# Validity of an IMU based trunk motion-analysis system coupled to a VR-environment

No registrations found.

| | |
|---|---|
| **Ethical review** | Positive opinion |
| **Status** | Recruiting |
| **Health condition type** | - |
| **Study type** | Observational non invasive |

## Summary

### ID

NL-OMON24434

**Source**
NTR

**Brief title**
TrunkyXL

**Health condition**

Not relevant

### Sponsors and support

**Primary sponsor:** Sint Maartenskliniek
**Source(s) of monetary or material Support:** Interreg North-West Europe (NWE)

### Intervention

### Outcome measures

**Primary outcome**

The main study parameter is trunk movement. Trunk movements are defined as relative movements in flexion-extension, lateroflexion and rotational directions of the upper back to the lower back, and lower back to the pelvis. This will be assessed with IMUs (2M

Engineering) and 3D optical movement analysis (VICON). The kinematic output from the different IMU-models will be compared to the kinematic output from the plug-in-gait VICON model by correlation analysis. From the correlation of the different IMU-models, optimal sensor locations will be identified to represent trunk movements accurately.

### Secondary outcome

Any feedback on the IMU-based VR-system can be identified by the SUS and the survey.

## Study description

### Background summary

Rationale: A significant proportion of stroke patients experience poor trunk stability. This is highly associated with decreased gait ability and difficulty with activities of daily living. Trunk stability is highly complicated to train and is perceived as uninteresting by patients, often resulting in reduced therapy compliance. Virtual Reality (VR) rehabilitation enables the possibility of real-time feedback on a personalized training, with high acceptability and excellent usability. Previously, the displacement of the Center of Pressure (CoP) has been used to control a VR-game. Although this method identifies the limits of stability while sitting, it does not provide any information about the execution of the movement in order to displace the CoP. Inertial Measurement Units (IMUs) could provide a more direct measure of movement execution by placing multiple IMUs on various segments of the body. This way, relative movements between these segments can be calculated and used as an input for a VR-game.
A VR-training prototype was developed in order to fill the gap in direct measures of movement execution in combination with VR-training to improve trunk stability. In this study, we would like to investigate the validity and optimal sensor position of an IMU-based system. Furthermore, usability of the VR-training prototype will be studied.
Objective:The aim of this pilot study is to test the validity and feasibility of an IMU based trunk motion-analysis system coupled to a VR-environment in healthy individuals. The secondary aim is to identify the optimal sensor locations to assess trunk movements in healthy individuals.
Study design: Cross-sectional, validation study.
Study population: Healthy human volunteers, age 40 - 65 years.
Intervention: Participants will be equipped with 5 IMUs and 27 optical markers. Subsequently, participants perform flexion, extension, lateroflexion, rotation and a combination of these movements with their trunk, starting from a sitting upright position. Finally, participants will play a demo version of the VR-training prototype before filling out the System Usability Scale (SUS) and a survey.
Main study parameters: The primary outcome measurement is the trunk movement (range of motion and movement over time during performance of the tasks).
Nature and extent of the burden and risks associated with participation, benefit and group relatedness: The participant needs to visit the Sint Maartenskliniek once. Duration of

preparation and tests will be 60 to 90 minutes. Execution of the trunk movements starting from an upright sitting position is not associated with any risks. Hereafter, a demo version of the VR-training will be played. This does not include any additional risks compared to playing a commercially available VR-game. The participant will be asked to fill out a survey and the SUS by the end of the visit. Participants have no direct benefit from participating in the study. Participating in the study contributes to increasing knowledge about trunk stability and the validity of an IMU based motion analysis system in order to control a VR-trunk stability game.

### Study objective

We hypothesize that an IMU based trunk motion-analysis system coupled to a VR-environment is a valid and feasable tool to assess trunk movements.

### Study design

One single session

### Intervention

N/A

## Contacts

**Public**
Sint Maartenskliniek
Carmen Ensink

024-365 9140
**Scientific**
Sint Maartenskliniek
Carmen Ensink

024-365 9140

## Eligibility criteria

### Inclusion criteria

Healthy participants, age between 40 and 65 years.

### Exclusion criteria

- Lower back pain
- Spine deformities
- Balance problems
- Epilepsy
- Any form of motion sickness experienced before with VR

## Study design

### Design

| | |
|---|---|
| Study type: | Observational non invasive |
| Intervention model: | Other |
| Allocation: | Non controlled trial |
| Masking: | Open (masking not used) |
| Control: | N/A , unknown |

### Recruitment

NL

| | |
|---|---|
| Recruitment status: | Recruiting |
| Start date (anticipated): | 20-04-2021 |
| Enrollment: | 15 |
| Type: | Anticipated |

### IPD sharing statement

**Plan to share IPD:** Undecided

**Plan description**
N/A

## Ethics review

Positive opinion

| | |
|---|---|
| Date: | 27-05-2021 |
| Application type: | First submission |

# 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 |
|---|---|
| NTR-new | NL9497 |
| Other | CMO regio Arnhem-Nijmegen : 2020-6432 |

# Study results

**Summary results**
N/A