

Why we act when we act: How brain, body, and environment interact in the generation of voluntary action

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Abstract

How does the brain decide when to act, or whether to act in the first place, when decisions are not dictated by immediate external imperatives? The mechanisms that govern so-called “self-initiated” decisions-to-act remain poorly understood. The simplest, and perhaps most naïve, view of decision making is that decisions-to-act are formed in the brain and then transmitted to the body to be carried out; and that the “when” of the action corresponds to a decision about when to act. However, recent evidence shows that the “when” of self-initiated action might be determined in part by ongoing stochastic fluctuations in brain activity, and that the actual “neural decision” or commitment to initiate action might come much closer in time to the onset of movement than previously thought - close enough to coincide in time with subjective estimates of the time of the conscious decision or “urge” to act. Other evidence shows that information about “decisions in the making” can be read out from muscles in the body well before action is initiated, suggesting that decisions-to-act are determined by the brain+body (through fast proprioceptive feedback) acting as a unified dynamical system. Furthermore, new evidence of ours shows that the “when” of self-initiated actions can be biased by unperceived regularities in the sensory environment, suggesting that the brain incorporates whatever information is available, however irrelevant, into its decisions about when to initiate action. Why do we act when we act? There are always reasons, but those reasons may not be localizable - coming from within us and all around us through an interplay between brain, body, and sensory environment.