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Overfitting of Explicit Strategies during Sensorimotor Learning

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Abstract

Multiple learning processes contribute to successful goal-directed actions in response to changes in physiological states and environments. Among them, explicit strategies play a crucial role, enabling rapid and flexible sensorimotor adaptation. Yet, how the training target distribution impacts strategy discovery remains poorly understood. To address this, we conducted a visuomotor adaptation reaching task that isolated explicit strategy. We manipulated two training distribution features in a 2×2 between-participants design ($N = 50/\text{group}$): the spatial arrangement (dense vs. distributed) and the target number (2 vs. 8). To pinpoint the strategies participants adopted, all groups periodically reached to a shared generalization target without feedback. Learning was faster with fewer and denser targets. Strikingly, the training target number had no effect on generalization, but those trained with densely arranged targets adopted simpler yet flawed strategies, leading to poor generalization. These findings suggest that training distribution influences strategy discovery—potentially steering participants toward overfitting, non-generalizable solutions.