Title: **Role of somatosensory function rehabilitation in post-spinal cord injury recovery**

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Abstract

Regain of daily activity is a major wish of patients after spinal cord injury, while the recovery of motor function recovery is the expection to achieve independent life. The involvement of somatosensory rehabilitation is usually overlooked in previous clinical rehabilitation. This study is to prove the role of somatosensory rehabilitation by experimental and clinical studies, respectively. In an experimental study of rat model, hemi-contusion injury was applied to the left dorsal cord of C5 using a 1.5-mm-diameter impounder at 500 mm/s in adult rats. We monitoring the motor and somatosensory function changes with motor evoked potential (MEP) and somatosensory evoked potential (SEP) in comparison with gross to fine motor skills. Our data confirmed that not only the descending motor pathway played a key role in the regulation of motor control, but also the sensory system showed its potential to provide information on recovery and plasticity. In a clinical study, brain computer interface (BCI) controlled robotic hand rehabilitation therapy was applied to post-stroke patients with hand deficit. Motor imagery and somatosensory BCI were employed to robotic control, while the hand function recovery results by these two BCI methods were compared. Results showed that somatosensory BCI is a safe and effective method to recovery hand function. This study demonstrated the important role of somatosensory rehabilitation in neural rehabilitation for patients after spinal cord injury.