Supplementary Electronic Material

*Equipment.*

The equipment setup was composed of: 1) a VR Cave with four stereoscopic screens of 1m x 1m, where 3D images were back-projected by NEC projectors; 2) a haptic interface composed by a 3 degrees of freedom (3DoF) robotic arm with a working space of 3m x 2m x 3m and a maximum continuous force feedback of 10 N (Bergamasco et al., 2006); 3) stereovision glasses for enabling subjects to perceived in 3D the stereoscopic images projected on the screens; 4) a VR scenario projected on the cave's frontal screen, consisting of a 3D avatar which reproduced the right upper limb of the subject and simulated the task of moving a virtual lever (Padilla Castaneda et al., 2014); 5) a visual reference for the identification of the hand position, in a form of a calibrated virtual ruler always projected at the same location on the frontal screen.

The experiment protocol required the measurement of the lengths of the subject arm and forearm for the correct estimation of the joint angles, the calibration of the starting position of the subject (zero position), of the virtual ruler and of the velocity of the movements. For the zero position, subjects adjusted their right arm to the starting position, graphically indicated in the screen at the beginning, with the real/virtual hands aligned at the ruler's zero along the Z axis, the shoulder and the elbow extended approximately at 25oand 70o, respectively.

For the virtual ruler calibration subjects then horizontally moved the arm and placed the hand (robot’s end-effector position) at their right limits within the constrained linear workspace along the X axis, and expressed the corresponding perceived positions on the ruler of the virtual hand. Once the zero and right limits of excursion were set up, the system computed three positions (lateral, P1; intermediate, P2; medial, P3). In order to calibrate the movement velocity, subjects were trained for performing repetitive lateral movements along the X axis, from the zero position up to the lateral limit during 3-5 minutes, until achieving a mean reference velocity of 45.0±20.0cm/s (graphically indicated with a bar on the screen). Additionally, a general manual calibration of the robot end-effector position along the horizontal X axis with respect to the virtual ruler units was done, giving 3.4 cm per ruler unit.

*Correct/incorrect visual feedback*.

For the correct/incorrect visual feedback we adopted an strategy reported in a previous study (Padilla-Castaneda, Frisoli, Pabon, & Bergamasco, 2014). The correct visual feedback consisted of the replication in real time of the subject movements by a virtual arm representing the subject arm, aligned with the subject arm in first-person perspective. The incorrect visual feedback not corresponding with the subjects real movement was introduced by showing the replicated movementshifted through an incremental drift of 2±0.5 ruler units (6.8±1.7 cm) of the virtual hand position, by augmenting the estimated joint angles of the subject's arm. The drift was progressively applied during the movement at an increment rate of 90 cm/s (twice the reference trained movement velocity of 45 cm/s). In this way, despite of subjects were aware that the visual feedback might be correct or incorrect during the experiment, the incremental drift was unnoticeable during the task.