Congress on NeuroRehabilitation and Neural Repair

Programme and Proceedings Book

Neurorehabilitation and Neuroscience Connected

21-22 May 2015 I Maastricht, the Netherlands

DSNR
Dutch Society of Neuro-Rehabilitation

BSNR
Belgian Society for Neurorehabilitation

lasting changes in the excitability of the corticospinal tract triggered the new era of tDCS research, first as a physiology tool and then as a potential method for therapeutic neuromodulation. tDCS incudes lasting changes in brain activity (called "after-effects") and behavioural performances in virtually any motor or cognitive domain, both in healthy individuals and in stroke patients. Since stroke deregulates brain excitability both in the damaged and undamaged hemispheres, three neuromodulation strategies can be applied: (1) "up-regulating" the excitability of the damaged hemisphere, (2) "down-regulating" the excitability of the non-damaged hemisphere or (3) doing both simultaneously. Whereas it is likely that tDCS induces more subtle changes than simple up- and down-regulating excitability, applying tDCS over M1 with each strategy demonstrated enhancements of the paretic upper limb. M1 is not only the major gate for the control of voluntary movements through the corticospinal tract, it is also a crucial node in the network involved in motor learning. This may be one of the reasons why neuromodulation of M1 by tDCS has the potential to enhance the functional gains driven by neurorehabilitation.

Potential: Postural feedback therapy combined with non-invasive transcranial direct current stimulation in patients with stroke.

Drs. Sarah Zandvliet and Dr. Erwin van Wegen.

Postural instability, balance problems and subsequent falls are very common in patients with a stroke and are strongly associated with future functional recovery. A combination of cerebellar transcranial direct current stimulation (tDCS) and postural feedback training (PFT) may improve balance in stroke patients to a level unattained by PFT alone. During this presentation, the first results of the cross-sectional study in which chronic stroke patients and age matched healthy subjects receive tDCS during a balance tracking task, will be presented. In addition, the outlines of a double blind RCT will be presented, in which we investigate whether cerebellar tDCS combined with PFT is more effective than PFT alone when started in the early period after stroke.

Neuromodulation of the spinal circuits by TSDCS for the Rehabilitation of spinal cord injury

A. Kuck[1], E. van Asseldonk[1], D. Stegeman[2], H. van der Kooij[1]

[1] University of Twente, Drienerlolaan 5, 7522 NB Enschede, the Netherlands
[2] Radboud University, Comeniuslaan 4, 6525 HP Nijmegen, the Netherlands

Spinal Cord Injury (SCI) is a severe injury to the pathways of the central nervous system (CNS). Despite a heavy post-injury physical rehabilitation regime, SCI patients are often bound to a wheelchair or left with other impairments diminishing their quality of life. Trans-spinal direct current stimulation (tsDCS) is a promising new technique for the treatment of SCI. During tsDCS a small direct current is applied to the spinal cord via two or more stimulation electrodes, placed on the back of the subject. The technique thereby aims to alter the response of the neural pathways in the spinal cord, which is hypothesized to have a positive effect on the recovery of the damaged spinal cord neurons. In previous studies, it has been shown that tsDCS is able to induce a polarity-dependent modulation of reflex and motor unit behavior as well as altering ascending proprioceptive information and associative plasticity effects on a corticospinal level. Current work in our laboratory focuses on further understanding and optimizing the use of tsDCS for the rehabilitation of SCI. We will therefore discuss the current developments in the field, the work done in our laboratory and potential future directions of the application of tsDCS to spinal cord injury rehabilitation.

Body Orientation in space: adaption to repeated challenges of stance and locomotor tasks
14.30 - 16.00 Room 0.1

Adaptation of leg muscle activity of healthy subjects standing on a predictably moving platform

Marco Schieppati

Fondazione Salvatore Maugeri (IRCCS), Scientific Institute of Pavia and University of Pavia, Italy

Standing on a platform continuously moving in anterior-posterior direction recruits short- and long-latency reflexes, and anticipatory postural adjustments to counteract the perturbations.

Sixty back-and-forth (10 cm) sinusoidal platform displacement cycles were administered eyes closed at 0.6 Hz. Centre of mass and leg muscle length were estimated based on optoelectronic recordings of reflective markers' position. Amplitude and time-distribution of Tibialis Anterior (TA) and Soleus (SOL) EMG activity were assessed. Bursts were defined as reflex or anticipatory based on the relationship between their amplitude and velocity of muscle length change prior to the bursts.