

Investigating the contribution of eye movements to visuomotor adaptation

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Abstract

Adapting hand movements to changes in our body or the environment is essential for skilled motor behavior. Although eye movements are known to assist hand movement control, how eye movements might contribute to the adaptation of hand movements remains largely unexplored. To determine to what extent eye movements contribute to visuomotor adaptation of hand tracking, participants were asked to track a visual target that followed an unpredictable trajectory with a cursor using a joystick. During blocks of trials, participants were either allowed to look wherever they liked or required to fixate a cross at the center of the screen. Eye movements were tracked to ensure gaze fixation as well as to examine free gaze behavior. The cursor initially responded normally to the joystick, but after several trials, the direction in which it responded was rotated by 90°. Although fixating the eyes had a detrimental influence on hand tracking performance, participants exhibited a rather similar time course of adaptation to rotated visual feedback in the gaze-fixed and gaze-free conditions. More importantly, there was extensive transfer of adaptation between the gaze-fixed and gaze-free conditions. We conclude that although eye movements are relevant for the online control of hand tracking, they do not play an important role in the visuomotor adaptation of such tracking. These results suggest that participants do not adapt by changing the mapping between eye and hand movements, but rather by changing the mapping between hand movements and the cursor's motion independently of eye movements.