How do young and older walkers adapt their gait to accommodate sudden gait perturbations?

Published: 11-03-2020
Last updated: 10-04-2024

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Ethical review	Approved WMO
Status	Pending
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON49426

Source
ToetsingOnline

Brief title
Responses to gait perturbations in young and older walkers

Condition

- Other condition

Synonym
ageing, old age

Health condition

In de studies die hier voorliggen worden de effecten van normale veroudering onderzocht.

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Groningen
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Elderly, Gait, Perturbation, Treadmill

Outcome measures

Primary outcome

1. Normalized step length: Defined as the distance between centers of pressure (CoP) of the feet at initial foot contact, normalized for leg length.

2. Normalized step time: defined as the time between two subsequent initial foot contacts, normalized for leg length.

3. Step width: defined as the absolute difference between the local minimum/ maximum CoP position during the consecutive contralateral single support phases of each stride.

4. Step length ratio, defined as (step length left - step length right)/ (step length left + step length right).

5. Step time ratio, defined as (step time left - step time right)/ (step time left + step time right).

6. Margin of Stability, defined as the distance between the extrapolated centre of mass (XCoM) and the CoP at contralateral foot lift. The XCoM is defined as CoM (i.e. the Centre of Mass) + VCoM*W0, where VCoM is the instantaneous velocity of the CoM and W0 is the gravitational acceleration.

Secondary outcome

1. Falls efficacy scale international

2. Perceived physical activity

3. Dutch General Self-efficacy Scale

Study description

Background summary

Walking is a controlled sequence of falls, and therefore a challenging and dangerous activity. This is especially evident in people with reduced walking capacity due to natural ageing or pathology. People often perceive these vulnerabilities and develop a cautious walking strategy: they walk slower and with shorter and wider steps. This walking strategy is a complex and somewhat paradoxical phenomenon: although it is intended to protect against upcoming perturbations, it can also cause an unstable gait and lead to falls. As of yet, we know little about the underlying mechanisms of cautious gait. Recently, a protocol has been developed at the dept. of Human Movement Sciences / UMCG enables the controlled and safe investigation of cautious gait by imposing simulated slips on a treadmill. This makes it possible to better understand cautious gait and develop fall prevention interventions for the elderly.

Study objective

The present project consists of 2 studies (study 1 & study 2) and is an extension of a recently conducted study in healthy young adults. The overarching goals of the project are to provide insight into (i) the development of cautious gait strategies and (ii) to determine the effect of age on this development. More specifically, study 1 will determine (i) whether responses to a warning ('you may experience a slip from now on') differ between young and old, (ii) whether an experimentally induced cautious gait pattern differs between young and old and (iii) whether the time that the cautious gait pattern persists after no more slips are offered, differs between young and old. In study 2 it will be determined whether the unexpected presentation of an unexpected stimulus to the other leg than where the cautious gait pattern was conditioned to, results in different adjustments in the elderly than for the young.

Study design

In both study 1 and study 2, a quasi-experimental design will be used with repeated measures, in which a group of young and a group of older adults will be exposed to a series of experimentally induced slips. The experiments involve 4 different phases (i.e. a baseline phase, a warning phase, a perturbation

phase, and a washout phase).

Intervention

In studies 1 and 2 a computer-controlled split-belt treadmill (M-Gait; Motek, Amsterdam, NL) will be used. The belt movement can be reversed with a high acceleration to induce slip-like perturbations. Belt-speed will be set to -1.2 m/s in both studies.

In study 1, 20 healthy young (18-30) participants and 20 healthy older (65-80) participants will be included. First, they will walk on the treadmill during the *baseline phase* (phase I) for 320 strides, while walking speed is fixed at -1.2 m/s. Next, during the *warning phase*, participants will be warned that they may experience a slip, although no actual slip will be presented (phase II; 200 strides). During the *perturbation phase* (phase III), a series of 30 slip-like perturbations will be presented to the right leg (10-12 minutes). During the *washout phase* (phase IV; 210 strides), no more perturbations will be presented, but the participants will not be informed about this.

In study 2, 20 healthy young (18-30) participants and 20 healthy older (65-80) participants will be included. Phases I, II, and IV will be identical to study 1.In phase III, perturbations will be presented consistently to either the left or right leg for 29 perturbations (10-12 minutes). The final perturbation will be presented to the other leg (e.g. a participant will experience slips presented to the left leg 29 times before the final slip will be presented to the right leg).

Study burden and risks

During the experiment, participants are fitted in a safety harness that is suspended from the ceiling. The harness will be adjusted so that participants will not be able to touch the belts with their knees. Handrails are located at each side of the treadmill for stabilization purposes. An emergency button (to stop the treadmill belts immediately) is attached to these handrails, which is easy to reach in case of an emergency. Additionally, the experimenter can manually stop the protocol in case of calamities. Finally, light cells are located at the front and rear end of the treadmill, which will stop the belts when the participant walks too far to the front or rear end of the belt. The researchers are certified to use the equipment. Overall, testing may be slight fatiguing but should not lead to excessive discomfort.

Because the studies focus on the effects of age, different age groups need to be included. Eventually, results may help in the construction of better falls prevention programs.

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

1. Participant is healthy
2. Is able to walk for 30 minutes without problems
3. Meets the age requirements at the time of inclusion (18-30 or 65-80)

Exclusion criteria

1. Neurological, orthopedic, visual, sensorimotor, vestibular or other impairments and injuries that are known to affect walking and/or balance
2. Participants should not have any prior experience with similar experimental paradigms
3. Recent hip or knee arthroplasty (< 24 months)

4. Body Mass Index > 30
5. For study 2 only: participation in study 1

Study design

Design

Study type: Interventional

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

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-03-2020
Enrollment:	80
Type:	Anticipated

Ethics review

Approved WMO

Date:	11-03-2020
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

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	NL72310.042.19