Walking recovery is one of the main goals after a spinal cord injury (SCI), although almost never attainable in subjects with complete lesion it’s a realistic object for subjects with incomplete lesions, among which recovery of walking is rated at first place among rehabilitation objectives. Epidemiological studies indicate in the last years a progressive increase of incomplete lesions among SCI in the last years (e.g., with chances of walking recovery) and recovery of ambulation has become the target of several rehabilitative approaches.

In subjects with SCI, age and lower extremity muscle strength have been commonly considered the main factors affecting walking function. Consequently, most rehabilitation approaches for SCI subjects aimed at reinforcing the lower extremities. However, as recently reported by our group, many factors besides muscle strength influence the recovery of walking function. In particular, we demonstrated that balance and spasticity, as well as weight and distance from the lesion, are key factors affecting walking performance in SCI subjects. From this statistical evidence derived the hypothesis that weight unloading, as well as balance and spasticity specific treatments might improve gait performance in SCI.

Gait control mechanisms are multifarious and in incomplete SCI subjects they might be lesioned in different degree. Classically, functional gait training is considered the most effective approach to recover gait function. Data collected in this thesis broaden this vision suggesting that, besides task specific training, ad hoc protocols aimed at specific impaired functions involved in gait control might help to boost recovery. An isolate intervention on single aspects of the gait functional impairments may help in improving gait function. Specifically we demonstrated that isolate visual BiofeedBack (vBFB) balance training without any specific task oriented gait exercise is effective in improving gait in subjects with chronic motor incomplete SCI. That, enhancement of somatosensory inputs by Kinesio Taping (KT) is effective in reducing spasticity an in improving both balance and gait functions. Finally that, compared to overground condition, water environment allows chronic motor incomplete SCI subjects to walk with a gait pattern more similar to the physiological one. These evidences support water environment as training condition for SCI rehabilitation.

In conclusion, present results demonstrate that for chronic incomplete SCI subjects gait rehabilitation might take advantage of integrating different approaches aimed at balance rehabilitation by vBFB, at somatosensory inputs enhancement by KT, as well as at body weigh support by water environment. An interaction among the different rehabilitation approaches is a topic that still needs to be verified. Better knowledge of the pathophysiological mechanisms determining gait impairment in SCI and a better understating of the effects of the different rehabilitation protocols on gait control systems will help us in progressing and in improving the efficacy of gait rehabilitation after SCI.
Program for Ph.D. lecture on Friday 24 April 2015

by

Federica Tamburella

Gait Recovery in Spinal Cord Injury Subjects: From Clinical Experience to Research Development

Chairman: Associate Professor Ernest Nlandu Kamavuako
Moderator: Associate Professor Natalie Mrachacz-Kersting

13.00 Opening by the Moderator
13.05 Ph.D. lecture by Federica Tamburella
13.50 Break
14.00 Questions and comments from the Committee
Questions and comments from the audience at the Moderator’s discretion
16.00 (No later than)
Conclusion of the session by the Moderator

After the session a reception will be arranged

To fulfill the requirements for the Ph.D. degree, Federica Tamburella has submitted the thesis: Gait Recovery in Spinal Cord Injury Subjects: From Clinical Experience to Research Development, to the Faculty Council of Medicine at Aalborg University.

The Faculty Council has appointed the following adjudication committee to evaluate the thesis and the associated lecture:

Professor Armin Curt
University of Zuerich
Switzerland

Professor Stefano Ferraina
University of Rome
Italy

Chairman:
Associate Professor Ernest Nlandu Kamavuako
SMI, Aalborg University
Denmark

Moderator:
Associate Professor Natalie Mrachacz-Kersting
SMI, Aalborg University
Denmark

The Ph.D. lecture is public and will take place on:

Friday 24 April 2015 at 13:00
Aalborg University – Room D2-106
Fredrik Bajers Vej 7 D2
9220 Aalborg East