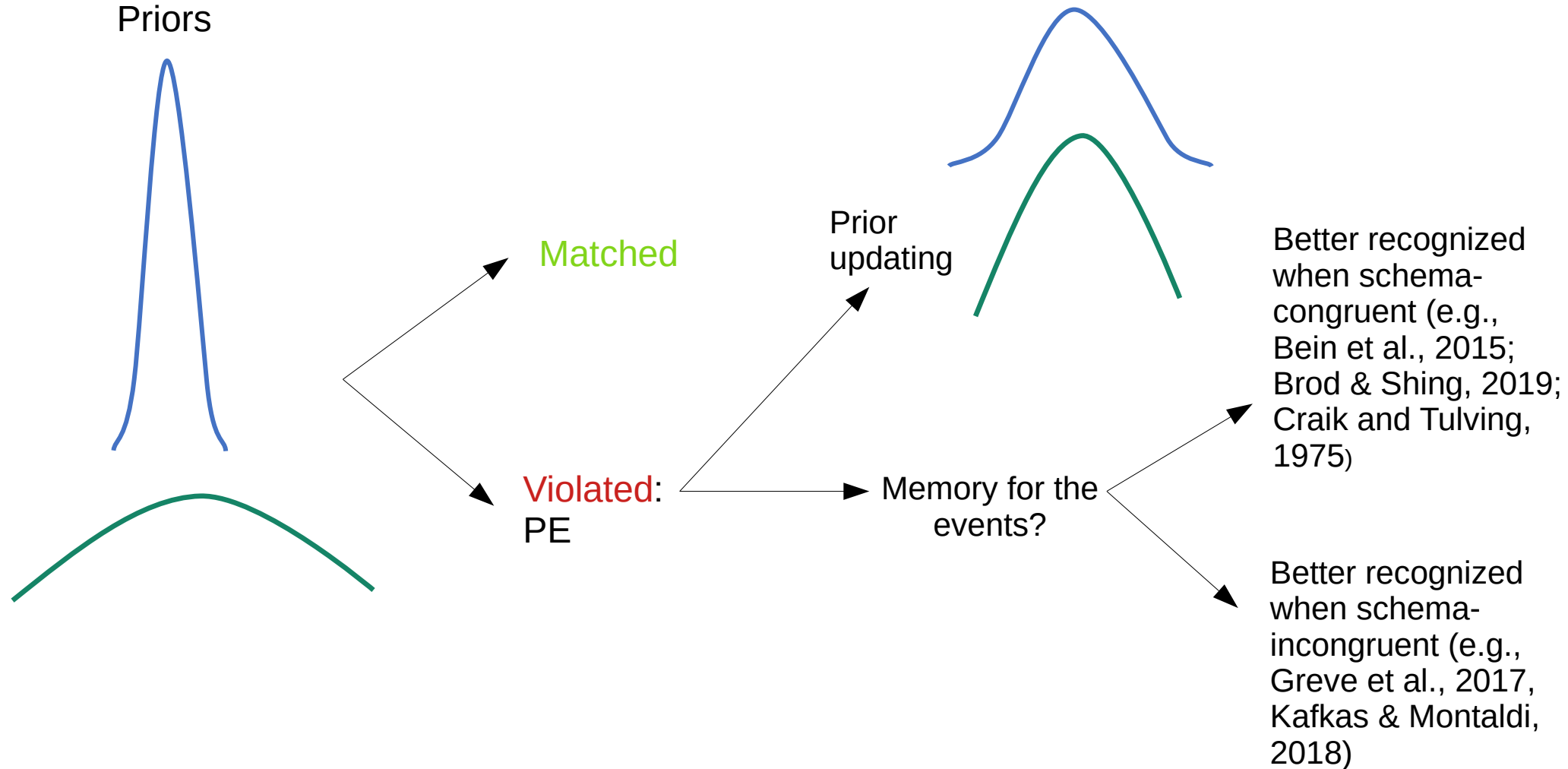# Prediction Error and Memory:
Insights from computational models
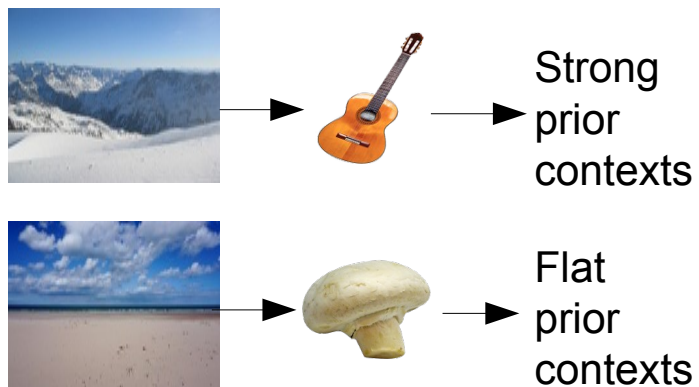
Francesco Pupillo, Javier Ortiz-Tudela, Rasmus Bruckner, Yee Lee Shing

FLUX 2021

Priors

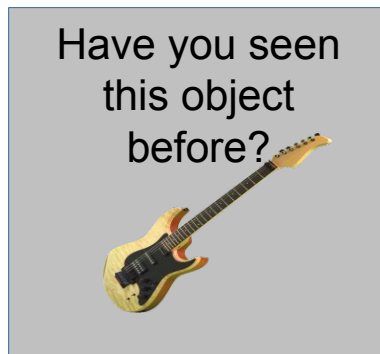Matched

Prior
updating

Violated:
PE

Memory for the
events?

Better recognized
when schema-
congruent (e.g.,
Bein et al., 2015;
Brod & Shing, 2019;
Craik and Tulving,
1975)

Better recognized
when schema-
incongruent (e.g.,
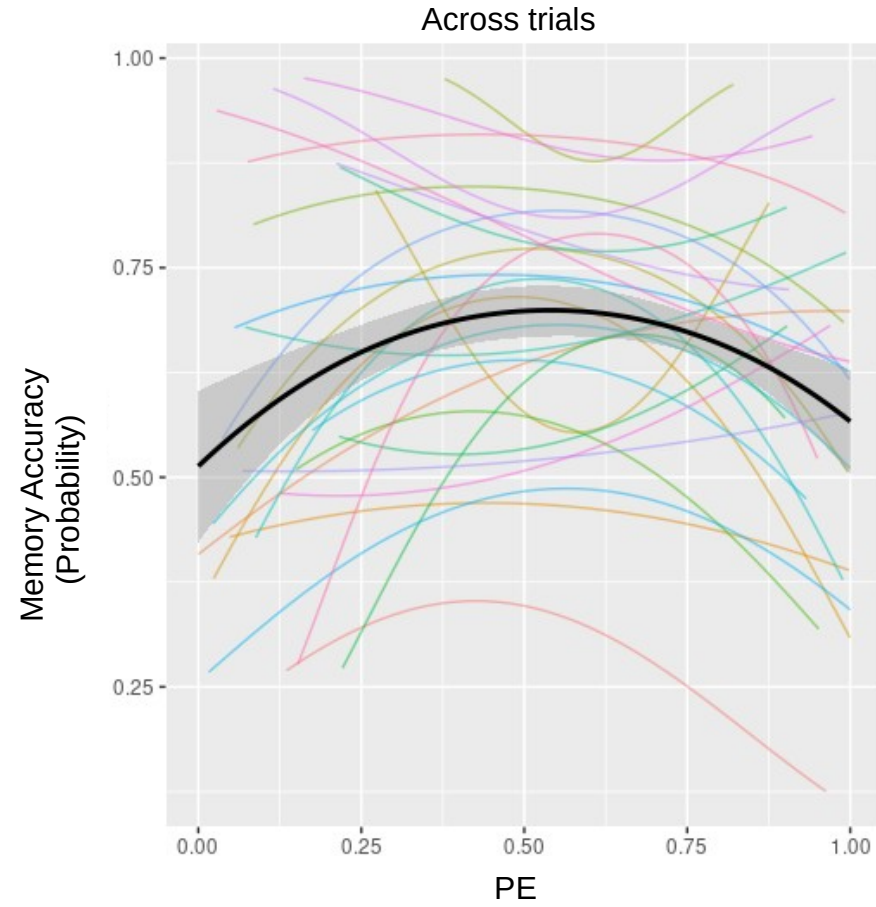Greve et al., 2017,
Kafkas & Montaldi,
2018)

Methods

Prediction Task

Reinforcement learning model

$$Q_{t+1}^{(c,j)} = Q_t^{(c,j)} + \alpha \cdot PE_t$$

$$PE_t = r_t - Q_t$$

$$r_t = 1, 0$$

Strong prior contexts

Flat prior contexts

Surprise recognition test

Have you seen this object before?

Results

Across trials

Prediction

Quadratic effect: β = - 6.43, *p* = .006
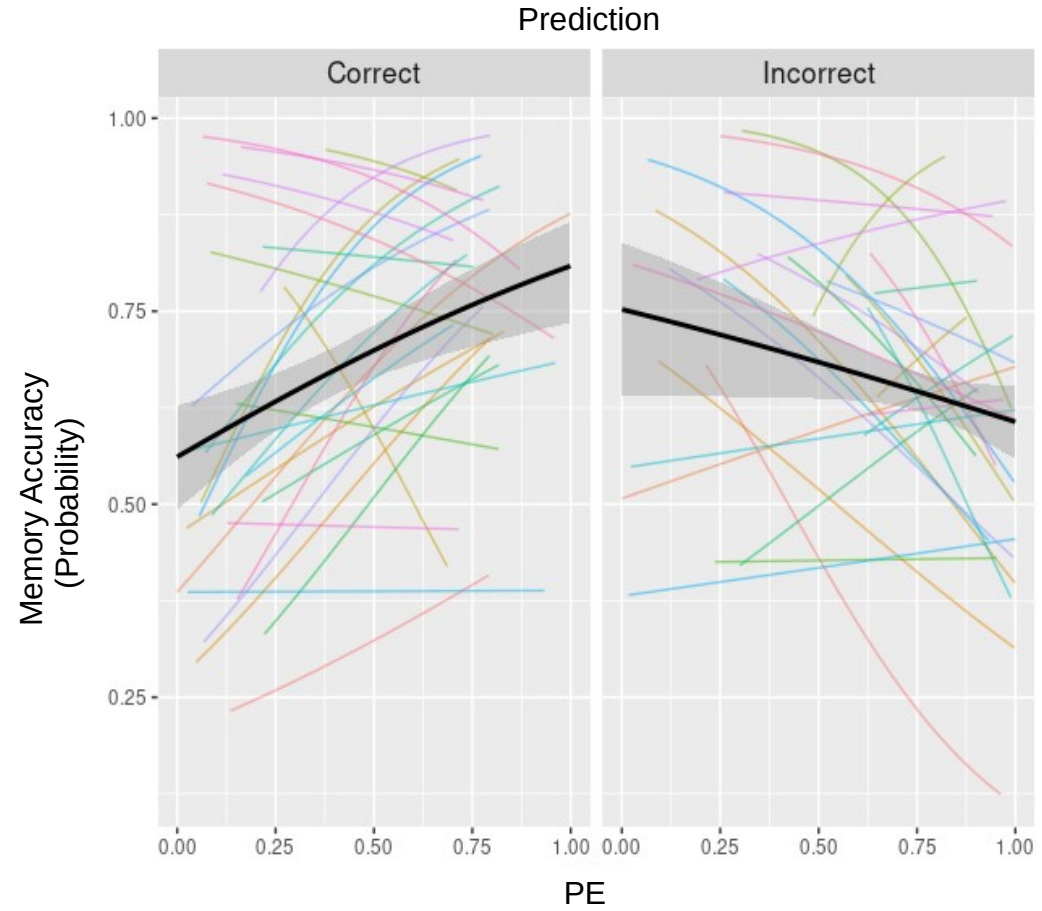
Interaction: β = -1.94, *p* = .001

Conclusions

- Important moderating role of prediction outcome and of considering PE in relation to the task participants are doing.

- Results are in line with with studies finding worse memory for unexpected events (Bein et al., 2015; van Kesteren et al., 2013), and with studies finding on reward PE showing enhanced memory for better than expected outcomes (De Loof et al., 2017; Jang et al., 2019).

- Strong prediction error in the context of positive feedback might indicate the utility of that item for future predictions.

- Strong prediction error in the context of negative feedback in a task where contingencies are stable may signal participants that that choice is not informative.

  OUTLOOK: Relationship between PE and memory in children.