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Health effects of recreation outdoors

Submission date
20/01/2021

Recruitment status
No longer recruiting

Registration date
22/01/2021

Overall study status
Completed

Last Edited
03/11/2022

Condition category
Other

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

Plain English summary of protocol

Background and study aims
In Sweden, >90 % of the adult population claim that being outdoors in nature gives some meaning to their life. Studies have shown that nature is a place to visit in order to achieve restorative effects. Thus, recreation outdoors may be an important aspect of human's everyday life. Common belief also tells us that being outdoors is good for individual health. The positive health effects of nature have been observed in a number of studies. These positive health effects include for instance; reduced blood pressure, shorter time hospitalized after surgery and improved global health. Merely reside close to a green area reduces morbidity and mortality independent of socioeconomic status. But most of these studies are based on subjective measurements of health, although studies using objective measures exist. Most studies also rely on observational study designs which hamper the ability to draw any conclusions regarding causal effects.

In this study we experimentally investigate if the positive effects of nature are reflected also in physiological parameters in a group of healthy elderly subjects (65 years or older). Our overall research hypothesis is that nature itself has a positive direct influence on health and not only as an effect of physical activity in a natural environment.

Who can participate?
Healthy individuals 65 years or older that are able to walk at a brisk pace for 30 minutes or longer.

What are the possible benefits and risks of participating?
Potential benefits for the individual include getting more information regarding individual health such as measurement on blood glucose levels and blood pressure. The risks of participating are relatively low since none of the examinations is something that goes outside normal health checks or normal activities of everyday life.

Where is the study run from?
The study is run from the Linnaeus University, Kalmar (Sweden)

When is the study starting and how long is it expected to run for?
January 2015 to December 2021

Who is funding the study?
The study is funded by the Family Kamprad Foundation (Sweden)

Who is the main contact?
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
HERO 4701 00 72

Study information

Scientific Title
Health Effects of Recreation Outdoors in older adults

Acronym
HERO

Study objectives
Exercising and recovery in nature promotes greater health benefits compared to exercising indoors among older adults.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 22/04/2015, Swedish Ethical Review Authority (Etikprövningsmyndigheten, Box 2110, 750 02, Uppsala, Sweden; +46 10-475 08 00; registrator@etikprovning.se), ref: Dnr 2015/96-31

Primary study design
Interventional

Study design
Randomized three-by-three crossover study

Study type(s)
Quality of life

Health condition(s) or problem(s) studied
Effects of exercise in healthy men and women aged 65 or older

Interventions
There are three experimental conditions which represented three different levels of exposure to nature (indoor, simulated outdoor and outdoor) and all tests in each condition is identical.

Indoor condition.
The room which represents the indoor condition is a plain test room with only the equipment required to complete the experiment.

Simulated outdoor condition.
The room representing the simulated outdoor condition is identical to the indoor room but decorated with a photo wallpaper of a beech forest, nature sounds (blackbird Turdus merula song), many green indoor plants and artificial daylight consisting of four fluorescent tubes.

Outdoor condition.
A lush suburban garden represents the outdoor condition, and the bike ergometer and the recovery chair was facing a deciduous forest. The site was chosen in order to minimize distinct disturbing urban sounds such as traffic but could also provide the feeling of being in nature.
All subjects will participate in each experimental condition and given that there are three experimental conditions there are six different orders that the participating subjects can perform the experiment. The exact order each subject will conduct the experiments is randomized.

Procedure
The subjects are instructed to avoid any strenuous physical activity 48 h before the testing. They are also instructed to avoid eating 2 hours before they come to the test site.
When the subjects arrive at the test site, independent of experimental situation, they are fitted with a heart rate monitor, and a venous catheter is inserted in the antecubital vein. After those initial procedures, the subjects will sit down and rest quietly. After ten minutes the resting heart rate and blood pressure are measured and the baseline blood sample is taken. After that, the subjects will start the exercise on the bike ergometer (Monark 818E, Monark, Vansbro, Sweden). The ergometer is adjusted according to the height of the subject and the initial resistance is determined depending on gender and training background. As a rule of thumb, the women start at 50 - 75 Watt and the males at around 100 Watt. During the first six minutes of the trial, the subjects will perform a submaximal test for aerobic capacity (Åstrand-test). During these six minutes, heart rate and resistance will be adjusted in order to reach steady-state with a heart rate of around 130 and a rating of 11 - 13 at the Borg RPE scale after six minutes. The subjects will however continue to bike for another 14 minutes before the test is terminated. After the termination of the physical exercise, the subject will be seated to rest quietly for 120 minutes during which a series of measurements will be conducted.

Subjects completed all three conditions in a random order (randomization using a random number generator).

Intervention Type
Behavioural

Primary outcome(s)
1. Power output (W) during exercise is determined based on the resistance and cadence on the cycle ergometer
2. Ratings of self perceived exertion is measured using BORG RPE 6-20 scale during the test at minutes 1-6 and upon the termination of the test and at minutes 10, 20, 30, 60, 120 of recovery
3. Heart rate is measured using a heart rate monitor (Polar RS800CX, Polar Electro Oy, Kempele, Finland) at baseline, during the test at minutes 1-6, upon the termination of the test, and at minutes 10, 20, 30, 60, 120 of recovery.
4. Blood pressure is measured using an automated blood pressure meter (Welch Allyn ProBP 3400, Welch Allyn, NY, USA) at baseline, upon the termination of the test, and at minutes 10, 20, 30, 60, 120
5. Lactate is measured using a lactate meter (Lactate plus, Nova Biomedical, MA, USA) at baseline, upon the termination of the test, and at minutes 10, 20, 30, 60, 120 of recovery
6. White blood cells (total cell count, lymphocytes, monocytes, neutrophils, eosinophils, and basophils) is measured using a HemoCue WBC Diff (HemoCue AB Ängelholm, Sweden) at baseline, upon the termination of the test, and at minutes 10, 20, 30, 60, 120 of recovery
7. All biomarkers are measured using The MAGPIX assay system that is based on ELISA principles and utilize xMAP technology (Luminex Corp., Austin, TX), and xPONENT 4.2 software (Luminex), immunoassay at baseline, upon termination of the test and at minutes 30, 60, and 120 after the test. The following biomarkers are analyzed:
7.1. Cortisol (Stress)
7.2. Interleukin-6 and tumor necrosis factor-alpha (Immunologic response)
7.3. Insulin and glucose (Metabolic response)
7.4. Brain-derived neurotrophic factor (Brain health)

Key secondary outcome(s)

1. Time spent outdoors measured using a questionnaire at baseline
2. Attitudes towards nature measured using a questionnaire at baseline
3. Degree of environmental friendliness measured using a questionnaire at baseline
4. Sociodemographic factors measured using a questionnaire at baseline

Completion date
31/12/2021

Eligibility

Key inclusion criteria
1. 65 years or older
2. A self-rated physical fitness of ≥ 6 on the Wisén scale, which is equivalent to being able to walk or cycle at a moderate pace for at least 30 minutes

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Senior

Sex
All

Total final enrolment
53

Key exclusion criteria
1. Taking any medication that may influence on the outcomes (such as beta-blocker)
2. No disease that may influence on any of the outcomes (such as Rheumatoid Arthritis)

Date of first enrolment
01/05/2015

Date of final enrolment
01/12/2015

Locations

Countries of recruitment
Sweden

Study participating centre

Linnaeus University
Linneuniversitetet Radix
Kalmar
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Sponsor information

Organisation
Linnaeus University

ROR
https://ror.org/00j9qag85

Funder(s)

Funder type
Charity

Funder Name
Familjen Kamprads Stiftelse

Alternative Name(s)
Kamprad Family Foundation

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
Sweden

Results and Publications

Individual participant data (IPD) sharing plan
The datasets analysed during the current study will be available upon request from either patrick.bergman@lnu.se or Jonas.ahnesjo@lnu.se for the purpose of inclusion in studies pooling data (e.g. meta-analysis) or other studies covered by our ethical permission.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		02/11/2022	03/11/2022	Yes	No
Participant information sheet			22/01/2021	No	Yes
Protocol file			22/01/2021	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes