

Motor Adaptation and Generalization in a Virtual Throwing Task Under Simulated Environmental Perturbation

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Ecological Motor Adaptation

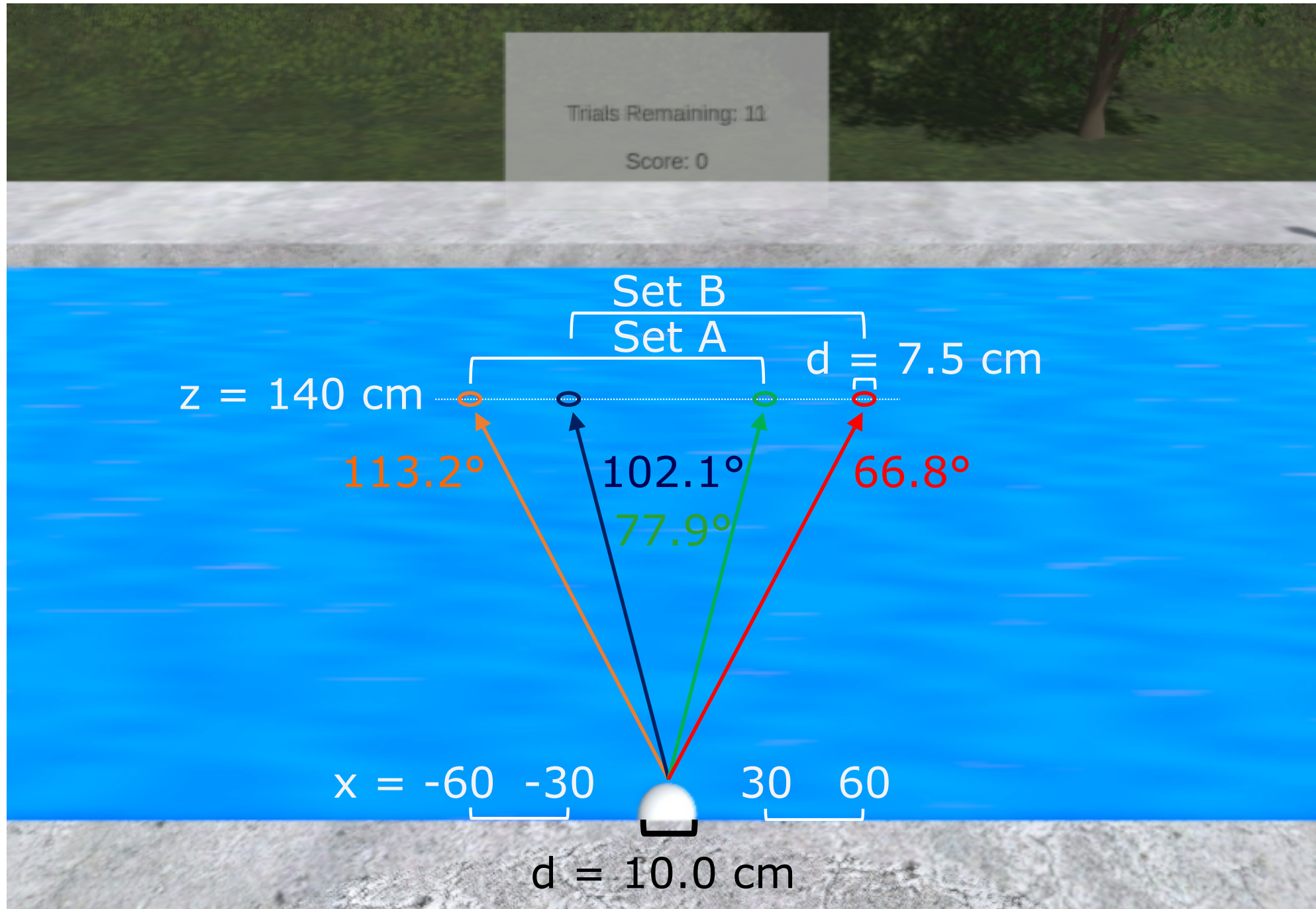
Motor adaptation has been extensively studied through visuomotor rotation and force field paradigms

Adaptation in the real-world often involves compensation to environmental perturbations (e.g., wind or water currents)

We wanted to investigate adaptation to a simulated environmental perturbation with rich sensory cues

Virtual Paradigm

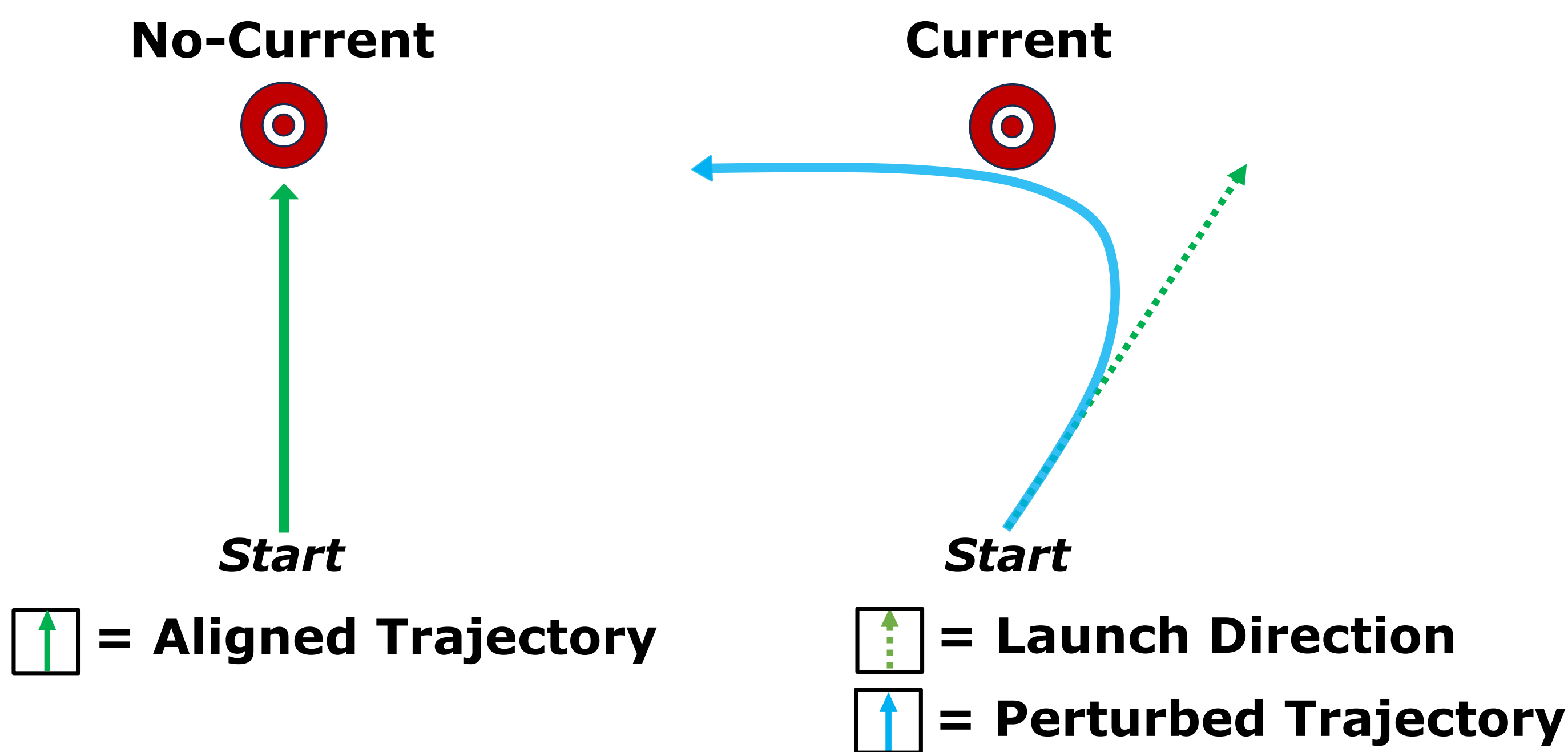
Participants (N = 41) launched a ball toward a target in VR



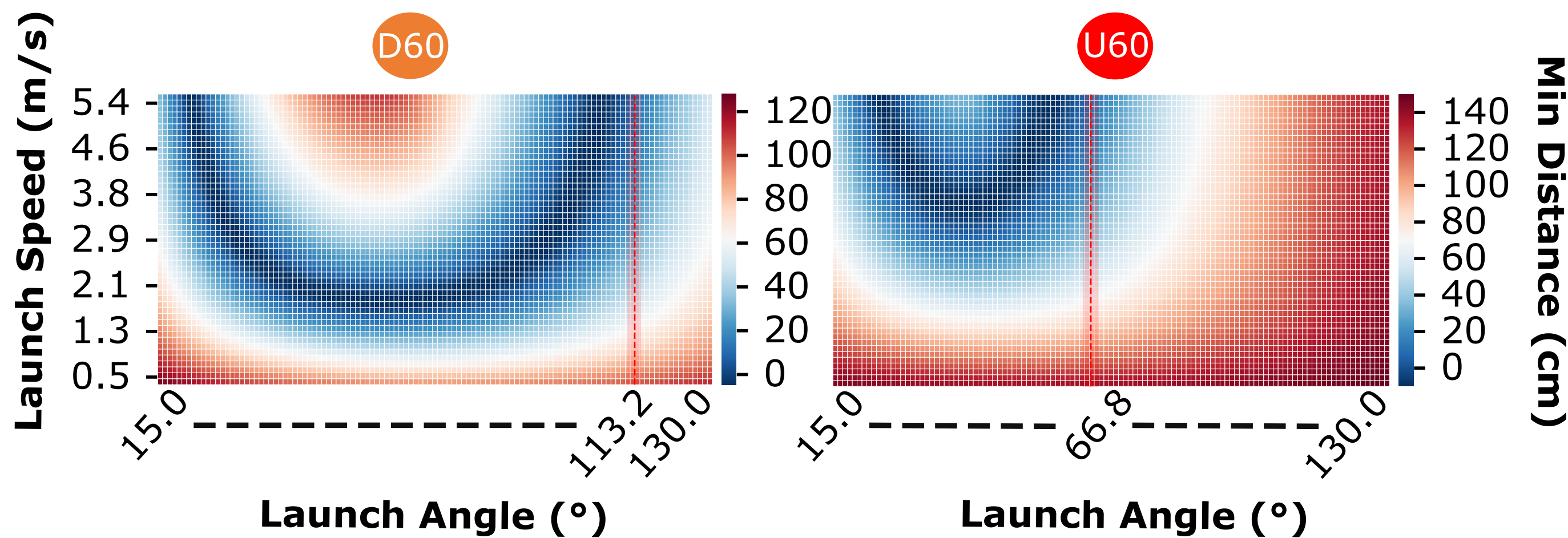
Trial Schedule



Trial Types



Target Types & Solution Spaces



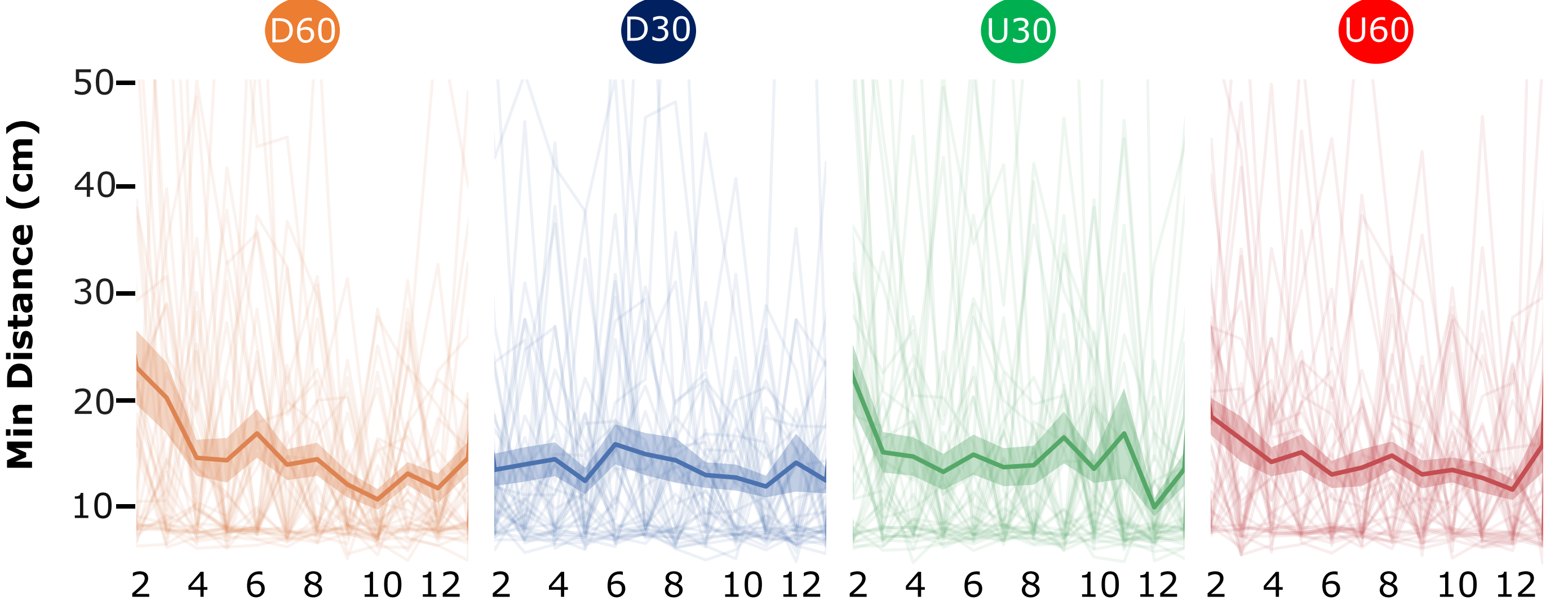
Main Takeaways

Error reductions from early to late training show that participants adapted their motor commands to the external perturbation

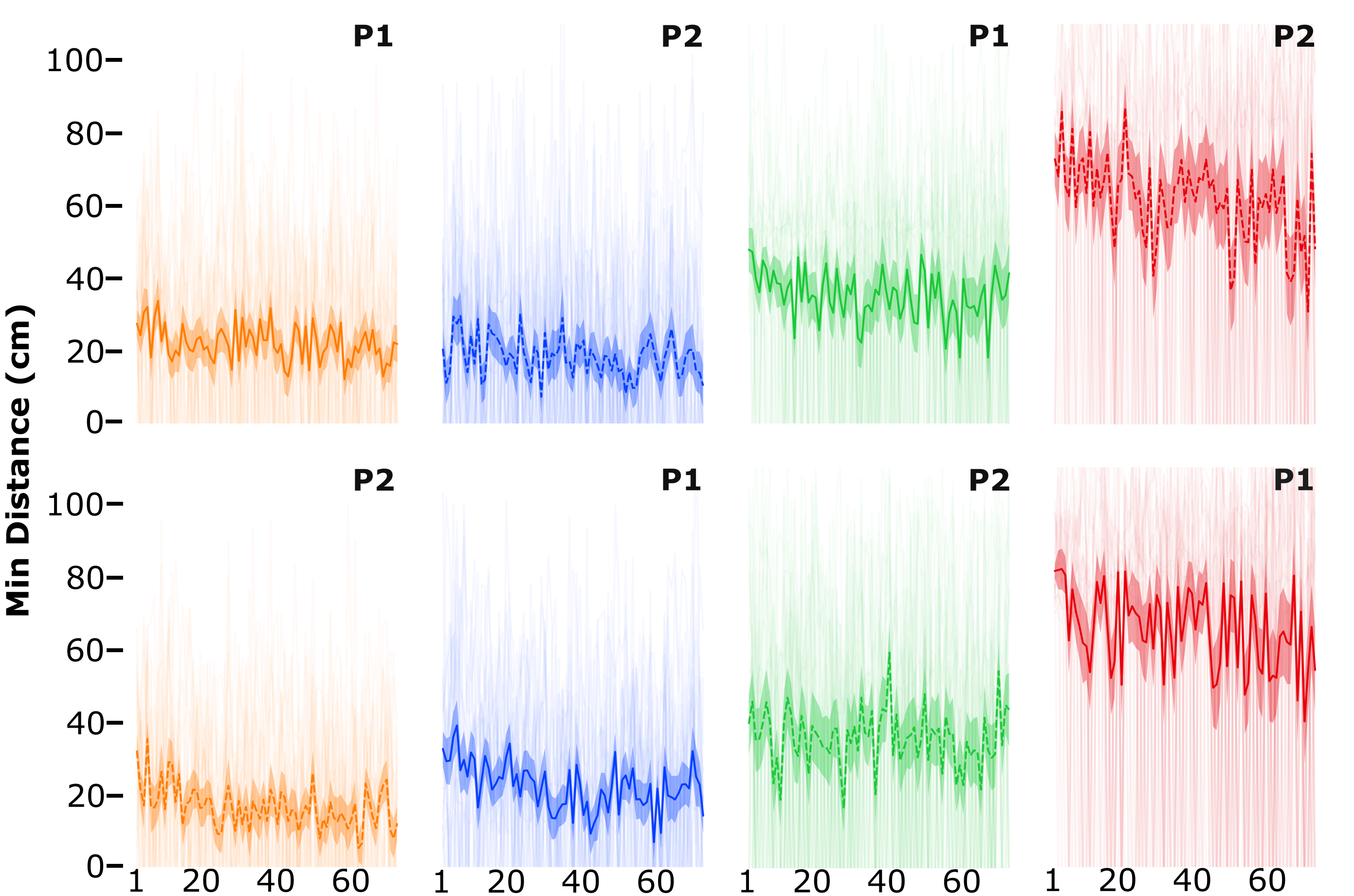
Lower initial errors for the Transfer targets compared to the Trained targets provide evidence that learning generalized to novel contexts

Together, these findings suggest that participants developed an internal model of ball-water dynamics, enabling them to generate successful goal-directed motor commands even in untrained contexts

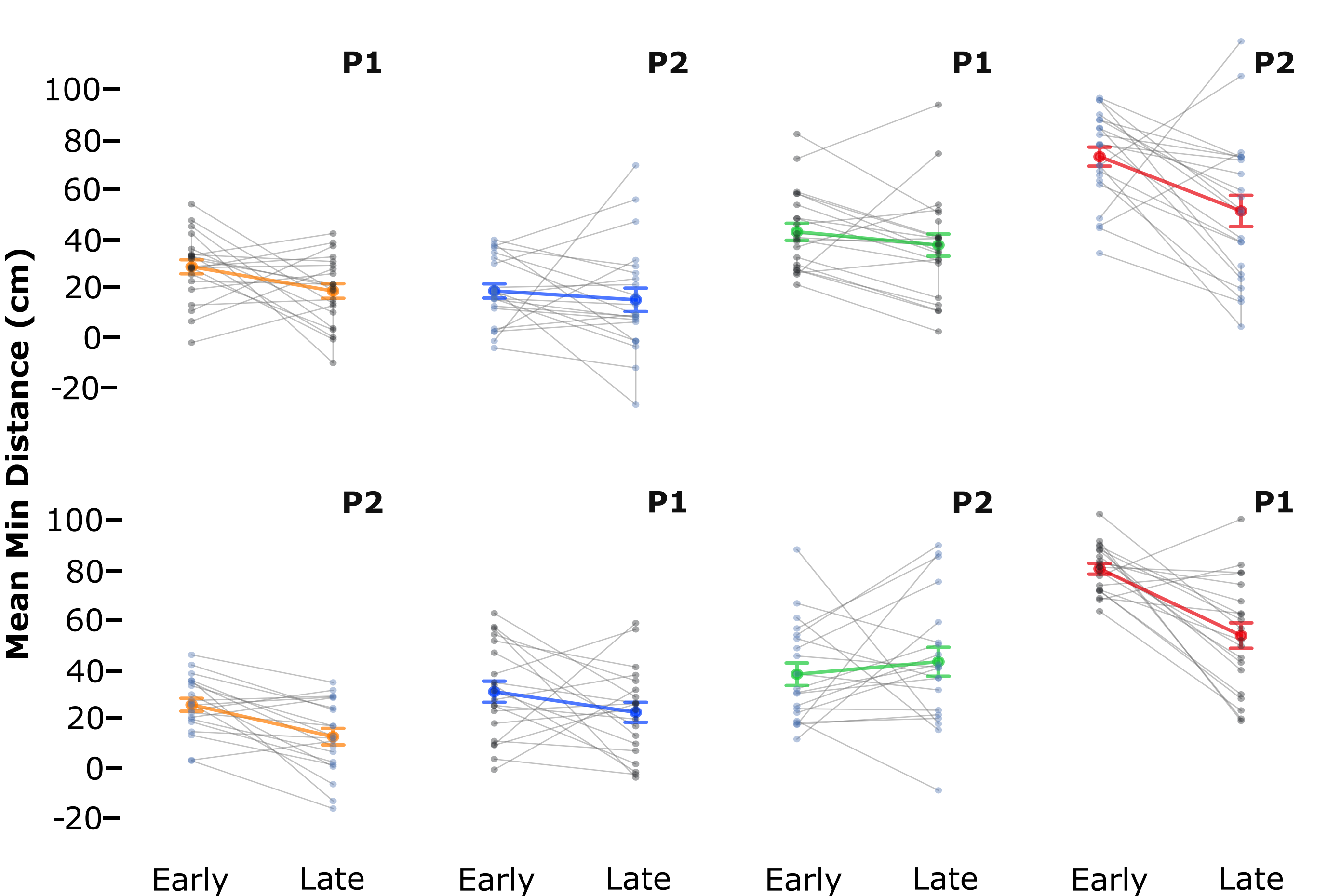
Baseline no-Current (Trials per Target)



Training under the Current (Trials per Target)



Error Reductions Across Early and Late Training



Generalization Across Novel Contexts

