Control of foot placement to counteract perturbations during walking

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Primary Objective:Assess the effect of walking velocity and the effect of timing, direction and velocity of sudden platform perturbations on foot placement to control balance during walking. Secondary Objective(s):• Determine the relation between...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON35344

Source
ToetsingOnline

Brief title
Control of foot placement during walking

Condition

- Other condition

Synonym
decreased or impaired sensory and/or motor systems

Health condition

verminderde of beschadigde sensorisch en/of motorische systemen

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Twente
Source(s) of monetary or material Support: Europees project: Mindwalker

Intervention

Keyword: balance control, foot placement, perturbations, walking

Outcome measures

Primary outcome

Change in foot placement as a response to the perturbations. Foot placement can be determined by the exact position where the foot is placed with respect to the other foot. Because balance control in lateral direction is most important in human balance control the main study parameter will be the step width.

Secondary outcome

• Standard gait parameters like step width, step time, swing time and stance time

• Path of the CoP during single stance

• Deviation of the CoM position and velocity changes of the CoM as a result of the perturbations

• Muscle activation of arm and leg muscles as a result of the perturbations

Study description

Background summary

Walking and maintaining balance during walking seems effortless, however, for people with impaired sensory or motor systems it can be a large effort. For these people training could be an opportunity to increase their walking ability. Robotic devices can provide people with the necessary support during training and are suitable for intensive and repetitive training. For the robot to be

able to assists people with maintaining balance during walking in a correct and natural way a good understanding and insight in balance control is necessary. At the moment there is no experimental data that provides us with this knowledge. Therefore we designed an experiment based on the stepping strategy which is the most important mechanism to control balance. With this experiment the control of foot placement to counteract perturbations during walking is studied. Data from this experiment will show how subjects respond to perturbations and could give information about the foot placement that is needed to counteract the perturbations and maintain balance.
In this way we will gain more knowledge and understanding about the balance control mechanism which in the end can be used in developing a model to control robotic devices.

Study objective

Primary Objective:
Assess the effect of walking velocity and the effect of timing, direction and velocity of sudden platform perturbations on foot placement to control balance during walking.

Secondary Objective(s):
• Determine the relation between the deviation and velocity of the centre of mass (CoM) with the step width, step length and step time
• Investigate the coupling between foot placement in the frontal and the sagitalsagittal plane.
• Investigate muscle activation to determine the contribution of arm movements and single muscles to balance control.

Study design

This study is designed as a cross-sectional intervention study to assess foot placement to control balance during normal and perturbed walking of healthy human subjects. All subjects participate in one session which will take approximately 3,5 hours. During the session the effect of different platform perturbations on foot placement used to control balance during walking will be tested. The perturbations vary within each experiment, but will be the same for each subject.
The result of this study can be used to reveal a part of controlling balance during walking .

Intervention

In this study there is one intervention. The balance of the subjects will be disturbed during walking in a balance experiment. This is done bij translations of a motion platform

Study burden and risks

Subjects will participate in one session which will take approximately 3 hours. During this session the subject will be asked to walk on a treadmill for ten trials. In two trials the subject will walk normally at 2 km/h and 4km/h. In the other eight trials the subject will walk at 2km/h or 4 km/h and will be perturbed by using platform movements of different velocities in different directions and during different phases of the gait cycle. Trials will be randomised and in between trials subjects will receive time to rest.
In this study there is a risk for the subjects to lose their equilibrium. Therefore the subjects will be wearing a safety harness during the experiment that is attached to the ceiling and which will prevent the subjects from falling.
Participants will have no direct benefit from taking part in this study.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)

Elderly (65 years and older)

Inclusion criteria

* age > 18 years
* able to walk on a treadmill

Exclusion criteria

Healthy subjects are excluded if they:
* have current orthopaedic problems
* have other neurological disorders
* have a history of cardiac conditions that interfere with physical load
* have chronic joint pain
* are pregnant

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	25-01-2012
Enrollment:	17
Type:	Actual

Ethics review

Approved WMO

Date:	18-10-2011

Application type:	First submission
Review commission:	METC Twente (Enschede)
Approved WMO Date:	03-01-2012
Application type:	Amendment
Review commission:	METC Twente (Enschede)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL37963.044.11