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The influence of ingesting fish oil during two weeks of weight loss on changes in body mass and muscle strength

Submission date
27/05/2019

Recruitment status
No longer recruiting

Registration date
31/05/2019

Overall study status
Completed

Last Edited
10/09/2021

Condition category
Other

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
For many athletes, optimizing body composition is of critical importance for performance. For many sports, performance can be improved by decreasing total body mass while maintaining or even increasing muscle mass; a concept known as healthy weight loss. From a practical standpoint, this healthy weight loss will allow athletes to increase their power-to-mass ratio or to fit into weight categories for competition. Although exclusive loss of fat mass during weight loss is preferred, inevitably if dietary macronutrient composition is not manipulated, muscle mass is lost too. This loss of muscle mass may be detrimental to performance. Therefore, dietary strategies to alleviate a loss of muscle mass during weight loss, and thus preserve performance, are of critical importance for athletes and exercisers desiring weight loss. It has previously been shown that a restriction of energy intake to 60% over two weeks led to up to 3kg of mass loss, of which 50% was muscle. We hypothesise that supplementing with fish oil supplementation before and during this period can increase the amount of fat loss, preserve muscle mass, increase muscle signals promoting muscle building and reduce muscle signals promoting muscle breakdown following protein feeding and exercise.

Who can participate?
For this study, we will be recruiting 20 participants from the Stirling area. Participants will be between 18-35 years of age and need to have been resistance training twice a week for at least 6 months prior to the study. Anyone already consuming fish oil supplements will be excluded from the study. Participants will be asked to limit their dietary fish intake to once per week during the study.

What does the study involve?
The study involves participants ingesting either a fish oil or placebo supplement for 6 weeks. After 4 weeks of supplementation, participants will undergo a 2-week weight loss period. Measurements of body composition and muscle performance will be measured before supplementation, immediately before the weight loss and immediately after the 2-week weight loss period.

What are the possible benefits and risks of participating?
Participants will undergo a period of weight loss which may potentially involve losing significantly more fat mass than muscle mass. Participants will receive free body composition assessments, free food over the weight loss period and free nutritional composition breakdown from their normal diet. Participants will also receive financial reimbursement for travel and time upon completion of the study. Participants will be exposed to low levels of radiation, 0.001 miliSieverts per one whole body scan. The amount of radiation that participants will be exposed to during each scan is equivalent to just over (1/3) of the average daily natural background radiation exposure in the UK. The dose of radiation they will be exposed to during each scan is therefore very small. Participants will perform a rigorous exercise bout that may result in fatigue and perhaps muscle soreness.
Any sign of injury or contraindications to exercise will result in the termination of the exercise and the study. We will be recruiting participants that have been resistance training for at least 6 months, and that are therefore familiar with rigorous exercise. Any soreness or difficulty in performing the exercise should, therefore, be minimised.

Where is the study run from?
The study will take place in the laboratories at the University of Stirling.

When is the study starting and how long is it expected to run for?
July 2017 to March 2018

Who is funding the study?
Smartfish Nutrition Ltd, Oslo, Norway

Who is the main contact?
1. Jordan Philpott
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2. Dr Oliver Witard
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Contact information

Type(s)
Public

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Additional identifiers

Protocol serial number
16/WS/0248

Study information

Scientific Title
Influence of dietary omega-3 fatty acid content on body composition and muscle performance changes during weight loss in resistance trained young men

Study objectives
Ingesting fish oil during a 2 week period of energy restriction augments changes in body composition and muscle performance compared to ingesting a placebo.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 23/01/2017, West of Scotland Research Ethics Service (West of Scotland REC 4 Research Ethics, Clinical Research and Development, West Glasgow Ambulatory Care Hospital Dalnair Street, Glasgow, G3 8SJ; WoSREC4@ggc.scot.nhs.uk; 0141 232 1808), ref: 16/WS/0248

Primary study design
Interventional

Study design
Interventional randomised controlled trial

Study type(s)
Other

Health condition(s) or problem(s) studied
Healthy volunteers

Interventions
Participants were randomly assigned to either a fish oil or a placebo supplement in a juice-based beverage form supplied by Smartfish Nutrition Ltd. The supplements were ingested for 6 weeks. The fish oil supplement contained 4g/day of omega-3. After 4 weeks of supplementation, participants will undergo a 2-week weight loss period. Measurements of body composition and muscle performance will be measured before supplementation, immediately before the weight loss and immediately after the 2-week weight loss period.

Participants were assigned to groups randomly using a list of 20 1 or 0 generated using the binomial distribution with probability 0.5 in Rstudio. Data was collected by Jordan Philpott either by computer output or by resistance machine output.

Trial days and measurements
Testing sessions commenced at ~07:00 on wks 1 (day 7), 4 (day 27) and 6 (day 41) following an overnight fast and having consumed 500 ml of water 1-2 h prior to arriving at the laboratory. Participants were instructed to empty their bladder before body weight was measured using standard laboratory scales (Seca Quadra 808, Birmingham, UK) with participants wearing

underwear only. Body composition was measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare). All DXA scans followed procedures previously described by Rodriguez-Sanchez & Galloway (2015) and were performed by the same trained technician (CV of body mass measurement = 1.95%, CV of LBM measurement = 1.6%, CV of fat mass measurement = 6.5%).
Muscle strength and endurance
The first test of muscle strength was a single leg isokinetic/eccentric maximum voluntary contraction (MVC) of the knee flexors using an isokinetic dynamometer. Participants were seated on the dynamometer with their upper body, hips and thigh securely strapped into the seat and their hip joint positioned at a 90° angle to their upper leg. The lower leg was attached to the arm of the dynamometer 1 cm above the lateral malleolus ankle joint with the axis of rotation of the dynamometer arm aligned with the lateral femoral condyle. The dynamometer arm was set to start and stop at angles 90 and 0 respectively at the knee joint. Participants were asked to use maximum effort to resist the dynamometer arm from moving the knee joint from a 90 to a 0 angle. Each participant performed 3×3 sets/reps of this MVC protocol with a 60 sec rest interval between sets. The highest peak torque recording from the 3 sets was recorded (CV of dominant leg MVC measurement = 6.65%, CV of non-dominant leg MVC measurement = 7.45%) . Following 5 min of rest, unilateral 1RM for leg extension and leg press was assessed using a previously validated protocol (Baechle and Earle, 2008) on a fixed resistance machine (Cybex International Inc, Cybex International, MA) (CV of dominant leg extension measurement = 3.75%, CV of non-dominant leg extension measurement = 5.1%, CV of dominant leg press measurement = 7.85%, CV of non-dominant leg press measurement = 6.85%). Seat and knee position was recorded during this testing session and was replicated during wks 4 and 6. On the same day, following a 10 min rest period, unilateral muscular endurance was measured. Participants completed as many repetitions as possible on leg extension and leg press exercises, with resistance set at 60% of individual baseline 1RM. Participants completed repetitions at their own speed but were instructed to cease exercising as soon as a rest period between repetitions was required. In total, testing sessions were completed within 180 min

Intervention Type
Supplement

Primary outcome(s)
Measured at weeks 1 (day 7), 4 (day 27) and 6 (day 41):
1. Weight loss
2. Body composition measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare)
3. Exercise performance during a two week period of energy restriction (60% of normal intake) measured using three exercises:
3.1 Single leg isokinetic/eccentric maximum voluntary contraction (MVC) of the knee flexors using an isokinetic dynamometer
3.2 Unilateral 1RM for leg extension and leg press on a fixed resistance machine
3.3 Muscular endurance (as many repetitions as possible on leg extension and leg press exercises, with resistance set at 60% of individual baseline 1RM).

Key secondary outcome(s)
Measured at weeks 1 (day 7), 4 (day 27) and 6 (day 41):
1. Fat mass measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare)

2. Fat-free mass measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare)
3. Bone mass measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare)
4. Overall body fat percentage measured using a narrowed fan-beamed dual-energy x-ray absorptiometry (iDXA GE Healthcare) with analysis performed using GE Encore 13.40.038 Software (GE Healthcare)
5. Resting energy expenditure measured using indirect calorimetry (Oxycon Pro; Cardinal Health)
6. Muscle anabolic signalling (the capacity for muscle to make new proteins) measured using western blot analysis
7. Muscle catabolic signalling (the signals driving the breakdown of muscle proteins by the body) measured using western blot analysis
8. mRNA expression (the expression of certain genes associated with muscle building and breakdown) during weight loss measured using western blot analysis.

Completion date
22/03/2018

Eligibility

Key inclusion criteria
1. Male aged 18 - 35 years.
2. Resistance training for at least two times per week for 6 months prior to the study.
3. Healthy (no known metabolic diseases or eating disorders as determined by our health questionnaire).

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Sex
Male

Total final enrolment
20

Key exclusion criteria
1. Currently supplementing with fish oil.
2. Currently taking medication that would provide inaccurate results as determined by our health questionnaire.
3. Involved in another clinical trial.

4. Substance abuse within the last year.
5. Eating disorder within the last year.
6. Metabolic disorders.
7. Employee of the sponsor, study site, or members of their immediate family.
8. Smoke regularly.

Date of first enrolment
25/06/2017

Date of final enrolment
01/03/2018

Locations

Countries of recruitment
United Kingdom

Scotland

Study participating centre
University of Stirling
Stirling
United Kingdom
FK9 4LA

Sponsor information

Organisation
Smartfish Nutrition Ltd.

ROR
https://ror.org/01r53zj15

Funder(s)

Funder type
Industry

Funder Name
Smartfish Nutrition Ltd.

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.
Contact name – Jordan Philpott
Contact email - j.d.philpott@stir.ac.uk
The datasets are available on request from the date of publication for 3 years
Individual participants datasets can be obtained upon request by that specific participant but not by anyone else. Participants were made aware of this upon giving consent to the study. Participants should seek datasets from Jordan Philpott, specific datasets will be made available to them via email.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		16/07/2019	10/09/2021	Yes	No
HRA research summary			28/06/2023	No	No