

# Practiced induced asymmetric task-switching costs: comparing pre-experimental experience with within-experiment training

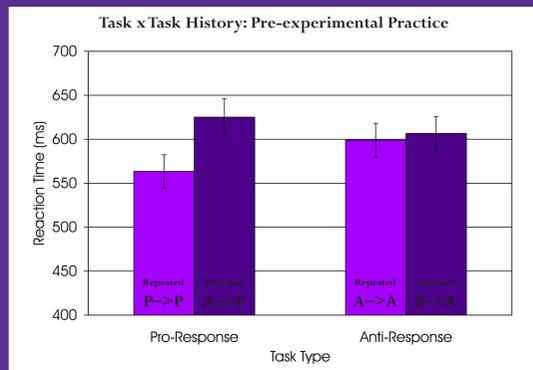
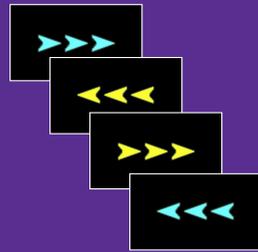
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## Introduction

Switching between different tasks or rule sets has been shown to produce decrements in performance. Switching between two response rules generally produces effects that are symmetric: switching from rule A to rule B incurs the same costs as switching from rule B to rule A. However, some combinations of rules produce more one-sided switching effects. Here we show how asymmetric switch costs can be generated by asymmetric task familiarity gained either prior to or during the experiment and compare the fMRI signatures of both types of experience.

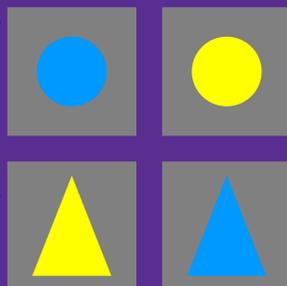
## Pre-experimental Practice

- Participants viewed sets of arrows and responded with left or right button presses.
- Based on the color of the arrows, the response was either in the direction the arrows pointed (pro-response) or in the opposite direction (anti-response).
- 6 blocks of 75 trials, 1300 ms response window, 1500–1800 ms ITI

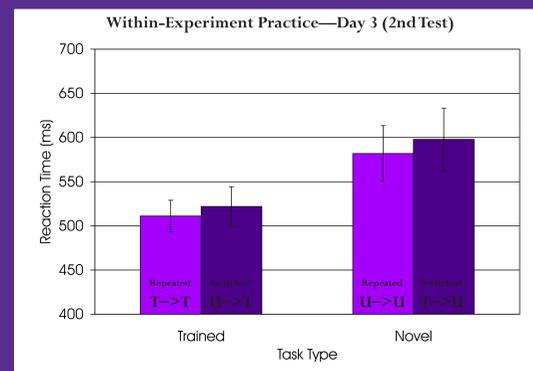
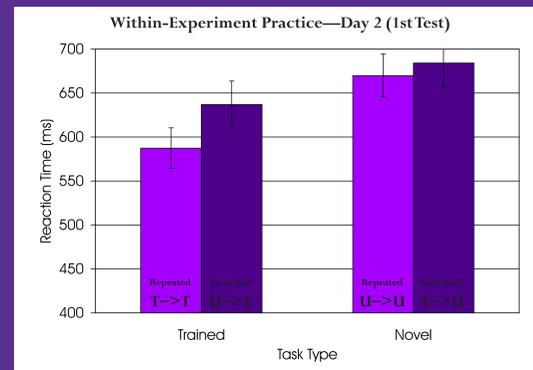
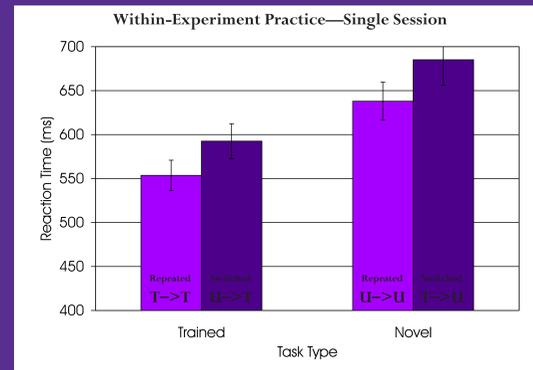


## Within-experiment Practice: Methods

- Participants were trained on two stimulus-response pairs: circles and triangles of a single color were paired with “z” and “/” keypresses (counterbalanced).
- 8 blocks of 100 trials each; about 35 minutes
- Stimulus stayed on the screen until a response was made.
- ITI was ~1600 ms for training and 1500–1900 ms for testing.
- Testing occurred 1–7 days later and was 6 blocks of 75 trials.
- When participants saw the trained color, they pressed the trained key (pro-response). When they saw the novel key they pressed the key for the opposite shape (anti-response).
- Participants were ≥98% correct for training, ≥90% at test.

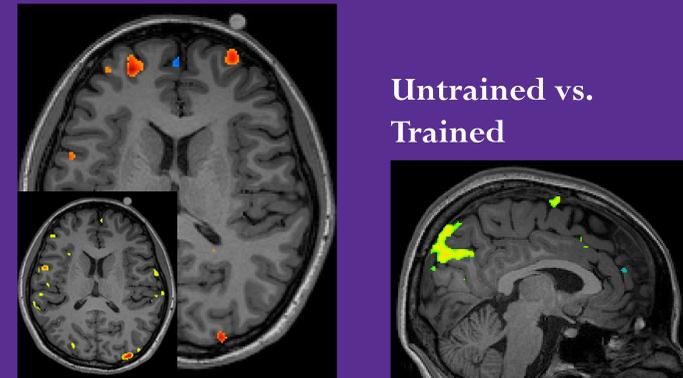
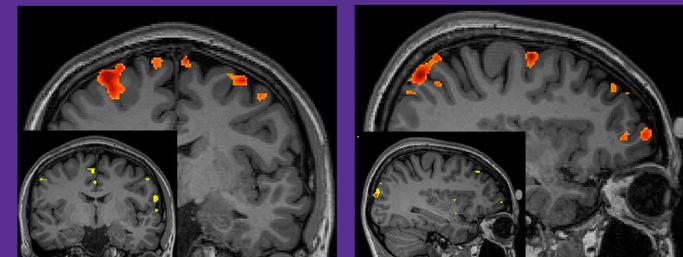


## Within-experiment Practice: Results



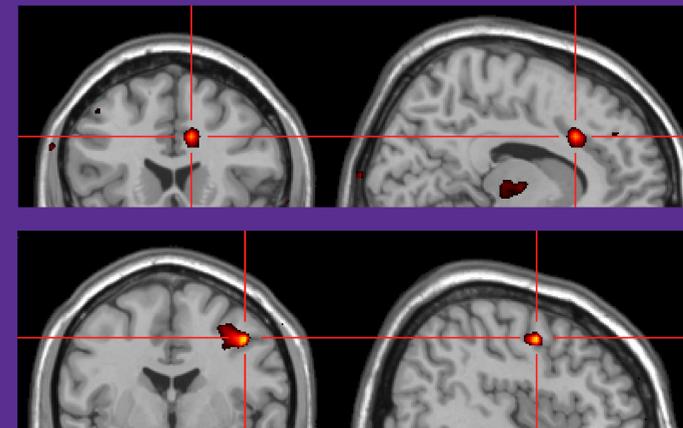
## Within-Experiment Practice — Day 2

Main: Trained Repeated vs. Trained Switched  
Inset: Untrained Repeated vs. Switched



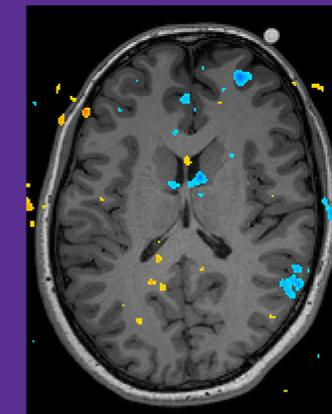
## Pre-experimental Practice (N=14)

Trained Repeated vs. Trained Switched



## Within-Experiment Practice — Single Session

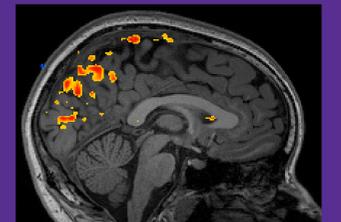
Trained Repeated vs. Trained Switched



**Pre-experimental Practice fMRI Methods:**  
Varian 4T, two-shot gradient-echo EPI sequence, half k-space TR=1.1 s, 20 axial slices, 3.5 x 3.5 x 3.5 mm voxels, 0.5mm slice gap.

**Within-Experiment Practice fMRI Methods:**  
Seimans Trio, one-shot EPI sequence with GRAPPA 3x acceleration, TR=1.55 s, 28 axial slices, 1.7 x 1.7 x 3.0 mm voxels, 0.5 mm slice gap.

Untrained vs. Trained



## Conclusions

Behaviorally, both pre-experimental and within-experiment practice produce switching costs. Switching costs are symmetric when both tasks are novel and when both tasks have had sufficient time to consolidate. However, switching costs are asymmetric when one task has had 24 hours to consolidate and the other has not. In that case, like in pre-experimental practice, costs are larger for trained trials than novel trials.

We expected the imaging results for the asymmetric behavior in the with-experiment practice to have the same neural signature as pre-experimental practice. While preliminary data shows strong activation in relevant areas such as the precuneus, dorsolateral prefrontal cortex, premotor and supplementary motor areas, no significant activity has been found in the anterior cingulate cortex or the inferior frontal junction.

## Acknowledgements

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