

# Bone and muscle structure and function in relation to exercise and oestrogen replacement

<b>Submission date</b> 11/06/2009	<b>Recruitment status</b> No longer recruiting	<input type="checkbox"/> Prospectively registered
<b>Registration date</b> 09/07/2009	<b>Overall study status</b> Completed	<input type="checkbox"/> Protocol
<b>Last Edited</b> 09/07/2009	<b>Condition category</b> Musculoskeletal Diseases	<input type="checkbox"/> Statistical analysis plan
		<input checked="" type="checkbox"/> Results
		<input type="checkbox"/> Individual participant data

**Plain English summary of protocol**  
Not provided at time of registration

## Contact information

**Type(s)**  
Scientific

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## Additional identifiers

**Protocol serial number**  
N/A

## Study information

**Scientific Title**  
Bone and muscle structure and function in relation to exercise and oestrogen replacement: a randomised double-blind placebo-controlled one-year-trial

**Acronym**  
Ex/HRT-study

## **Study objectives**

Deterioration of bone and muscle properties may occur after menopause. High-impact, power training and oestrogen-containing hormonal replacement therapy (HRT) may reverse these deteriorations. Combined treatments with both training and HRT may have additional effects.

## **Ethics approval required**

Old ethics approval format

## **Ethics approval(s)**

Ethical Committee of the Central Hospital of Central Finland has approved this study on 11th June 1996 (ref: Dnro1053/04/046/06). The study was re-evaluated concerning the use of DNA-samples and approved on the 18th October 2005.

## **Study design**

Randomised double-blind placebo-controlled one-year-trial

## **Primary study design**

Interventional

## **Study type(s)**

Treatment

## **Health condition(s) or problem(s) studied**

Osteopenia, sarcopenia

## **Interventions**

Exercise (Ex): 1-year progressive physical training programme that included a supervised circuit training session twice a week and a series of exercises at home 4 days per week. Training was high-impact power training consisting of circuit training periods for 8 - 11 weeks, interrupted by three high-impact aerobic dance periods for 2 weeks and a summer pause for 5 weeks. They also used placebo tablets.

HRT: the combined oestradiol (2 mg) and noretisterone acetate (1 mg) product (Kliogest®, Novo Nordisk) was administered continuously, one tablet per day for one year. The administration of HRT was conducted double-blinded.

Ex+HRT: participants conducted the training program and used HRT.

CO: control arm participants did not receive any treatment, but they used placebo and were asked not to change their daily physical activities.

Total duration of the treatment was 12 months; the 12-month measurements were performed within a week of ending the treatments. This part of the trial was completed on the 30th August 1997.

A 10-year follow-up measurement was also performed for the participants who were willing to come back to the lab (n = 47). These measurements were performed from the 15th September to 24th November 2007. End of analysis and follow-up will be on the 31st December 2013.

## **Intervention Type**

Drug

## **Phase**

Not Applicable

## **Drug/device/biological/vaccine name(s)**

Oestradiol, noretisterone acetate (Kliogest®)

## **Primary outcome(s)**

1. Developing methods for the testing of material and structural changes in the trabecular and cortical bone sites of the lower leg in relation to high-impact exercise and hormone replacement:

1.1. Single photon absorption method

1.2. Computed tomography

1.3. Elastic wave propagation

1.4. Ultrasonography

2. The effects of a high-intensity, explosive-type physical training and hormonal replacement on lower leg muscle mass, structure and performance in post-menopausal women:

2.1. Ultrasonography

2.2. Computed tomography

2.3. Muscle biopsies

2.4. Maximal isometric strength measurements with dynamometer chair

2.5. Measurement of explosive muscle power; ability to elevate the body's centre of gravity during vertical jumps onto a contact mat

2.6. Muscle performance; maximal running speed over 20 m distance

All measurements were done at baseline (0 months), at mid-point (6 months) and after completion of the treatments (12 months).

## **Key secondary outcome(s)**

1. Examining the molecular mechanism responding to high-intensity, explosive-type physical training and hormonal replacement by using muscle biopsies, taken at baseline, after 0.5 years of study onset and after 1 year of study onset, by microarray and other applicable molecular methods

2. Examining the adaptation of bone collagen metabolism and the different types of muscle fibres to altered force transmission and oestrogen status (using serum and urine samples to determine the content of deoxypyridinoline in overnight (10 hour) samples and using immunohistochemical methods with respective antibodies

All measurements were done at baseline (0 months), at mid-point (6 months) and after completion of the treatments (12 months).

## **Completion date**

31/12/2013

## **Eligibility**

### **Key inclusion criteria**

1. No serious medical conditions

2. No current or previous use of medications including oestrogen, fluoride, calcitonin, bisphosphonates or steroids

3. Last menstruation at least 0.5 years but not more than 5 years ago

4. Follicle-stimulating hormone levels greater than 30 iu/litre

5. No contra-indications for exercise and HRT

6. Aged 50 - 57, caucasian post-menopausal women

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Adult

**Sex**

Female

**Key exclusion criteria**

1. Serious medical conditions
2. Current or previous use of medications including oestrogen, fluoride, calcitonin, biophosphonates or steroids
3. Currently menstruating or having last menstruation within 0.5 years of the onset of study or longer than 5 years ago
4. Follicle-stimulating hormone levels less than 30 iu/litre
5. Contra-indications for exercise and HRT

**Date of first enrolment**

01/09/1996

**Date of final enrolment**

31/12/2013

**Locations****Countries of recruitment**

Finland

**Study participating centre**

PO Box 35

Jyväskylä

Finland

40014

**Sponsor information****Organisation**

University of Jyväskylä (Finland)

**ROR**

<https://ror.org/05n3dz165>

# Funder(s)

## Funder type

Government

## Funder Name

Finnish Academy (Finland) - 1st January 1996 - 1st January 2001

## Funder Name

Finnish Funding Agency for Technology and Innovation (TEKES) (Finland) - 1st January 1996 - 1st January 2001

## Funder Name

Finnish Ministry of Education (Finland) (ref: 98/772/2002)

# Results and Publications

## Individual participant data (IPD) sharing plan

## IPD sharing plan summary

Not provided at time of registration

## Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Results article</a>	ultrasound and bone mineral density assessment results	01/06/1999		Yes	No
<a href="#">Results article</a>	developing methods for assessing changes in bone results	01/07/2000		Yes	No
<a href="#">Results article</a>	initial results	01/08/2001		Yes	No
<a href="#">Results article</a>	bone mass distribution results	01/07/2002		Yes	No
<a href="#">Results article</a>	developing methods for testing the material changes and turnover in bone results	01/07/2002		Yes	No
<a href="#">Results article</a>	lower-body muscle power results	01/06/2004		Yes	No
<a href="#">Results article</a>	muscle attenuation results	01/09/2005		Yes	No
	muscular transcriptome results	01/12			

[Results article](#)

[Participant  
information sheet](#)

Participant information sheet

/2007

11/11

/2025

11/11

/2025

Yes

No

No

Yes