Compensating for a visuomotor rotation in the absence of sensory prediction errors

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Overview

- Sensorimotor learning of a visuomotor rotation is considered to be driven by error-based learning.

- However, recent work has highlighted how performance on such tasks may reflect the operation of multiple learning processes.

- To distinguish between these processes, we devised a variation of a visuomotor rotation task in which error-based learning should be minimized.

Background

Examples of multiple learning phenomena involved in visuomotor rotation tasks:

- Savings
- Strategic aiming
- Generalization
- Influence of prior reaches

Experimental Design

Four target positions displayed simultaneously.

Minimization of Error Based Learning

- Two rotation groups: In the first, participants were naïve about the rotation, in the second they were informed about the rotation.

Small vs Large Rotation sizes

- Two versions of each task condition (left) were run. One where the angle between each of the three cursors was 15°, and one with 45°.

- For the rotation condition, the cursors were rotated by the same amount as the spacing between the cursors.

Results

- Participants in the Not Rotated condition learned an equivalent rotation behavior but not via error-based learning.

- Smaller aftereffects in the 45° group compared to 15° group could be due to increased visual blurring/feedback uncertainty (Kasuga et al. 2013, Wei & Kording 2010).

- Informing participants about the rotation could increase explicit awareness and encourage the use of a strategy, shifting the peak of adaptation.

Conclusions and Questions

- Future: Characterizing non-adaptive learning mechanisms for different target distributions? (Verstynen & Sabes 2011)