



Coming to Terms with Effort in Movement Control and Decision Making

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Dr. Alaa Ahmed received a B.Sc. in Mechanical Engineering from the American University in Cairo in 1999 and a Ph.D. in Biomedical Engineering from the University of Michigan at Ann Arbor in 2005. From 2006-2008, she was a Whitaker International Fellow and post-doctoral researcher in sensorimotor control at the University of Cambridge. In 2008, she joined the University of Colorado Boulder as an assistant professor in the Department of Integrative Physiology. Her research program uses a neuroeconomic approach that combines techniques from neuroscience, economics, psychology and engineering to investigate the costs and constraints underlying human sensorimotor decision-making, learning, and control. Dr. Ahmed is the recipient of an NSF CAREER Award and a DARPA Young Faculty Award.

ABSTRACT Decisions depend on the reward at stake and the effort required. However, these same variables influence the vigor of the ensuing movement, suggesting that factors that affect evaluation of action also influence performance of the selected action. In this talk, I will describe a mathematical framework that links decision-making with motor control. The critical assumption of this model is to represent effort via the metabolic energy expended to produce the movement. I will show that a single mathematical formulation of action predicts both the decisions that animals make as well as the vigor of the movements that follow. This framework can explain choices that people make in reaching and force production and changes in vigor with healthy aging. I suggest that decision-making and movement control share a common utility in which the expected rewards and the energetic costs are discounted as a function of time.

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