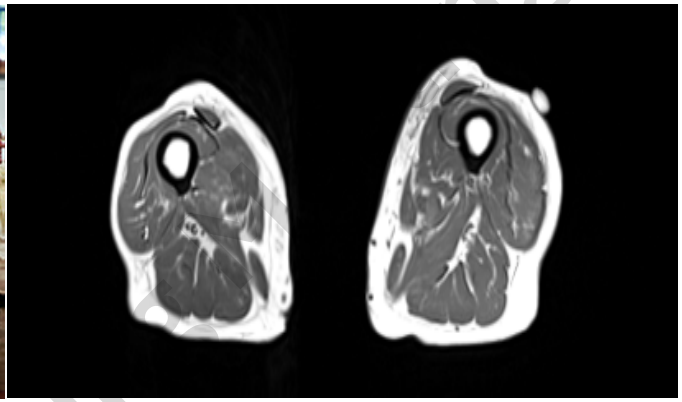
Exercise for sarcopenia: what's the evidence?



Dr Carolyn Greig PhD FPhysiol
University of Birmingham
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UNIVERSITY OF BIRMINGHAM

The University of Nottingham

MRC-ARUK Centre for Musculoskeletal Ageing Research

Ensuring Adults are Fit for Old Age

BGS_Cardiff_10 April 2019

Exercise for Sarcopenia: What's the Evidence?

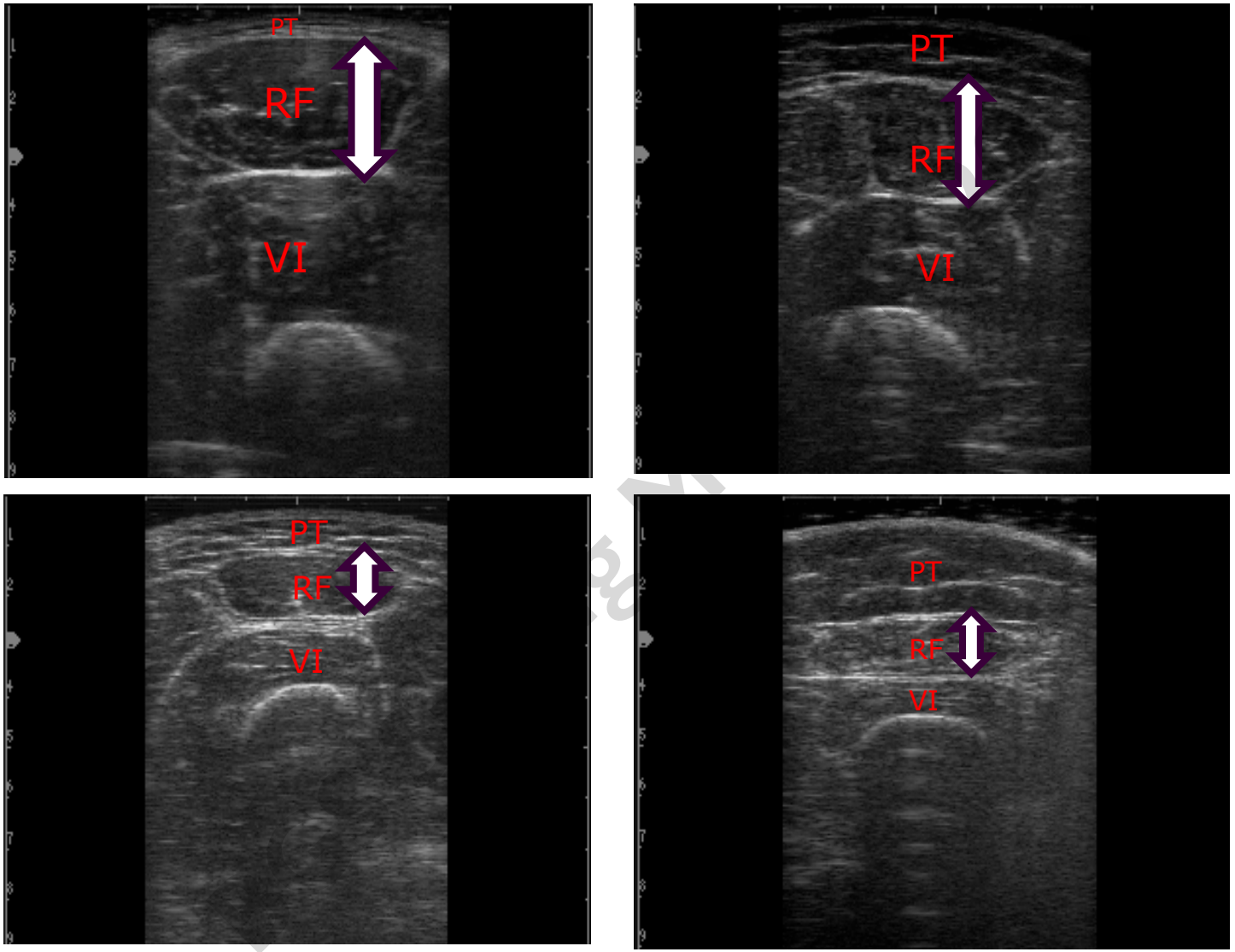
1. Does increasing physical activity via exercise combat sarcopenia?

2. Can we influence sarcopenia by reducing physical inactivity (through sitting less)?

3. What's the latest on evidence base for exercise (RET) plus nutritional supplementation (protein) to counteract sarcopenia?

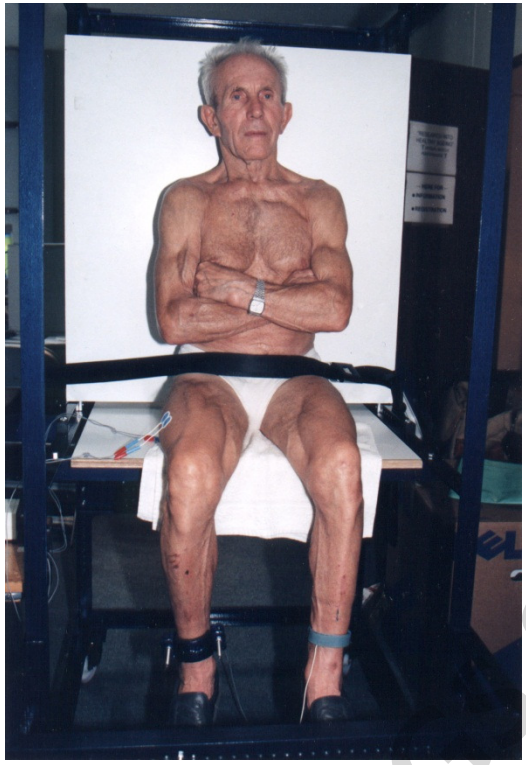
4. Summary

Reduced muscle size in older age

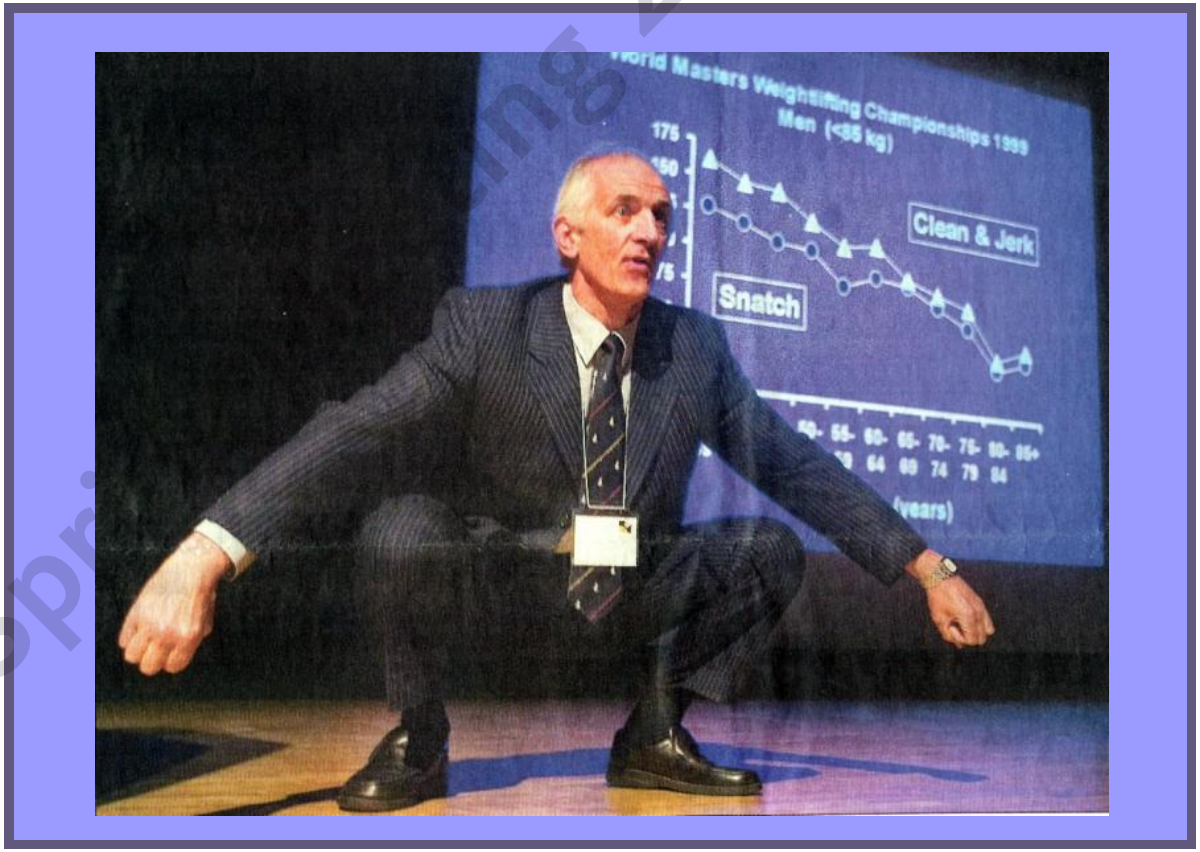


L-R; Young man, young woman (18-35 y), older man, older woman (>65 y)
PT; perimuscular tissue, RF; rectus femoris, VI; vastus intermedius

World Masters Weightlifting Championships (Glasgow 1999)

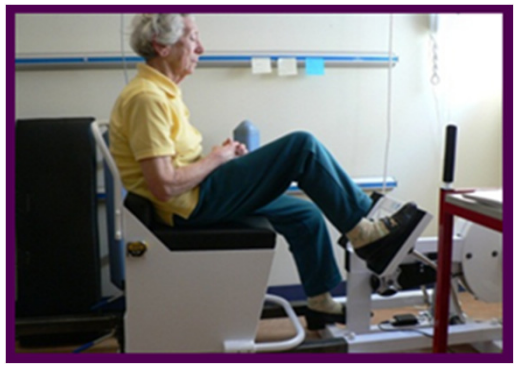


Winner 62kg (men 80+) aged 87y

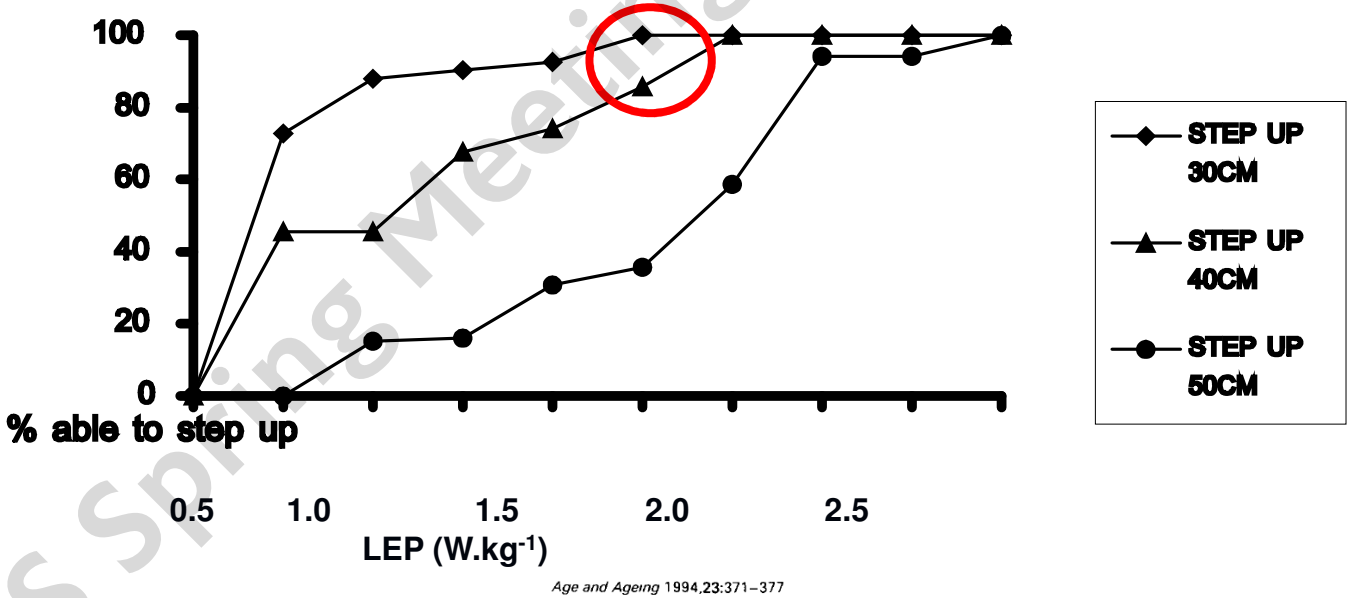


The importance of muscle power

Power/kg (LEP/kg) and percentage of healthy and medically stable men and women stepping up 30, 40 or 50 cm



LEP



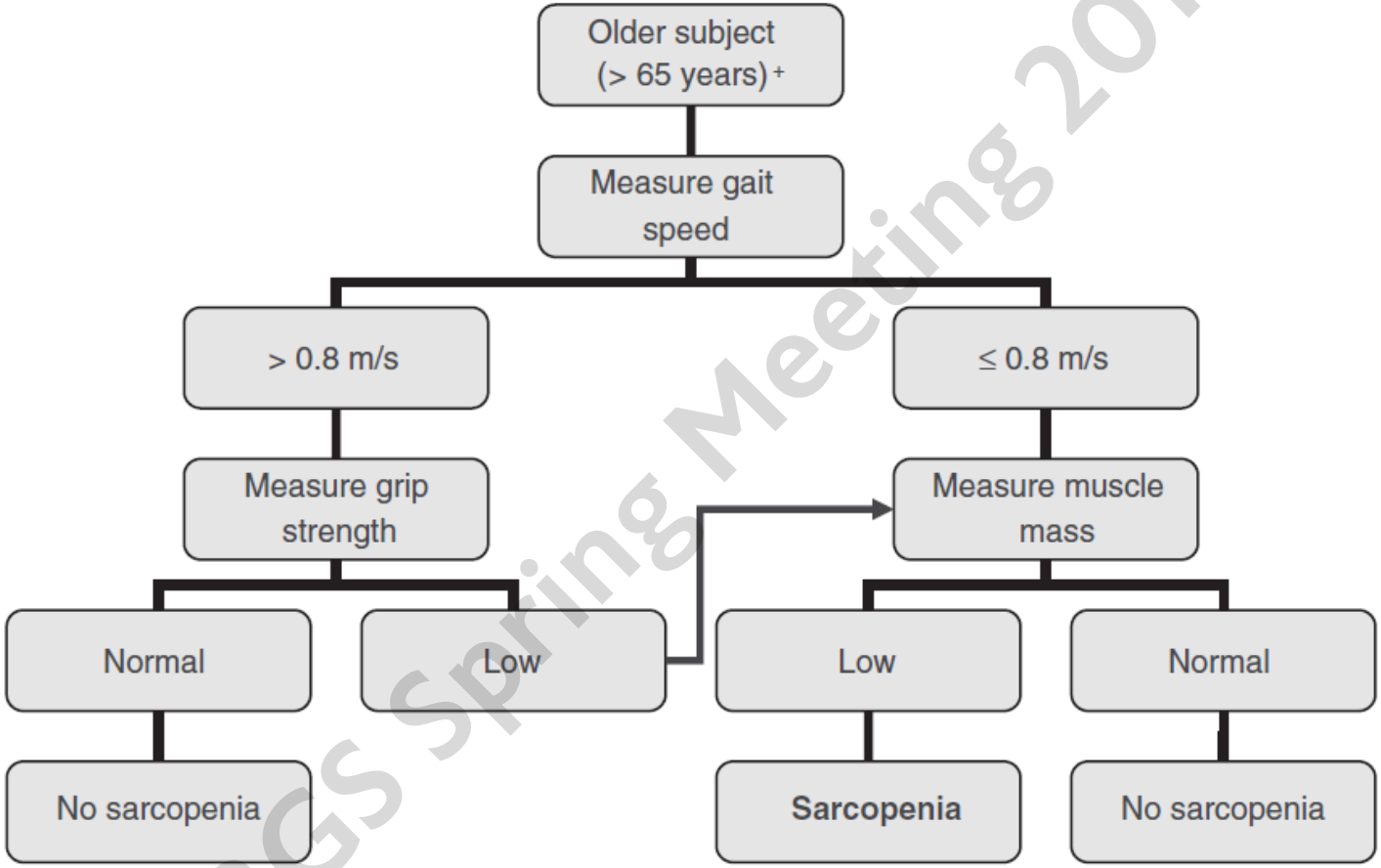
Age and Ageing 1994,23:371–377

LEP significantly correlated with selected measures of functional ability (chair rise time and step height) in men and women

Strength, Power and Related Functional Ability of Healthy People Aged 65–89 Years

DAWN A. SKELTON, CAROLYN A. GREIG, JANET M. DAVIES, ARCHIE YOUNG

Sarcopenia algorithm 2010



(Cruz-Jentoft AJ et al. 2010)

Sarcopenia: algorithm 2019

(Cruz-Jentoft AJ et al. 2019)

Plan

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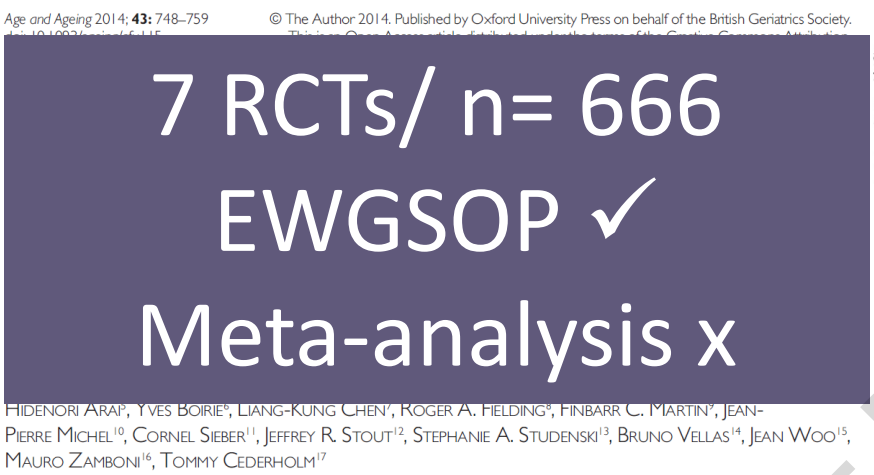
3. What's the latest on evidence base for exercise plus nutritional supplementation to counteract sarcopenia?

4. Summary

Does exercise combat sarcopenia?

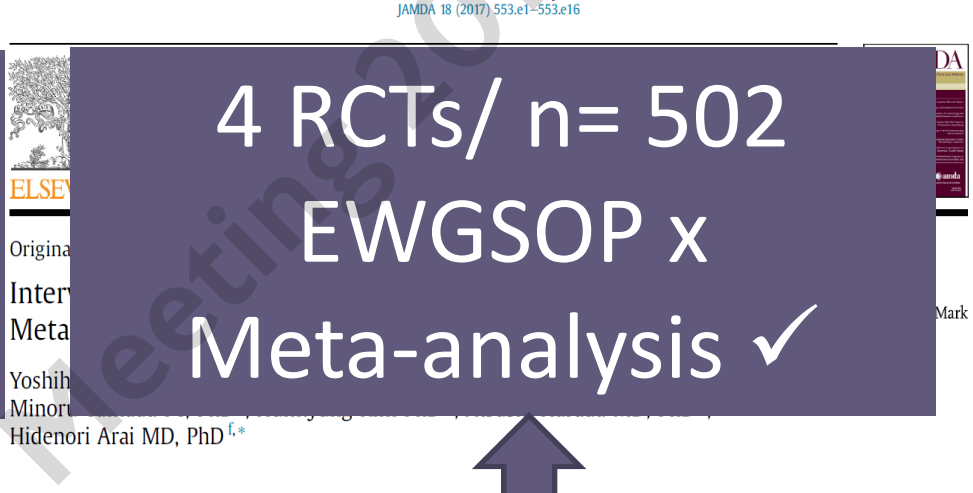
Cruz-Jentoft et al., 2014


Age and Ageing 2014; 43: 748–759 © The Author 2014. Published by Oxford University Press on behalf of the British Geriatrics Society.

HIDENORI ARAI[5], YVES BOIRIE[6], LIANG-KUNG CHEN[7], ROGER A. FIELDING[8], FINBARR C. MARTIN[9], JEAN-PIERRE MICHEL[10], CORNEL SIEBER[11], JEFFREY R. STOUT[12], STEPHANIE A. STUDENSKI[13], BRUNO VELLAS[14], JEAN WOO[15], MAURO ZAMBONI[16], TOMMY CEDERHOLM[17]

7 RCTs/ n= 666
EWGSOP ✓
Meta-analysis x

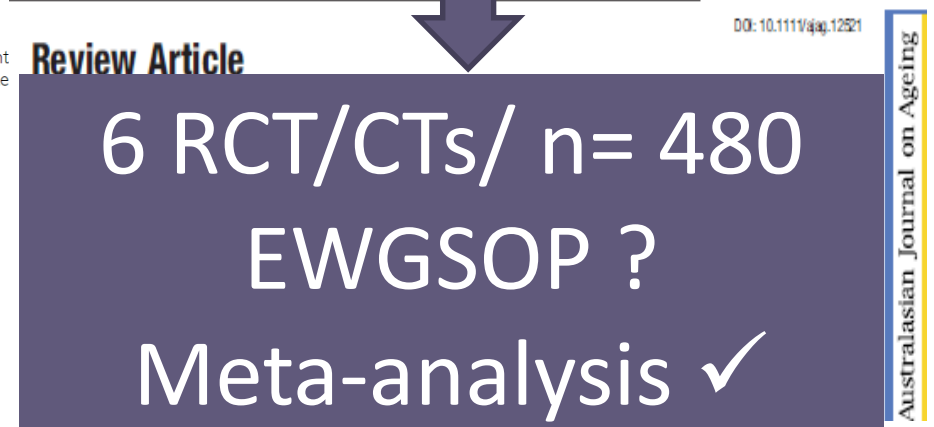
Yoshimura et al., 2017


JAMDA 18 (2017) 553.e1–553.e16

Hidenori Arai MD, PhD [f,*]

4 RCTs/ n= 502
EWGSOP x
Meta-analysis ✓

Vlietstra et al., 2018

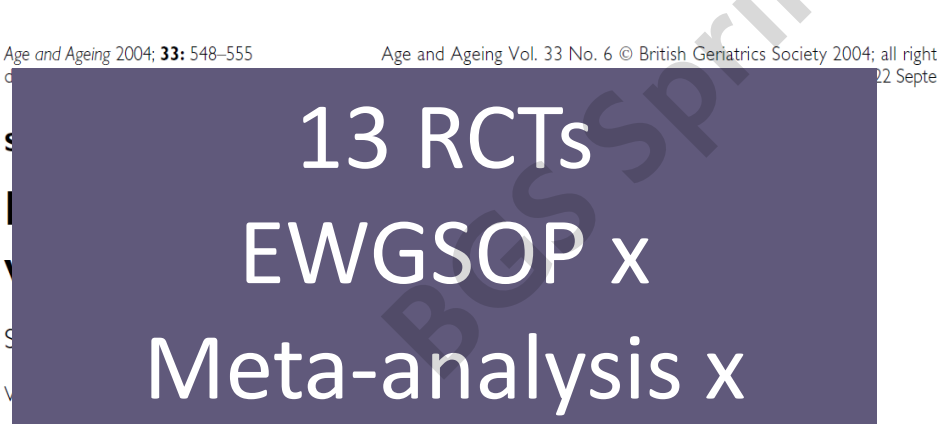

DOI: 10.1111/ajag.12521

Review Article

Australasian Journal on Ageing

6 RCT/CTs/ n= 480
EWGSOP ?
Meta-analysis ✓

Borst 2004


Age and Ageing 2004; 33: 548–555 Age and Ageing Vol. 33 No. 6 © British Geriatrics Society 2004; all right

13 RCTs
EWGSOP x
Meta-analysis x

Effect of PA/ RET interventions on muscle mass unclear although possible effects on strength and performance?

Study	Population	Intervention	Age	MM FFM	MS MP	PP
Binder et al. 2005	Community frail	RET	83 (4)	✓	✓	-
Rydwik et al. 2008	Community frail	PA	>75	X	✓	-
Bonnefoy et al. 2003	Institution frail	RET	83	X	-	✓
Suetta et al. 2008	Post-op (elective) frail	RET	60-86	✓	✓	✓
Goodpaster et al. 2008	Community sedentary	PA	70-89	X	M	-
Kemmler et al. 2010	Community	HI mixed	65-80	✓	✓	✓
Bunout et al. 2001	Community	RET	≥70	X	✓	M

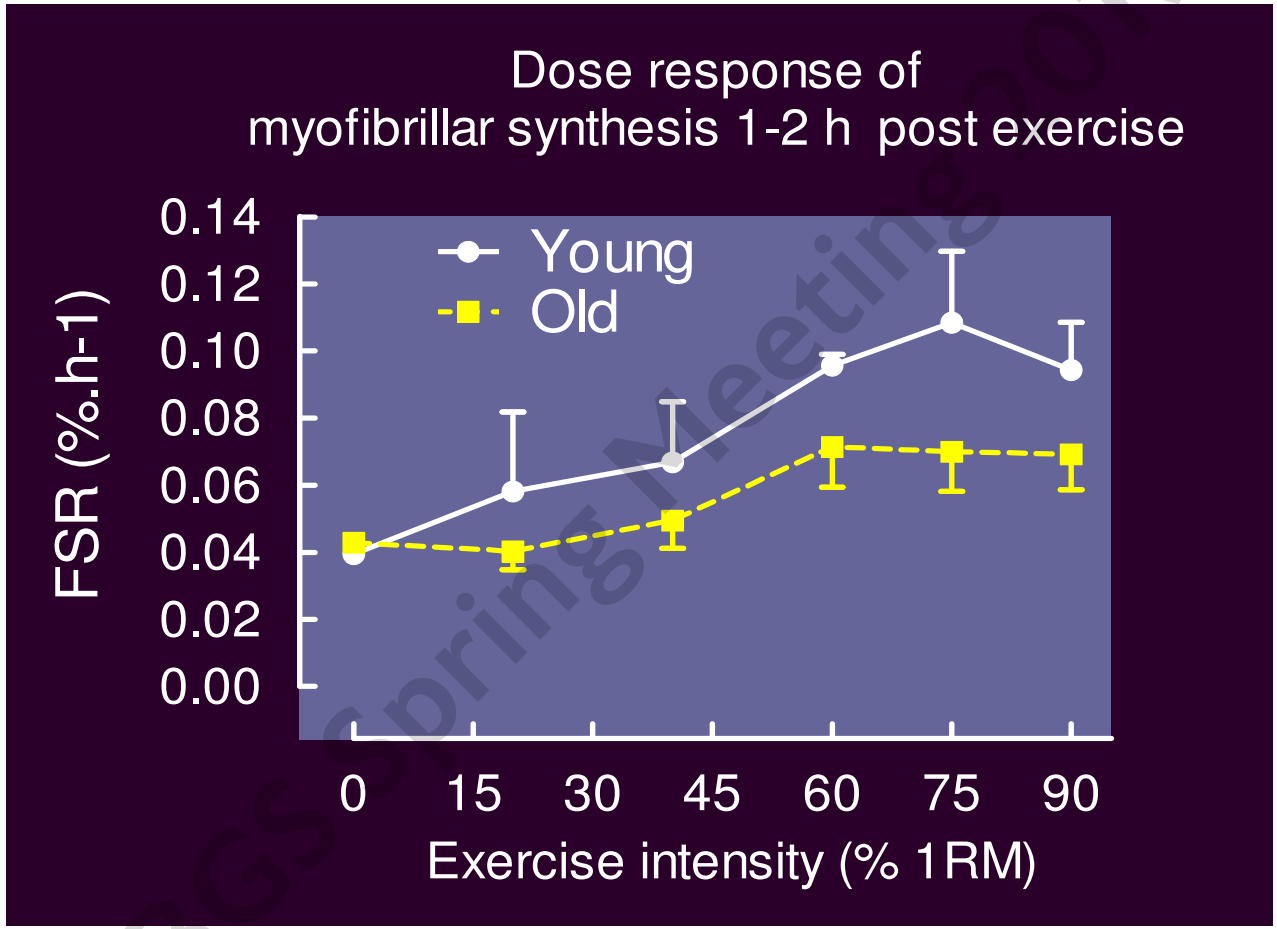
M = maintained
HI = high intensity

From Cruz-Jentoft et al 2014

Summary (part 1)

Evidence suggests that exercise interventions may play a role in improving muscle mass, muscle strength, and physical performance in sarcopenic individuals: Quality of evidence varies from very low-quality (Yoshimura/ Vlietstra) to moderate (Cruz-Jentoft)

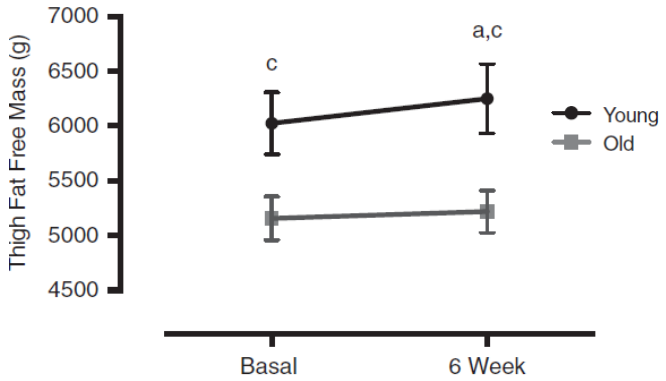
Older adults show acute anabolic resistance to MPS

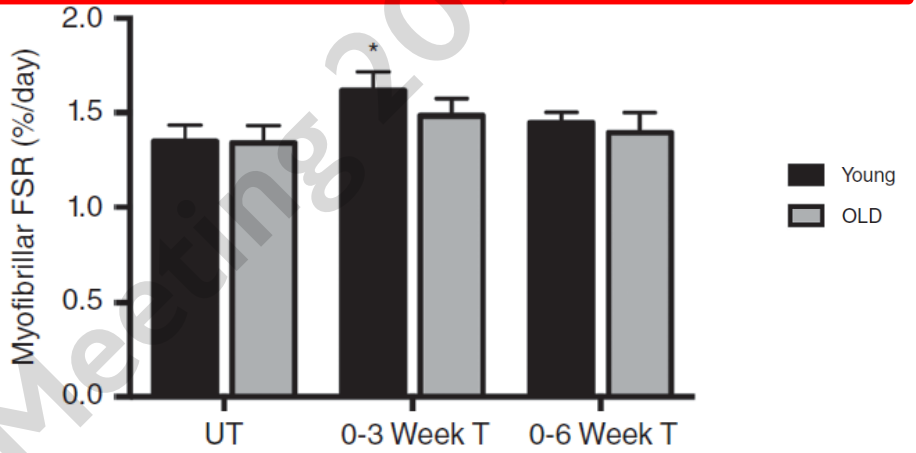


Kumar et al., J Physiol 2009

Older adults show blunted responsiveness to RET

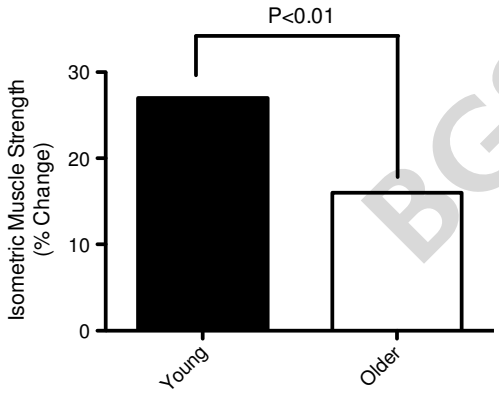
In response to 6weeks RET, in men (67-71 y) blunted hypertrophic responses underpinned by deficits in long-term muscle protein synthesis

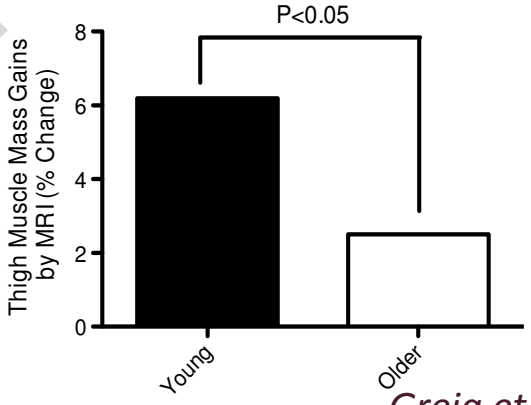




Brook et al J Physiol 2016; 594 (24) 7399-7417

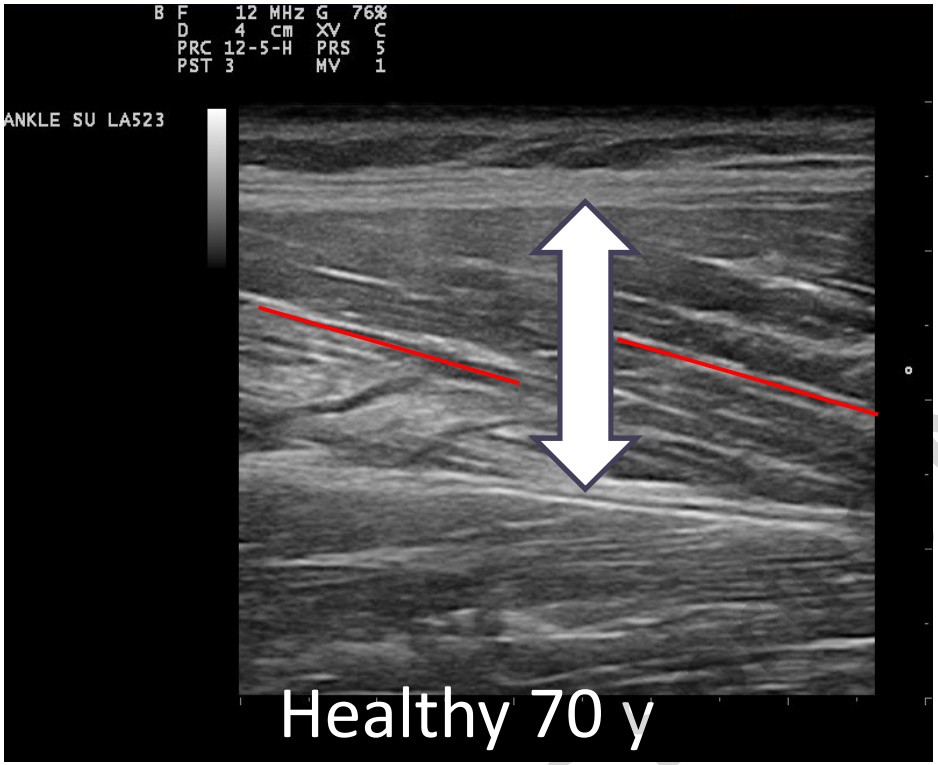
Older, sarcopenic women (76-82 y) exposed to same relative training intensity have a 'blunted' capacity to adapt in terms of both function and mass

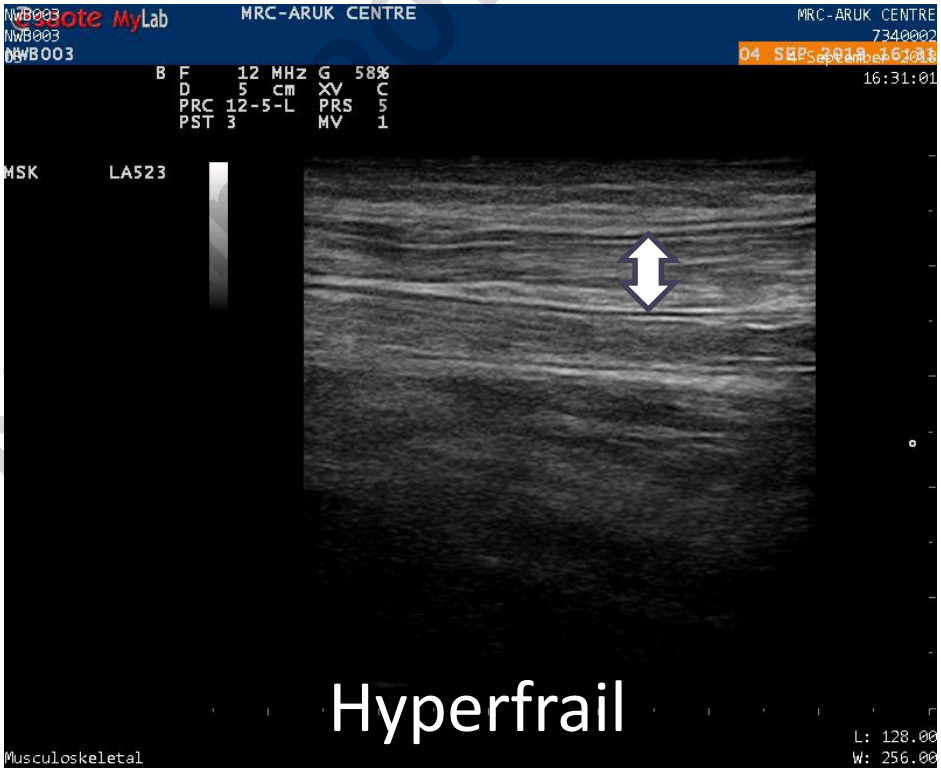




Greig et al., Exp Gerontol 2012; 46: 884-90

Is there a point at which exercise interventions for sarcopenia (and frailty) may be ineffective?





Arthritis Research UK | University of Birmingham | The University of Nottingham | MRC Medical Research Council

MRC- Arthritis Research UK Centre for Musculoskeletal Ageing Research

Courtesy of E Lunt, A Gordon, J Gladman, PL Greenhaff

Plan

1. Does increasing physical activity via exercise combat sarcopenia?

2. Can we influence sarcopenia by reducing physical inactivity (through sitting less)?

3. What's the latest on evidence base for exercise plus nutritional supplementation to counteract sarcopenia?

4. Summary

Evidence of association of sedentariness and sarcopenia in older age:

Preventive Medicine 91 (2016) 264–272

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Cross-sectional associations of objectively measured physical activity and sedentary time with sarcopenia and sarcopenic obesity in older men

Daniel A. Aggio MSc [a,b,*], Claudio Sartini MSc [a,b], Olia Papacosta MSc [a], Lucy T. Lennon MSc [a], Sarah Ash [a], Peter H. Whincup PhD, FRCP, FFPH [c], S. Goya Wannamethee PhD, FFPH [a,b], Barbara J. Jefferis MSc, PhD [a,b]

[a] UCL Department of Primary Care & Population Health, UCL Medical School, Rowland Hill Street, London NW3 2PF, UK
[b] UCL Physical Activity Research Group, UK
[c] Population Health Research Institute, St George's University of London, Cranmer Terrace, London. SW17 0RE, UK

Aggio et al., 2016

Sedentary time marginally associated with increased risk of sarcopenic obesity independent of MVPA (RR 1.18 [95% CI 0.99, 1.40])

Breaks in sedentary time independently associated with a reduced risk of sarcopenic obesity….

Osteoporosis International (2018) 29:1341–1350
https://doi.org/10.1007/s00198-018-4428-6

ORIGINAL ARTICLE

Association of sitting time and breaks in sitting with muscle mass, strength, function, and inflammation in community-dwelling older adults

N. Reid [1] · G. N. Healy [1,2,3] · J. Gianoudis [4] · M. Formica [4] · P. A. Gardiner [5,6] · E. E. Eakin [1] · C. A. Nowson [4] · R. M. Daly [4,7]

Reid et al., 2018

Total sitting time associated with lower % lean mass;

Significant –ve association of sitting time with FSST (β = 0.13, 95% CI 0.00, 0.25) and 30STS performance (β = – 0.28, 95% CI – 0.51, – 0.04)

UK PA guidelines 2011

Where's the evidence from interventions to reduce sitting time in older adults?


Maturitas 116 (2018) 89–99

Contents lists available at ScienceDirect

Maturitas

journal homepage: www.elsevier.com/locate/maturitas

Interventions targeting sedentary behavior in non-working older adults: a systematic review

Justin Avery Aunger*, Paul Doody, Carolyn Anne Greig

School of Sport, Exercise, and Rehabilitation Sciences, University of Birmingham, B15 2TT, United Kingdom

Summary (part 2)

Cross-sectional data show associations between sitting time and breaks in sitting time on muscle mass and function in sarcopenic older adults and risk of sarcopenic obesity but lack of acute and chronic interventional data

Plan

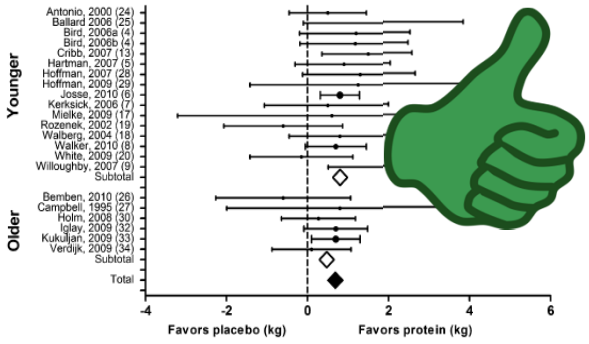
1. Does increasing physical activity via exercise combat sarcopenia?

2. Can we influence sarcopenia by reducing physical inactivity (through sitting less)?

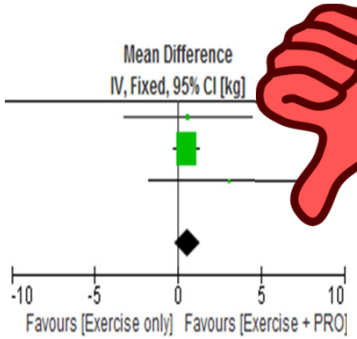
3. What's the latest on evidence base for exercise plus nutritional supplementation to counteract sarcopenia?

4. Summary

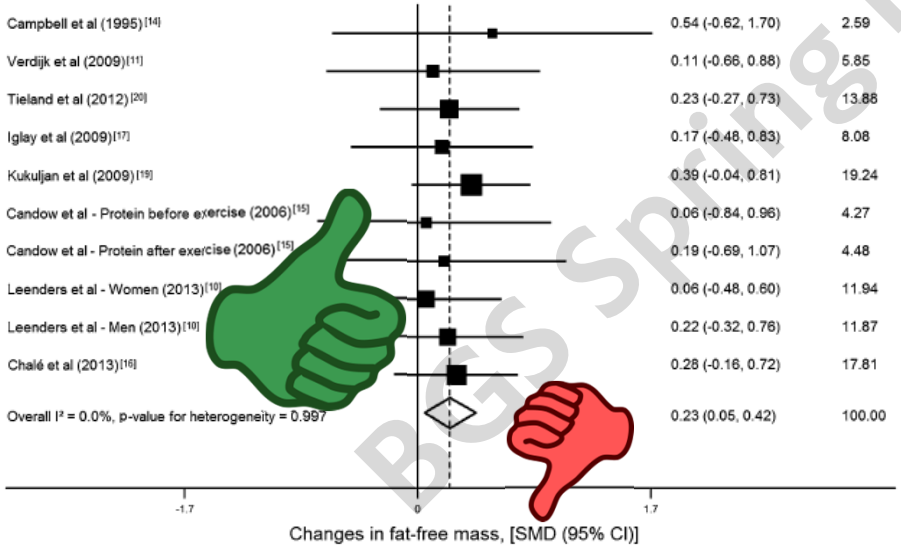
There is an additive albeit blunted effect of RET plus protein compared with RET alone on FFM in older age



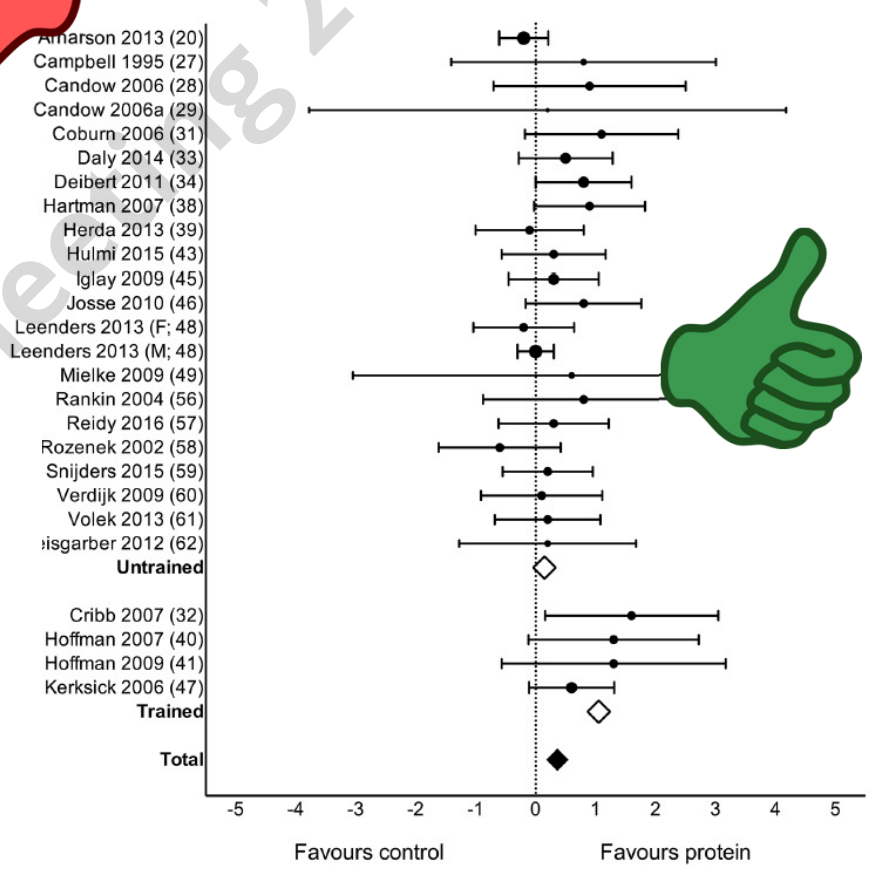
Cermak et al., 2012



Thomas et al., 2016



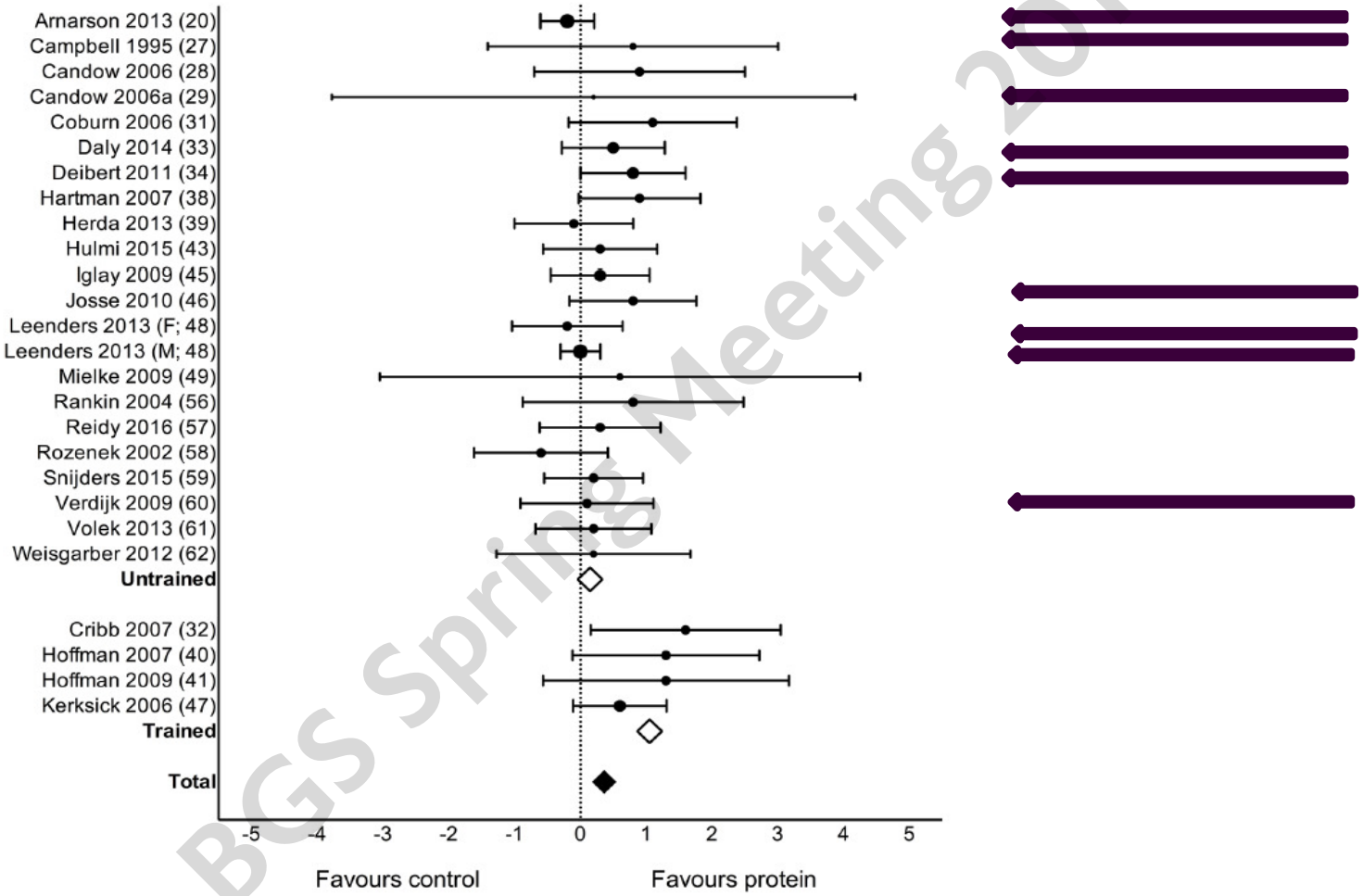
Finger et al., 2015



Morton et al., 2017

Also Shad et al., 2016 for MPS

Additive albeit blunted effect on FFM of RET plus protein compared with RET alone in older age



Morton et al., Br J Sports Med 2017

CALM

CALM is an interdisciplinary research collaboration focusing on age-related loss of skeletal muscle mass and the effect of dietary protein and physical activity in achieving a healthier and more active lifestyle among older people

Bechshøft et al. Trials (2016) 17:397
DOI 10.1186/s13063-016-1512-0

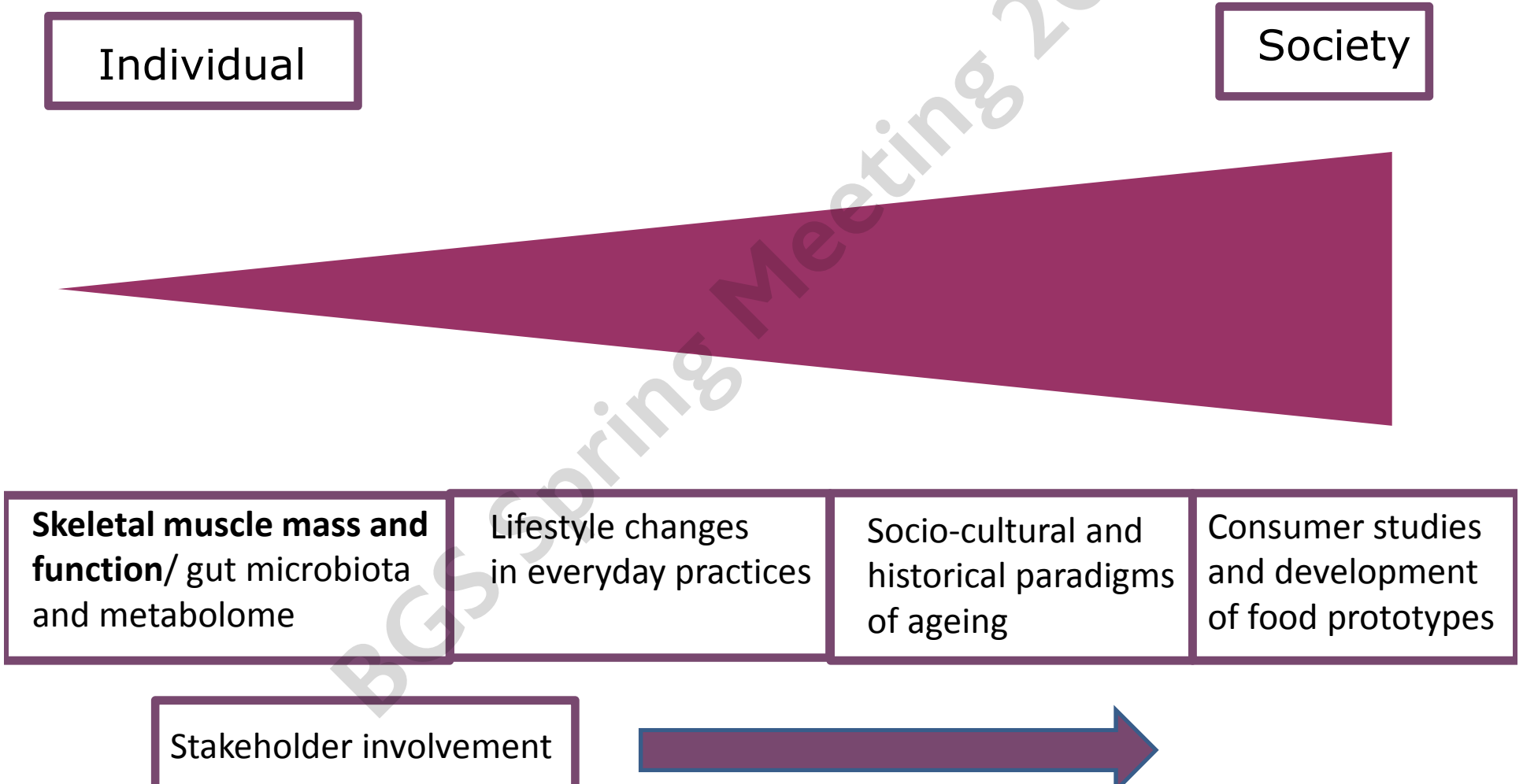
Trials

STUDY PROTOCOL Open Access

Counteracting Age-related Loss of Skeletal Muscle Mass: a clinical and ethnological trial on the role of protein supplementation and training load (CALM Intervention Study): study protocol for a randomized controlled trial

Rasmus Leidesdorff Bechshøft[1,2], Søren Reitelseder[1,2], Grith Højfeldt[1], Josué Leonardo Castro-Mejía[3], Bekzod Khakimov[3], Hajar Fauzan Bin Ahmad[3], Michael Kjær[1], Søren Balling Engelsen[3], Susanne Margrete Bølling Johansen[3], Morten Arendt Rasmussen[3,4,5], Aske Juul Lassen[6], Tenna Jensen[6], Nina Beyer[7], Anja Serena[8], Frederico Jose Armando Perez-Cueto[3], Dennis Sandris Nielsen[3], Astrid Pernille Jespersen[5] and Lars Holm[1,2*]

CALM



Exercise for sarcopenia: what's the evidence?

1. Exercise improves quality, quantity and physical performance and thus combats sarcopenia but direct evidence of benefit in (i) groups of individuals defined as sarcopenic according to EWGSOP and (ii) to sarcopenia status is lacking and quality of evidence is mainly low
2. Unclear whether interventions to reducing sitting time can influence sarcopenia
3. Evidence base for efficacy of combined RET/ nutritional supplementation trials for sarcopenia is thin (but growing)
4. **"Well designed and adequately powered, multicentre trials at scale and internationally unified diagnostic criteria promoting high-quality interventional trials"**

Acknowledgements

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Dr Thomas Jackson
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Prof Philip Atherton
Prof Kenneth Smith
Dr Matt Brook
Prof Paul Greenhaff
Prof John Gladman

Glasgow Caledonian University

Prof Dawn Skelton
Dr Sebastien Chastin
Prof Jo Booth

University of Copenhagen

Prof Astrid Jespersen

BGS
British Geriatrics Society
Improving healthcare for older people

The Dunhill Medical Trust

MRC Medical Research Council

VERSUS ARTHRITIS

Funded by NHS
National Institute for Health Research

National Osteoporosis Society