Interaction effects of environmental regularity and prediction error on episodic memory

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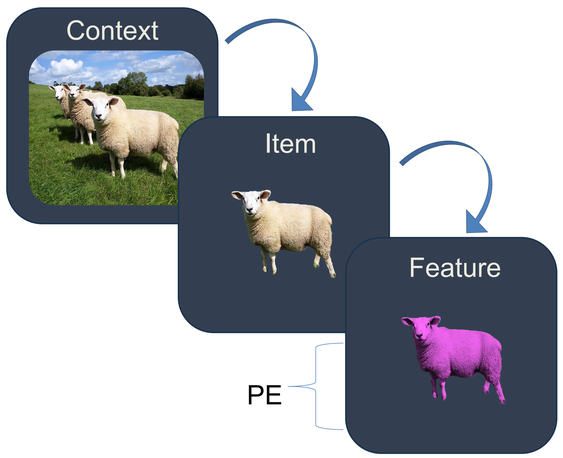
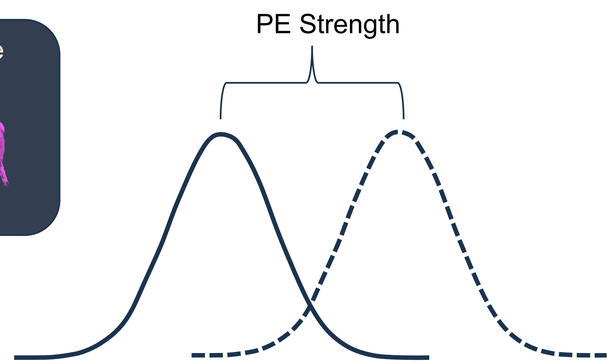
Introduction

Predictive Interactive Multiple Memory Signals (PIMMS)

- Prediction error is a violation of expectations
- Assumes that our mental representations are organized in a hierarchy, where representations active at one level of the hierarchy predict the activity at lower levels.
- Predicts a linear relationship between PE strength and memory outcome

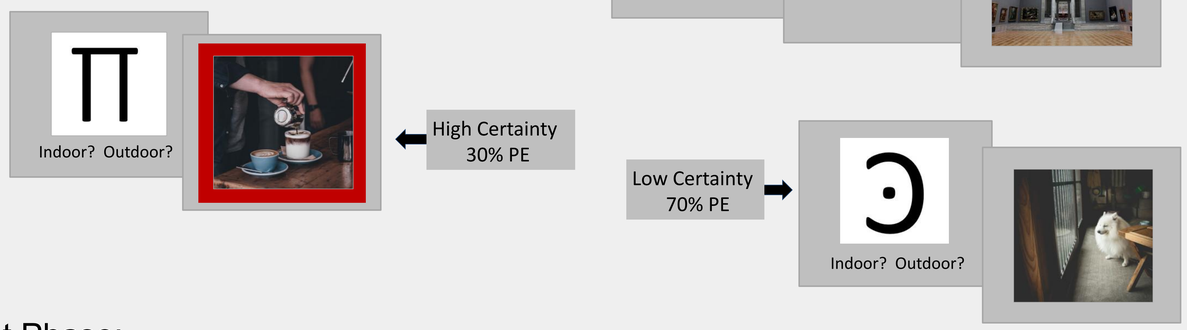




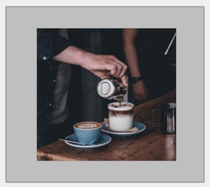
Method

Learning Phase:

Encoding Phase:

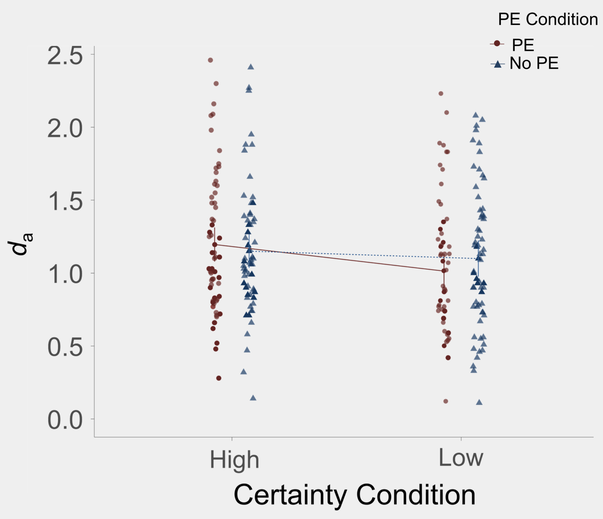


Test Phase:



Sure New 1 2 3 4 5 6 Sure Old

Results



Results were analyzed using linear mixed method modeling (N = 62)

There was no significant difference in memory (d'_a) between PE conditions ($F(1,61) = .310$, $p = .580$).

Numerically, there was a trend toward the predicted pattern in the certainty condition, with better memory in the High than in the Low Certainty condition, but it was not significant ($F(1,61) = 4.00$, $p = .050$).

Numerically, there was a trend for an interaction between Certainty and PE, but it was not significant ($F(1,61) = 4.144$, $p = .046$). This pattern was driven by memory being significantly better for PE items in the High Certainty condition ($M = 1.196$) compared to PE items in the Low Certainty condition ($M = 1.014$; $t = 2.592$, $p = .012$).

Discussion

- The influence of PE on human memory varies in existing research. Some studies show PE enhances memory (Smith et al., 2013), while others suggest it weakens it (Kim et al., 2014)
- Our experiment tests PIMMS predictions about how PE strength influences memory in contexts with different levels of certainty
- Our preliminary data partially supports predictions made by PIMMS. Specifically, results suggest that when context regularity is high (few PEs), a PE stands out and is remembered better than when an error occurs in a context with low regularity (many PEs).
- Whether PE captures attention should also be tested, possibly using eye-tracking or EEG

References

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