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The health promoting potential of nature experiences in virtual reality

Submission date
11/08/2020

Recruitment status
No longer recruiting

Registration date
28/08/2020

Overall study status
Completed

Last Edited
06/09/2022

Condition category
Other

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims.
Green exercise (any physical activity in the presence of nature) is proposed as a key cost-effective nature-based solution to promote health and well-being. However, green exercise is often subjected to a number of barriers, such as weather conditions and accessibility to quality natural environments. Virtual Reality (VR), a computer-generated virtual environment, can in this context provide a valuable supplement to integrate nature exposure and green exercise.
The specific purposes of this project are:
1. To establish how to best develop a high-quality GreenVR;
2. To study how healthy adults perceive and respond to different GreenVRs, in order to establish which type of GreenVR provides the best mental health outcomes;
3. To evaluate the risk of our GreenVR to induce cyber-sickness, identifying factors that can cause and prevent it.
4. To evaluate the potential of GreenVR technology as a strategy to promote more participation in real green exercise.

Who can participate?
Healthy adults with normal or corrected to normal vision and limited experience with virtual reality (less than monthly use).

What does the study involve?
Participants will be required to meet at the sport-physiology laboratory at INN University and watch a short video clip validated to induce feelings of sadness. The participant will then be randomly assigned to either walk on a treadmill while watching a virtual walk in nature or walk on a treadmill without the virtual experience. Two virtual scenarios will be tested, both showing the exact same environment, but developed using different techniques: one will be developed using commercial 360' video-camera, while the other will be developed using video-games technology. To avoid 'placebo effects', the participants won't be told what condition they will undergo. Questionnaires and measures of heart rate and blood pressure will be administered before, during, and after the treadmill walk.

What are the possible benefits and risks of participating?
All participants will receive a gift certificate of 100 NKR. Some may experience improved mood

and increased motivation to exercise outdoors. On the other hand, some may experience minor negative side effects associated with cyber-sickness, such as dizziness and general discomfort.

Where is the study run from?
INN University, Elverum, Norway.

When is the study starting and how long is it expected to run for?
April 2020 to December 2020

Who is funding the study?
Inland Norway University of Applied Sciences and RFF Innlandet

Who is the main contact?
Prof Giovanna Calogiuri, giovanna.calogiuri@inn.no)

Study website
https://app.cristin.no/projects/show.jsf?id=624906

Contact information

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
Cristin-Project-ID: 624906

Study information

Scientific Title
GreenVR - Developing and validating health-promoting VR systems

Acronym
GreenVR 2020

Study objectives
H1 – virtual green exercise will be characterized by lower effort relative to exercise intensity compared to regular indoor exercise, with no difference between a 360˚ video and a 3D-model
H2 – virtual green exercise will be perceived as a more positive experience compared to regular indoor exercise, with no difference between a 360˚ video and a 3D-model
H3 – virtual green exercise will have a more positive impact on measures of psychophysiological health compared to regular indoor exercise, with a superior effect for 3D-model compared to 360˚ video for affective responses
H4: Virtual green exercise will lead to increased ratings of connectedness with nature and future green exercise intention, with no difference between a 360˚ video and a 3D-model
H5: The increased ratings of future green exercise intention will be associated with the participants' changes in connectedness with nature, affective responses (enjoyment and changes in positive affect, tranquillity, negative affect, and fatigue) and perceived environmental restorativeness (fascination, being away, extent, and compatibility)

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 13/08/2020, Regional committee for medical and health-related research (REK) (Gullhaugveien 1-3, 0484 Oslo, Norway; +47 22 84 55 11; rek-sorost@medisin.uio.no), ref:134663

Study design

Single-blinded randomized controlled trial with parallel groups and repeated measurements

Primary study design
Interventional

Secondary study design
Randomised controlled trial

Study setting(s)
Other

Study type(s)
Other

Participant information sheet
Not available in web format, please use contact details to request a participant information sheet

Health condition(s) or problem(s) studied
Wellbeing

Interventions
Treatment conditions:
The participants will undergo a 10-minutes self-paced walk on a manually driven treadmill whilst being exposed to either a 360˚ video or a 3D-model representing a natural environment.
The exposure to the treatments and control conditions will be preceded by a preliminary elicitation of sadness using a short-film.
1. Treatment 1: Treadmill walk, in combination with exposure to a 3D model IVE
2. Treatment 2: Treadmill walk, in combination with exposure to a 360' video IVE
3. Control: Treadmill walk only with no exposure to any IVE
IVE= Immersive Virtual Environments

Measurements will be taken at three time-points:
1. Baseline, i.e. right before starting the experimentation
2. After watching the short-video (pre-exposure)
3. After exposure to the treatments or control conditions

Intervention Type
Device

Phase
Not Specified

Drug/device/biological/vaccine name(s)
Immersive Virtual Environments

Primary outcome measure
Affect (Physical activity affect scale, PAAS) measured at pre-exposure and post-exposure

Secondary outcome measures

1. LTEQ: Leisure time exercise questionnaire measured at baseline
2. GE-INT: Future green exercise intention measured at baseline and post-exposure
3. N-connect: Connectedness with nature scale measured at baseline and post-exposure
4. PAAS: Physical activity affect scale measured at baseline, pre-exposure and post-exposure
5. Blood pressure (BP, measured using a semi-automatic sphygmomanometer) for 5 min at baseline, pre-exposure and post-exposure
6. Enjoyment (Single-item scale) measured at post-exposure
7. Perceived exertion (Ratings of perceived exertion, RPE) measured at post-exposure
8. Cyber sickness (Simulator-sickness questionnaire) measured at post-exposure
9. Presence (Presence see scale) measured at post-exposure
10. Perceived environmental restorativeness (Perceived restorativeness scale, PRS) measured at post-exposure
11. Walking speed (measured by the treadmill) for a 10 min period during exposure
12. Heart rate (continuous monitoring during walking) for a 10 min period during exposure

Overall study start date
01/04/2020

Completion date
04/12/2020

Eligibility

Key inclusion criteria
1. Age >18 years old
2. Normal or corrected to normal vision
3. Limited experience with VR (less than monthly use)
4. No previous diagnosis of balance impairments

Participant type(s)
Healthy volunteer

Age group
Adult

Lower age limit
18 Years

Sex
Both

Target number of participants
60 participants

Total final enrolment
60

Key exclusion criteria
Limited understanding of Norwegian language

Date of first enrolment
01/09/2020

Date of final enrolment
30/12/2020

Locations

Countries of recruitment
Norway

Study participating centre
Inland Norway University of Applied Sciences
Postboks 400
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Sponsor information

Organisation
Inland Norway University of Applied Sciences

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Sponsor type
University/education

Website
https://eng.inn.no

ROR
https://ror.org/02dx4dc92

Funder(s)

Funder type
Government

Funder Name
Regional Research Fund Inland Norway (RFF - innlandet) - Project code: 292761

Results and Publications

Publication and dissemination plan
Current publication and dissemination plan asof 17/12/2021:
The plan is to publish two articles. One for H1-H3 (study 1) and one for H4 with focus on Connectedness with Natute (study 2). A third study with focus on Future green exercise intention (H4) will be written as a "multi-study" article along with data from previous studies. Findings relative to H5 will not be published in journal articles, but presented at conferences and internal meetings and used as an explorative foundation for future studies. Preliminary results will be presented at various research conferences, at national and international level.

Previous publication and dissemination plan:
The plan is to publish two articles. One for H1-H3 (study 1) and one for H4-H5 (study 2). Study 2 will be written as a "multi-study" article along with data from previous studies.
Preliminary results will be presented at various research conferences, at national and international level.

Intention to publish date
30/06/2022

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available due to consent not being given. Sample-level data (e.g. means and standard deviations) will be made available upon request from Giovanna Calogiuri (giovanna.calogiuri@usn.no) or Sigbjørn Litleskare (sigbjorn.litleskare@inn.no)

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Basic results		26/01/2022	26/01/2022	No	No
Results article		06/07/2022	06/09/2022	Yes	No
Results article		05/04/2022	06/09/2022	Yes	No