International
Journal of Neurorehabilitation

Suzuki T, Int J Neurorehabilitation 2015, 2:4
DOI: 10.4172/2376-0281.1000e113

Editorial Open Access

The Effective Methods for Motor Imagery

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Received date: Oct 05, 2015; **Accepted date:** Oct 07, 2015; **Published date:** Oct 14, 2015

Editorial

What is Motor imagery?

Motor imagery, the mental rehearsal of a motor act without overt movement, improves motor performance in healthy subjects [1] and aids in the recovery of motor function following stroke [2,3]. The effects of motor imagery have been discussed in many neurophysiological studies using motor-evoked potentials (MEPs), the Hoffman reflex (H-reflex), the T-wave, and the F-wave.

Motor imagery may facilitate corticospinal excitability, not spinal neural function

The corticospinal excitability during motor imagery may result from an increase in MEP amplitude measured by transcranial magnetic stimulation [4,5]. However, H-reflex, T-wave, and F-wave, which are used as indices of excitability of spinal neural function during motor imagery, were not measured in these studies [6-9]. Kasai et al. [8] reported that the amplitude of the H-reflex of the radial flexor muscle during motor imagery with wrist flexion did not increase, whereas the amplitude of MEPs increased. In addition, Oishi et al. [9] reported that the amplitude of the H-reflex during motor imagery decreased in a speed skater. These reports indicate that motor imagery cannot increase the excitability of spinal neurons.

If motor imagery is used as part of a patient's rehabilitation program, it has the potential to increase both motor cortical function and spinal neural function, which can improve muscle function. The ultimate goal of motor imagery research is to find the optimal way of improving the excitability of spinal neural function in the clinical setting.

How does motor imagery facilitate the spinal neural function?

Jeannerod [7] reported that the amplitudes of the H-reflex and T-wave were significantly higher during pedaling with motor imagery than during pedaling without motor imagery. In addition, Hale et al. [6] demonstrated that motor imagery training gradually increased the amplitude of the H-reflex of the soleus muscle with ankle planter flexion under 40, 60, 80, and 100% of the maximal voluntary contraction (MVC). These reports further support the notion that motor imagery using typical methods is effective in exciting spinal neural function.

In our research, subjects learnt 50% MVC by isometrically contracting the opponens pollicis muscle by holding a pinch meter with a sensor between the thumb and the index finger. The subjects were then asked to imagine the same contraction under two conditions: "with sensor" condition involved holding the pinch meter and sensor between the thumb and the index finger, whereas "without sensor" condition did not involve holding the pinch meter and sensor. We aimed to determine whether mental simulation associated with the motion of holding the pinch meter and sensor can increase the excitability of spinal neurons in the absence of the actual muscle contraction.

Motor imagery in the "with sensor" and "without sensor" conditions at approximately 50% MVC isometric contraction of the opponens pollicis muscle without overt motor output increased the excitability of spinal neural output to the thenar muscles. Because the relative data for the persistence and amplitude ratio during motor imagery in the "with sensor" condition were higher than those during motor imagery in the "without sensor" condition, the movement preparation for a motor imagery task involving 50% MVC isometric contraction of the opponens pollicis muscle is very important.

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