



**University of
Zurich** ^{UZH}

Department of Economics – Neuroeconomics Seminar

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Neir Eshel
Stanford University

Dopamine release is inversely related to economic demand

Decision-making requires a consideration of both costs and benefits. Although mesolimbic dopamine (DA) plays an established role in reward-related decisions, there has been longstanding controversy over its sensitivity to costs vs benefits. Manipulations of DA function imply a primary role in mediating cost calculations, while DA recordings suggest a preference for encoding benefit. These studies often confound cost and benefit by varying both simultaneously, and rarely combine correlational and causal tools to explore how encoding relates to behavior. Here we independently varied costs and benefits, studying DA's role using both recording and manipulation. We found that DA release reflects changes in both cost and benefit, although the precise relationship depended on the time within a trial and the site of DA release. Then we used behavioral economics to probe how these patterns of DA release relate to two important behavioral parameters: a mouse's preferred level of reward consumption and the amount of work it is willing to expend to maintain that consumption. We found that DA release in the nucleus accumbens core and dorsolateral striatum does not predict an animal's preferred level of consumption. It does, however, strongly reflect an animal's willingness to work for reward. Surprisingly, the more DA released for each reward, the less demand for that reward. The inverse relationship between DA release and demand held true both for natural rewards and optogenetic stimulation of DA release in both striatal targets. Our findings support a model of dopamine and reinforcement in which a minimal level of DA release is critical to motivate behavior, but increments above that level may reduce demand.