ISRCTN10033645 https://doi.org/10.1186/ISRCTN10033645

Evaluation of the impact of muscle relaxation techniques on recovery in sport

Submission date 02/07/2023	**Recruitment status** No longer recruiting	[X] Prospectively registered [_] Protocol [_] Statistical analysis plan [_] Results [_] Individual participant data [X] Record updated in last year
Registration date 04/07/2023	**Overall study status** Completed	
Last Edited 12/09/2024	**Condition category** Other	

Plain English summary of protocol

Background and study aims
In the context of sports competition, the assessment of the impact of physical methods (manual and other) between successive series of efforts is important for an athlete for extending their ability to conduct physical effort. At the same time, we have a limited time to use them. Therefore, the aim of this study is to assess the immediate effect on the ability of athletes to continue exercising when using various methods of short-term muscle relaxation.

Who can participate?
Healthy male athletes aged 18-40 years

What does the study involve?
The test includes measurements of the properties of various muscles at rest, followed by a fatigue intervention related to performing plyometric jumps on the box until refusal to continue the effort, followed by a 1-minute break. The number of such series is 5, reflecting the conditions of a championship fight in MMA. The main athletes tested are MMA fighters. During the break, participants will be randomly allocated to various methods of muscle relaxation.

What are the possible benefits and risks of participating?
During the fatigue test, the participant may feel slight exercise discomfort, however, it should be remembered that these are athletes for whom physical effort and muscle fatigue are a natural phenomenon. In addition, they are constantly monitored by the medical staff of the Provita Zory Polska Medical Center where the examinations will take place.

Where is the study run from?
Provita Medical Center (Poland)

When is the study starting and how long is it expected to run for?
January 2023 to August 2023

Who is funding the study?
Provita Medical Center (Poland)

Who is the main contact?
Robert Trybulski, rtybulski@o2.pl

Contact information

Type(s)
Scientific

Contact name
Mr Robert Trybulski

ORCID ID
http://orcid.org/0000-0002-4276-4813

Contact details
al.Zjednoczonej Europy
37
Żory
Poland
44-240
+48 (0)502591428
rtrybulski@o2.pl

Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
No. 24 of April 24, 2023

Study information

Scientific Title
The influence of various methods of muscle relaxation on the process of post-exercise muscle regeneration in athletes

Acronym
SRM

Study objectives
Methods of manual regeneration and ice stimulation in the breaks between efforts and after exercise are more effective at reducing muscle fatigue than passive rest or sham therapy

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 24/04/2023, National Council of Physiotherapists (al. Jerozolimskie 93, Warszawa, 02-001, Poland; +48 (0)22 230 23 80; komisjaetykibadan@kif.info.pl), ref: No. 24 of April 24, 2023

Study design
Interventional single-center randomized single-blind crossover study

Primary study design
Interventional

Secondary study design
Randomised cross over trial

Study setting(s)
Other therapist office

Study type(s)
Efficacy

Participant information sheet
Not available in web format, please use the contact details to request a consent form

Health condition(s) or problem(s) studied
Post-workout recovery in athletes

Interventions
The experiment will be carried out according to a randomized crossover design where each participant conducts a familiarization intervention with contrast therapy ice massage and 1-minute nautical massage for the thigh muscles and forearm muscles. A total of 100 volunteers submitted by MMA trainers in accordance with the inclusion and exclusion criteria will be randomly divided into two and four groups and subjected to various methods of physical and manual muscle relaxation in the sacral system. Using simple randomisation methods, athletes will be assigned to groups by random selection with the website https://www.randomizer.org/. Participants will not know which group they have been assigned to. The implementation of the intervention is planned at Centrum Medyczne Provita, which is a clinical facility registered by the relevant authorities and subject to national regulations. Before the intervention, the subjects will undergo resting measurements, followed by a fatigue test. The fatigue test will consist of performing plyometric jumps to the refusal of effort on a box 45-50 cm high, with a break between sets of 1 minute. The number of series is 5. Before the start of the test, the athletes will perform a properly planned warm-up. During the examination of the participants' health, it is controlled by a paramedic, the measurements will be made by properly trained students, and the entire application of the intervention is managed by the project manager, Dr Robert Trybulski, PT.

Other project participants at the stage of data preparation and publication are:
coordinator - head of research dr kf - physiotherapist Robert Trybulski - assistant professor at the University of Upper Silesia
Dr. hab. n. kf. Michał Wilk - Professor of the Academy of Physical Education in Katowice, head of

the Department of Sports Training and Self-Defense
Dr. hab. n kf. Michał Krzysztofik – assistant professor at the Department of Sports Training and Self-Defense.
Jakub Jarosz, MA – assistant at the Department of Sports Training and Self-Defense

Intervention groups for forearm muscles:
1. Manual vibrations and shaking of eMG muscles (n = 30) stimulation time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
2. Ice massage of eCG muscles (n = 30) stimulation time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
3. Passive eRG rest (n = 30) rest time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
4. Sham cSG therapy (n = 30) rest time - 1 minute in each inter-workout break, a total of 5 series, total intervention time about 15-30 minutes

Intervention groups for thigh muscles:
1. Manual vibrations and shaking of eMG muscles (n = 30) stimulation time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
2. Ice massage of eCG muscles (n = 30) stimulation time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
3. Passive eRG rest (n = 30) rest time - 1 minute in each break between exercises, a total of 5 series, total intervention time about 15-30 minutes
4 Sham cSG therapy (n = 30) rest time - 1 minute in each inter-workout break, a total of 5 series, total intervention time about 15-30 minutes

For all subjects, an analysis of individual primary variables will be carried out in the following periods, assuming the measurement times:
– rest value (Rest)
– value after GR therapy (Fasting 1-5 min, 24 h and 48 h)

Variables analyzed: muscle tone (F = Hz), stiffness (S = N/m), flexibility, relaxation (ms), "creep", muscle pain threshold (PT-kG or N), muscle strength (W), perfusion unit PU (no reference), RSI (no reference) - relative strength index)

For secondary outcomes, the following measurements were taken for all study participants: muscle tone (T - [Na Hz]), stiffness (S - [N/m]), flexibility (E- [NaN]), pressure pain threshold (PPT - [N/cm]) microcirculatory response described in non-reference units (PU) and maximum isometric force (Fmax [kgf]). All participants were tested under these time conditions (between 10 a.m. and 12 p.m.) in a standardized resting position. All measurements were taken at rest (r) - (rest), 1-5 minutes before the exercise test and after the end of the test (postex.) - after 1-5 minutes, 24 hours, 48 hours). Properly trained students and physiotherapists participated in the measurements. The order of measurements was PU, T, S, E, PPT, RSI, Fmax.

Measurement devices used: Myoton (Myoton AS, MyotonLtd, Estonia 2021) inclinometer (Baseline USA 2020), body composition analyzer (Accuniq BC720, Korea), algometer (FPIX 5.2021 USA), Force Decks measurement platform (Vald Performance Australia 2012), Tendo Sports (Czech Republic 2015).

Intervention Type
Other

Primary outcome measure

Measured at rest, 5 minutes, 24 and 48 hours after the exercise test:
1. Muscle tone (F = Hz), stiffness (S = N/m), flexibility and relaxation (ms) measured with a myotonometer (MyotonPRO AS, Myoton Ltd, Estonia 2021)
2. Muscle strength (W) measured with a hand dynamometer (EH106 China 2020)
3. Perfusion Units (PU) measured with a Laser Doppler Flowmeter (LDF), (Perimed, Sweden 2004)
4. Muscle power (Relative Strength Index [RSI]) measured behind the measurement platform Strength Decks (Vald Performance Australia 2012) or Fmax measured with an electronic hand dynamometer (EH106 China) 2020

Secondary outcome measures
Measured at rest, 1-5 minutes before the intervention and 1-5 minutes after the intervention, 24 hours and 48 hours:
1. Muscle pain threshold (PT-kG or N) measured with the FDIX algesimeter (Wagner Instruments, Greenwich, CT, USA 2013)
2. Number of jumps made, counted during each exercise test
3. Arterial pressure and pulse measured with an electronic blood pressure monitor before and after the exercise test

Overall study start date
10/01/2023

Completion date
10/08/2023

Eligibility

Key inclusion criteria
1. Randomly selected athletes with at least 3 years of training experience training min. 4 times a week
2. Aged 18-40 years
3. Healthy men

Participant type(s)
Healthy volunteer

Age group
Adult

Lower age limit
18 Years

Upper age limit
40 Years

Sex
Male

Target number of participants
100

Key exclusion criteria
1. Elevated blood pressure before the test (blood pressure >140/90 mmHg)
2. Patients treated after injuries, injuries or unspecified skin and myofascial lesions of the musculoskeletal system
3. Tattoos at the measurement site
4. Extreme fatigue, fever, infection or at the explicit request of the test person
5. Study participants had to abstain from training for 48 hours and abstain from exercise for 24 hours during the study
6. Participants were asked to refrain from consuming ergogenic beverages for 4 hours before the study

Date of first enrolment
20/07/2023

Date of final enrolment
01/08/2023

Locations

Countries of recruitment
Poland

Study participating centre
Medical Center Provita
al.Zjednoczonej Europy
37
Zory
Poland
44-240

Sponsor information

Organisation
Medical Center Provita

Sponsor details
al.Zjednoczonej Europy
37
Żory
Poland
44-240
+48 (0)502591428
provitazory@gmail.com

Sponsor type

Hospital/treatment centre

Website
https://www.rehabilitacja-provita.pl

Funder(s)

Funder type
Hospital/treatment centre

Funder Name
Medical Center Provita

Results and Publications

Publication and dissemination plan
Planned publication in a high-impact peer-reviewed journal

Intention to publish date
30/03/2025

Individual participant data (IPD) sharing plan
The datasets generated and/or analyzed during the current study are/will be available at the request of Robert Trybulski (rtrybulski@o2.pl). The type of data provided is a personal survey containing personal data. Participants signed informed consent.

IPD sharing plan summary
Available on request