The Effect of Type and Timing of Error Signals on Initial Implicit Changes in Visuomotor Adaptation

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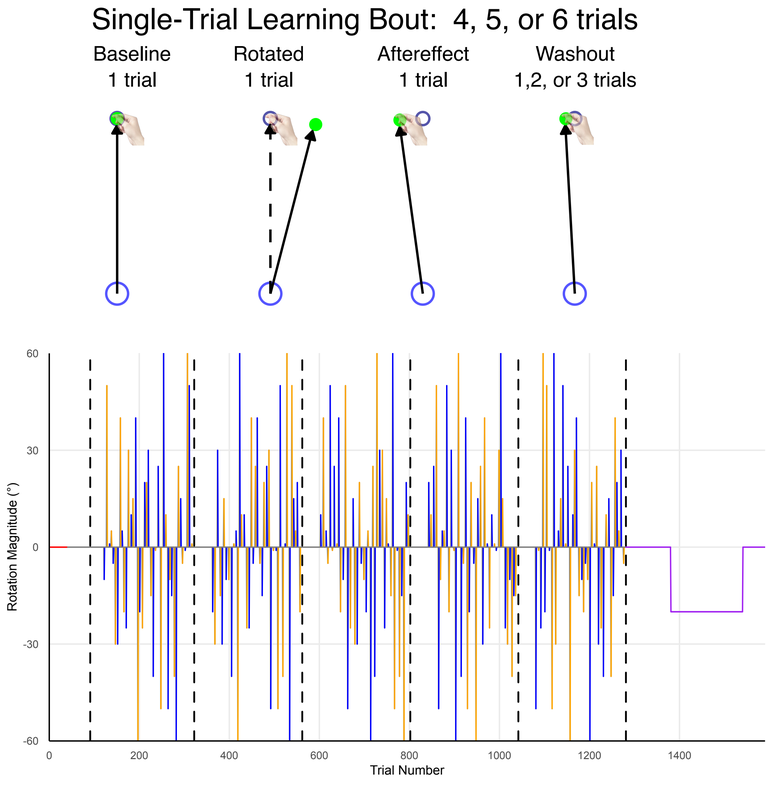
Initial rate of implicit change

Although implicit visuomotor adaptation is well studied, little is known about the earliest stages—especially how error type, magnitude, and timing shape single-trial learning. We used a single-trial approach to quantify initial implicit changes during movement-contingent adaptation to altered visual feedback. Across varying perturbation magnitudes, we examined how different error signals and their timing contribute to early recalibration.

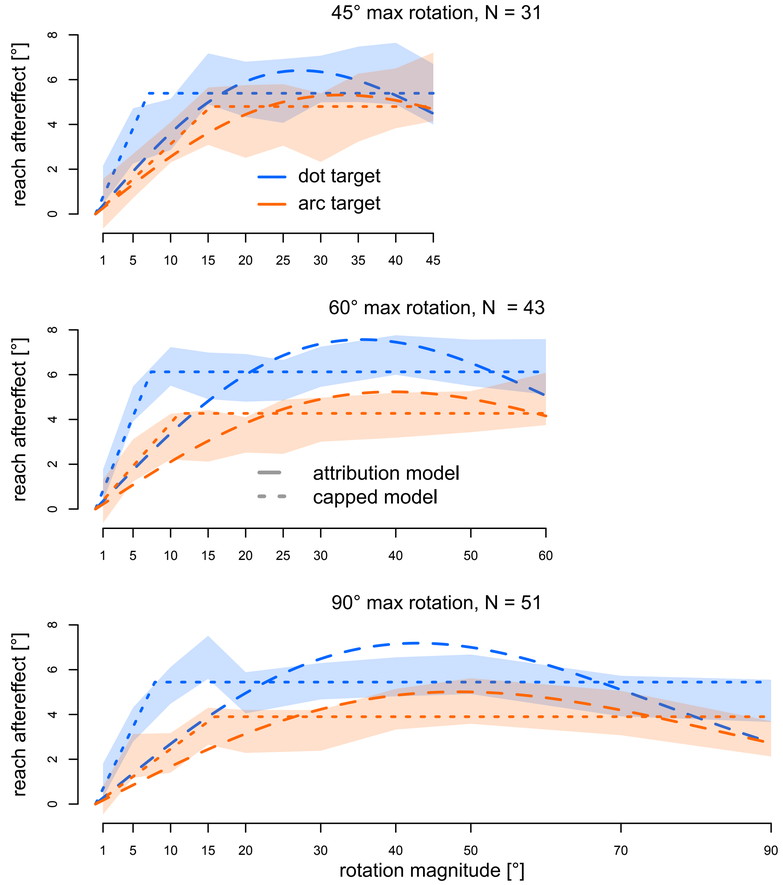


Effect of type of error signals and magnitude

Initial implicit changes saturated across perturbations from 15° to 90°, with no attenuation at higher magnitudes.

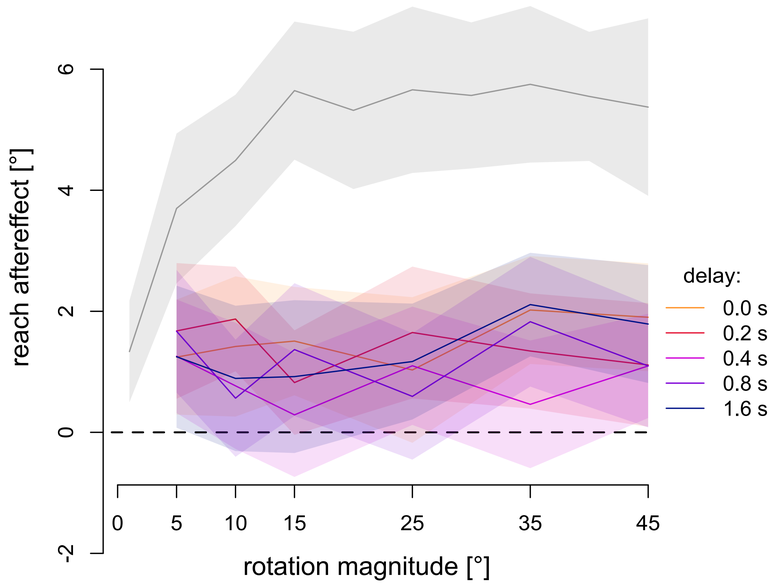
Comparing error signals with training target types

Initial afterffects were larger following targets that provided both SPE and target error (dot target) than those who only received SPE signals (arc target).



Effect of limited endpoint feedback and delays

Initial aftereffects were smaller when single-trial learning occurred with endpoint feedback compared to continuous cursor feedback. However, introducing feedback delays of up to 1.6 seconds did not lead to further reductions in aftereffect magnitude.



Take away

- Initial implicit adaptation does not scale with error size.
- Task error also plays a role in initial implicit adaptation.
- Initial implicit adaptation is reduced with endpoint-only feedback compared to continuous feedback, but not reduced with delays in feedback.

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