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Combining mental simulation and abstract reasoning explains people's reaction time in an intuitive physics task

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Abstract

How do people reason intuitively about everyday physical events? Two broad camps provide very different answers to this question. The first camp emphasizes mental simulations: when people predict where a bouncing ball will end up, they run a mental process that roughly approximates the motion of the ball. The second camp emphasizes rules and abstractions: when reasoning about the bouncing ball, people may reason 'the ball and table are solid, the ball can't go through the table'. Here we bring the two views together, with a model of physical reasoning that combines mental simulation and abstraction. We show behavioral signatures of both rule-usage and mental simulation in a response-time study in which participants reason about the trajectory of a ball. We present a novel model that can account for these signatures, and compare it to current models of physical reasoning that cannot.