E-Poster

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Neural Basis of Lower-Limb Visual Feedback Therapy: An EEG Study in Healthy Subjects

Topic: Virtual Reality

Ahmed Adham[1], Ba Thien Le[2], Julien Bonnal[2], Hugo Bessaguet[1], Etienne Ojardias[1], Pascal Giraux[1], Pascal Auzou[2]

[1]*Neurology, CHU Orléans, Orléans, France*
[2]*Physical Rehabilitation Medicine, CHU Saint-Etienne, Saint-Etienne, France*

BACKGROUND

Video-feedback observational therapy (VOT) is an intensive rehabilitation technique based on movement repetition and visualization that has shown benefits for motor rehabilitation of the upper and lower limbs. Despite an increase in recent literature on the neurophysiological effects of VOT in the upper limb, there is little knowledge about the cortical effects of visual feedback therapies when applied to the lower limbs. The aim of our study was to better understand the neurophysiological effects of VOT. Thus, we identified and compared the EEG biomarkers of healthy subjects undergoing lower limb VOT during three tasks: passive observation, observation and motor imagery, observation and motor execution.

METHODS

We recruited 38 healthy volunteers and monitored their EEG activity while they performed a right ankle dorsiflexion task in the VOT. Three graded motor tasks associated with action observation were tested: action observation alone (O), motor imagery with action observation (OI), and motor execution synchronized with action observation (OM). The alpha and beta event-related desynchronization (ERD) and event-related synchronization (or beta rebound, ERS) rhythms were used as biomarkers of cortical activation and compared between conditions with a permutation test. Changes in connectivity during the task were computed with phase locking value (PLV).

RESULTS

During the task, in the alpha band, the ERD was comparable between O and OI activities across the precentral, central and parietal electrodes. Action observation involved the same regions but had greater ERD over the central electrodes. In the beta band, there was a gradation of ERD intensity in O, OI and OM over central electrodes. After the task, the ERS changes were weak during the O task but were strong during the OI and OM (Cz) tasks, with no differences between OI and OM.

CONCLUSION

This study demonstrated the recruitment of mirror neurons during lower limb VOT due to visual feedback, coupled to a strong recruitment of the sensorimotor cortex evoked by motor imagery and action execution. These results also emphasize the need for an active task, either motor imagery or motor execution during VOT.

Statement of Disclosures

None

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Corresponding Author:
Ahmed Adham
Physical Rehabilitation Medicine, CHU Saint-Etienne, Saint-Etienne, France
Email: ahmed.adham@chu-st-etienne.fr