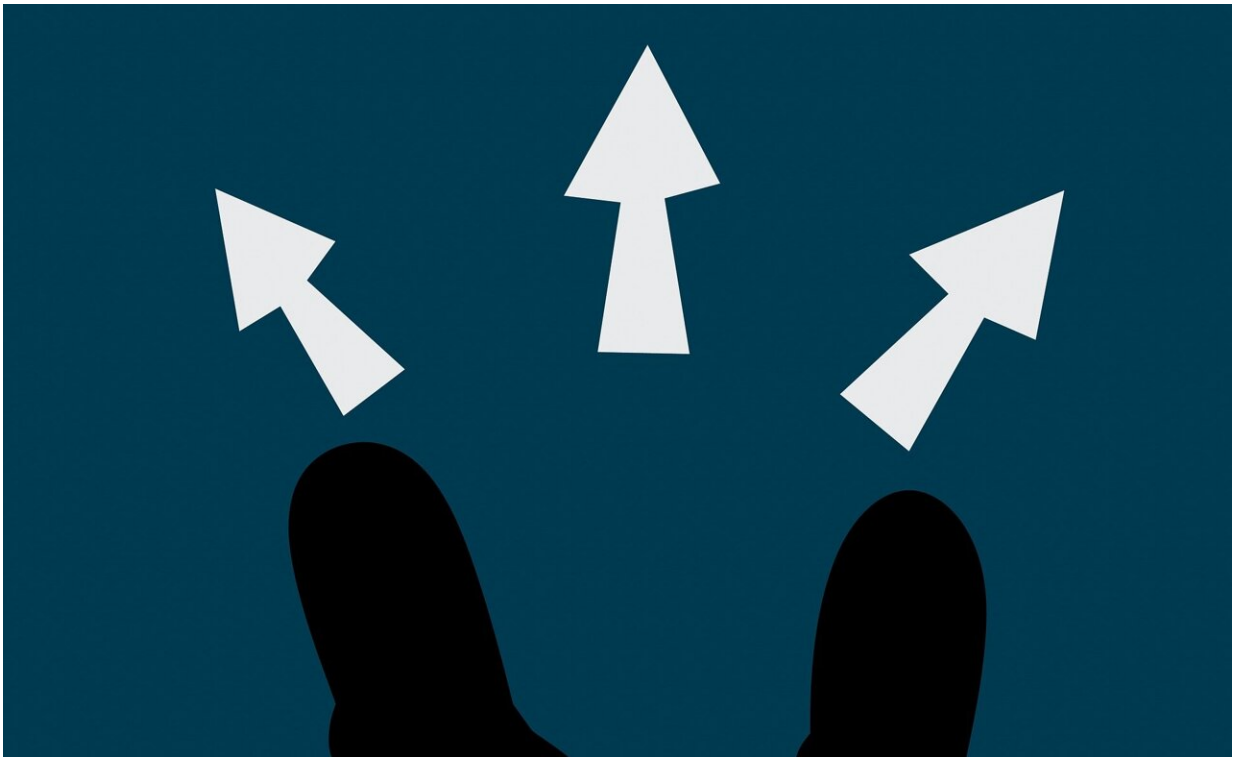# New study reveals goal-oriented rewards as key factors in decision-making

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Research from UC Berkeley's Department of Psychology is shifting the understanding of human decision-making processes by highlighting the importance of goal-oriented rewards. Conducted by Berkeley Psychology Professor Anne Collins and Berkeley Psychology doctoral

student Gaia Molinaro, the study suggests that the value people attribute to outcomes is subjective, and heavily influenced by their personal goals and the context of the decision.

The study was published in *PLOS Biology*.

"Value isn't just determined by an objective reward or outcome," Collins said. "Our research suggests that people's perception of value is largely shaped by their personal goals and the context in which the decision is made."

For example, you might order a chocolate ice cream cone and be perfectly satisfied with your choice. But if you then find out that there's another flavor available, you might feel less satisfied with your initial selection. In this case, the objective value of the ice cream cone hasn't changed. What's changed is your subjective perception of its value relative to the newfound best option, thus highlighting the impact of goal achievement on decision-making.

Using data collected from over 1,000 individuals by various laboratories, the Berkeley team has confirmed this theory by developing an "intrinsically enhanced" reinforcement learning model. While other theories propose that subjective value is simply adjusted based on different observed alternatives, the model developed by Berkeley researchers offers a new perspective: It centers around the concept that achieving a goal is crucial. The intrinsically enhanced model is not the first to examine this phenomenon, but it does provide a new way to understand the problem.

"Our study proposes a paradigm shift in how we understand decision-making," Molinaro said. "It shows the critical importance of considering goal-dependent rewards, which may significantly alter our understanding of decision-making processes."

The potential applications of this research are vast and varied. This new understanding could inform public policies encouraging positive behavior changes or help shape financial decisions. In an educational setting, it could be utilized to show students how learning specific topics can assist in achieving their particular goals. The research could also inform therapeutic strategies for patients suffering from mental illness or eating disorders.

This research could inspire innovation in the field of the development of artificial intelligence. "As it stands, an AI model cares primarily about extrinsic rewards," Collins said. "Our research suggests that integrating intrinsic, goal-oriented rewards could substantially enhance these models."

While these findings are a significant step forward in understanding decision-making processes, further research is needed to fully understand and apply this concept across various fields. The Berkeley team plans to continue exploring this important area of cognitive neuroscience.

More information: Gaia Molinaro et al, Intrinsic rewards explain context-sensitive valuation in reinforcement learning, *PLOS Biology* (2023). DOI: 10.1371/journal.pbio.3002201

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