Asymmetric Task Switching Costs Generated by Task Practice

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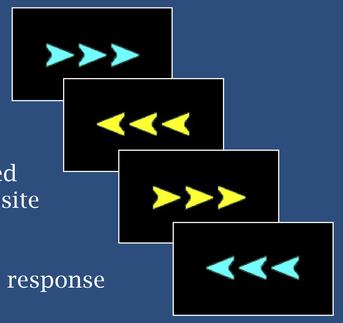
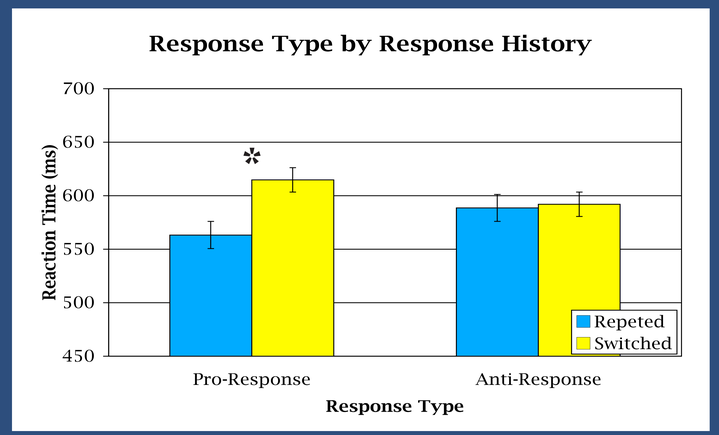
Introduction

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.

Pre-Experimental Associations—Behavior

- 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

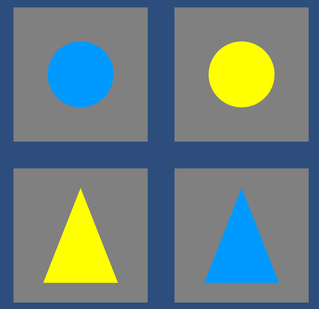




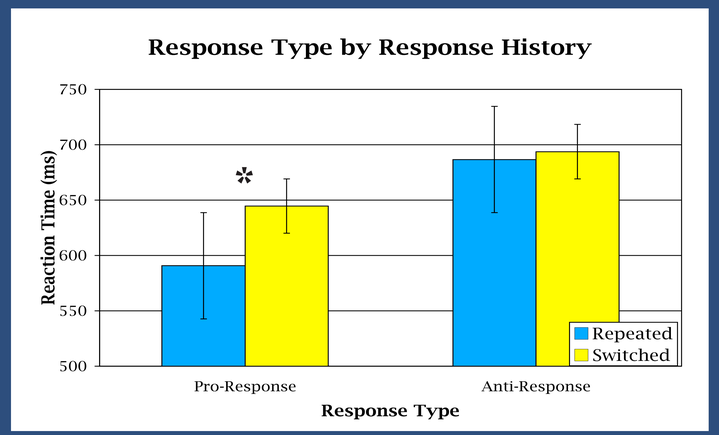
There was a significant effect of response history ($F(1,9)=33.323$, $p<0.001$) and a significant interaction between response type and response history ($F(1,9)=43.423$, $p<0.001$).

Within-Experiment Training

- 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.

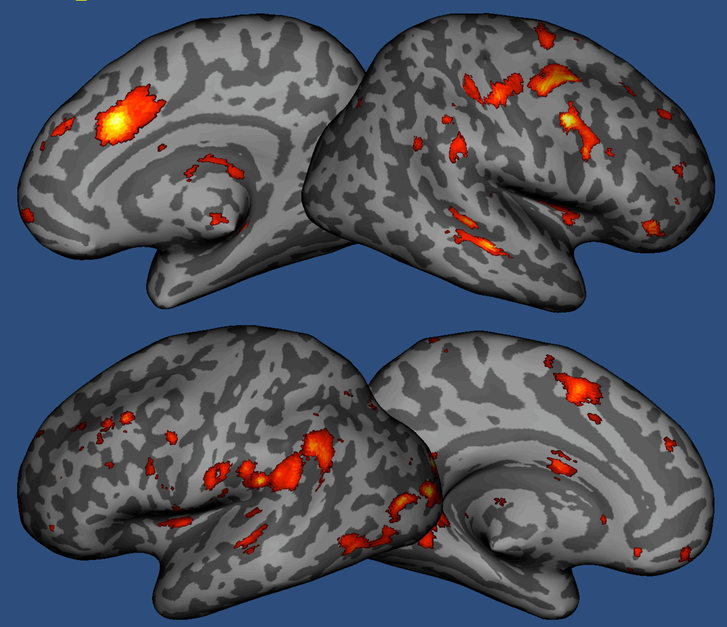


- ITI was ~1600 ms for training and 1500–1900 ms for testing.
- Testing occurred 1–7 days later and was 6 blocks of 75 trials.
- When participants saw the trained color, they pressed the trained key (pro-response). When they saw the novel color they pressed the key for the opposite shape (anti-response).
- Participants were ≥98% correct for training, ≥90% at test.



There was a significant effect of response type ($F(1,8)=37.753$, $p<0.0001$) and a significant interaction between response type and response history ($F(1,8)=12.391$, $p<0.008$).

Pre-Experimental Associations—fMRI



Conclusions

Asymmetric task switching costs were seen in two versions of a pro-/anti-response task. In the first, arrows served as stimuli with a pre-experimental response bias. In the second, half an hour of practice on two arbitrary stimulus-response pairs in a prior session produced comparable results.

Practice or facility with a rule, whether due to experimental training or real-world experience can lead to asymmetric switching behavior with greater switching costs for pro-response trials than anti-response trials.

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