



# Incidental encoding reveals the time-varying nature of post-error adjustments in cognitive processing

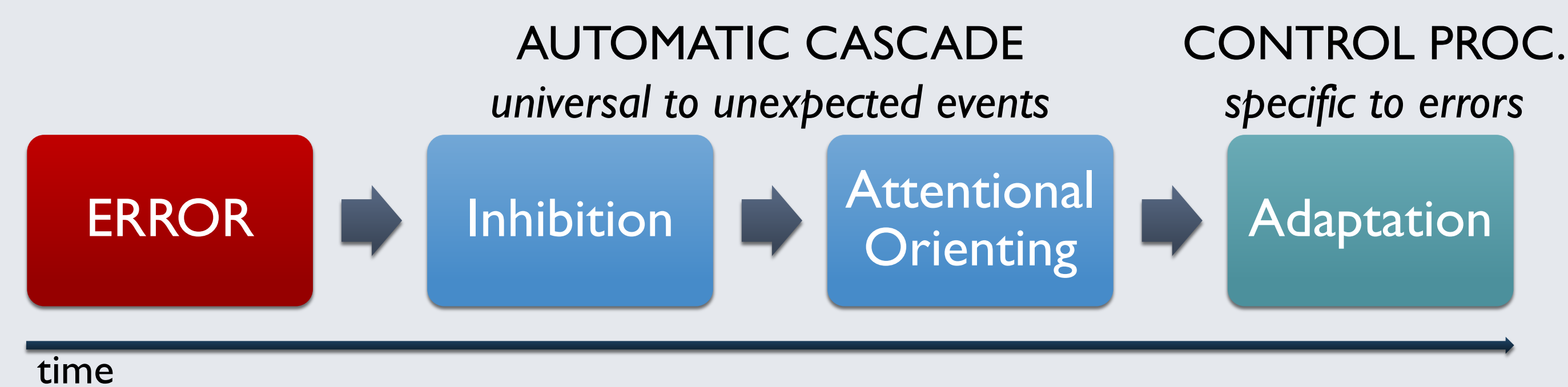
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## Introduction

Adaptive orienting theory suggests that errors are treated as an expectancy violation, triggering a cascade that starts with inhibition of ongoing motor and cognitive activity, followed by attentional orienting to identify the source of the error.<sup>1</sup>

This enables error-specific adaptive control processes geared at improving task performance.<sup>1</sup>



Post-error processing may appear adaptive or maladaptive depending on when the cascade is interrupted by the next trial.<sup>2</sup>

**Purpose:** To investigate the time-dependent nature of post-error processing and assess the degree of on-task focus on each trial through incidental encoding

## Methods

Participants were recruited through Amazon Mechanical Turk.

Experiment 1: ~1000 ms RSI

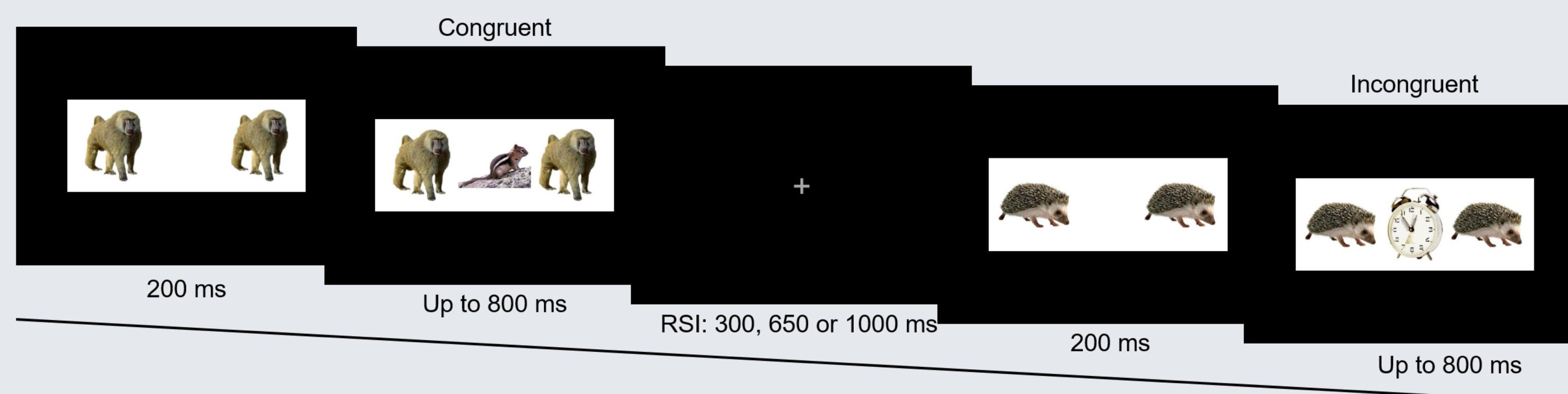
N = 100

Experiment 2: 300 ms RSI

N = 96

Experiment 3: 650 ms RSI

N = 99



Incidental encoding with an object-based flanker task (120 trials) using trial-unique target and flanker images.

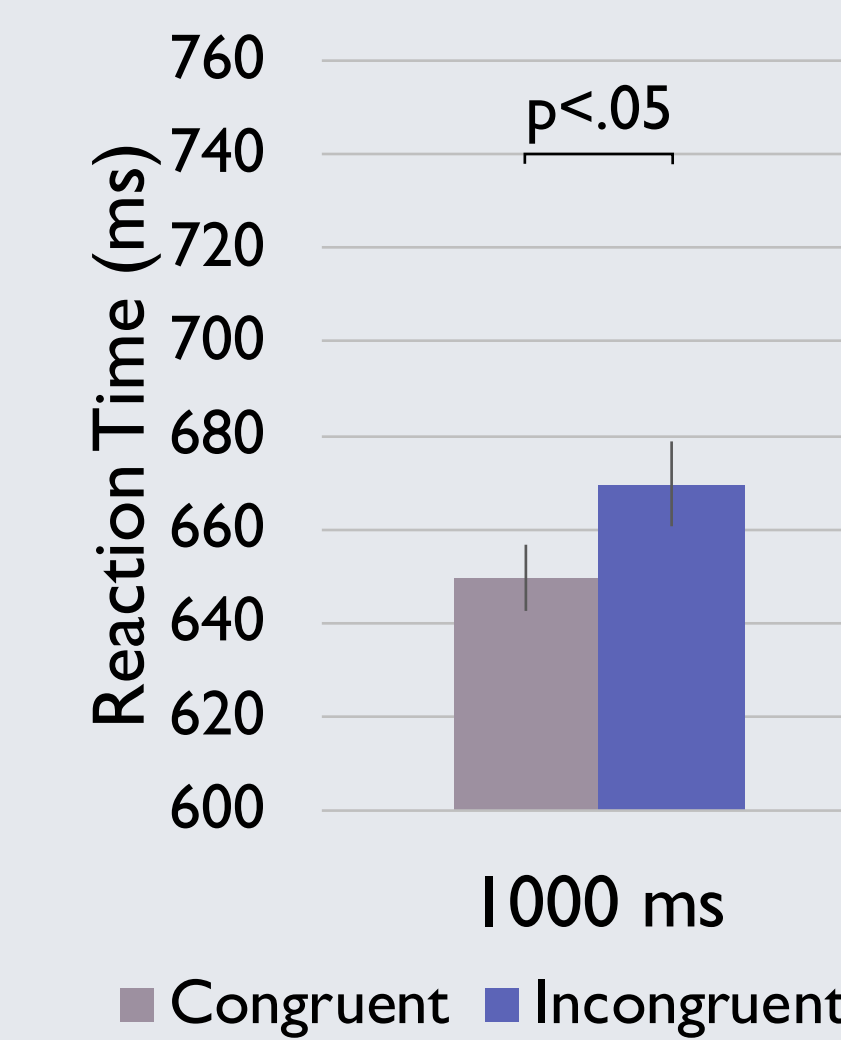
Participants categorized target images as living or non-living.

Followed by a surprise old/new recognition task (360 trials).

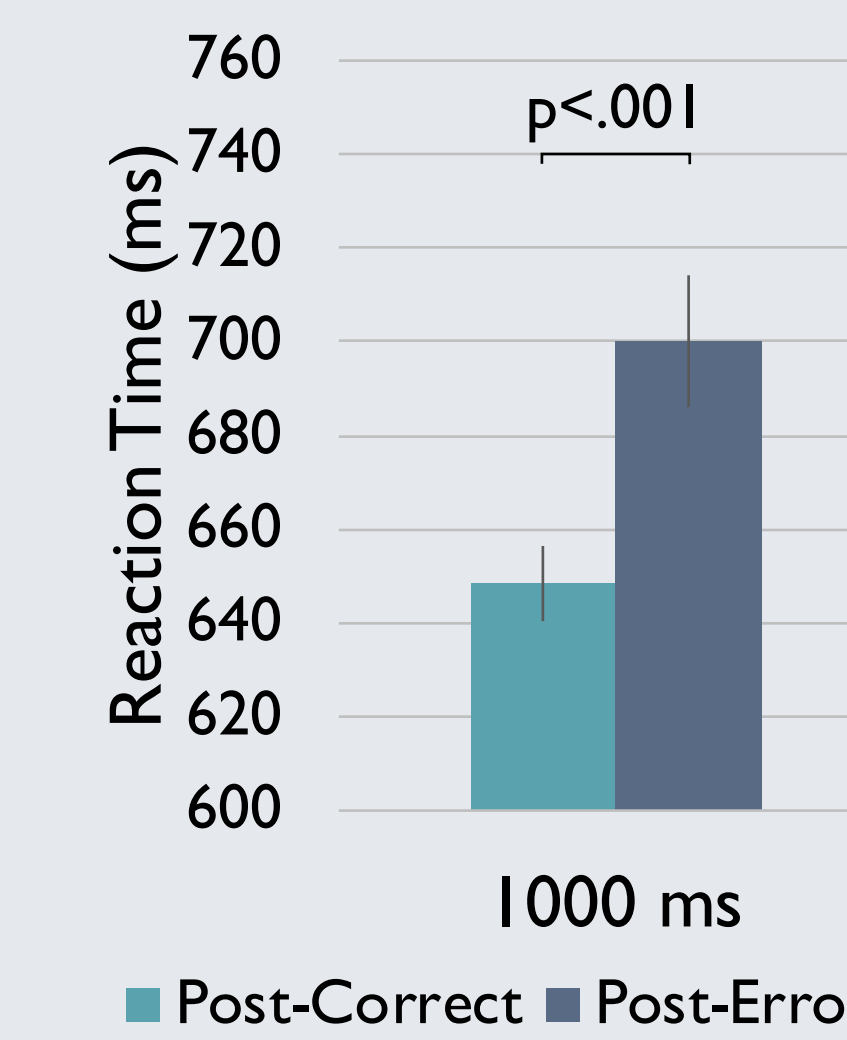
## Results

Experiment 1

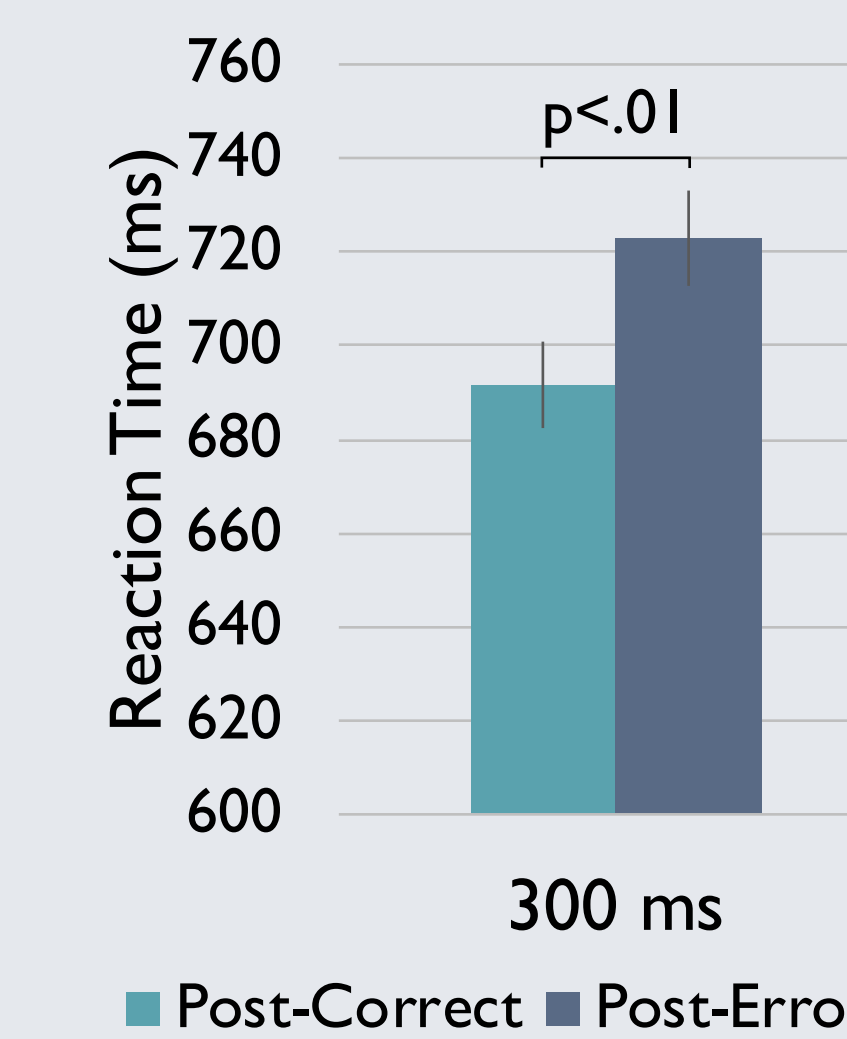
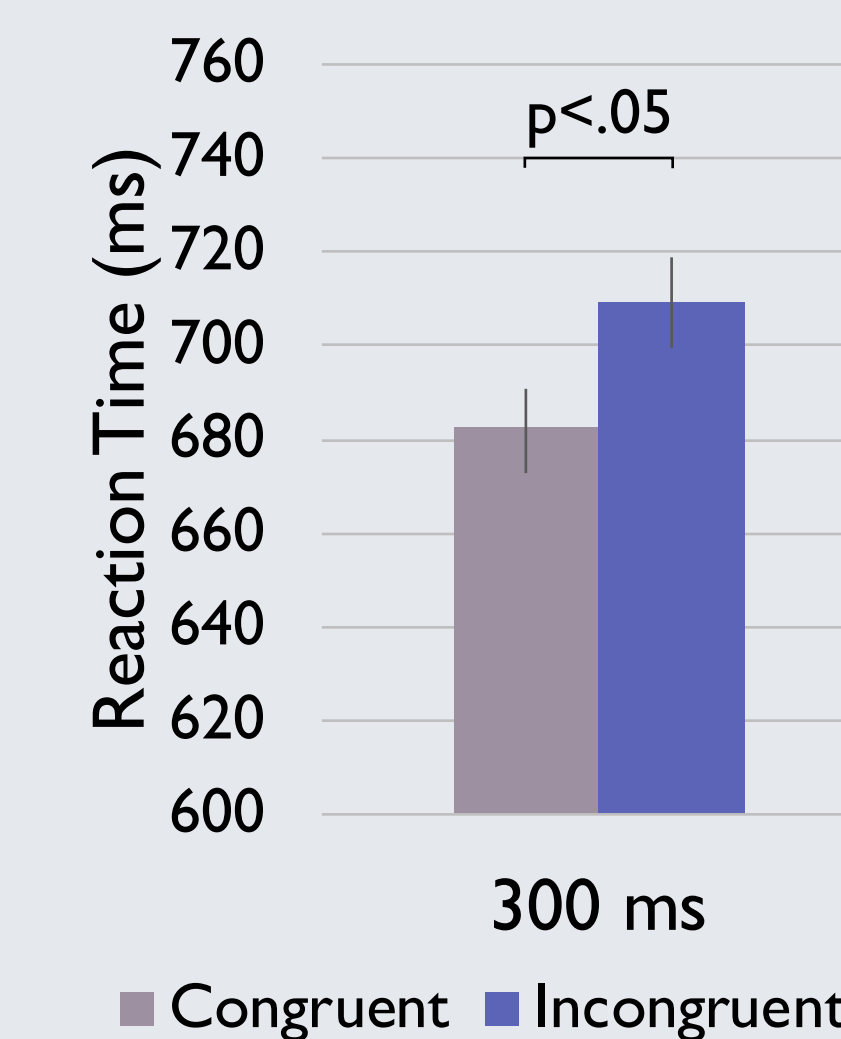
### Congruency Effect



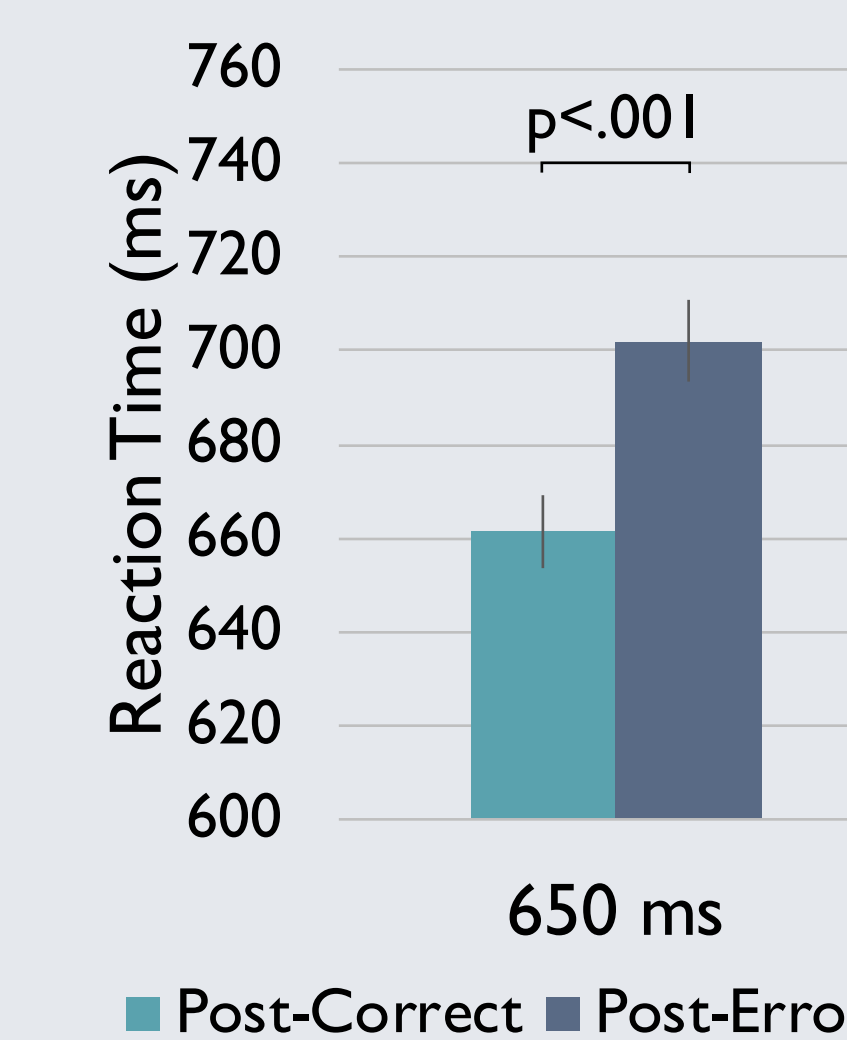
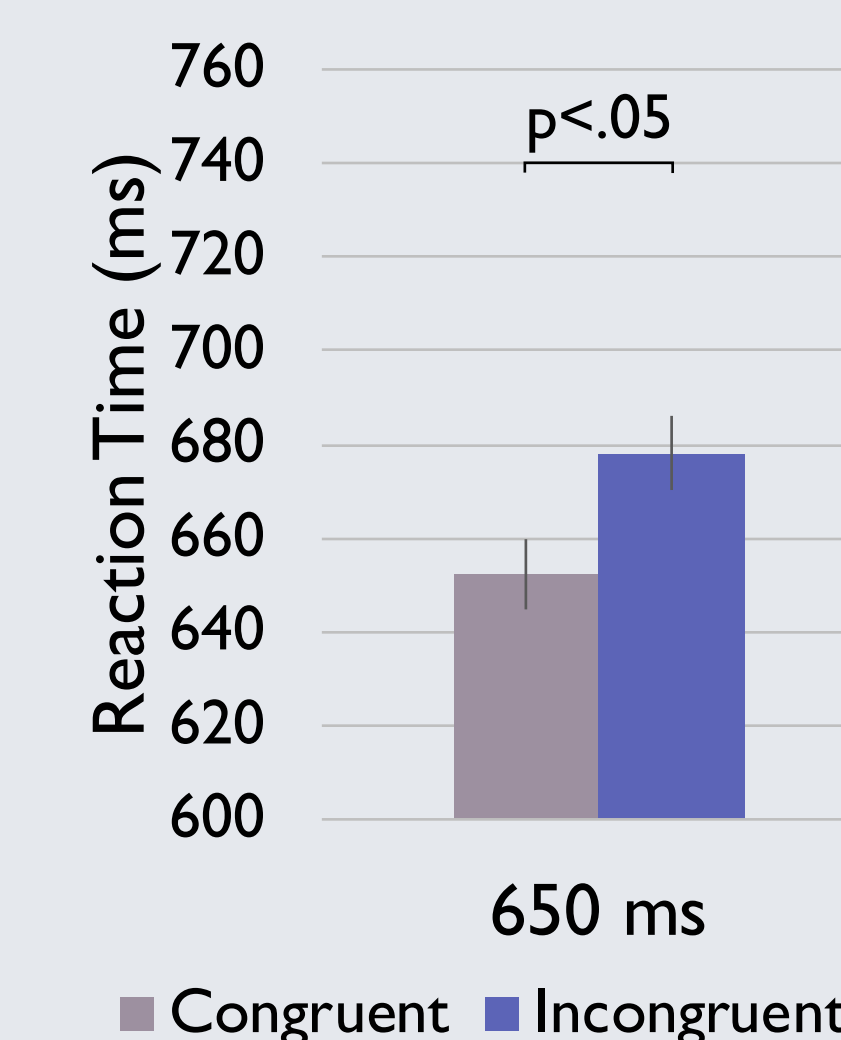
### Post-Error Slowing



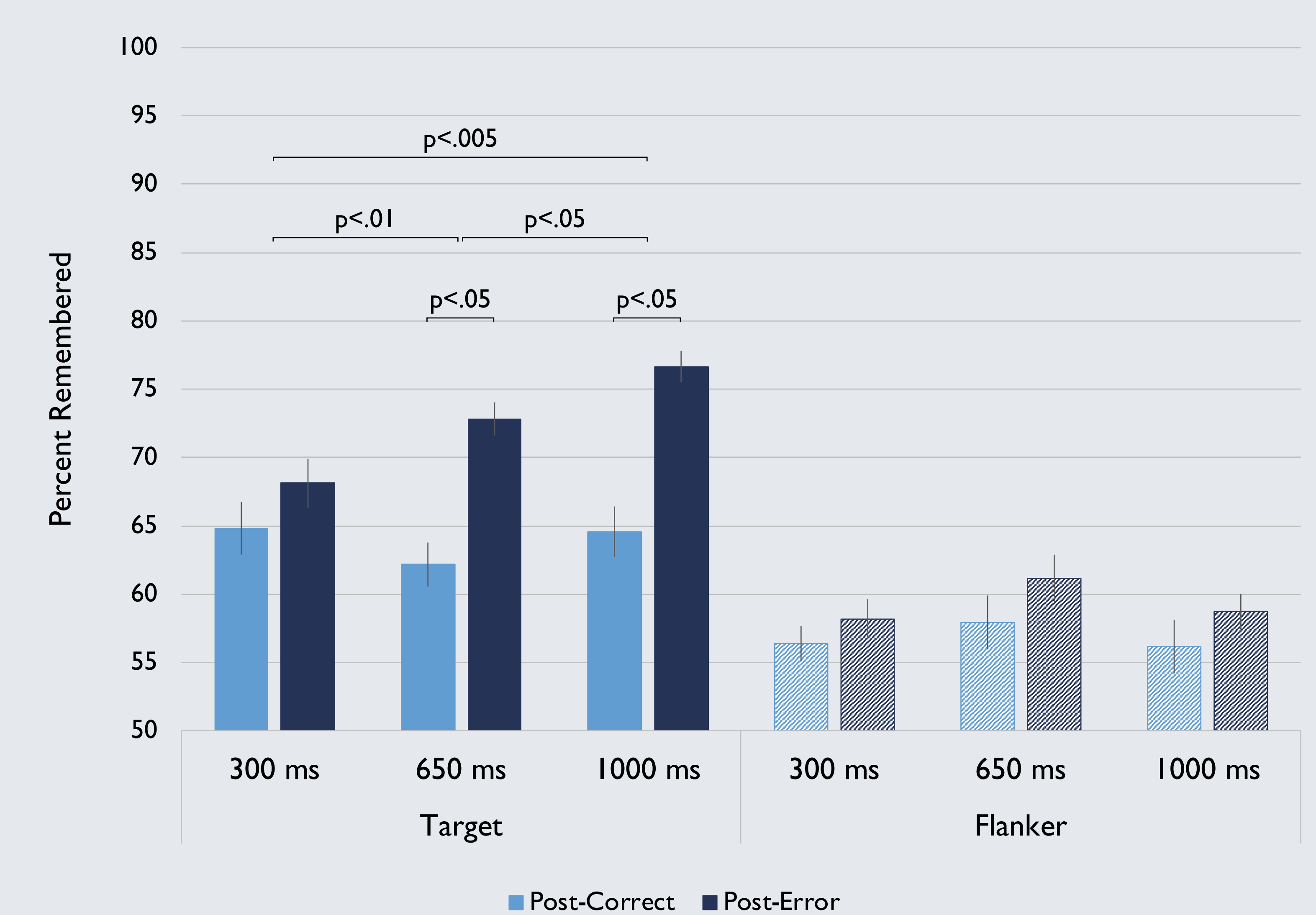
Experiment 2



Experiment 3



### Post-error memory enhancement is target-specific & time-dependent



To test for effects due to conflict elicited by incongruent stimuli, we compared memory for the target on post-incongruent vs post-congruent trials and found no differences.

To account for effects due to added exposure to the objects during post-error trials, we matched the RTs of the post-error trials by selecting the slowest quartile of post-correct trials. Still, we observed better target memory for post-error trials.

## Conclusions

The flanker task showed classic congruency and post-error slowing effects.

No beneficial encoding effects were observed when stimuli were presented with a 300 ms RSI following the error. However, a **post-error target enhancement (PETE)** effect did emerge at 650 ms and grew further at the 1000 ms RSI.

In line with the adaptive orienting account, these findings suggest that making an error results in enhanced processing selective to the task stimulus, but that this adaptive process only emerges following an initial period of disrupted task processing. When the processing cascade is interrupted, adaptive adjustments are not observed.