

The value of time: Dovetailing dynamic modeling and dynamic empirical measures to conceptualize the processes underlying delay discounting decisions.

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How do people come to a decision when facing conflicting options? In the case of delay discounting (e.g. Frederick, Loewenstein, & O'Donoghue, 2002) – the choice between an immediate but small reward and a delayed but large one – research generated a multitude of descriptive models pinpointing precisely how people devalue and choose rewards across delays (Doyle, 2013). This descriptive and outcome-centered perspective has been complemented recently by models focusing on the process dynamics leading to delay discounting decisions (Rodriguez, Turner, & McClure, 2014). We present work that embraces and adds to this dynamic approach in two ways. First, we demonstrate how dovetailing continuous dynamic modeling and continuous empirical measures (Dshemuchadse, Scherbaum, & Goschke, 2012; Spivey, Grosjean, & Knoblich, 2005) constrains the conceptualization of the processes underlying a decision. Second, we extend the dynamic approach from the intra-trial time scale of single decisions to the inter-trial time scale of sequences of decisions (compare Duran & Dale, 2014) to explore their interacting effects on behavior (Scherbaum, Dshemuchadse, & Kalis, 2008; Scherbaum, Dshemuchadse, Leiberg, & Goschke, 2013). We present a dynamic computational model of delay discounting behavior (Tuller, Case, Ding, & Kelso, 1994; see also O'Hora, Dale, Piironen, & Connolly, 2013; van Rooij, Favela, Malone, & Richardson, 2013) that reproduces existing data (Scherbaum et al., 2013) and predicts new behavioral patterns such as a dependence of current choices on choice history or the temporal decay of these choice persistence effects. The model's predictions are validated in three experiments, indicating the complementary value of harvesting decision dynamics at different time scales on the modeling and the experimental side of the investigation of delay discounting decisions.

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