RIMS Conference, Hamburg, 2012

Maximal surface EMG activity increases following resistance training in patients with multiple sclerosis

[1]**Dalgas U**., [2,3]Stenager E., [3]Lund, C., [1]Rasmussen C, [4]Petersen T., [1]Ingemann-Hansen T. & [1]Overgaard K.

[1]Section of Sport Science, Department of Public Health, Aarhus University, Denmark
[2]Department of Neurology, Soenderborg Hospital, Denmark
[3]Institute of Regional Health Services, University of Southern Denmark
[4]Department of Neurology, Aarhus University Hospital, Denmark

E-mail: dalgas@sport.au.dk

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Background

Lower extremity muscle strength is often impaired in MS patients and may cause impaired functional capacity *Schwid et al. 1999, Savci et al. 2005, Thoumie et al. 2005*

Impaired muscle strength can be explained by muscular and/or neural impairments

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Background

Some studies, but not all, have shown muscular atrophy in MS patients compared to healthy controls

Kent-Braun et al. 1997, Garner et al. 2003, Carroll et al. 2003, Lambert et al. 2002

Also, impaired neural drive and neural activation has been reported in MS patients

Scott et al. 2011, Rice et al 1992

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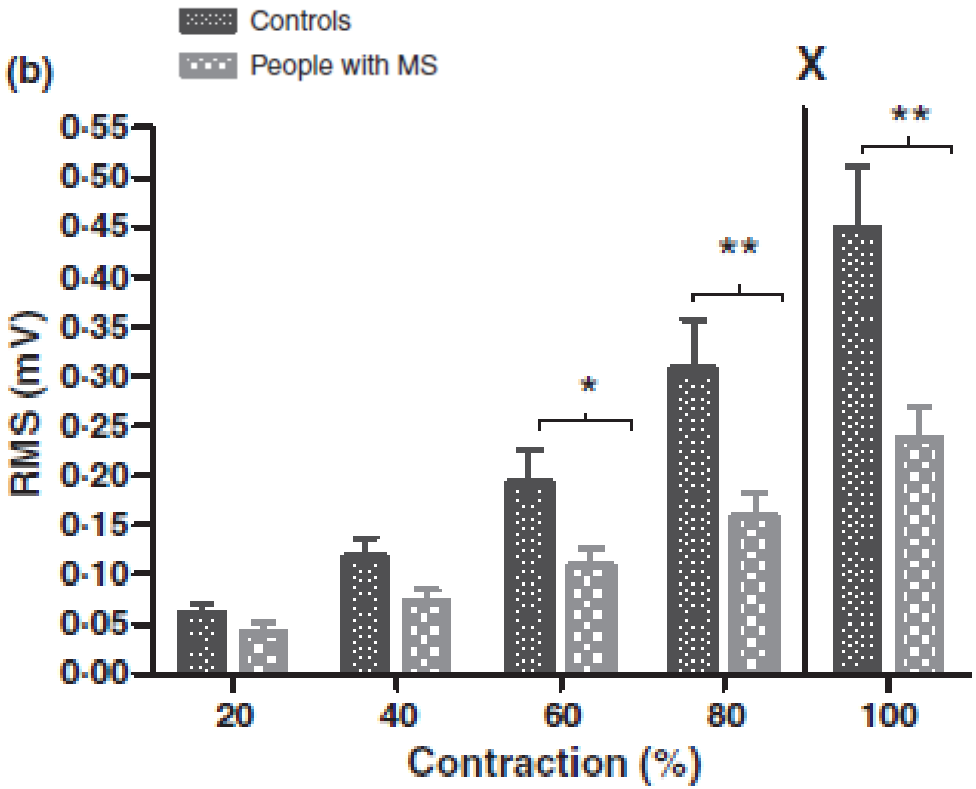
Clin Physiol Funct Imaging (2011) **31**, pp11–17 doi: 10.1111/j.1475-097X.2010.00972.x

Surface EMG characteristics of people with multiple sclerosis during static contractions of the knee extensors

Sasha M. Scott, Adrienne R. Hughes, Stuart D. R. Galloway and Angus M. Hunter

Nutrition, Physical Activity and Health Research Group, University of Stirling, Stirling, Scotland



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Background

Resistance training is a safe, beneficial and accepted exercise modality in MS rehabilitation *Kjølhede et al. 2012*

Resistance training effectively improves muscle strength (and functional capacity) in MS patients *Dalgas et al. 2009*

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Background

In healthy subjects resistance training can improve the maximal neural drive

Folland et al. 2007

Only one study has examined neural adaptations to resistance training in MS

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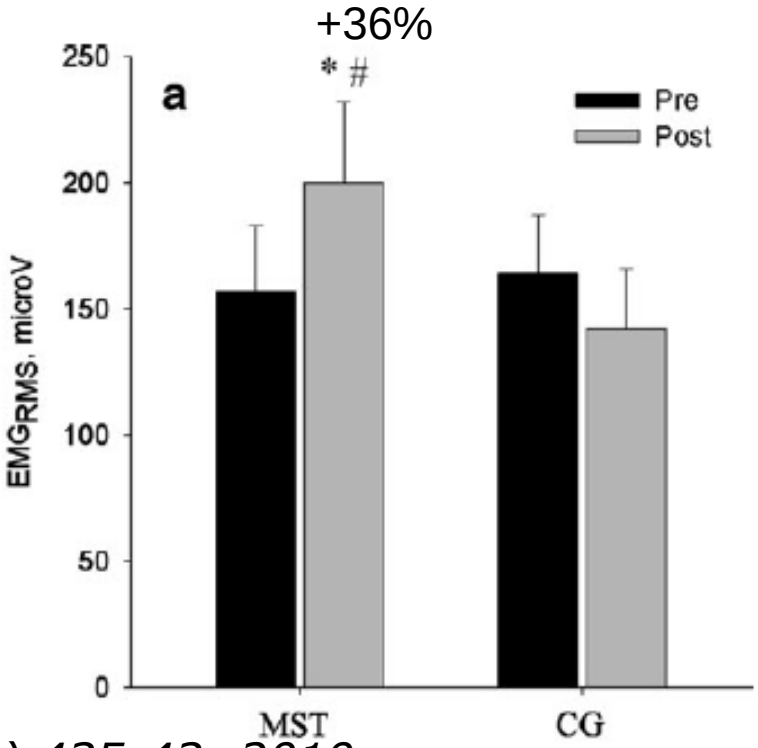
Background

Eur J Appl Physiol
DOI 10.1007/s00421-010-1519-2

ORIGINAL ARTICLE

Enhanced neural drive after maximal strength training in multiple sclerosis patients

Marius S. Fimland · Jan Helgerud · Markus Gruber · Gunnar Leivseth · Jan Hoff



3weeks
5d/week
Intense RT
Soleus

Fimland et al. Eur J Appl Physiol 110 (2) 435-43; 2010

Purpose

To determine the effects of intensive resistance training (2d/week) of the lower body on the neural drive to the knee extensors and knee flexors in MS patients

To evaluate whether potential effects are maintained 12 weeks after the trial

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Hypothesis

Resistance training will improve the neural drive to both knee extensors and flexors

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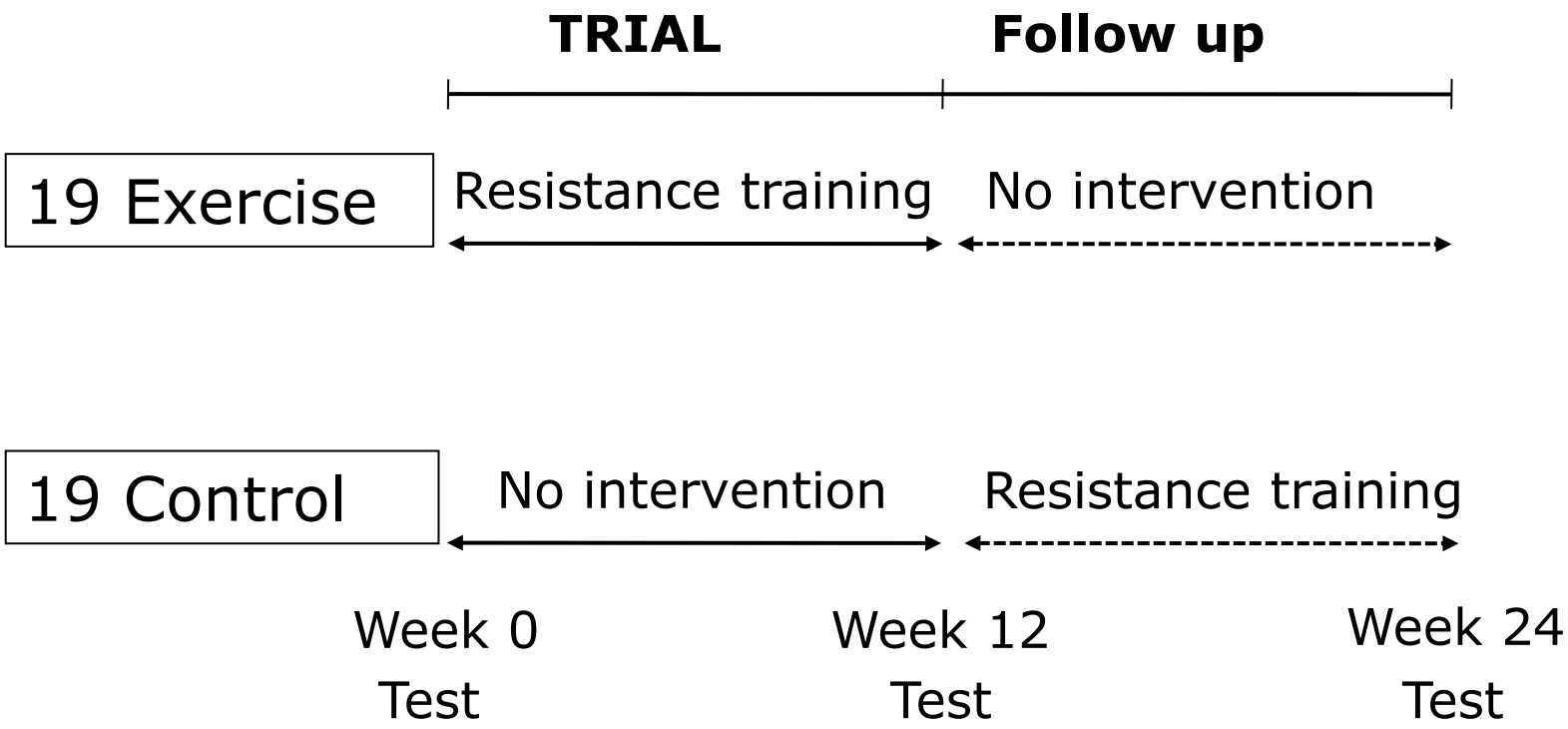
Study design



RRMS
EDSS: 3-5.5

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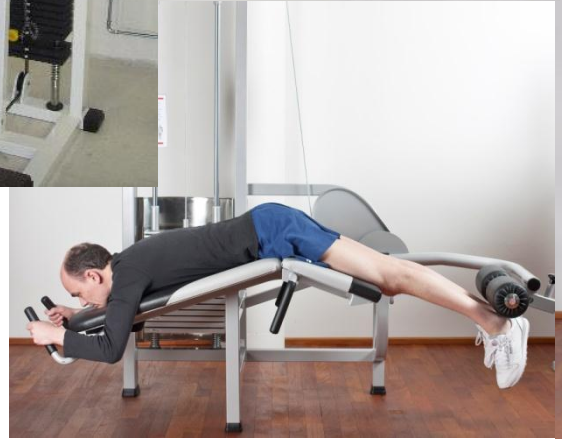
Resistance exercises

Five leg exercises

performed twice weekly



Training protocol

Weeks	Sets	Reps	Load
1 & 2	3	10	15 RM
3 & 4	3	12	12 RM
5 & 6	4	10	10 RM
7 & 8	4	10	10 RM
9 & 10	4	8	8 RM
11 & 12	3	8	8 RM

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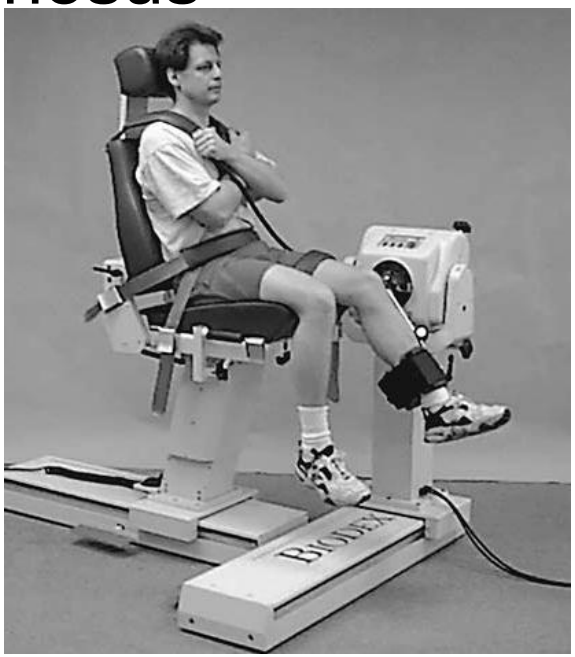
Background

Surface EMG recordings during maximal isometric knee extension and knee flexion from:

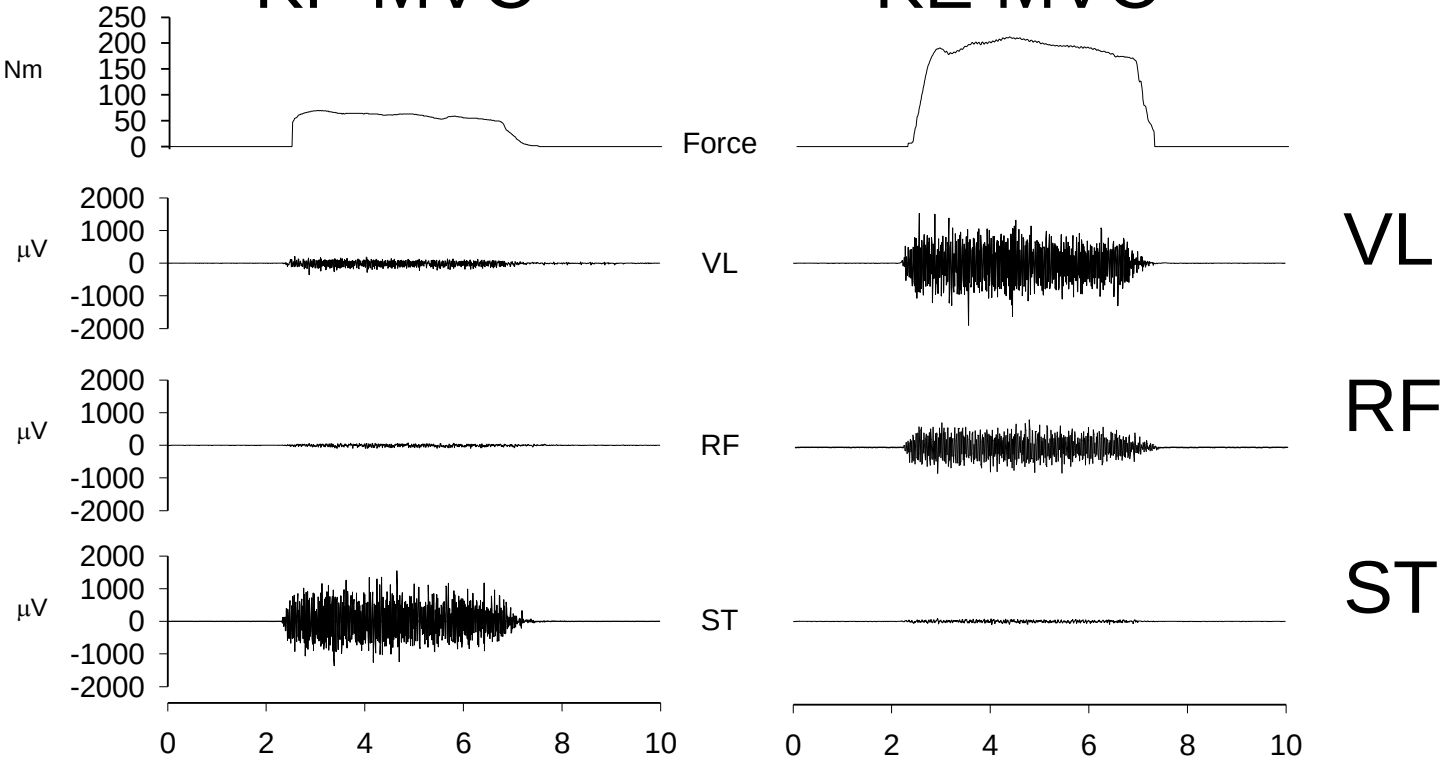
1. Rectus femoris
2. Vastus lateralis
3. Semitendinosus



Typical EMG recording

KF MVC

KE MVC



VL

RF

ST

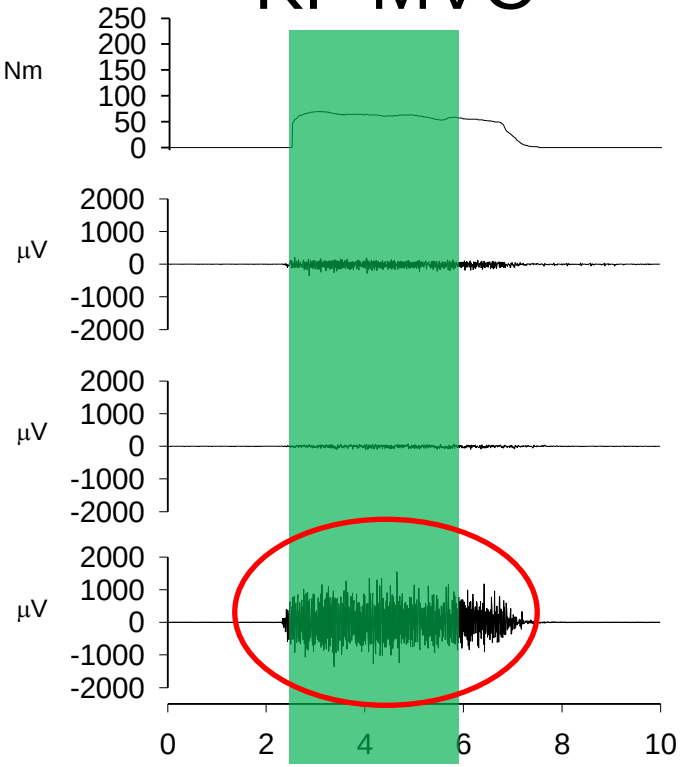
Time [s]

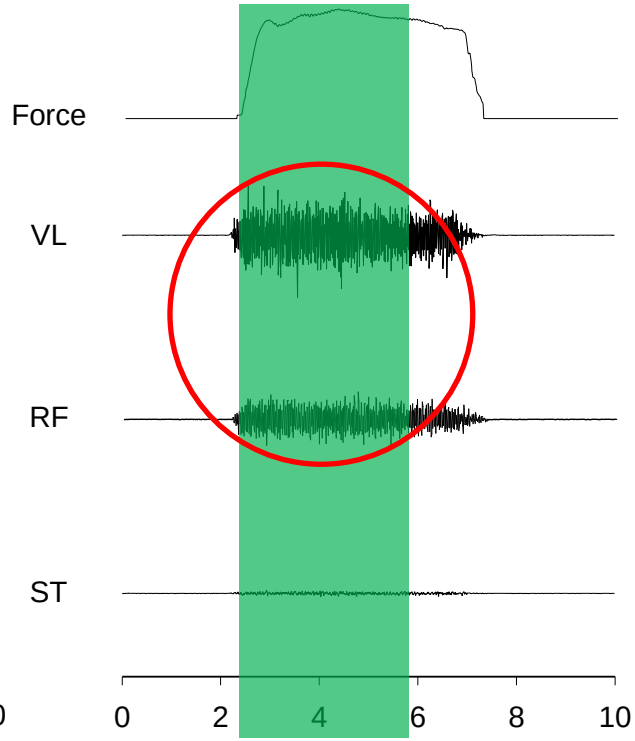
Time [s]

Typical EMG recording

KF MVC

KE MVC





TTI

iEMG VL

iEMG RF

iEMG ST

Time [s]

Time [s]

Baseline

	CONTROL	EXERCISE	P value
Numbers	16 (6♂/10/♀)	15 (5♂/10♀)	
Age (yrs)	49.1 ± 8.4	47.7 ± 10.4	n.s.
Height (cm)	168.9 ± 12.3	169.8 ± 9.4	n.s.
Weight (kg)	66.9 ± 15.2	70.1 ± 14.2	n.s.
EDSS (arbitrary units)	3.9 ± 0.9	3.7 ± 0.9	n.s.
Time since diagnosis (yrs)	8.1 ± 6.0	6.6 ± 5.9	n.s.
Immuno-modulatory treatment (+/-)	11/5	7/8	n.s.

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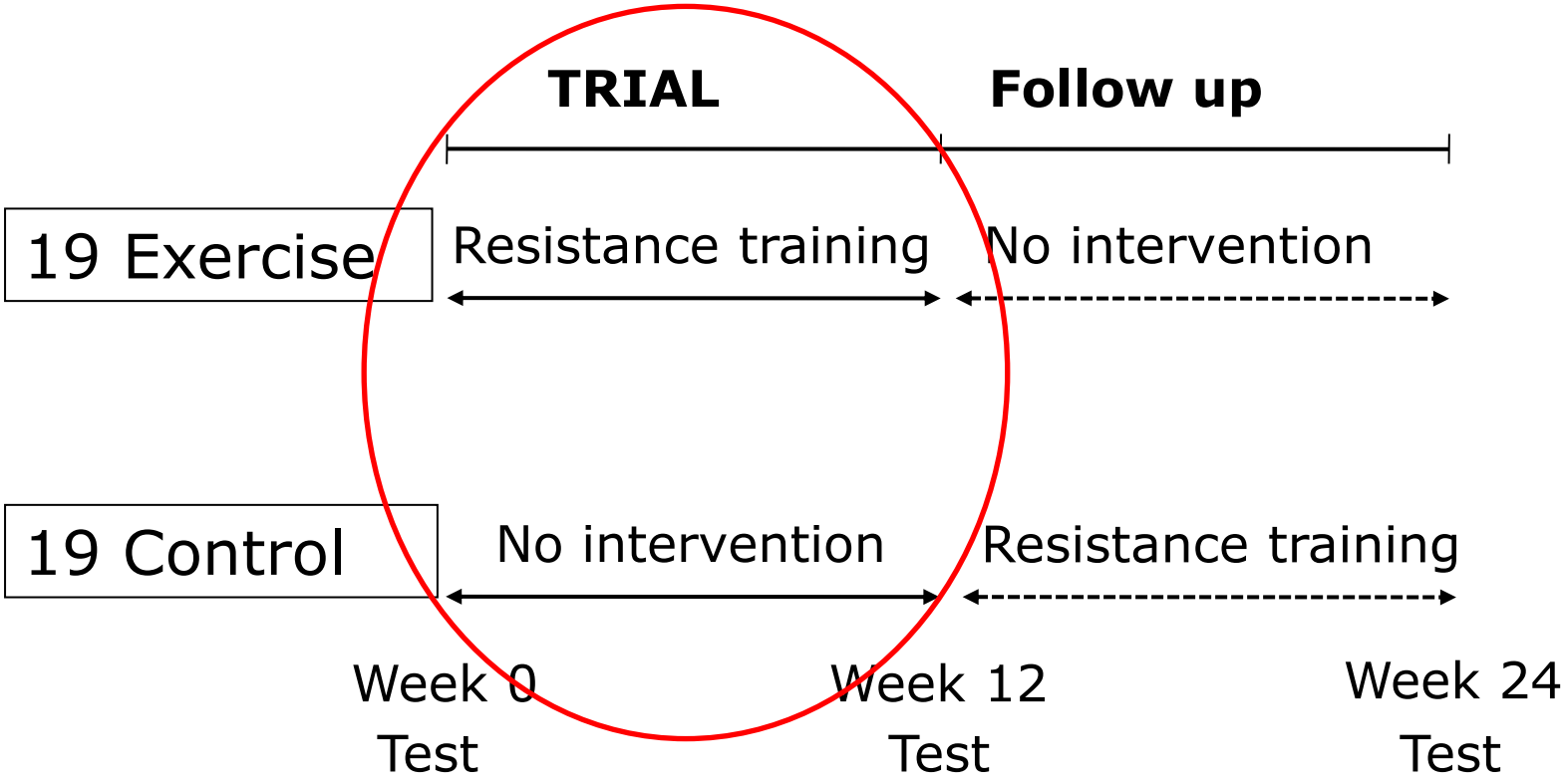
Results



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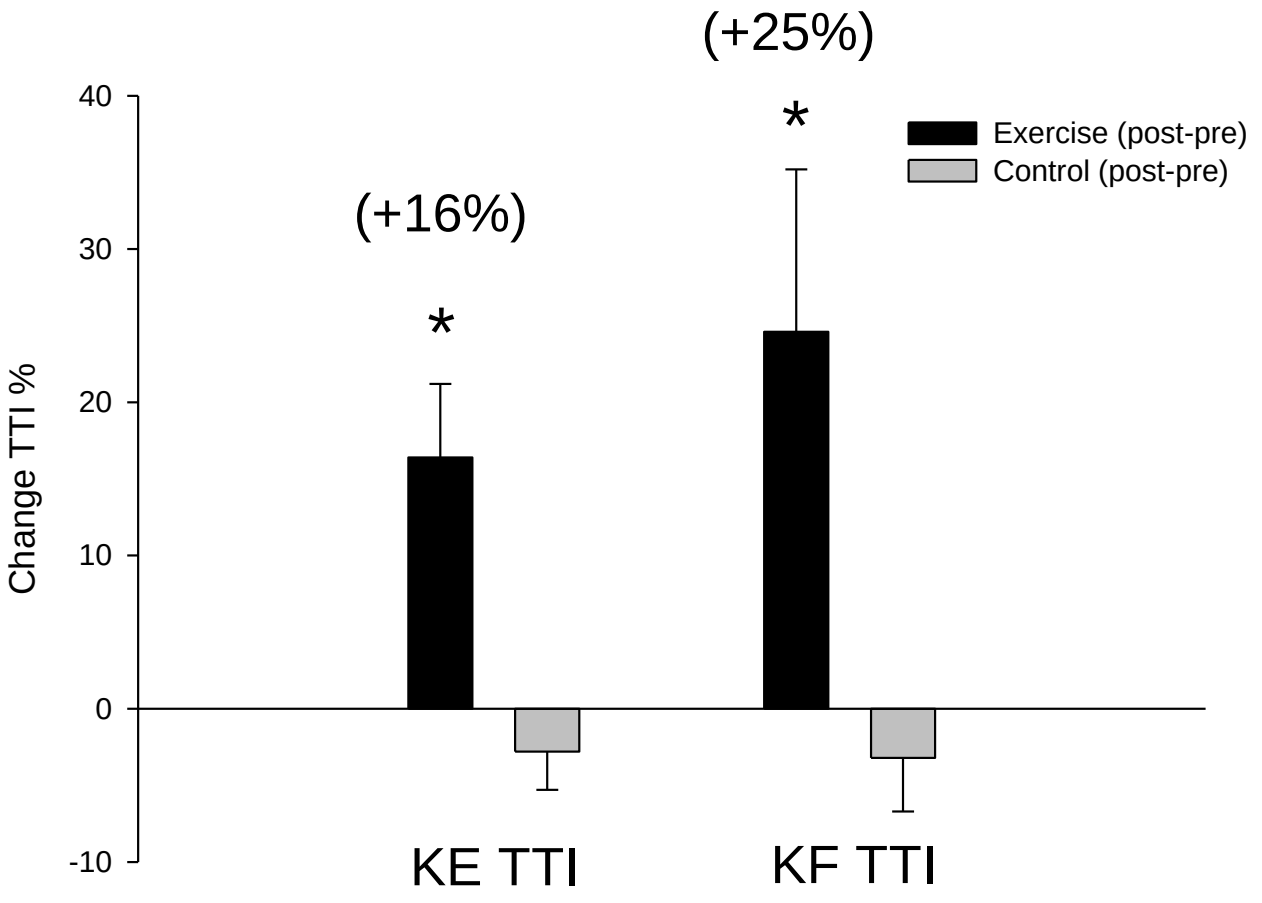
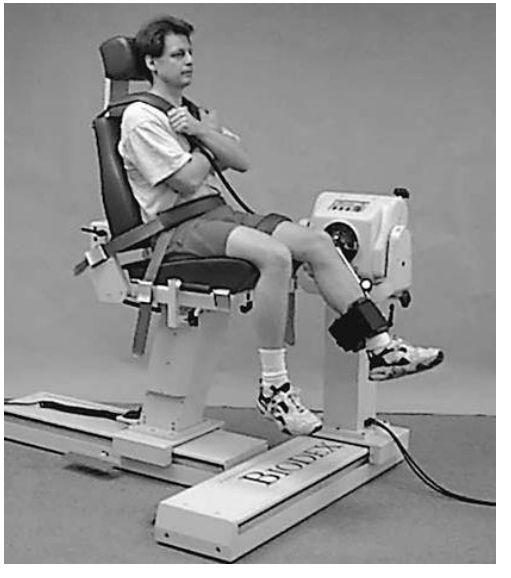
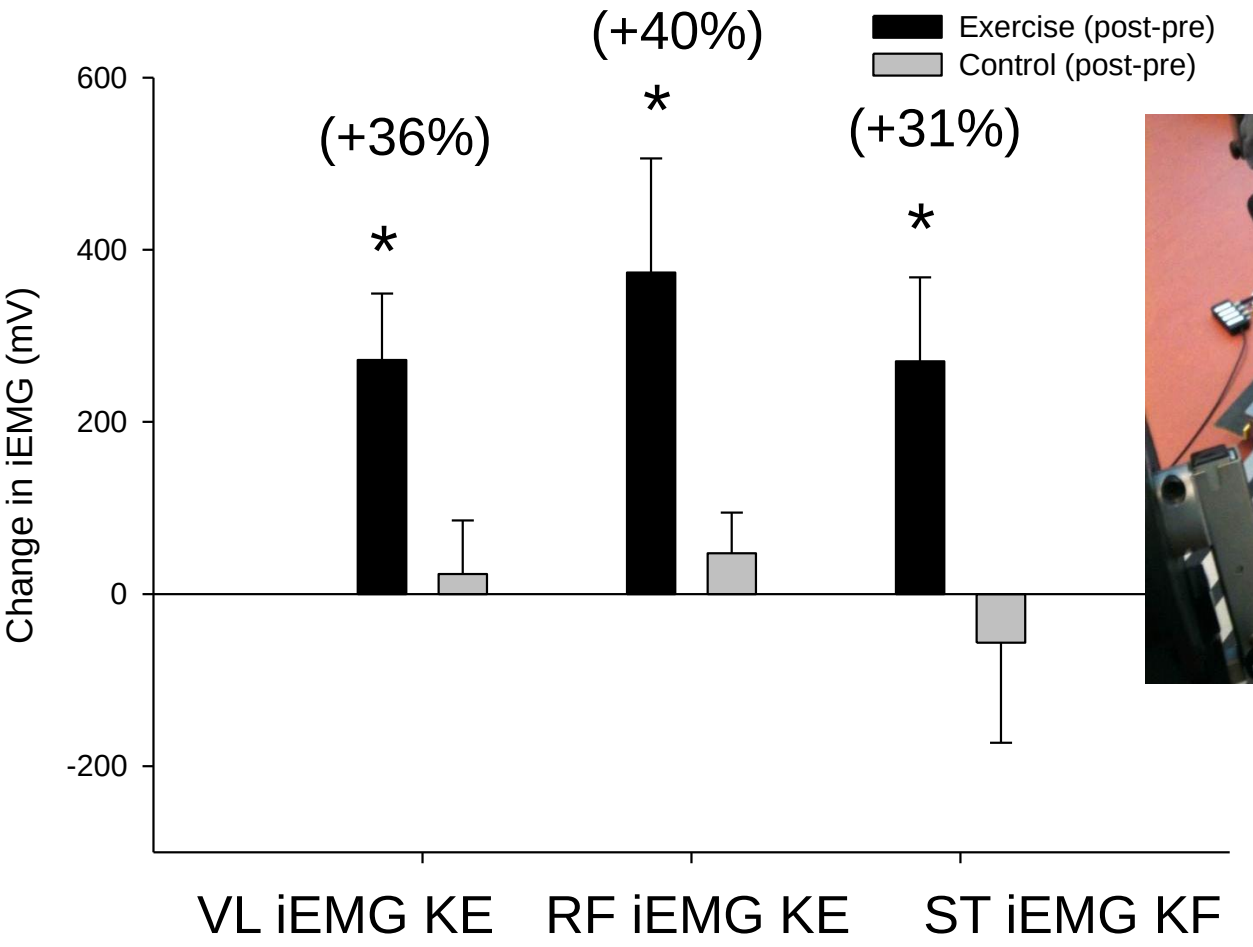
Results


(+25%)
(+16%)
*
*
Exercise (post-pre)
Control (post-pre)
Change TTI %
40
30
20
10
0
-10
KE TTI
KF TTI



Results



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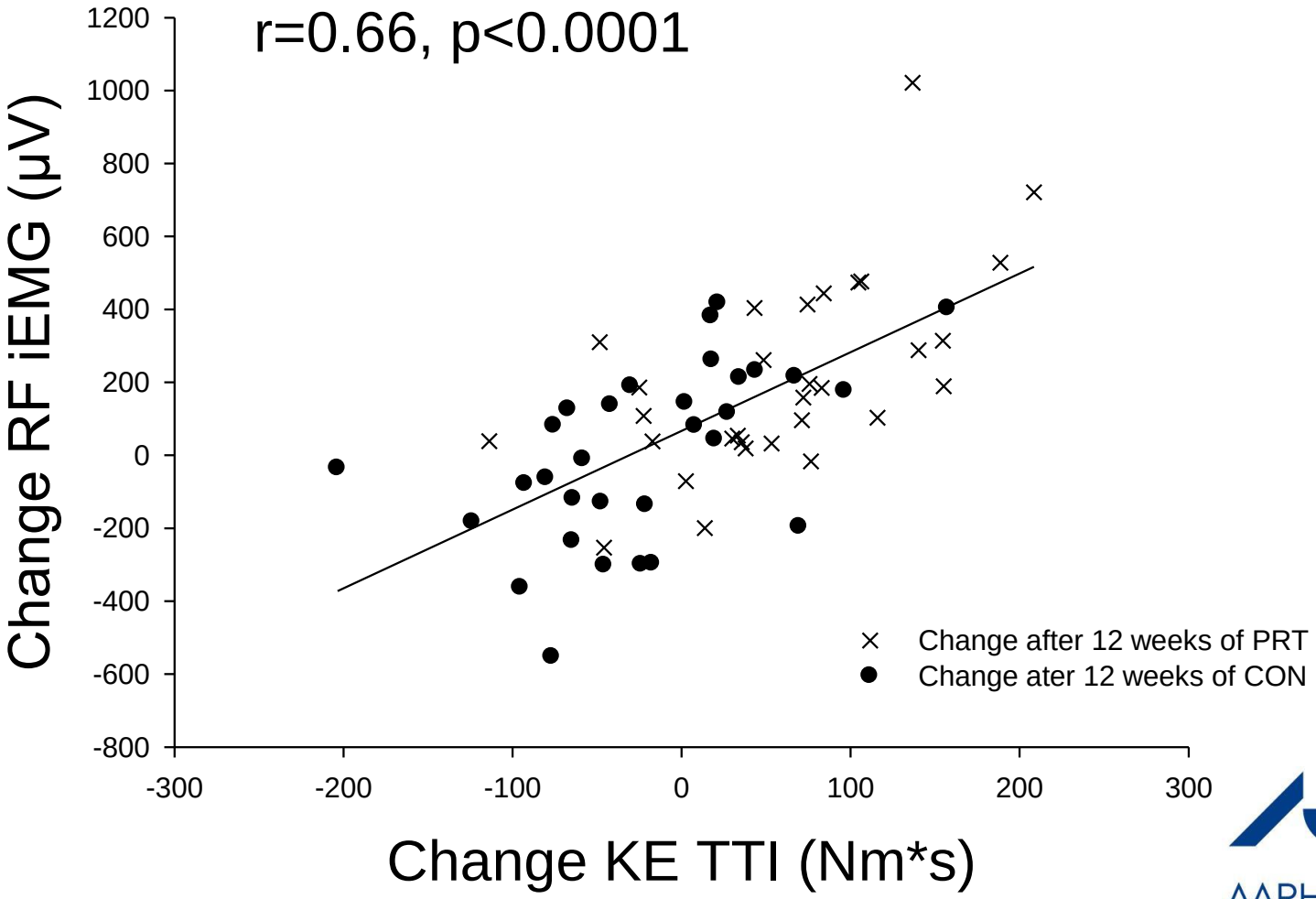
Results



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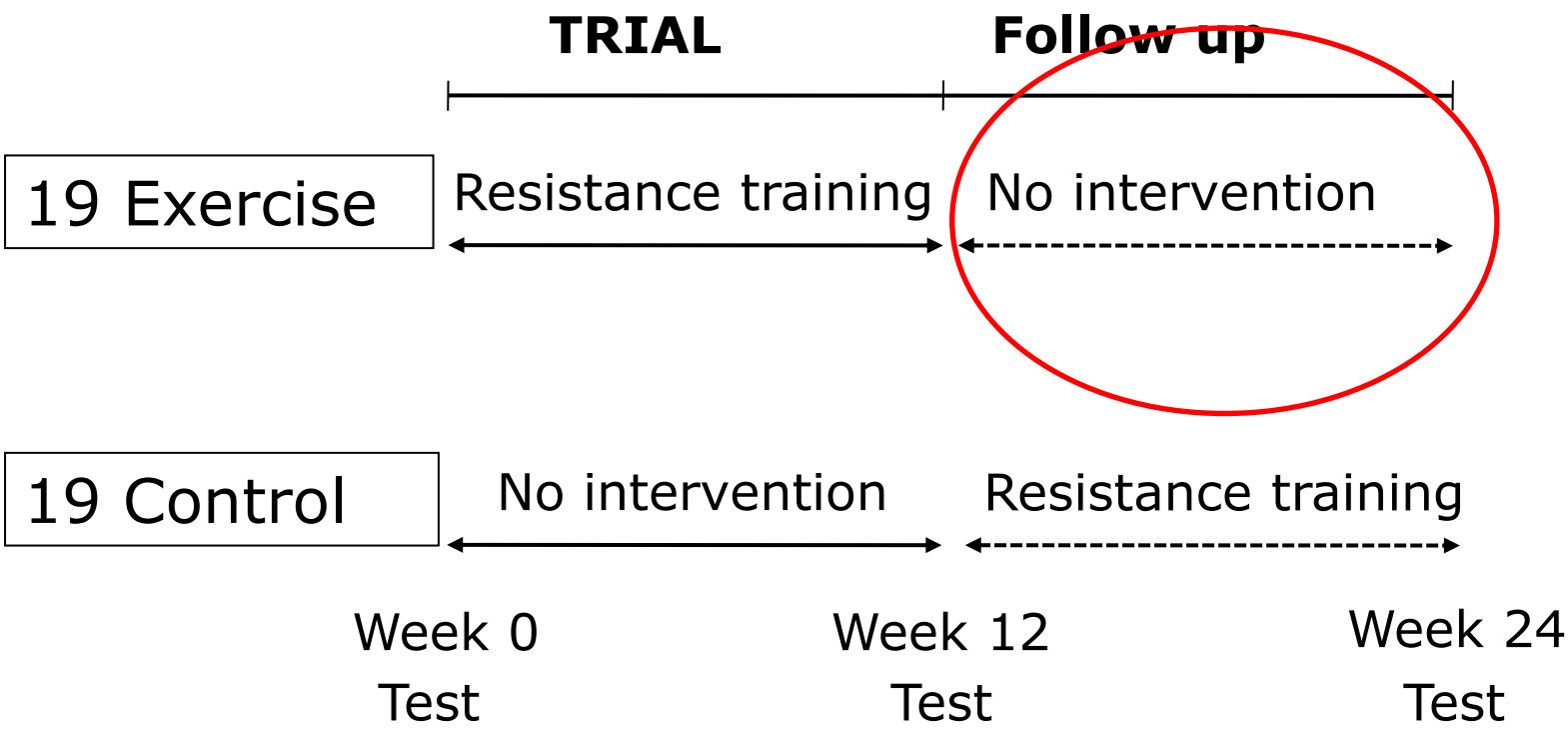
Results



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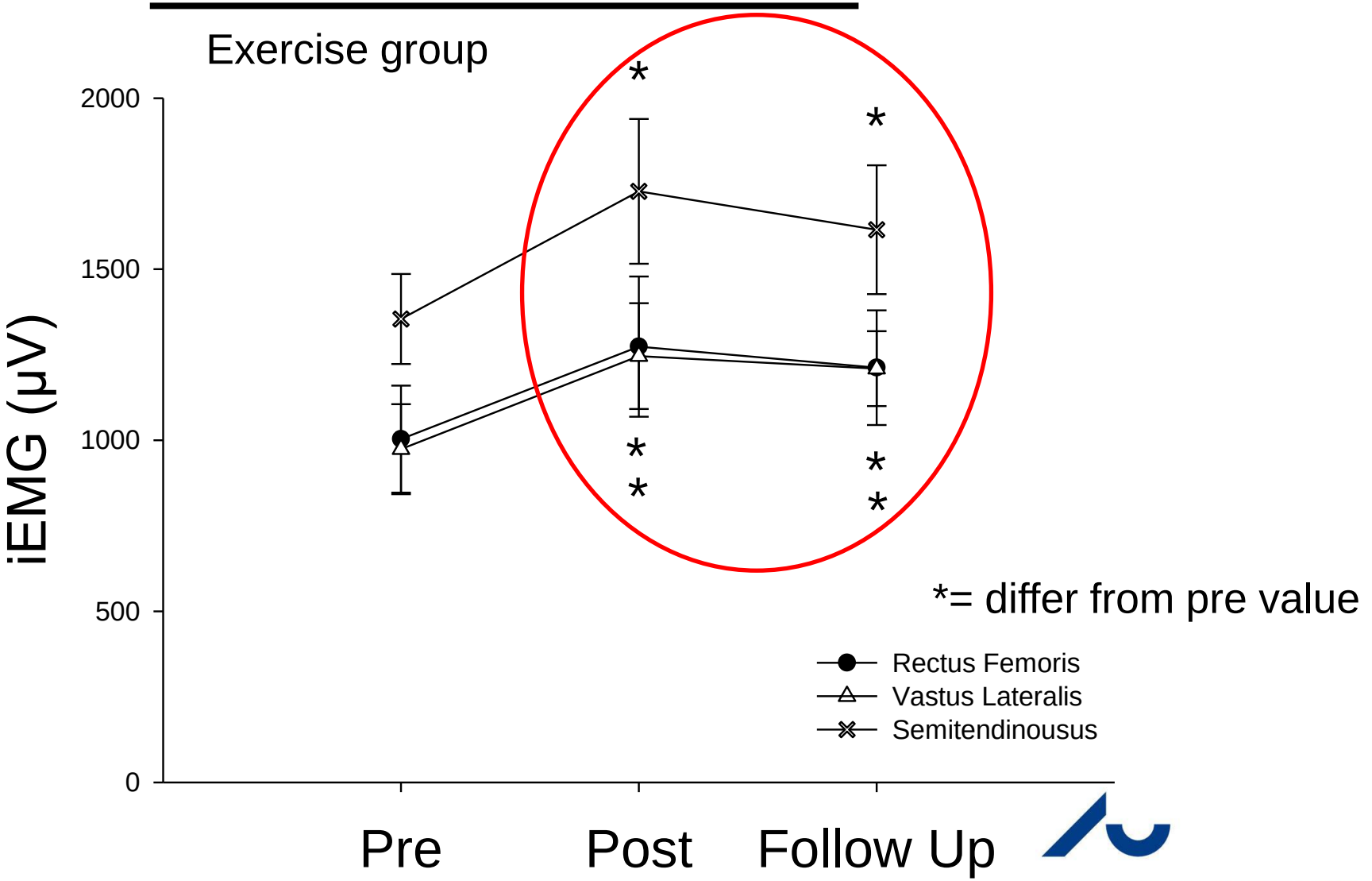
Results



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Results

	TRIAL	Follow up
19 Exercise	Resistance training	No intervention
19 Control	No intervention	Resistance training

Week 0 Test — Week 12 Test — Week 24 Test

Dalgas et al. Neurology:73:1478-84:2009

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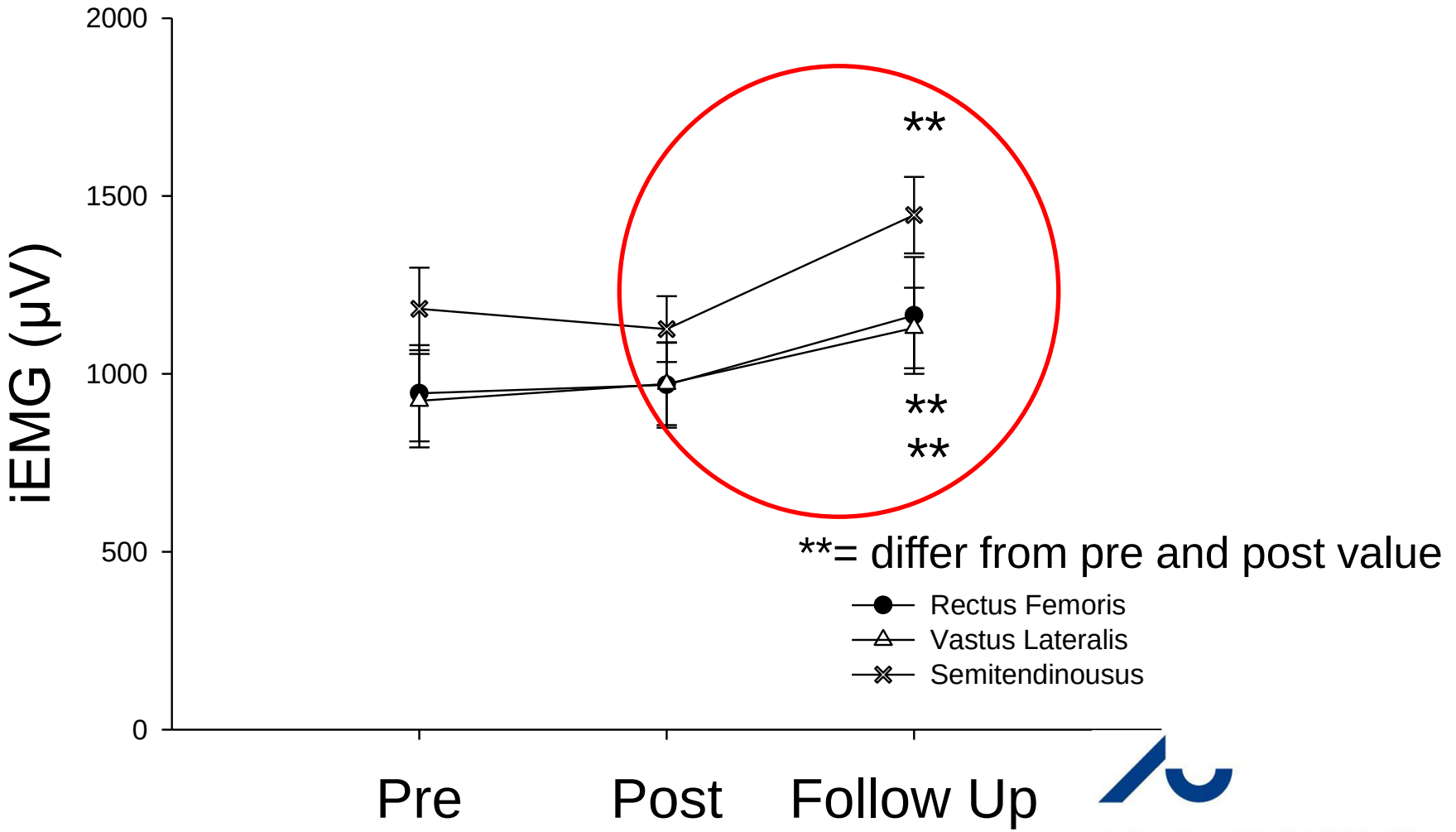
Results

Control group



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Conclusion

Twelve weeks of intense progressive resistance training 2d/w of the lower extremities improve the maximal surface EMG activity in patients with multiple sclerosis, with the effects persisting at 12 weeks follow-up.

Findings could be reproduced in the control group.

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Thank you for your attention!

Dep. Sports Science, University of Aarhus
T. Ingemann-Hansen,
K. Overgaard
C. Knudsen
T. Kjølhede
K. Vissing
MS Clinic of Southern Denmark, Sønderborg Hospital
E. Stenager

Dep. Neurology, Aarhus University Hospital
J. Jakobsen,
T. Petersen
HJ Hansen
V. Brandt

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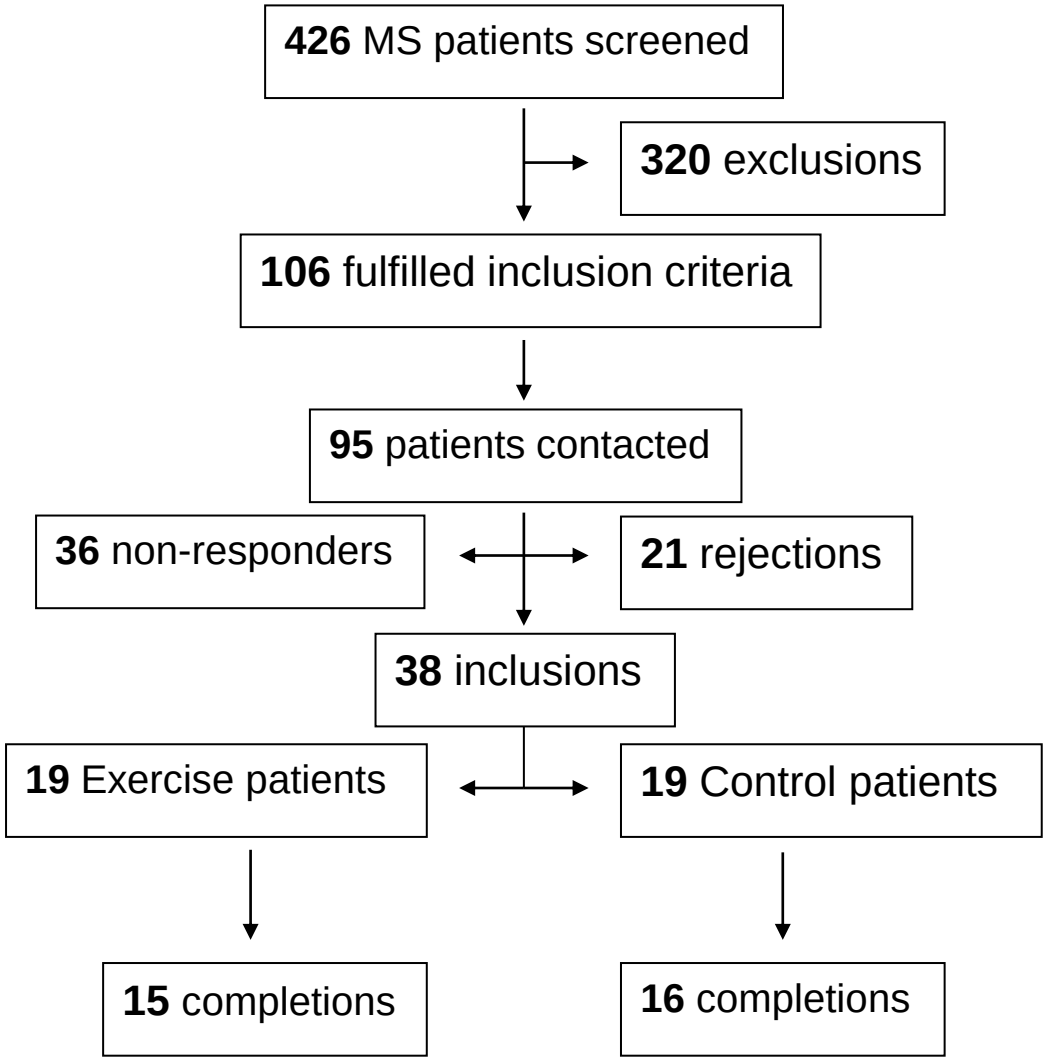
Participants



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