

Lecture 4183

Tool-use training in augmented reality: Changes on forearm body schema and somatosensory representation

Submission

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Abstract Submission

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Abstract Body

Miller et al. (2014) described altered arm representation and body schema after training to use a mechanical gripper for grasping distant objects. We examined whether similar training with a virtual tool in augmented reality (AR) would have comparable effects. Thirty young adults learned controlling a virtual gripper to grasp virtual objects at various locations in horizontal plane. Vibrotactile feedback was applied to thumb and index fingers through a CyberTouch II cyber glove when the tool touched the object. Participants performed 4 training blocks with 60 trials each. In a tactile distance judgement task performed before, after 2 blocks, and after 4 blocks of training, participants judged distances between two tactile stimuli, synchronously applied to their right forearm. The stimuli were applied either along ("vertical") or perpendicular ("horizontal") to the arm, with three distances per orientation (5 trials per orientation and distance). Mean estimation errors were calculated. ANCOVA with orientation as factor and estimation error at t0 as covariate to correct for baseline differences, revealed a significant effect of orientation ($F(1,375) = 4.1156, p = .043, p\eta^2 = .011$). Estimation errors were smaller for vertical as compared to horizontal orientations, indicating that the stimulated locations on the arm were perceived as being closer together for the vertical orientation. These results confirm that virtual tool use training has a strong short-term effect on the body schema. We conclude that the virtual tool was integrated into the arm representation resulting in a shrinkage of perceived distances on the arm along the vertical axis.

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