Prospective uncertainty: The range of possible futures in physical predictions
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Introduction

- Physical prediction is well explained as accurate extrapolation of an uncertain, probabilistic world (Battaglia et al 2013, Smith & Vul 2013)
- Implies that people form a probability distribution over possible future states
- Can people reason about the uncertainty captured in these probability distributions?

Task

- **Observe initial motion**
- **Predict motion & set paddle length**
- **Observe actual path**

| N = 43 |
| 450 trials / participant |
| Measures: |
| 1. Predictions (paddle position) |
| 2. Uncertainty (paddle length) |

Prediction model

- **Physical forward model + Center expectation**

Smith & Vul (2013)

Explains predictions Explains variability

| r = 0.88 |
| r = 0.51 |

Results

- 1) By-trial uncertainty relates to variability in predictions
- 2) Model explains by-trial uncertainty well
- 3) Uncertainty explained in part by both measures

| r = 0.45 |
| r = 0.45 |

Discussion

- Explicit measures of uncertainty track estimates of how much uncertainty people should have
- Suggests that people have and use probabilistic distributions over where objects might go
- Both estimates of uncertainty capture different facets of peoples’ uncertainty