

## **ACTION VIDEOGAME PLAY IMPROVES VISUAL MOTOR CONTROL**

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Can action videogame play improve visual motor control? If yes, can it be used in training complex visual motor skills such as driving? Here we took a control-theoretic approach and tested non-video-game players with a typical compensatory manual control task. After playing a driving (Experiment 1) or a first-person shooter (FPS) action videogame (Experiment 2) for only five hours, participants improved significantly in both the control precision (measured as the RMS error) and response amplitude (gain) for their performance on the manual control task. No enhancement on participants' contrast sensitivity function was observed. We fit the performance data to an extensively validated Crossover Model to further understand how action gaming affects the perceptual system that processes visual information and the neuromuscular system that executes the control command. Our model-driven analysis revealed that playing either a driving or an FPS game improved the perceptual sensitivity to input visual information for online motor control; that playing the FPS game also facilitated anticipating input errors to generate control ahead of time but hurt the stability of the neuromuscular system. In contrast, no effect on the control performance was observed for participants who played a non-action videogame. We then examined whether the improvement in the performance on the manual control task can transfer to daily visual motor control tasks such as driving. We found that lane-keeping performance significantly improved for participants who completed a 40-min training session of the manual control task while no such improvement was observed for participants without training. In summary, the present study provides the first empirical evidence for a causal link between action gaming (for as short as five hours playing) and enhancement in visual motor control. The findings have practical implications for developing training tools to improve performance on daily visual motor control tasks such as driving.

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