

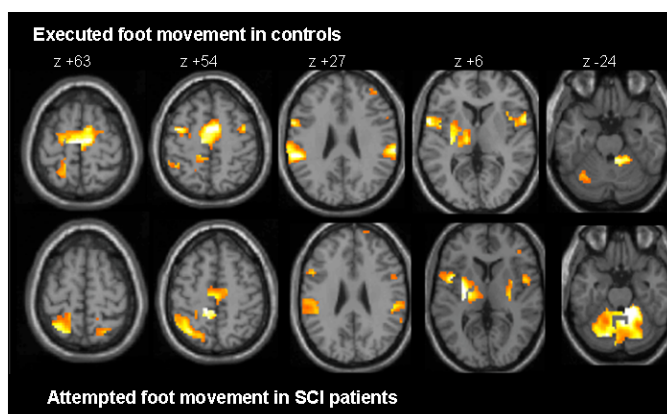
Cortical representation of movements after SCI

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Patients with spinal cord injury (SCI) provide a human model in which the effects of de-afferentation and de-efferentation on brain activation can be studied.

In both healthy subjects and chronic complete paraplegics the cortical representation of motor imagery, movement attempt and observation of foot movements were investigated with behavioral and neuroimaging methodologies. The results showed the retained integrity of movement attempt and motor imagery networks in SCI patients and suggests that these patients can still dispose of the full motor program for foot movements. Therefore attempted and imagined foot movements should be integrated in rehabilitative strategies. Finally, foot movement observation activates similar motor region as if the movement would be actually performed. The findings are highly relevant, clinically as well as for basic neurosciences, as they provide converging evidence for remnant motor representation in these patients, an important issue in future rehabilitative strategy.

Currently we investigate the influence of foot movement complexity on brain activation patterns, exploring the effect of speed, force and visual feedback in controls and SCI patients. In addition a learn-paradigma will enhance our knowledge about the role of proprioception resp. visual feedback in learning a movement sequence and its corresponding brain activation. The results will increase our knowledge on foot representations and their reorganization in SCI patients, and eventually improve therapeutic strategies.



The figure shows results from the functional magnetic resonance imaging experiment. Activation patterns from the group analysis are displayed on a mean anatomic T1-weighted image. The upper row shows foot movement execution in the control, while the lower row shows movement attempt in SCI patients.