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How do two types of intense exercise affect a brain neurotrophic factor?

Submission date	Recruitment status	[_] Prospectively registered
03/07/2025	No longer recruiting	[_] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
03/07/2025	Completed	[X] Results
Last Edited	**Condition category**	[_] Individual participant data
03/08/2026	Other	

Plain English summary of protocol

Background and study aims
Exercise is linked to neuroplasticity, our brain's ability to adapt to different environments and experiences. When we exercise, various brain health protective neurotrophic factors are released that improve brain functioning and health. Therefore, it is important to research the optimal exercise protocols, in terms of intensity, type and goal, to promote this neuroplasticity. This study aimed to test two high-intensity exercise protocols and how they affect a specific neurotrophic factor, brain-derived neurotrophic factor, as well as lactate concentration (an indicator of fatigue and metabolism).

Who can participate?
Young healthy adults aged 20-30 years, with both females and males included

What does the study involve?
Participants were randomly allocated into three groups. One experimental exercise group completed a 15-minute high-intensity protocol, while another one had a 15-minute maximum intensity protocol. The control group watched a 15-minute educational video. Brain-derived neurotrophic factor was measured in saliva with participants passively drooling into a specific tube. Lactate concentration was measured from capillary blood.

What are the possible benefits and risks of participating?
There is a possibility that the exercise will be tiring or cause physical or psychological fatigue. The tests can cause psychological fatigue. During the exercise, heart rate will be monitored to control the intensity, and a team of sports scientists will be present to monitor the process and stop the study if necessary. The risk will be reduced by warming up so that the exercise load increases gradually.

Where is the study run from?
Sports Physiology Laboratory, Faculty of Biology, University of Latvia (Latvia)

When is the study starting and how long is it expected to run for?
November 2023 to February 2025

Who is funding the study?
We acknowledge the donation of SIA "Mikrotīkls" (MikroTik) administered by the University of Latvia Foundation, project no. 2322

Who is the main contact?
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Additional identifiers

Study information

Scientific Title

Effects of high-intensity training and reduced exertion high-intensity training on brain-derived neurotrophic factor: a block randomized controlled trial

Study objectives
H1: Lactate and brain-derived neurotrophic factor (BDNF) will increase after acute exercise, compared to baseline, but will not increase in the control group.
H2: Brain-derived neurotrophic factor (BDNF) will increase with increased lactate.

Q1: Will the reduced-exertion high-intensity training (REHIT) load lead to a higher BDNF post-exercise increase than high-intensity training (HIIT)?

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 12/01/2024, Life science and medicine scientific research ethics committee of the University of Latvia (Raiņa bulvāris 19, Riga, LV-1586, Latvia; +371 (0)67033881; lu@lu.lv), ref: No. 71-35/2

Primary study design
Interventional

Study design
Three-group pre-post block randomized controlled trial

Study type(s)
Efficacy

Health condition(s) or problem(s) studied
Acute exercise effect on brain-derived neurotrophic factor

Interventions
Block randomization was used to assign participants to three groups. One experimental exercise group completed a 15-minute HIIT protocol, while another one had a 15-minute REHIT protocol, and the control group watched a 15-minute educational video.

Intervention Type
Behavioural

Primary outcome(s)
Brain-derived neurotrophic factor (BDNF) measured in saliva using an ELISA kit pre-exercise and directly after the main part of the exercise (before cooldown)

Key secondary outcome(s)
1. Lactate measured pre-exercise and directly after the main part of the exercise (before cooldown)
2. Glucose measured pre-exercise and directly after the main part of the exercise (before cooldown)

Both measured in capillary blood samples using a Biosen Lactate and Glucose Analyser

Completion date
12/02/2025

Eligibility

Key inclusion criteria
1. Young adults, aged 20 - 30 years, without any medical conditions that would limit their ability to exercise
2. No colourblind vision, as some of the cognitive tests (not included in the analysis) were in various colour forms
3. Non-smokers
4. Exercise up to three times a week.

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
20 Years

Upper age limit
30 Years

Sex
All

Total final enrolment
60

Key exclusion criteria
1. Athletes
2. People who have health conditions that do not allow them to exercise

Date of first enrolment
11/03/2024

Date of final enrolment
12/02/2025

Locations

Countries of recruitment
Latvia

Study participating centre
Sports Physiology Laboratory, Faculty of Biology, University of Latvia
Jelgavas iela 1, Zemgales priekšpilsēta
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Sponsor information

Organisation
University of Latvia

ROR
https://ror.org/05g3mes96

Funder(s)

Funder type
Industry

Funder Name
SIA "Mikrotīkls" (MikroTik)

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated and/or analysed during the current study will be published as a supplement to the results publication.

IPD sharing plan summary
Published as a supplement to the results publication

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		03/11/2025	03/08/2026	Yes	No