

Neurophysiological Evaluation of Visual and Haptic Sense Mechanisms in Grip Movements with Artificial Visual Transmission Delay

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Abstract

Prior studies have been performed about weight illusions showing that grip movements can manipulate visual feedback. However, in these experiments, usually only the appearance of the object is changed, such as in the Material-Weight Illusion (MWI) or Size-Weight Illusion (SWI), the most famous among the weight illusions. Here, we confirm the phenomenon of the weight illusion being induced by creating a temporal difference between an object's motion information (lifting) and its visual information (lifted). We used here a virtual reality device with a stereoscopic object gripping system using two haptic devices. We show that it was the manipulation of time that caused the illusion. Still, we could observe neither change of grip force (GF) nor load force (LF) in grip movements of the participants.

Using transcranial magnetic stimulation (TMS), we investigated the activity of the primary motor cortex by examining the excited state of this area during presentation of a visual transmission delay. We observed that the amplitudes of motor evoked potentials were different between various transmission delay times. This result suggests that the weight illusion is associated with activation of the motor cortex and not muscle activity.

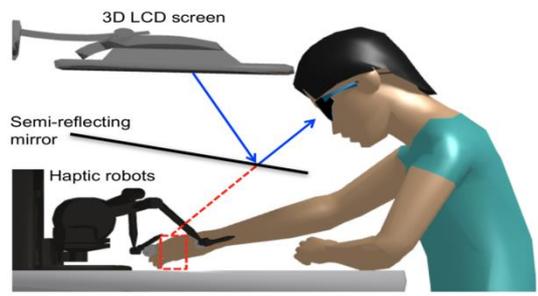


Fig.1 : Stereoscopic and Gripping System

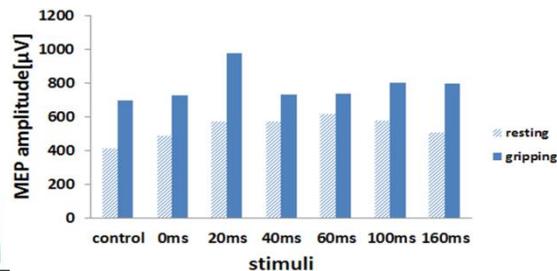


Fig.7 : MEP amplitude (subject1)

References

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