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Generating stimulus anticipation from stimulus and prediction history

Isabelle Hoxha^{1,2}, Clark Bäker³, Sylvain Chevallier⁴, Stefan Glasauer⁵, Michel-Ange Amorim^{1,2}

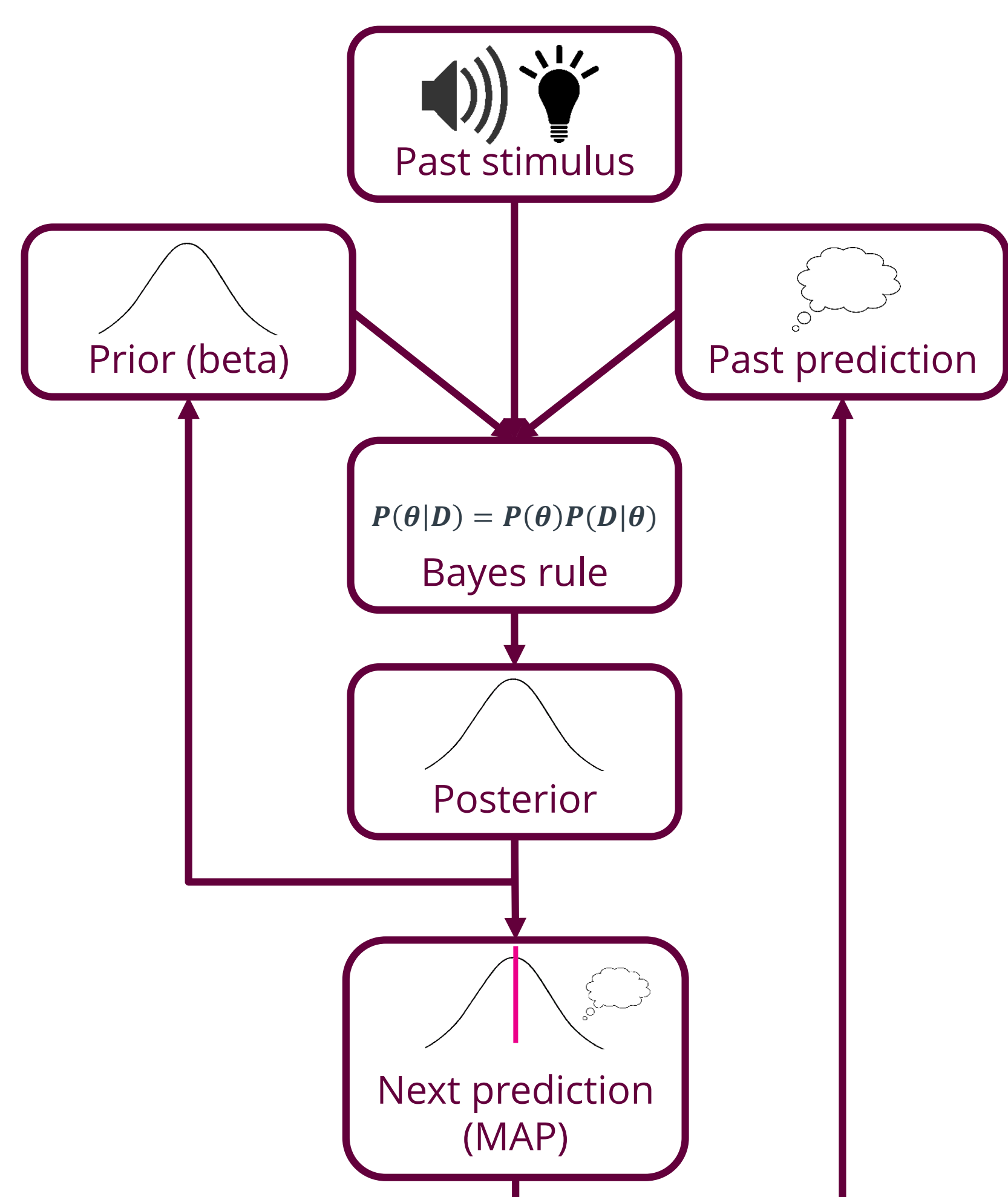
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Introduction

Perceptual decisions depend not only on the stimulus, but also on prior expectations, which impact behavior at the single-decision level [1,2,3]. Since predictions are mainly unconscious [4], a generative model of predictions could enhance our understanding of single decisions.

Previous studies have shown that predictions depend on past events [5]. These effects have been modelled through psychometric curves and Bayesian inference [6,7], but only considered past stimuli. Here we assume that the prediction depends on past predictions and stimuli.

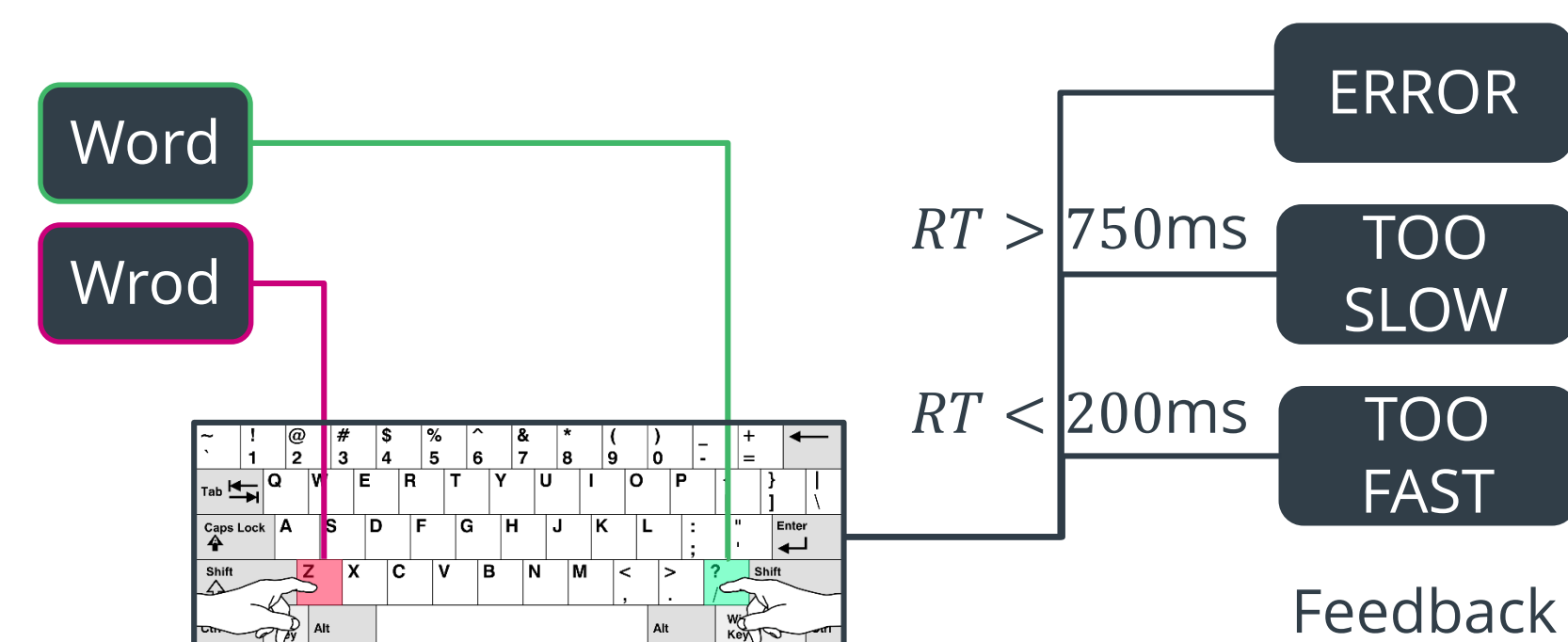
Methods: Bayesian inference



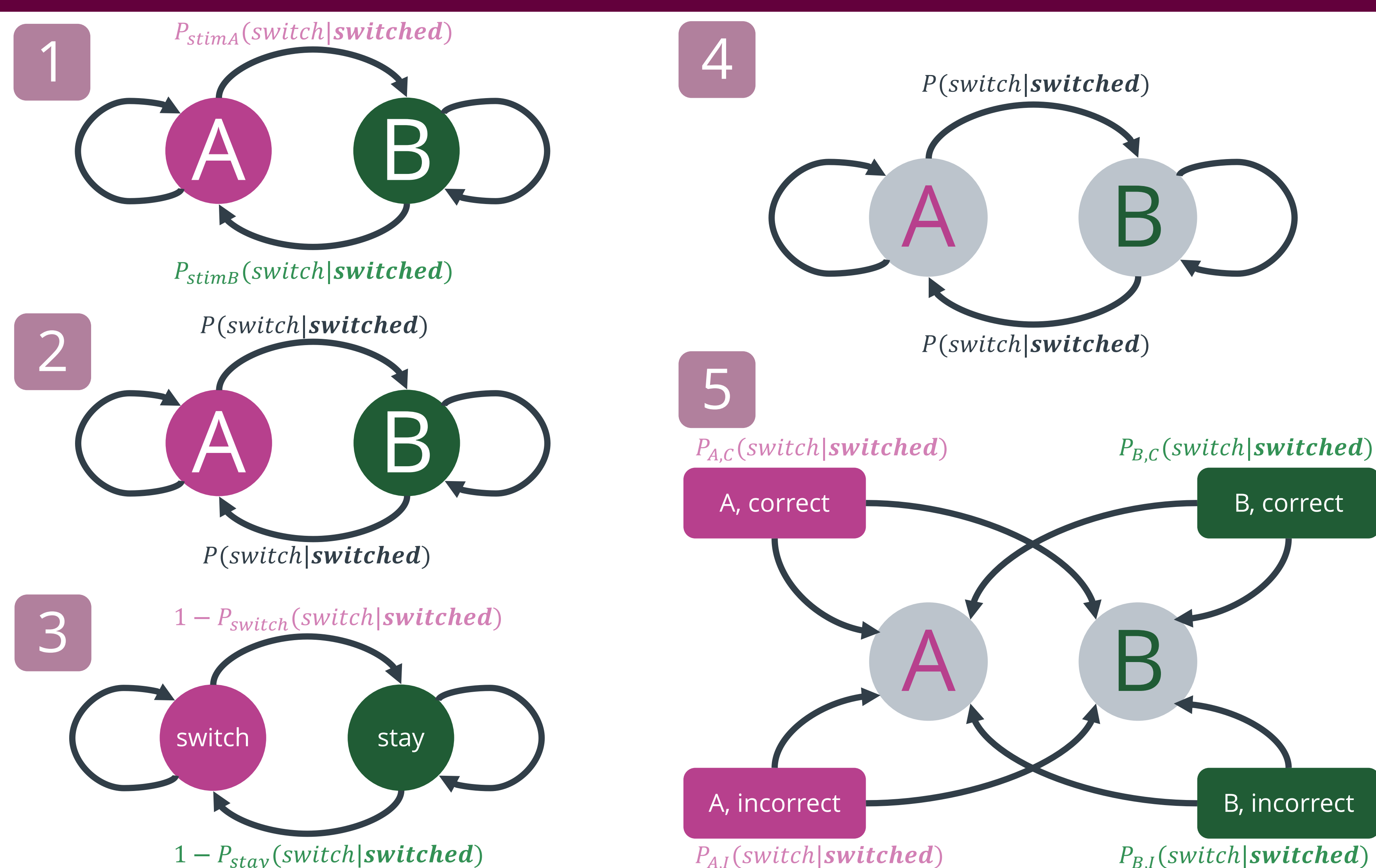
Methods: Paradigm

Dataset collected and published by Wagenmakers et al. (2008) [8]

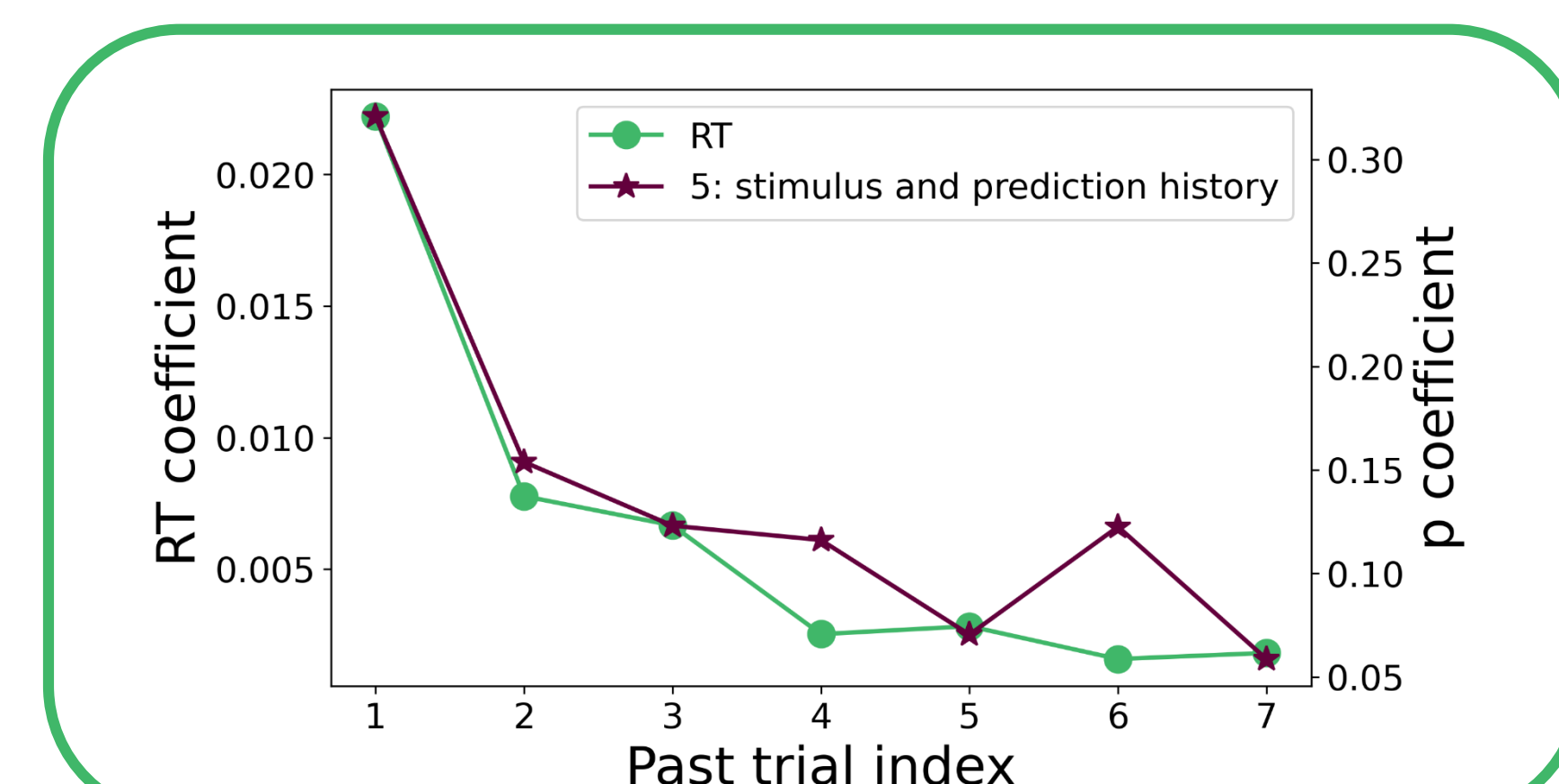
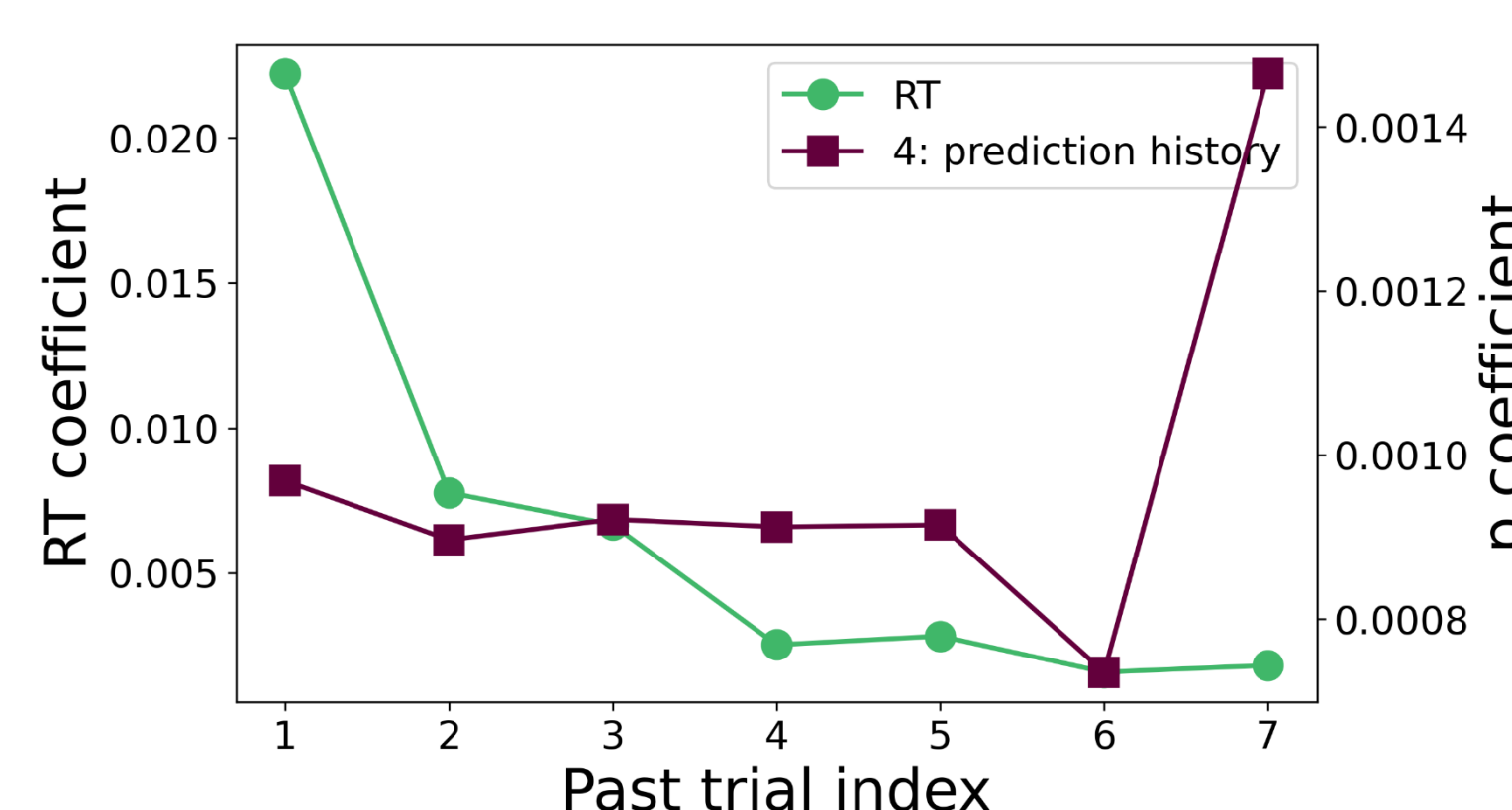
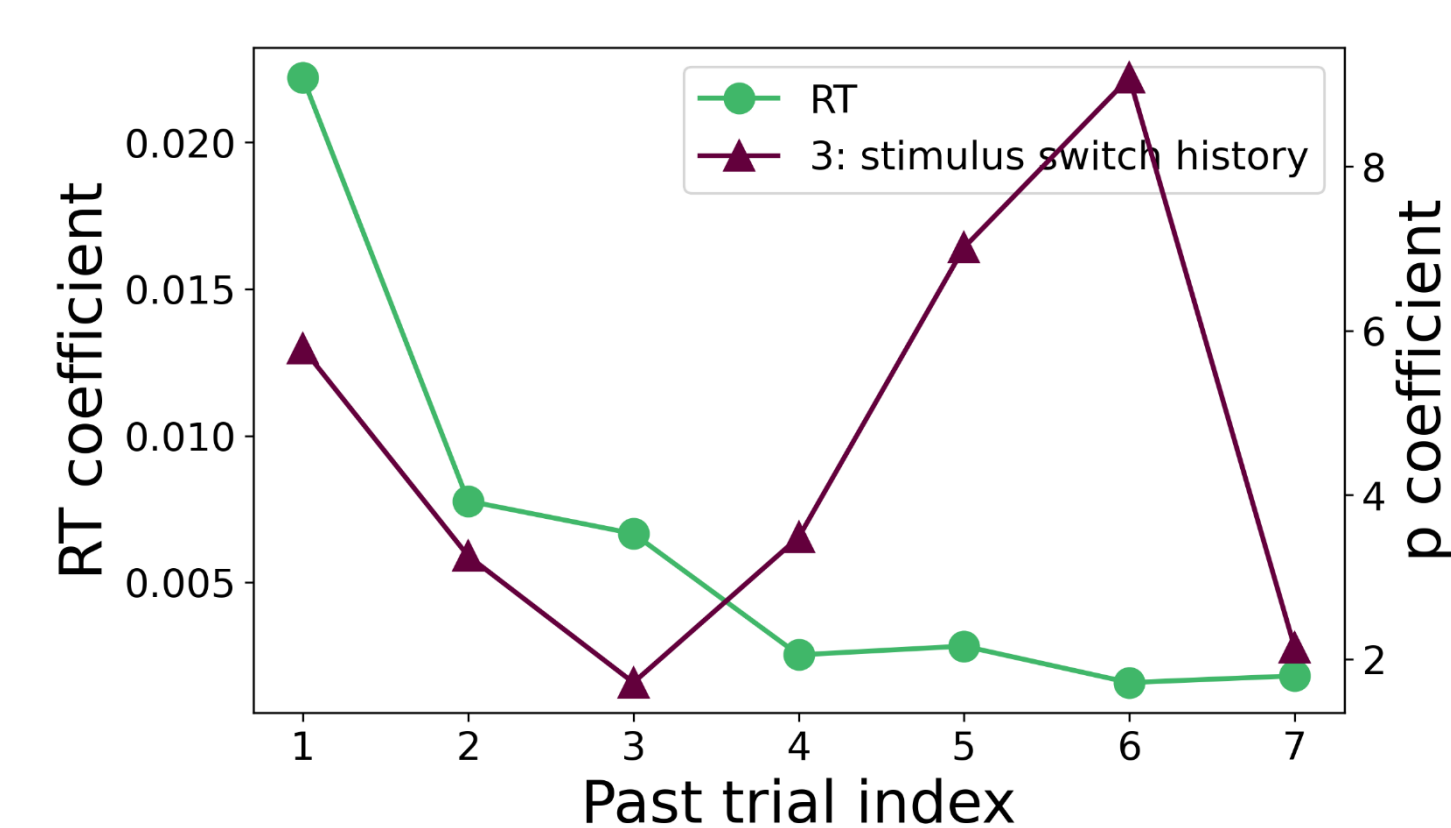
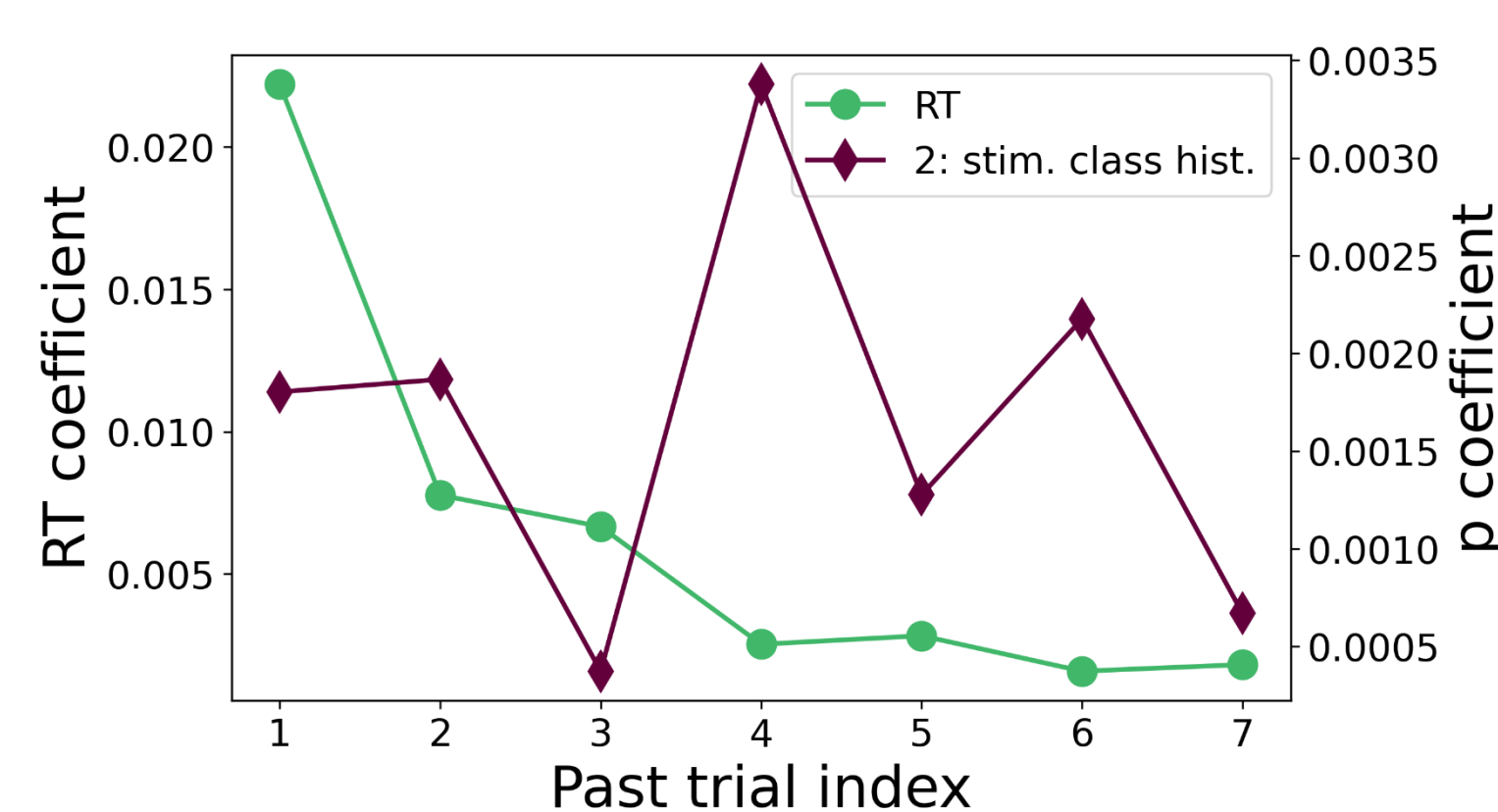
- Word vs. non-word classification task
- 17 human participants
- 2 train blocks × 15 trials + 20 blocks × 96 trials = 1950 trials per participant
- 3 levels of difficulty (based on frequency of word)



Results: Predictions emerge from past stimuli and predictions



Future is history: predictions computed from past stimuli and predictions correlate with behavior more strongly than predictions computed from past stimuli only



- The models based on the class of past stimuli only (models 1 and 2) do not correlate with response times
- The model based on past stimulus switches (model 3) relies both on recent and more ancient stimulus history
- The model based on past predictions only (model 4) relies too much on older events when response times rely more heavily on more recent past events.
- The model based on both past stimuli and predictions (model 5) correlates with response times.

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