Cold and hot water immersion as a strategy to promote post-exercise recovery in healthy young men.

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To assess the effect of a 2 week resistance exercise training program combined with CWI on muscle protein synthesis and the reponse to the ingestion of a single bolus of protein and carbohydrate after post-exercise CWI or HWI on muscle protein...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON44748

Source
ToetsingOnline

Brief title
Cold & Hot water immersion

Condition

- Other condition

Synonym
Not applicable

Health condition

Geen, gezonde proefpersonen zullen worden getest

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Cooling, Immersion, Muscle, Protein

Outcome measures

Primary outcome

Muscle protein synthesis

Muscle glycogen concentration

Secondary outcome

Blood plasma glucose, insulin and amino acids.

Muscle, skin and core temperature.

Visual analogue scale

Study description

Background summary

Cold- and hot-water immersion (CWI/HWI) are frequently applied strategies to accelerate post-exercise recovery in both recreational as well as professional athletes. Another important recovery strategy for athletes is to ingest proper post-exercise nutrition (i.e., protein and carbohydrate) in order to replete endogenous glycogen stores and augment the skeletal muscle adaptive response to exercise. However, the effect of repeated post-exercise CWI on muscle protein synthesis and subsequent muscle recovery has never been assessed. In addition, it is not clear what the acute effect is of post-exercise CWI or HWI on muscle protein synthesis and glycogen repletion following food ingestion.

Study objective

To assess the effect of a 2 week resistance exercise training program combined with CWI on muscle protein synthesis and the reponse to the ingestion of a single bolus of protein and carbohydrate after post-exercise CWI or HWI on

muscle protein synthesis and glycogen repletion in healthy young males.

Study design

A controlled intervention study.

Intervention

Healthy, young men will be assigned to a 2-week resistance type exercise period combined with cold-water immersion (CWI) to assess the effect on muscle protein synthesis. We will apply 2H2O measurements during repeated CWI sessions following exercise to measure muscle protein synthesis.
In another group, healthy, young men will be assigned to a single bout of resistance type exercise followed by hot-water immersion (HWI) to assess the effect on muscle protein synthesis. Following each session, subjects will ingest 20 g of milk protein combined with 45 g of carbohydrate immediately following 20 min of one-legged CWI of both legs at different temperatures (i.e., 8 degrees Celsius vs. 30 degrees Celsius) or one-legged HWI of both legs at different temperatures (i.e., 40 degrees Celsius vs. 30 degrees Celsius). During the CWI period, a total of 7 resistance training bouts will be performed separated by at least 1 recovery day. During the HWI period a single resistance type exercise session will be performed. During the first training day of this experiment, subjects will ingest 20 g of intrinsically [1-13C]-phenylalanine and [1-13C]-leucine labeled milk protein [1, 2] combined with 45 g of carbohydrate immediately following 20 min of one-legged cold or hot water immersion (CWI/HWI). During this day, primed continuous intravenous tracer infusions will be applied and regular blood samples will be collected to assess digestion and absorption kinetics. Muscle biopsies will be obtained immediately prior to beverage ingestion and 120 min and 300 min after beverage ingestion from both legs to determine de novo muscle protein synthesis and glycogen resynthesis rates from both cold water immersed (CWI) or hot water immersion (HWI) and thermoneutral water immersed control (CON) legs. At the end of the 2-week training protocol, 2 additional muscle biopsies will be obtained (one from the left leg and one from the right leg) to assess muscle protein synthesis over 2 weeks in both legs.

Study burden and risks

The risks involved in participating in this experiment are minimal. Cold- or hot-water immersion of the legs might give some temporal discomfort to the subjects. Insertion of the catheters in a vein is comparable to a normal blood draw and the risk is a small local hematoma. Blood samples will be drawn during the screening and test day. In total, 16 blood samples of 8 mL and 8 muscle biopsies will be obtained in the CWI trial. In the HWI trial, a total of 11 blood samples of 8 mL and 6 muscle biopsies will be obtained. The muscle biopsy might cause some minor discomfort for maximally up to 24 h after the procedure,

characterized as a feeling that is comparable to muscle soreness or the pain after bumping into a table. In addition, it might leave a dull feeling in the muscle, which can take longer than 24 hours. The incision made for obtaining the muscle biopsy will heal completely. The labeled, non-radioactive amino acids tracers that will be infused intravenously are produced according to GMP standards and are safe for human use. The subjects will ingest doses of 50ml of 70% deuterium oxide (2H2O) to enrich the body water pool to approximately 1 APE (Atom Percent Excess). Deuterium oxide dosing to achieve a body water enrichment of 1 APE is completely safe as it is far below the threshold for biological toxicity in humans (approximately 20 APE) and will be returned to baseline enrichments within 30 days. The test beverages used in the first experimental test day contain intrinsically labeled dietary protein, which is safe for human consumption and has been used in previous studies (MEC 12-3-058, MEC 11-3-088 and MEC 14-3-002).

Contacts

Public
Universiteit Maastricht

Universiteitssingel 60
Maastricht 6229 ER
NL
Scientific
Universiteit Maastricht

Universiteitssingel 60
Maastricht 6229 ER
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)

Elderly (65 years and older)

Inclusion criteria

- Males
- Aged between 18-35 years
- Healthy, recreationally active
- BMI < 25 kg/m2
- The ability to comply with the protocol (i.e. the set-up for the CWI is designed for subjects that are at least 1.70 m or taller).

Exclusion criteria

- Smoking
- Allergies to milk proteins (whey or casein)
- Female
- Arthritic conditions
- A history of neuromuscular problems
- Recent (<1 y) participation in amino acid tracer studies
- Individuals on any medications known to affect protein metabolism (i.e. corticosteroids, non-steroidal anti-inflammatories, or prescription strength acne medications).
- Individuals with GI diseases

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	21-12-2015
Enrollment:	32
Type:	Actual

Ethics review

Approved WMO Date:	16-10-2015
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)
Approved WMO Date:	15-03-2017
Application type:	Amendment
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

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	ID
CCMO	NL54490.068.15

Study results

Date completed:	29-06-2017
Actual enrolment:	24