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Blood flow control to the brain throughout a resistance training intervention in women

Submission date 22/07/2025	**Recruitment status** No longer recruiting	[_] Prospectively registered [X] Protocol
Registration date 29/07/2025	**Overall study status** Completed	[_] Statistical analysis plan [_] Results
Last Edited 07/05/2026	**Condition category** Circulatory System	[_] Individual participant data [X] Record updated in last year

Plain English summary of protocol

Background and study aims

This study is exploring how different types of resistance training (like lifting weights) might affect blood flow to the brain. Past research suggests that people who regularly do resistance training may experience changes in their blood vessels, which could influence how blood flows in the brain. The researchers want to compare two types of training: one using heavy weights with fewer repetitions, and another using lighter weights with more repetitions. They'll use imaging tools to measure brain blood flow before, during, and after the training.

Who can participate?

The study is looking for young, healthy women who meet certain health and fitness criteria. There are some medical conditions and medications that would prevent someone from taking part, to ensure safety.

What does the study involve?

Participants will be assigned to one of two resistance training programs. They'll have their brain blood flow measured using imaging tools at three points: before training starts, during the training period, and two weeks after the training ends. All exercise sessions will be supervised to ensure safety.

What are the possible benefits and risks of participating?

There are some small risks related to physical activity, but these will be minimized through health screenings and supervision. A possible benefit is that participants may develop healthy exercise habits that continue after the study ends.

Where is the study run from?

McMaster University (Canada)

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

September 2024 to May 2026

Who is funding the study?
The study is funded by the Natural Sciences and Engineering Research Council of Canada (NSERC).

Who is the main contact?
Lead student investigator, Vanessa Mizzi, mizziv@mcmaster.ca
Lead principal investigator, Dr Baraa Al-Khazraji, alkhazrb@mcmaster.ca

Contact information

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Study information

Scientific Title

Cerebral blood flow control in women during a ten week, two paradigm resistance training intervention

Acronym
CCRE

Study objectives
Although studies have shown that resistance exercise affects the vasculature, the time course of cerebrovascular adaptations throughout a resistance exercise training intervention and following cessation of resistance exercise (i.e., detraining) is unknown. As well, it remains unknown whether resistance exercise intensity influences cerebral blood flow control and effects of detraining on cerebral blood flow control. This study aims to investigate the effect of two resistance training paradigms (low load vs high load) on cerebral blood flow control over the course of a ten-week intervention and two weeks post-training cessation (i.e., detraining) in women. It is hypothesized that cerebral blood flow control will improve over the course of the resistance training intervention. It is also hypothesized that after training cessation, vascular adaptations would trend towards pre-intervention levels. Lastly, it is hypothesized that the females undergoing lower load or higher load groups would show similar cerebral blood flow control since both groups are training to volitional failure.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 21/04/2025, Hamilton Integrated Research Ethics Board (237 Barton Street East, Hamilton, L8L 2X2, Canada; +1 9055212100; eREBHelpdesk@hhsc.ca), ref: 18711

Primary study design
Interventional

Study design
Single-centre interventional randomized controlled trial

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Studying cerebrovascular health in relation to resistance exercise in young, healthy women

Interventions
This is a randomized control trial that evaluates cerebral blood flow control during a ten-week resistance training intervention.

Participants will be randomized to either a heavy-lifting group (able to perform 8-12 repetitions /set to volitional failure) or a light-lifting group (able to perform 15-25 repetitions/set to volitional failure). They will perform 10 weeks of resistance exercise training, training twice weekly. They will also be asked to cease training for two weeks post intervention, to assess detraining effects. The researchers will take various measurements vascular characteristics and the cerebral-pressure flow relationship pre-intervention, throughout the intervention, and post-intervention.

The randomisation process for the intervention was completed using an online tool (www.sealedenvelope.com). We used the block randomisation feature to ensure balanced allocation across groups. The system generated the randomisation codes, which were then used to assign participants accordingly.

Intervention Type
Behavioural

Primary outcome(s)
Cerebral-pressure flow relationship measured using a continuous blood pressure finger cuff and a transcranial doppler ultrasound at weeks 1-10, 12 during the leg press set.

Key secondary outcome(s)
1. Cerebrovascular reactivity measured using the Douglas bag at weeks 1-10, 12
2. Vascular characteristics (pulse wave velocity, distensibility, global cerebral blood flow, flow mediated dilation) using tonometers and Duplex ultrasound at week 0, 10, and 12.
3. Fatigue characteristics (questionnaires, rating of perceived exertion, lactic acid concentration) measured using questionnaires, verbal ratings, and Nova Biomedical Lactate Plus Meter at weeks 1-10, 12.

Completion date
05/05/2026

Eligibility

Key inclusion criteria
1. Young, healthy females aged 18-35 years
2. Must be able to maintain a habitual diet and perform resistance exercise two times per week throughout the trial
3. Must be able to perform exercise twice weekly
4. Able to begin exercise (assessed by Get Active Questionnaire)
5. Understand the study procedures and sign this form providing informed consent to participate in the study

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Upper age limit
35 Years

Sex

Female

Total final enrolment
33

Key exclusion criteria
1. Pregnancy
2. Mild traumatic brain injury in the last year
3. Any history of severe traumatic brain injury
4. Cardiovascular conditions
5. Cerebrovascular conditions
6. Neurological conditions
7. Metabolic syndrome
8. History of syncope or light-headedness
9. History of migraines or chronic headache
10. Respiratory illnesses
11. Diabetes
12. Claustrophobia
13. Any current musculoskeletal injury that would make resistance exercise difficult or unsafe
14. History of psychosis
15. Eating disorders
16. Manic or bipolar disorder
17. Major psychiatric conditions
18. Dependence on alcohol or drugs within the past year
19. Use of medications known to affect protein metabolism, including:
19.1. Corticosteroids
19.2. Non-steroidal anti-inflammatory drugs (prescription or daily over-the-counter use)
19.3. Prescription-strength acne medications
20. Use of anabolic steroids or other banned performance-enhancing substances as outlined by the Canadian Center for Ethics in Sport

Date of first enrolment
20/05/2025

Date of final enrolment
12/01/2026

Locations

Countries of recruitment
Canada

Study participating centre
McMaster University
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Sponsor information

Organisation
McMaster University

ROR
https://ror.org/02fa3aq29

Funder(s)

Funder type
Research council

Funder Name
Natural Sciences Engineering Research Council

Results and Publications

Individual participant data (IPD) sharing plan
The data-sharing plans for the current study are that all data will be made publicly available upon reasonable request from the PI, Dr. Baraa Al-Khazraji (alkhazrb@mcmaster.ca).

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol file			07/05/2026	No	No