Handgrip exercise in models of IR

Published: 09-04-2025 Last updated: 25-06-2025

To explore the effect of acute local handgrip exercise on the ability to protect against myocardial damage in ex vivo models of myocardial ischaemia-reperfusion e.g. the Langendorff perfused rat heart, isolated cardiomyocytes from rat heart, and the...

Ethical review	Approved WMO
Status	Pending
Health condition type	Myocardial disorders
Study type	Observational invasive

Summary

ID

NL-OMON57691

Source Onderzoeksportaal

Brief title Handgrip exercise in models of IR

Condition

• Myocardial disorders

Synonym Ischaemia reperfusion injury cardiac damage

Research involving Human

Sponsors and support

Primary sponsor: Radboud Universitair Medisch Centrum **Source(s) of monetary or material Support:** ZonMW

Intervention

Movement therapy

Explanation

N.a.

Outcome measures

Primary outcome

The reduction of myocardial injury via the transfer of humoral cardioprotective agents, present in plasma obtained before/after handgrip exercise in various <i>ex vivo </i>models of IR.

Secondary outcome

Secondary study parameters involve the measurement of cardiac mechanical function, altered cardioprotective signal transduction, histological assessment of tissue integrity, metabolic alterations, and the detection of biomarkers of injury (lactate dehydrogenase).

Study description

Background summary

Exercise training has strong cardioprotective effects in asymptomatic subjects as well as those with established cardiovascular risk and/or disease. Ischaemia-reperfusion (IR) represents a significant and harmful stimulus for tissues, including the myocardium and the vascular endothelium. Studies have found evidence that exercise training is associated with reduced endothelial and cardiac IR injury, which may partly contribute to the protective effects of exercise training. Possibly, acute bouts of exercise possess the ability to prevent endothelial IR injury in humans and potentially myocardial rescue.

Recent studies have demonstrated that also handgrip exercise has a distinct impact on the ability to prevent endothelial and potentially cardiac IR injury. Such protection through exercise would be similar as observed with ischaemic preconditioning (IPC), i.e. a validated and successful method to prevent endothelial IR injury and is typically applied with short episodes of local arm ischaemia. This raises the question of whether local (forearm) exercise may be sufficient to induce systemic protective effects. This is highly relevant since whole-body training is a demanding type of exercise, which might be difficult to implement in the clinical setting. Local, handgrip exercise, however, would be more feasible to implement in clinical settings to reduce IR injury. Currently, mechanistic insights of exercise preconditionings' cardioprotection are difficult to assess in vivo, highlighting the need for

additional models to explore the effects of single handgrip exercise on myocardial rescue.

Study objective

To explore the effect of acute local handgrip exercise on the ability to protect against myocardial damage in ex vivo models of myocardial ischaemia-reperfusion e.g. the Langendorff perfused rat heart, isolated cardiomyocytes from rat heart, and the human heart slices model, and Engineered heart tissue platform. A secondary objective is to explore the potential mechanisms by which single exercise preconditioning elicits beneficial effects on IR injury.

Study design

Within-subject design

Intervention

A single session of local handgrip exercise with an intensity of 50% of their maximal contractile strength.

Study burden and risks

Handgrip exercise is not associated with a significant health risk in our participants. Blood will be drawn two times for the analysis of cardioprotective factors using ex vivo models of IR. The volunteers will not benefit directly from participating in this study.

Contacts

Scientific

Radboud Universitair Medisch Centrum Tom Luiken Philips van Leydenlaan 15 Nijmegen 6500 HB Netherlands 024 3613416 **Public** Radboud Universitair Medisch Centrum Tom Luiken Philips van Leydenlaan 15 Nijmegen 6500 HB Netherlands 024 3613416

Trial sites

Trial sites in the Netherlands

Radboud Universitair Medisch Centrum Target size: 15

Listed location countries

Netherlands

Eligibility criteria

Age Adults (18-64 years)

Inclusion criteria

- Adults >18 years, <65 years.
- BMI < 30kg/m2
- Recreational athlete (i.e. minimal 1h/week exercise, maximal 5 days/week of exercise)
- Mentally able/allowed to give informed consent

Exclusion criteria

A potential subject who meets any of the following criteria will be excluded from participation in this study:

- Presence of an absolute contra-indication for the performance of exercise (see also SOP Inspanningstest Department of Physiology):

- Acute myocardial infarction (3-5 days)
- Unstable angina
- Uncontrolled arrhythmias causing symptoms or hemodynamic compromise
- Active endocarditis
- Acute myocarditis or pericarditis
- Symptomatic severe aortic stenosis
- Uncontrolled heart failure
- Acute pulmonary embolus or pulmonary infarction
- Thrombosis of lower extremities
- Suspected dissecting aneurysm
- Uncontrolled asthma
- Pulmonary oedema

- Respiratory failure

- Acute noncardiopulmonary disorder that may affect exercise performance or be aggravated by exercise (i.e. infection, renal failure, thyrotoxicosis)

- Smoking
- Mental impairment leading to inability to cooperate
- Use of medication that alters the effect of cardioprotection:
- β-blockers
- Calcium Channel blockers
- Nitrates
- Opioids
- Anti-platelet agents (e.g. paracetamol)
- Statins and anti-hyperlipidaemic drugs
- Anti-diabetic treatment

Study design

Design

Study phase:	N/A
Study type:	Observational invasive
Intervention model:	Single
Allocation:	N/A: single arm study
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

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Recruitment status:	Pending
Start date (anticipated):	01-06-2025
Enrollment:	15
Duration:	1 months (per patient)
Туре:	Anticipated

Medical products/devices used

Product type:

N.a.

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IPD sharing statement

Plan to share IPD: Yes

Plan description

The pseudonymized data will be accessible in the Radboud Data Repository under restricted access. Requests for acces will be checked by the PI against the conditions for sharing the data as described in the signed Informed Consent. The scripts used in this project will also be uploaded and shared in the RDR.

Ethics review

Approved WMO	
Date:	18-06-2025
Application type:	First submission
Review commission:	METC Oost-Nederland

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register Research portal **ID** NL-009860