Vrije Universiteit Brussel
Faculteit Lichamelijke Opvoeding
en Kinesitherapie

U wordt vriendelijk uitgenodigd op
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de academische graad van
DOCTOR IN DE REVALIDATIEWETENSCHAPPEN
EN KINESITHERAPIE

EVA SWINNEN

Die zal plaatsvinden op
Donderdag 13 februari 2014 om 16:00
in Auditorium Vandendriessche op de campus Jette

NEUROLOGICAL GAIT REHABILITATION: THE INFLUENCE OF WALKING SPEED, BODY WEIGHT SUPPORT AND ROBOT-ASSISTANCE ON THE TRUNK

Promotors: Prof. dr. Eric Kerckhofs
Prof. dr. Jean-Pierre Baeyens

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Voorstelling van het proefschrift

Background
Robot-assisted gait rehabilitation has been reported to improve gait- and balance related outcome measures, but it has not been proven that gait rehabilitation robots have improved outcome effect as compared to other gait rehabilitation methods. The trunk and pelvis are important to maintain balance during gait. Despite, scare research has been presented concerning the importance of the trunk and the pelvis for walking. One of the questions in context is whether body weight support may restrict the movements of the trunk and the pelvis during robot-assisted treadmill walking, consequently may lead to insufficient training of trunk balance.

Methods
Kinematic and electromyographic analysis of the trunk and pelvis were performed during (1) walking on a treadmill at different speeds (young and older healthy participants), (2) walking on a treadmill with different levels of body weight support (persons with multiple sclerosis and healthy participants) and (3) robot-assisted treadmill walking with the Lokomat-system (healthy participants).

Results
Globally, (1) on a treadmill, when walking slower than normal the trunk muscles were less active and the movements of the trunk and pelvis changed significantly; (2) as compared with walking without body weight support, increasing percentages of body weight support were accompanied by an increase in abdominal muscle activity, a decrease in back muscle activity and a significant change of trunk and pelvis movements; and (3) during robot-assisted treadmill walking with the Lokomat-system complemented with the use of body weight support, differences in trunk and pelvis kinematics were found as compared with treadmill walking without robot-assistance.

Conclusion
It can be concluded that walking on a treadmill at a low speed, with high amounts of body weight support or with robot-assistance with the Lokomat-system leads to significant changes in trunk muscle activity and trunk and pelvis movements. These differences may have an influence on the training of trunk balance during gait rehabilitation. The results of the current studies should be taken into account in developing gait rehabilitation robots and in gait rehabilitation itself. First, it can be suggested that body weight support should be restricted to patients with no or limited trunk control. Furthermore, it is advisable to decrease the amount of body

weight support beneath 30% as soon as patients are able to carry their own weight. Secondly, for the development of gait rehabilitation robots it is advisable to have the body weight of the person carried by the exoskeleton to avoid the pendulum effect of the body weight support system.

Curriculum Vitae

Eva Swinnen obtained her diploma of Master in Rehabilitation Science and Physiotherapy with magna cum laude in July 2005 at the Vrije Universiteit Brussel. After her graduation she worked as a physiotherapist in a private practice and rehabilitation center. From 2006 until 2008 she was an academic assistant at the department of Rehabilitation and Physiotherapy of the faculty of Physical Education and Physiotherapy.

In 2009 she started her PhD project as part of the ALTACRO (Automated Locomotion Training using and Actuated Compliant Robotic Orthosis) project. She published 7 articles as first author in peer reviewed journals, 2 articles as co-author and presented her findings at several (inter)national scientific conferences.

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