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. However, how asymmetric task-switch costs can be generated by asymmetric task familiarity has been largely unexplored. Here we show how asymmetric switching costs can be generated by asymmetric task familiarity. Pre-experimental practice induced asymmetric task-switching costs:

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 arrow pointed (pro-response) or in the opposite direction (anti-response).
- 8 blocks of 75 trials, 1500–1800 ms ITI
- Stimulus stayed on the screen until a response was made.

Within-Experiment Practice: Methods
- Participants were ≥98% correct for training, 96% correct for within-experiment practice.
- 1500–1800 ms ITI for testing.
- 8 blocks of 100 trials each; about 35 minutes

Within-Experiment Practice: Results
Within-Experiment Practice — Day 2
Main: Trained Repeated vs. Trained Switched
Inset: Untrained Repeated vs. Switched

Within-Experiment Practice — Day 3
Main: Trained Repeated vs. Trained Switched

Within-Experiment Practice — Single Session
Trained Repeated vs. Trained Switched

Pre-experimental Practice (N=14)
Pre-experimental Practice
- Varian 4T, two-shot gradient-echo EPI sequence, half k-space TR=7.1 s, 28 axial slices, 1.7 x 1.7 x 3.5 mm voxels, 0.5mm slice gap
- Within-Experiment Practice
- Siemens Trio, one-shot EPI sequence with GRAPPA, 16 acceleration, TR=1.55, 32 axial slices, 1.7 x 1.7 x 3.0 mm voxels, 0.5 mm slice gap

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 pre-experimental practice, costs are larger for trained trials than novel trials.

We expected the imaging results for the asymmetric behavior to be in the superior parietal lobule, which is involved in rule switching. However, asymmetric switching costs were seen in the anterior cingulate cortex or the inferior frontal junction.

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