

# Brain compensatory mechanisms enhance the recovery from spinal cord injury

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A research team led by Tadashi Isa, a professor at the Japanese National Institute for Physiological Sciences, NIPS (SEIRIKEN), and Dr. Yukio Nishimura (University of Washington, Seattle), have found that brain compensatory mechanisms contribute to recovery from spinal cord injury. This study was conducted in collaboration with Hamamatsu Photonics (Dr. Hideo Tsukada) and RIKEN (Dr. Hiroataka Onoe).

It was supported by the Japan Science and Technology Agency (JST). The team reports their findings on November 16, 2007 in *Science* magazine.

The basis of neurorehabilitation relies on the concept that training recruits remaining intact neuronal systems to compensate for partial injury to the spinal cord or brain. Until recently, the neuronal basis of these compensatory mechanisms has been poorly understood.

In previous work, the research team showed that finger dexterity could recover with rehabilitation following transection of the direct cortico-motoneuronal pathway in the Japanese macaque monkey. In the current study, brain imaging (PET scan) indicated that bilateral primary motor cortex contributes to early-stage recovery of finger movement.

During late-stage recovery, more extensive regions of the contralesional primary motor cortex and bilateral premotor cortex were activated to compensate for impaired finger movements. Pharmacological inactivation of these regions during rehabilitation slowed recovery. These results suggest that brain compensatory mechanisms actively enhance recovery from spinal cord injury.

Professor Isa explains that this study is the first to show that brain compensatory mechanisms contribute to recovery following injury to the central

nervous system. The functional plasticity of the brain compensates for lost function and enhances recovery from injury. "This study reinforces our current understanding of neurorehabilitation and may lead to new rehabilitation strategies for patients with spinal cord injuries or any kind of brain damage", said Professor Isa.

Source: National Institute for Physiological Sciences

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