

Effects of visual cues on adaptation to internal and external errors

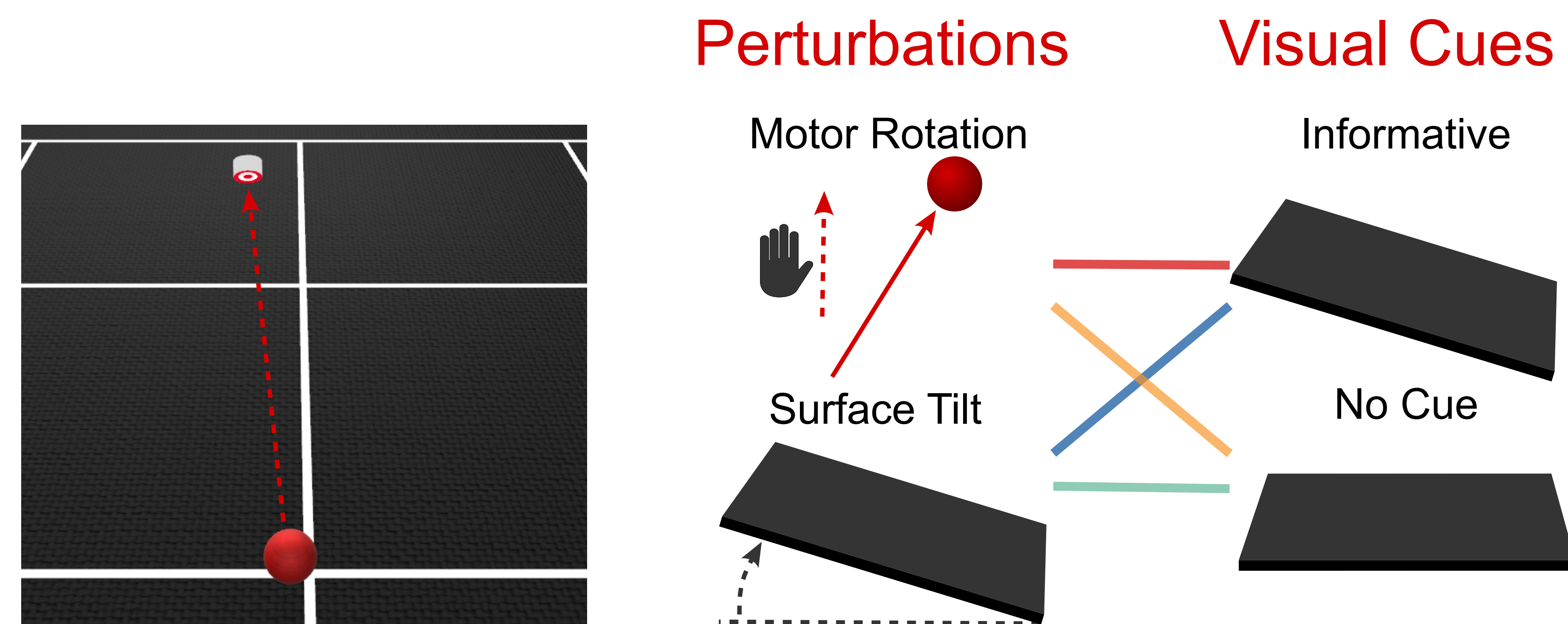
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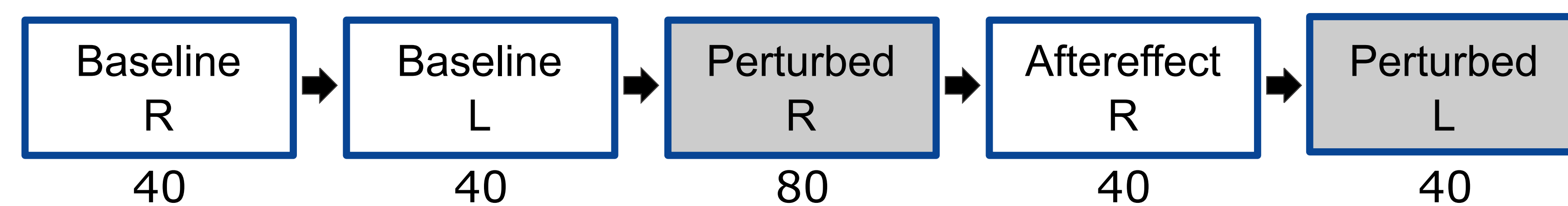
Error attribution during motor adaptation

During human motor adaptation, information about the source of motor errors is valuable and our motor system differently adapts to internal and external sources of error. Internal and external error attribution cannot be directly measured and in the past, has been difficult to disambiguate. We developed a set of tasks with clear disambiguation between internal and external errors. We explored how adaptation to such errors is affected by informative visual cues.

Participants rolled balls towards visual targets in an immersive virtual reality environment



Task schedule

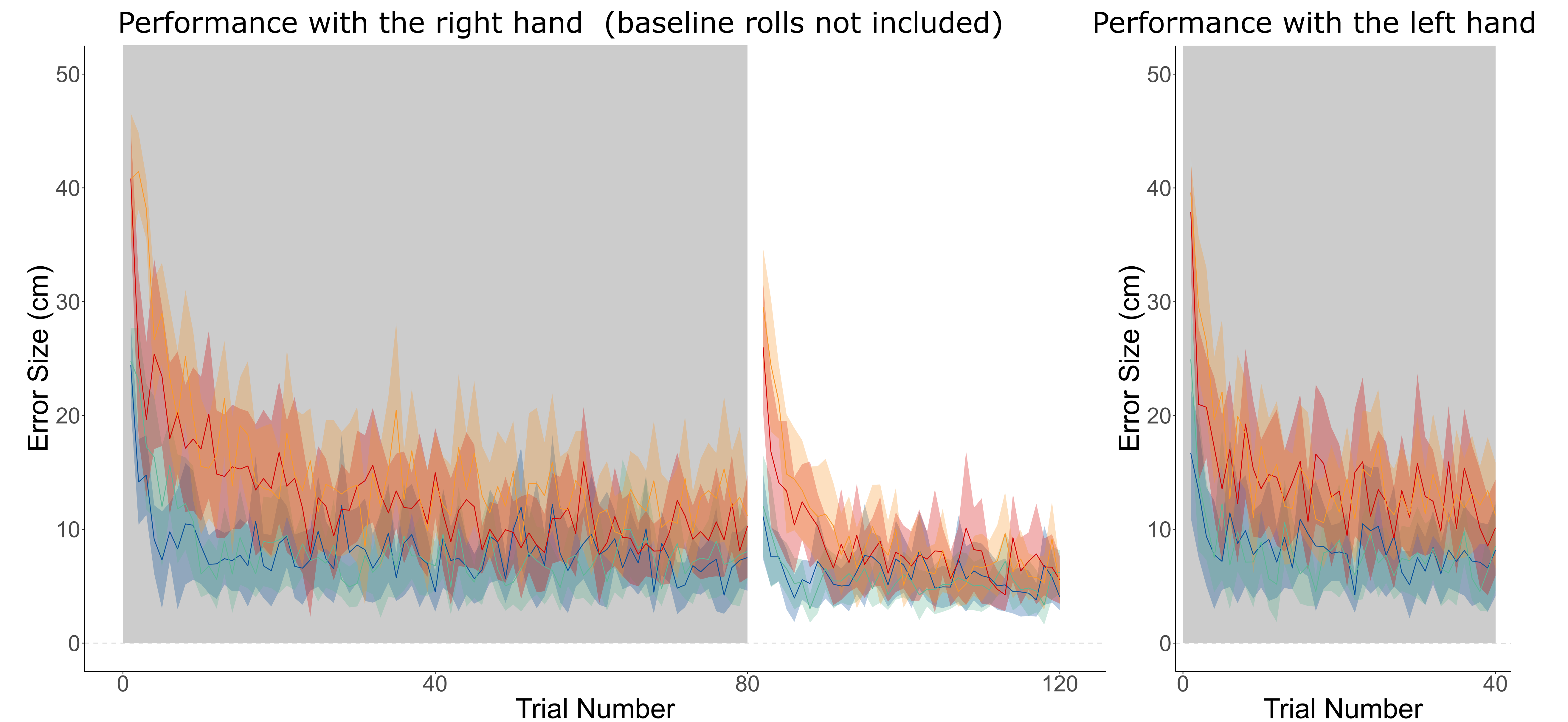


The experiment included 5 blocks of rolling tasks: 2 blocks of non-perturbed rolls, 1 adaptation block where rolls were perturbed, 1 block of non perturbed rolls to determine the aftereffects of adaptation, and finally one block of perturbed rolls to explore learning transfer to the opposite hand.

Participants (N = 73) were split into 4 groups with differing perturbations and visual cues

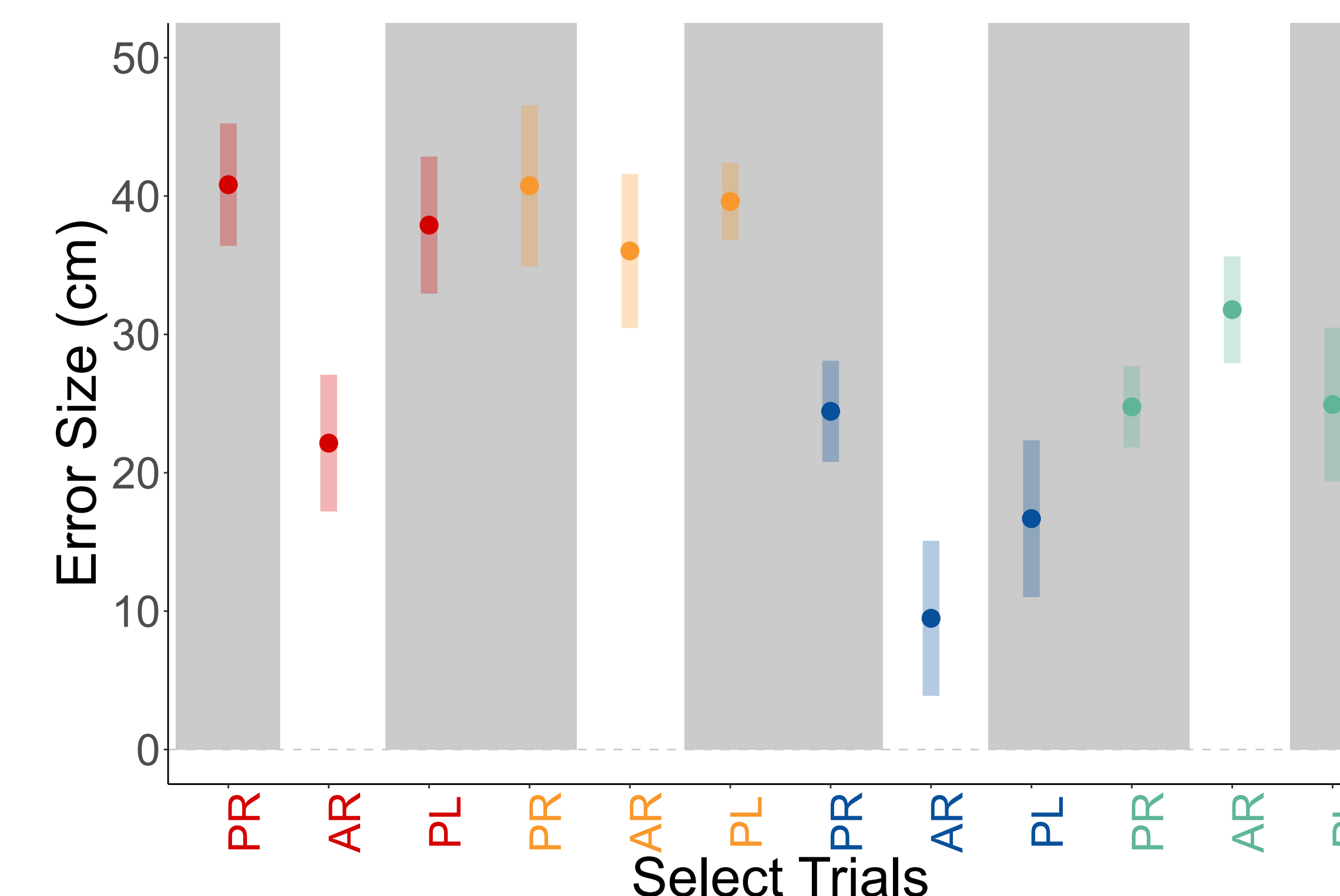
- Rotation + informative cue:** 30° visuomotor rotation for all Perturbed trials.
- Rotation + no cue:** 30° visuomotor rotation for all Perturbed trials.
- Plane tilt + informative cue:** 25° surface tilt for all Perturbed trials.
- Plane tilt + no cue:** 25° surface tilt for all Perturbed trials.

Participants in all groups adapted to the perturbation



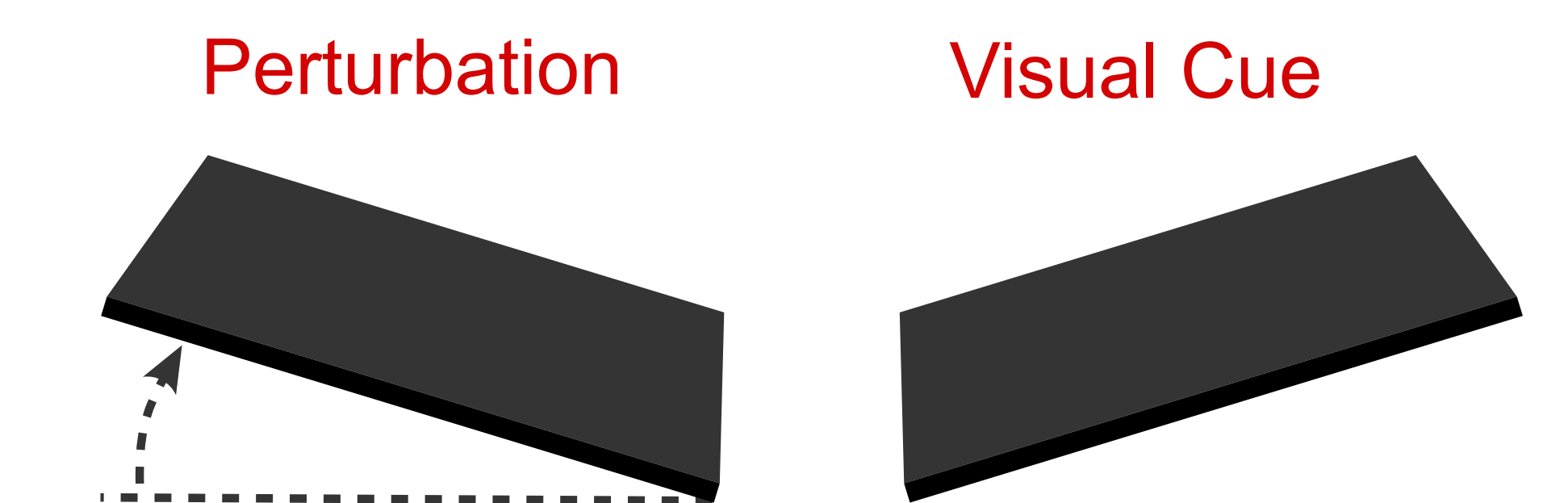
Visual cues were necessary for external error attribution

Groups without visual cues had increased aftereffects. Surface tilt and informative cues were necessary for transferred learning to the opposite hand (external error attribution)

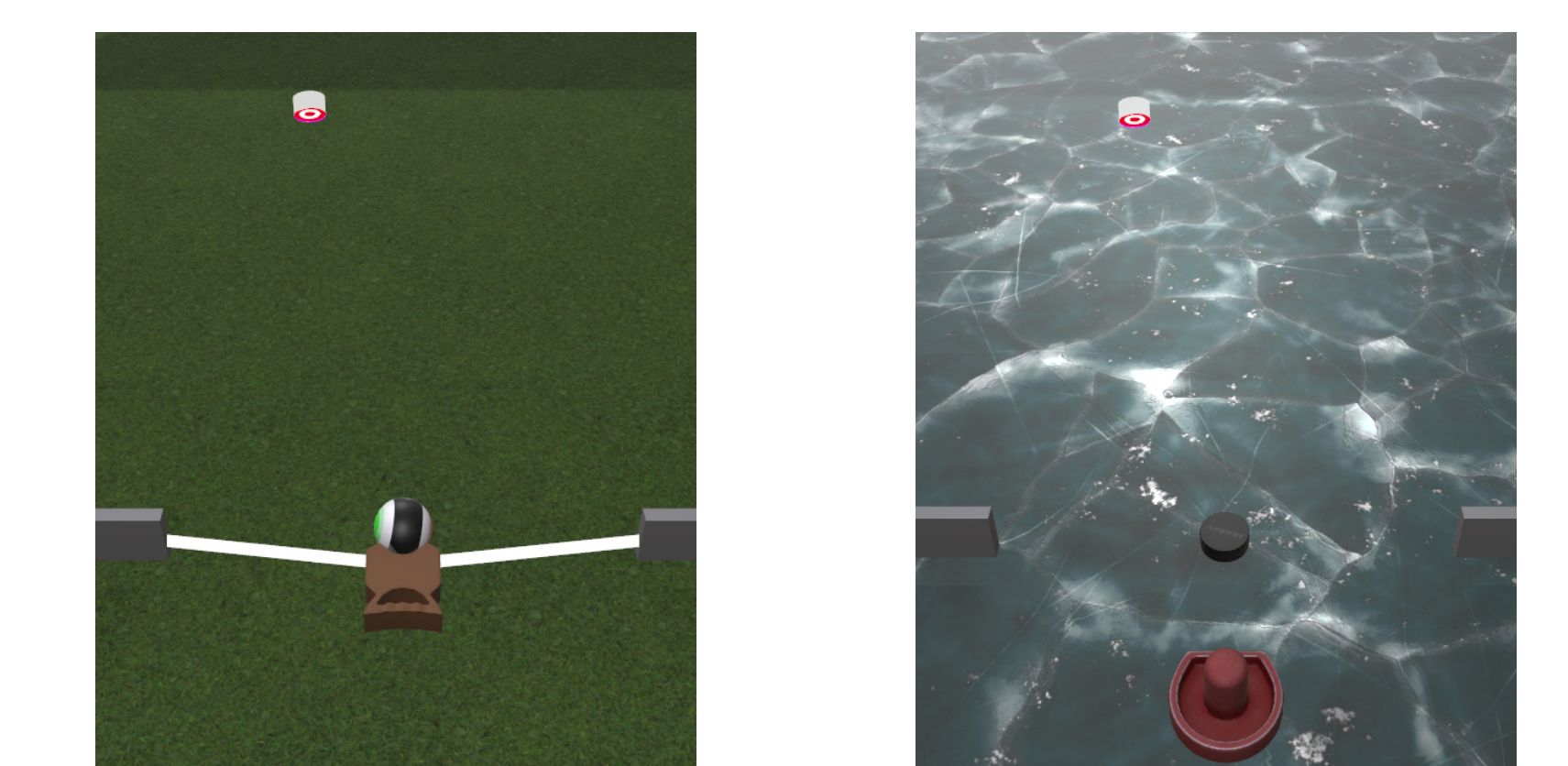


Next steps

Non-informative cues



Tools and environments



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