

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

<b>Submission date</b> 22/07/2025	<b>Recruitment status</b> No longer recruiting	<input type="checkbox"/> Prospectively registered <input type="checkbox"/> Protocol
<b>Registration date</b> 29/07/2025	<b>Overall study status</b> Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 29/07/2025	<b>Condition category</b> Circulatory System	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> 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

### Type(s)

Scientific, Principal investigator

### Contact name

Dr Baraa Al-Khazraji

### ORCID ID

<https://orcid.org/0000-0003-1075-4183>

### Contact details

1280 Main St W

Hamilton

Canada

L8S 4L8

+1 9055259140

alkhazrb@mcmaster.ca

### Type(s)

Public

### Contact name

Ms Vanessa Mizzi

### ORCID ID

<https://orcid.org/0009-0006-9483-0364>

### Contact details

1280 Main St W

Hamilton

Canada

L8S 4L8

+1 9055259140

mizziv@mcmaster.ca

## Additional identifiers

Clinical Trials Information System (CTIS)

Nil known

Protocol serial number

Nil known

## 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

### Study design

Single-centre interventional randomized controlled trial

### Primary study design

Interventional

### 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](http://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

**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**

1280 Main St W

Hamilton

Canada  
L8S 4L8

## 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](mailto:alkhazrb@mcmaster.ca)).

### IPD sharing plan summary

Available on request