BRAIN AND MALNUTRITION
Chronic Diseases Association ONLUS

VI Congresso Nazionale B&M
Nutrizione e Neurodegenerazione

SESSIONE II: RELATORI

- ***Sarcopenia nell'anziano dalla diagnosi al trattamento***

Prof. Francesco Landi
Direttore Unità di riabilitazione geriatrica presso l'Università Cattolica del sacro Cuore, Roma

MILANO | 11-12 MAGGIO | 2017

Sarcopenia nell'anziano dalla diagnosi al trattamento

Francesco Landi, MD, PhD
Catholic University, Geriatric Center, Gemelli Hospital - Rome, Italy

Aging and muscle

Loss of muscle mass, strength and function

Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

JAMDA 18 (2017) 88.e17–88.e24

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JAMDA

journal homepage: www.jamda.com

Original Study

Age-Related Variations of Muscle Mass, Strength, and Physical Performance in Community-Dwellers: Results From the Milan EXPO Survey

Francesco Landi MD, PhD *, Riccardo Calvani PhD, Matteo Tosato MD, PhD, Anna Maria Martone MD, Domenico Fusco MD, PhD, MD, Alex Sisto BA, Elena Ortolani MD, Giulia Savera BS, Sara Salini MD, Emanuele Marzetti MD, PhD

Department of Geriatrics, Neurosciences, and Orthopedics, Catholic University of the Sacred Heart, Rome, Italy

Aging and muscle

Loss of muscle mass, strength and function

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Università Cattolica del Sacro Cuore
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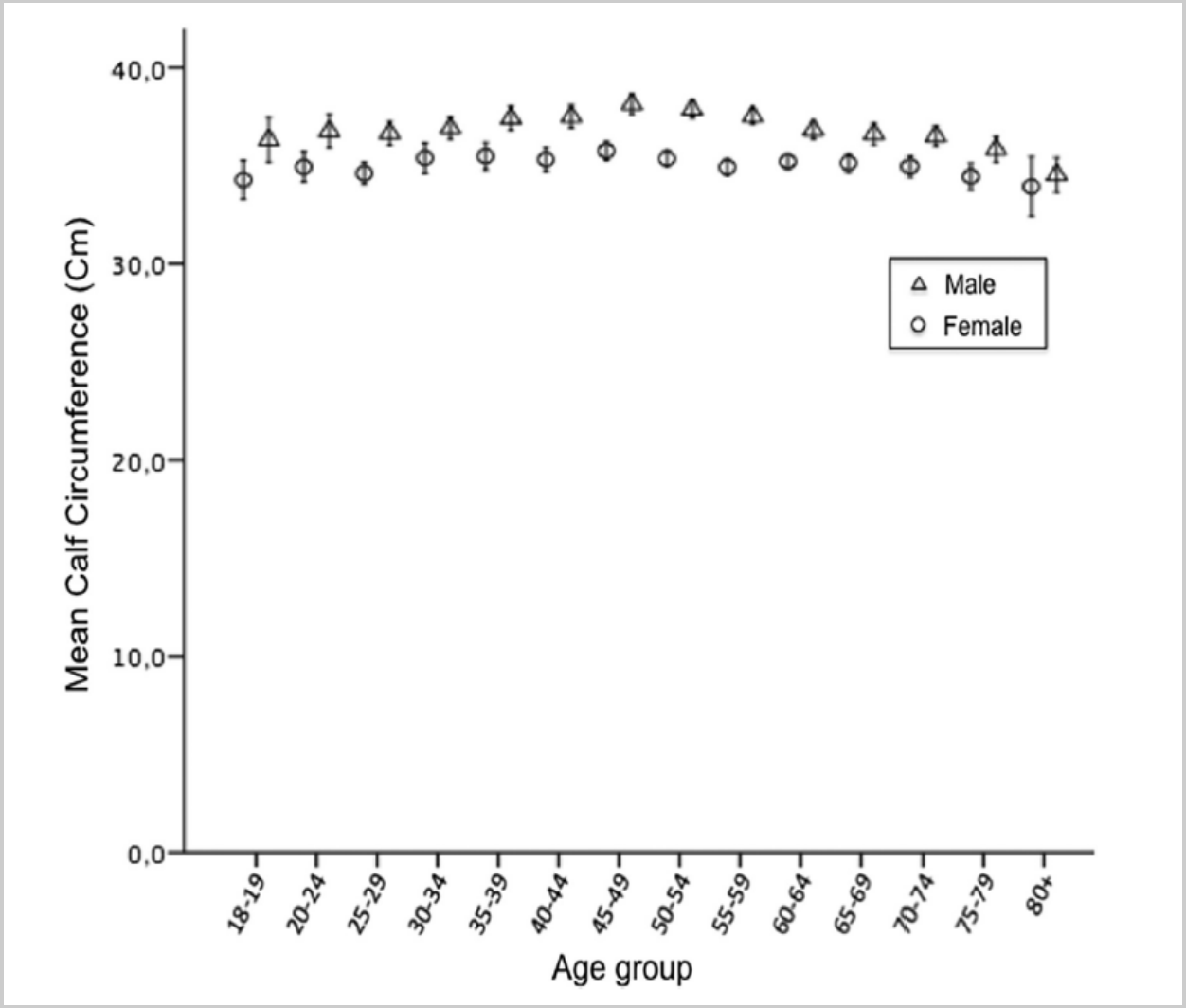

Aging and muscle

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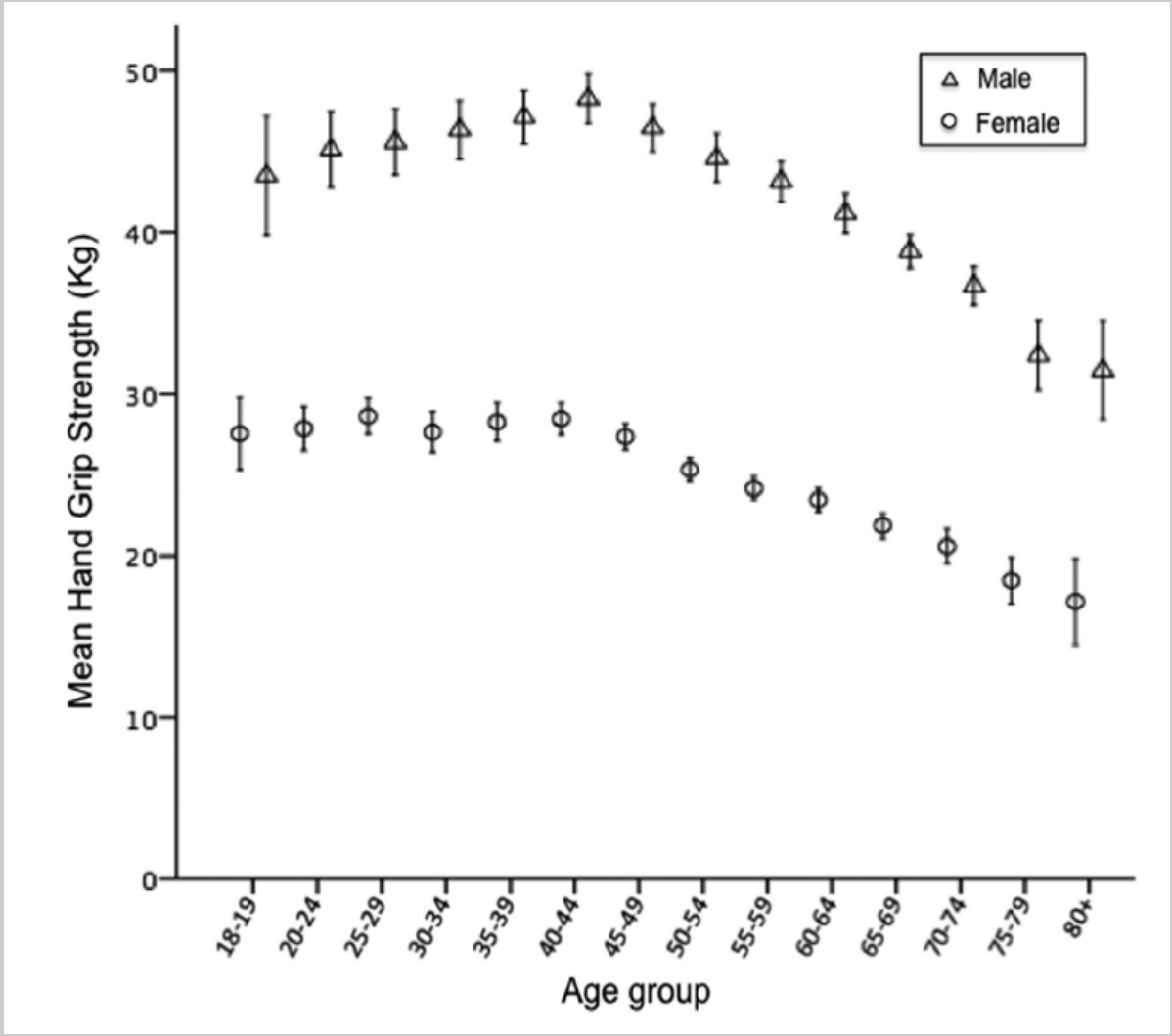

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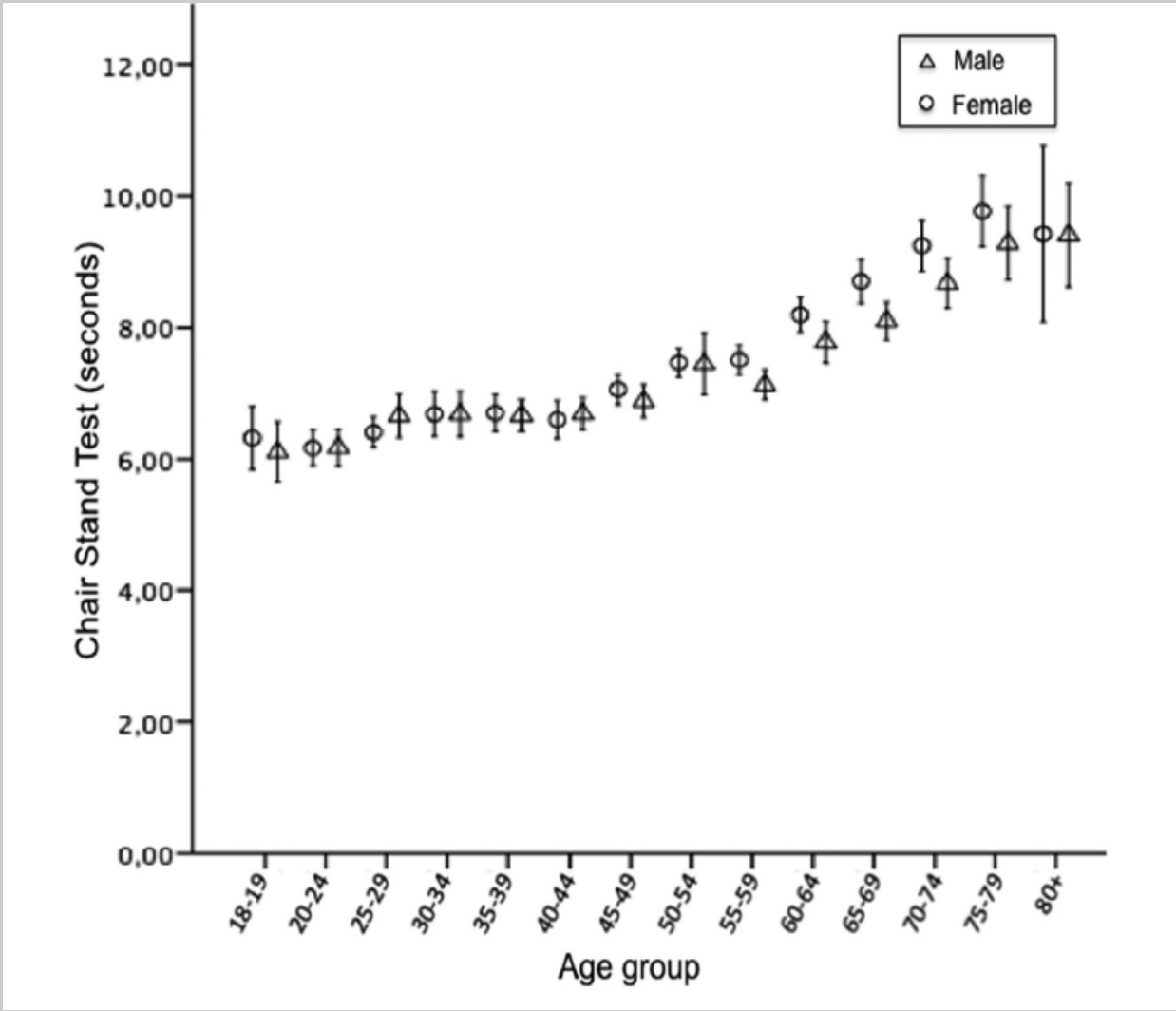

Aging and muscle

Loss of muscle mass, strength and function

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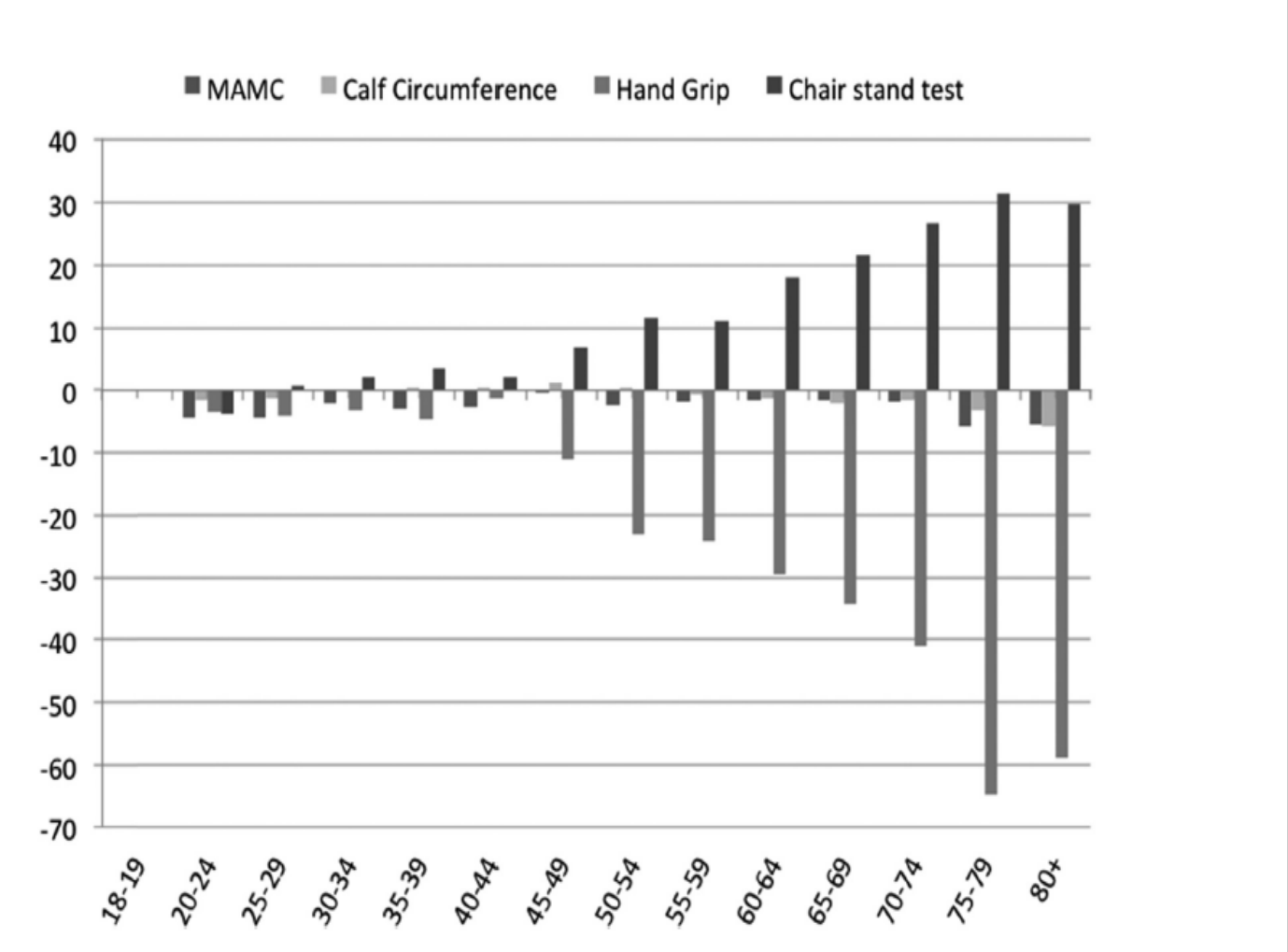

EWGSOP suggested algorithm for sarcopenia case finding in older individuals

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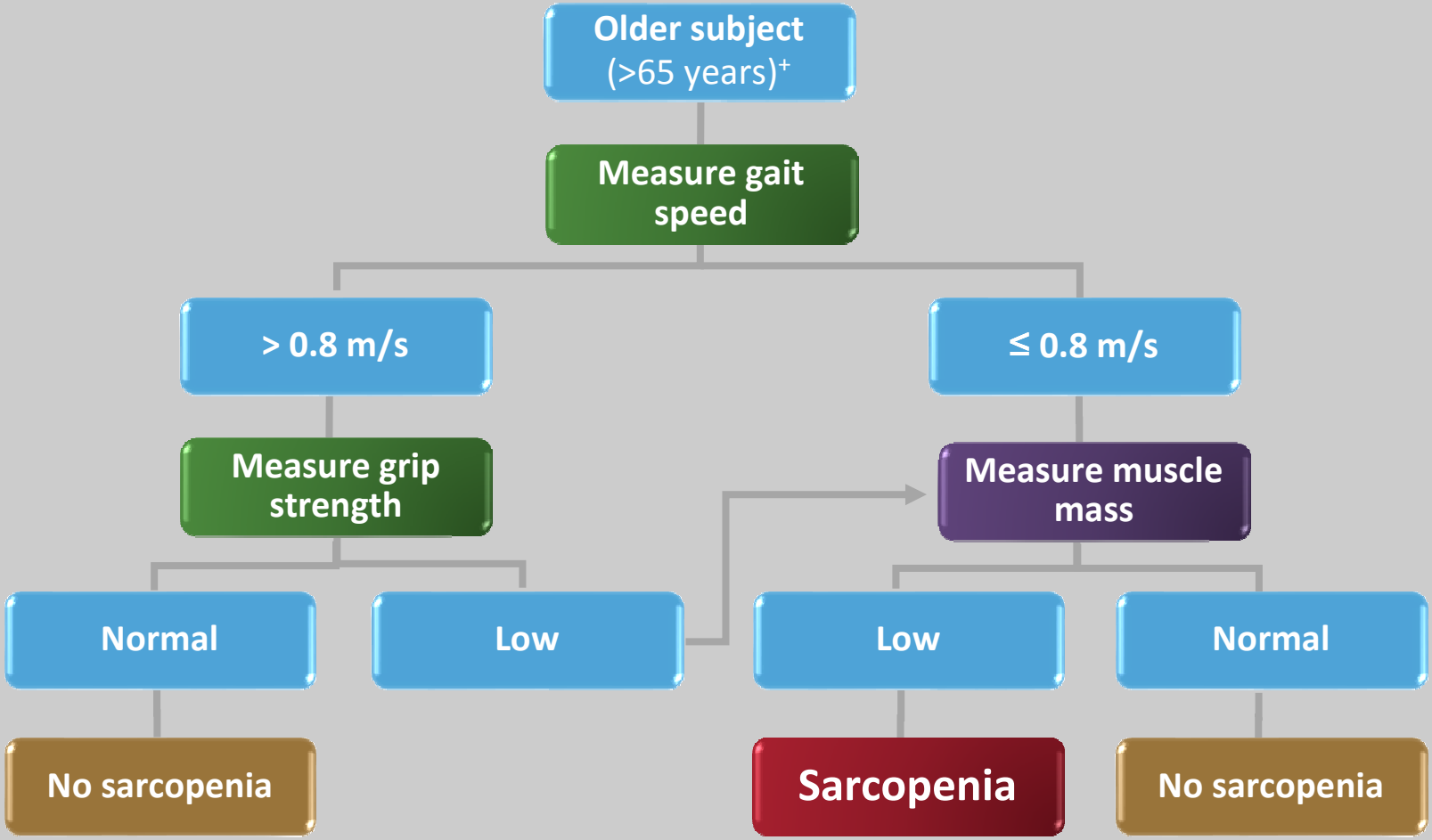

Under-nutrition, Sarcopenia and Frailty

Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

European Geriatric Medicine xxx (2016) xxx–xxx

ELSEVIER

Available online at
ScienceDirect
www.sciencedirect.com

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EM|consulte
www.em-consulte.com/en

Research paper

Sarcopenia and frailty: From theoretical approach into clinical practice

F. Landi [a,*], A. Cherubini [b], M. Cesari [c], R. Calvani [a], M. Tosato [a], A. Sisto [a], A.M. Martone [a], R. Bernabei [a], E. Marzetti [a]

[a] *Department of Geriatrics, Neurosciences and Orthopaedics, Catholic University of the Sacred Heart, Rome, Italy*
[b] *Geriatric Hospital, Italian National Research Center on Aging (INRCA), Ancona, Italy*
[c] *Gérontopôle, centre hospitalier universitaire de Toulouse, Toulouse, France*

Under-nutrition, Sarcopenia and Frailty

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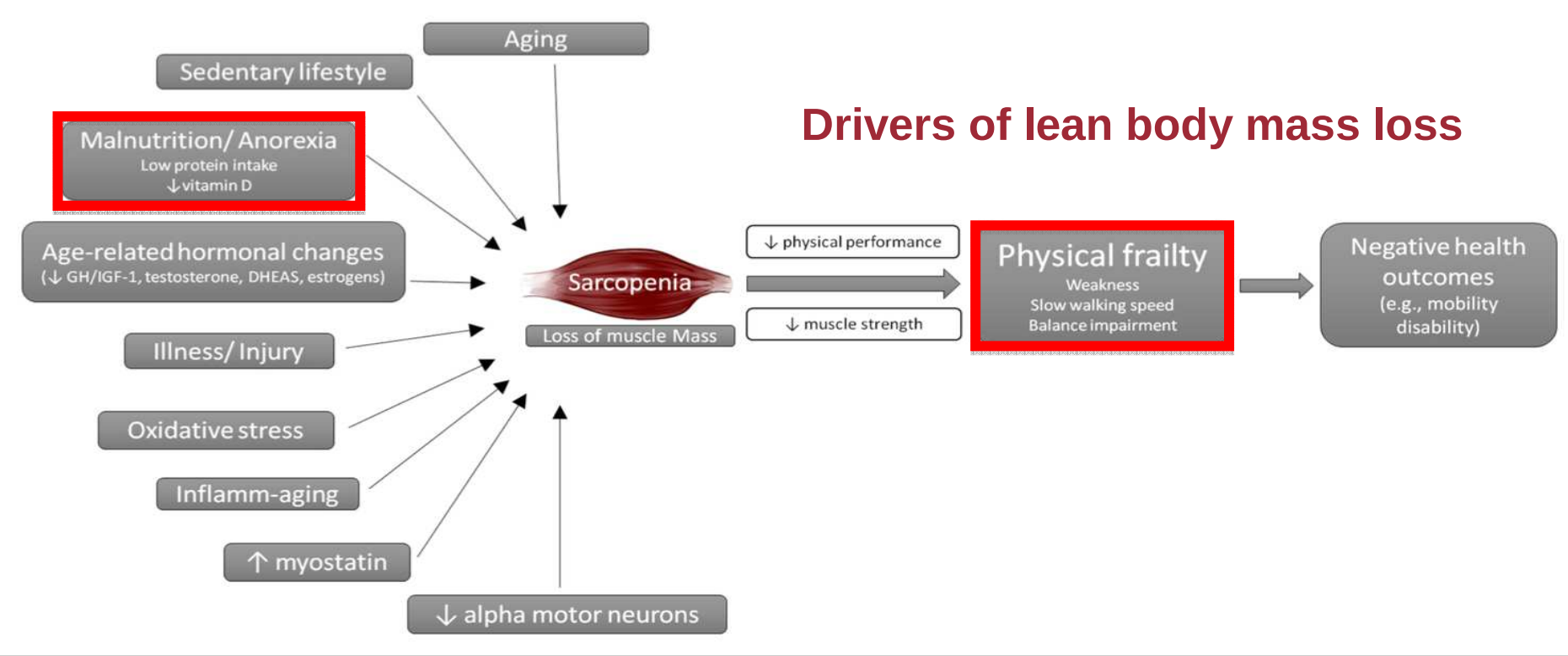
- Physical inactivity and decreased dietary intake
- Decreased protein synthesis and increased protein breakdown
- Infiltration of fat into muscle



Aging and muscle
Factors that affect muscle mass

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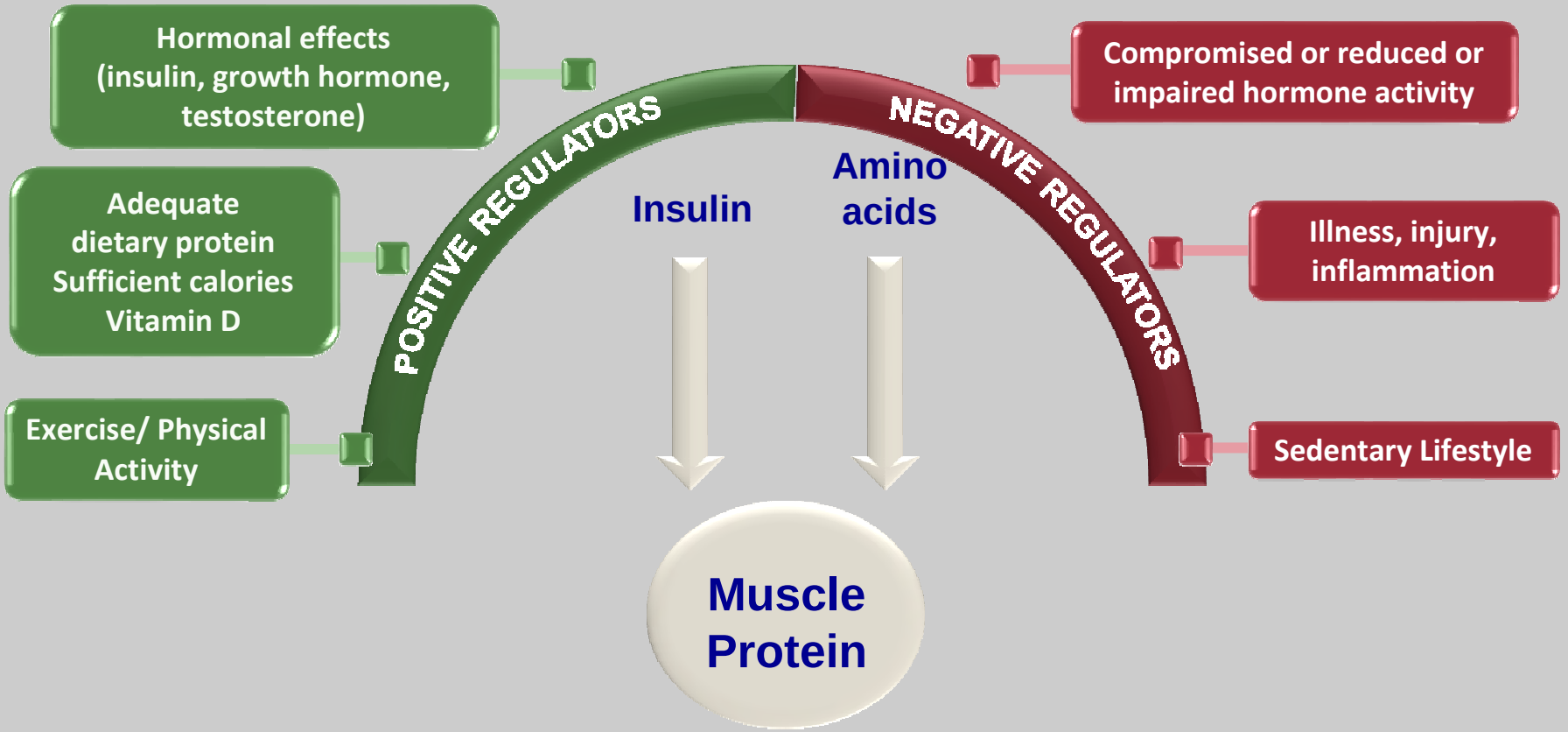

Robinson S, *et al. J Aging Res*. 2012: 2012: 510801.

Anorexia of aging → Sarcopenia

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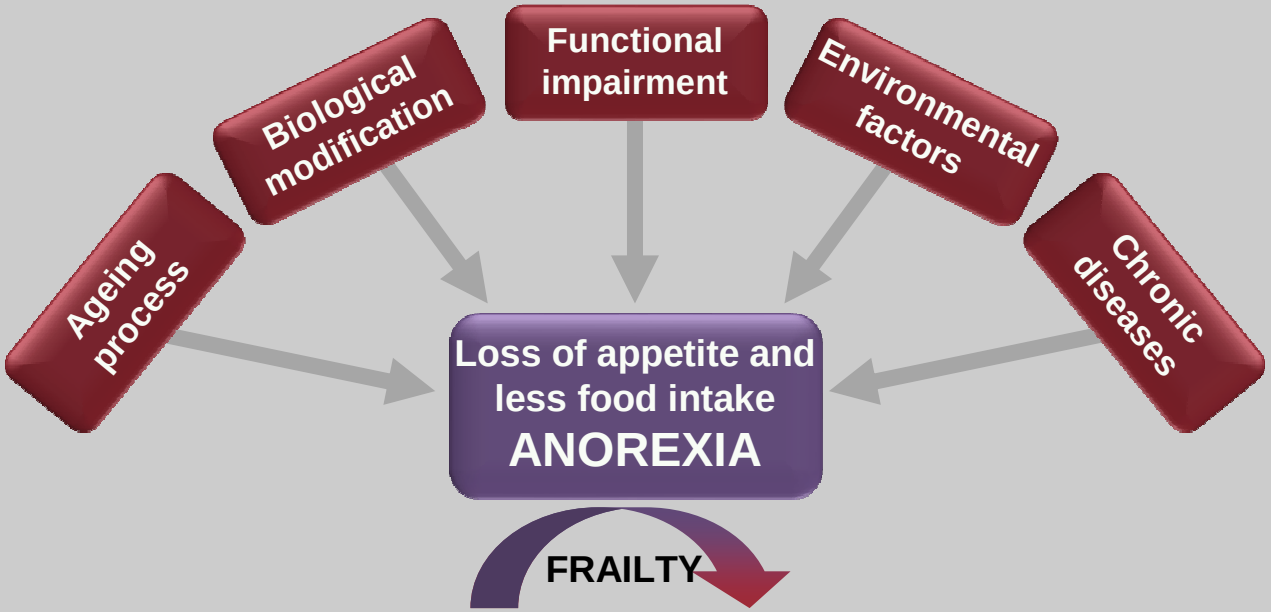
Università Cattolica del Sacro Cuore
Gemelli

The Anorexia of Aging: Is It a Geriatric Syndrome?

Francesco Landi, MD, PhD, Alessandro Laviano, MD, and Alfonso J. Cruz-Jentoft, MD

J Am Med Dir Assoc 2010, Editorial comment



- Cachexia / sarcopenia
- Reduced physical performance
- Decreased mobility / incident disability
- Poor quality of life
- All-cause mortality

→ **Poor outcomes**

Risk factors for sarcopenia

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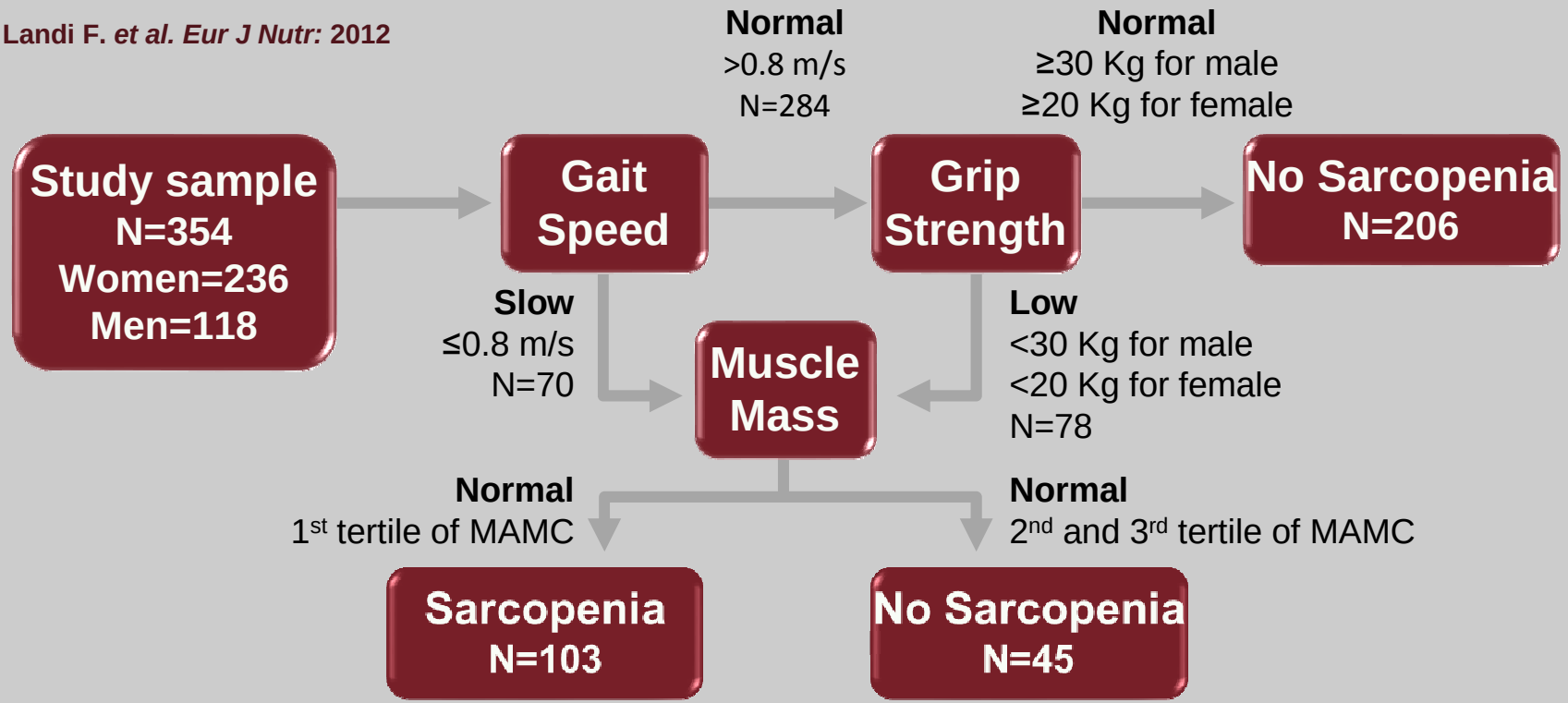
Università Cattolica del Sacro Cuore
Gemelli

Association of anorexia with sarcopenia in a community-dwelling elderly population: results from the *il*SIRENTE study

Francesco Landi · Rosa Liperoti · Andrea Russo · Silvia Giovannini · Matteo Tosato · Christiana Barillaro · Ettore Capoluongo · Roberto Bernabei · Graziano Onder

Landi F. *et al. Eur J Nutr:* 2012



Anorexia of aging → Sarcopenia

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Università Cattolica del Sacro Cuore
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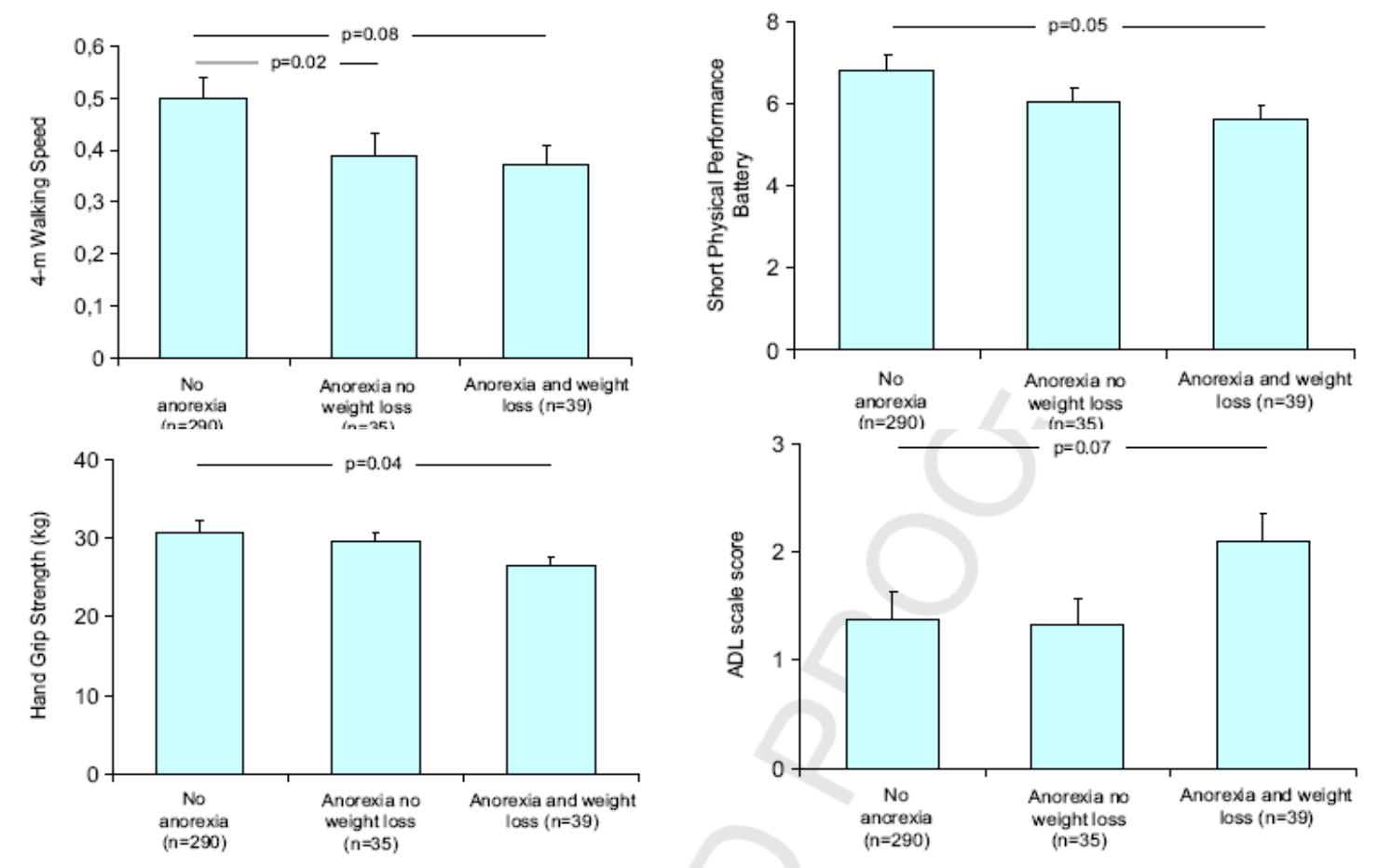
Anorexia, physical function, and incident disability among the frail elderly population: Results from the ilSIRENTE Study



Landi F. *et al. J Am Med Dir Assoc:* 2010: 11: 268–274

Anorexia of aging → Sarcopenia

Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

Review

Anorexia of Aging: Risk Factors, Consequences, and Potential Treatments

Francesco Landi *, Riccardo Calvani, Matteo Tosato, Anna Maria Martone, Elena Ortolani, Giulia Savera, Alex Sisto and Emanuele Marzetti

nutrients

Pleasure of eating only few foods in the elderly
(taste/smell – chewing – swallowing)

Poor alimentary variety of choice – Liquid and/or semi-solid foods

Higher risk of quantitative malnutrition due to low-calorie intake

Higher risk of qualitative low intake of single nutrients
(protein, vitamin D, zinc)

Anorexia of aging → Sarcopenia

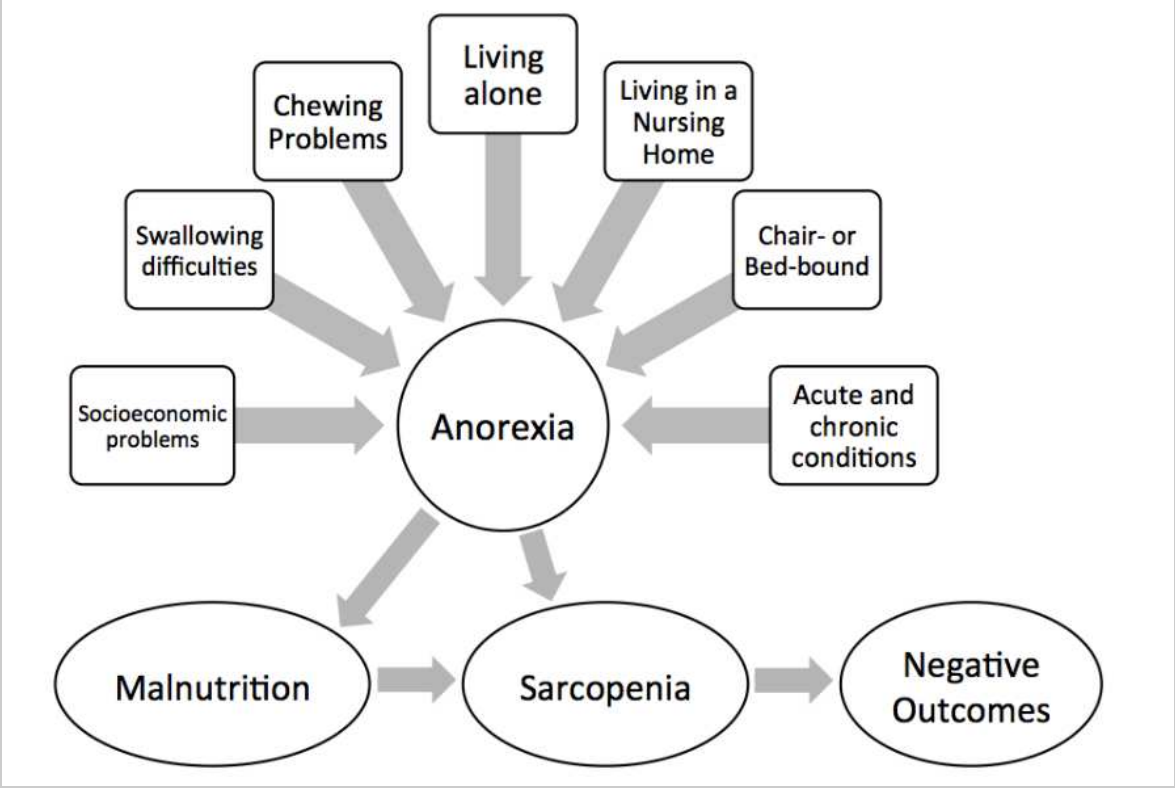
Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

Review

Anorexia of Aging: Risk Factors, Consequences, and Potential Treatments

Francesco Landi *, Riccardo Calvani, Matteo Tosato, Anna Maria Martone, Elena Ortolani, Giulia Savera, Alex Sisto and Emanuele Marzetti

nutrients



Nutrients 2016 Jan 27;8(2).

Can sarcopenia be prevented / treated?

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Università Cattolica del Sacro Cuore
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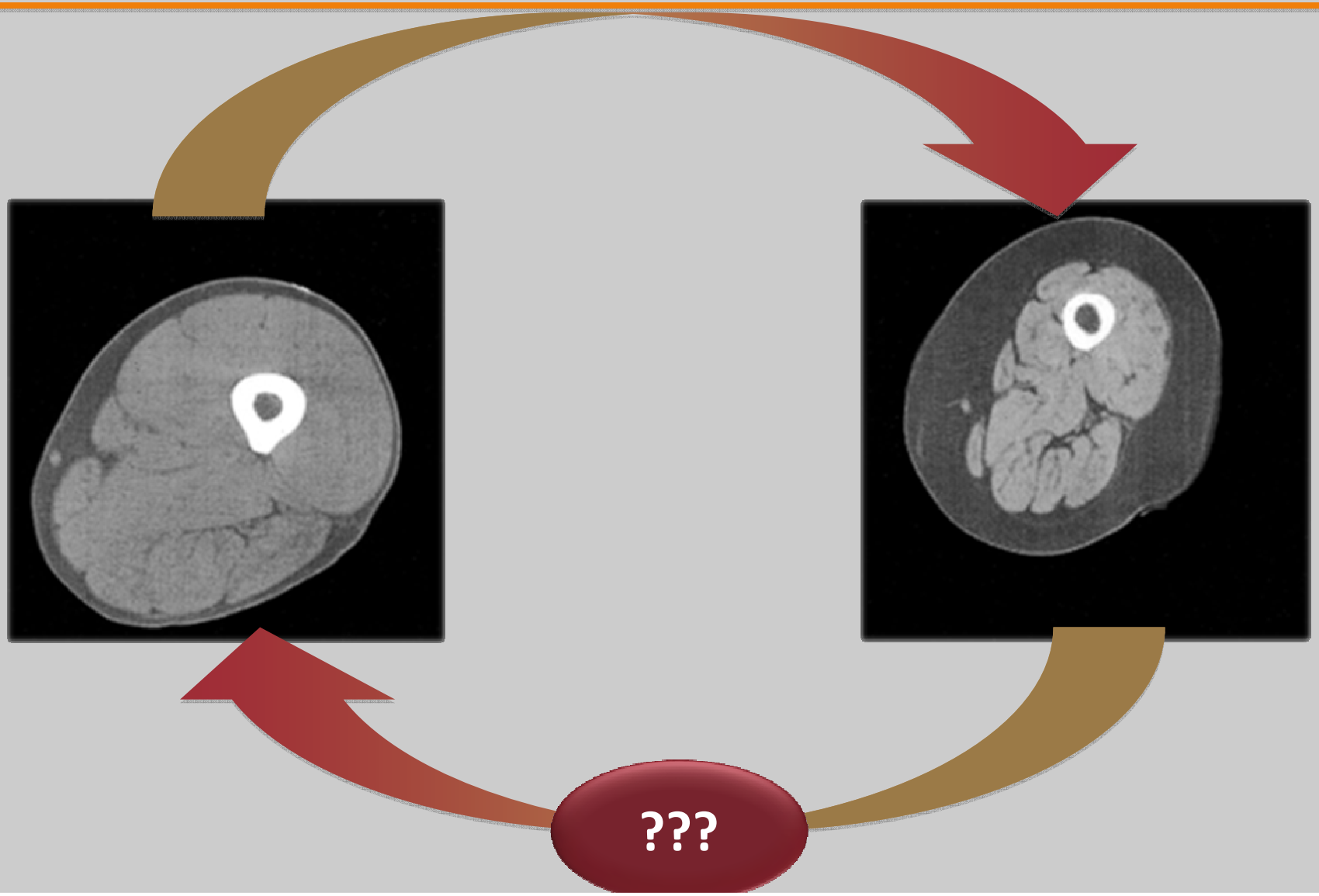

Potential therapeutic strategies

Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

CHAPTER 20

The Future of Drug Treatments

Francesco Landi (MD, PhD) and Graziano Onder (MD, PhD)
Department of Geriatrics, Catholic University of the Sacred Heart, Rome, Italy
Yves Rolland (MD)
Gérontopôle of Toulouse, Toulouse, France

Testosterone

Ace-inhibitors

Statin

Growth Hormone

Estrogen

DHEA

Essential fatty acids (Ω-3)

Creatine

Cytokines inhibitors
Myostatin inhibitors

Leptin

Anti oxidants (Zn, Se)

Physical exercise
Nutritional supplements

Protein - Vitamin D

Nutrition-muscle connection

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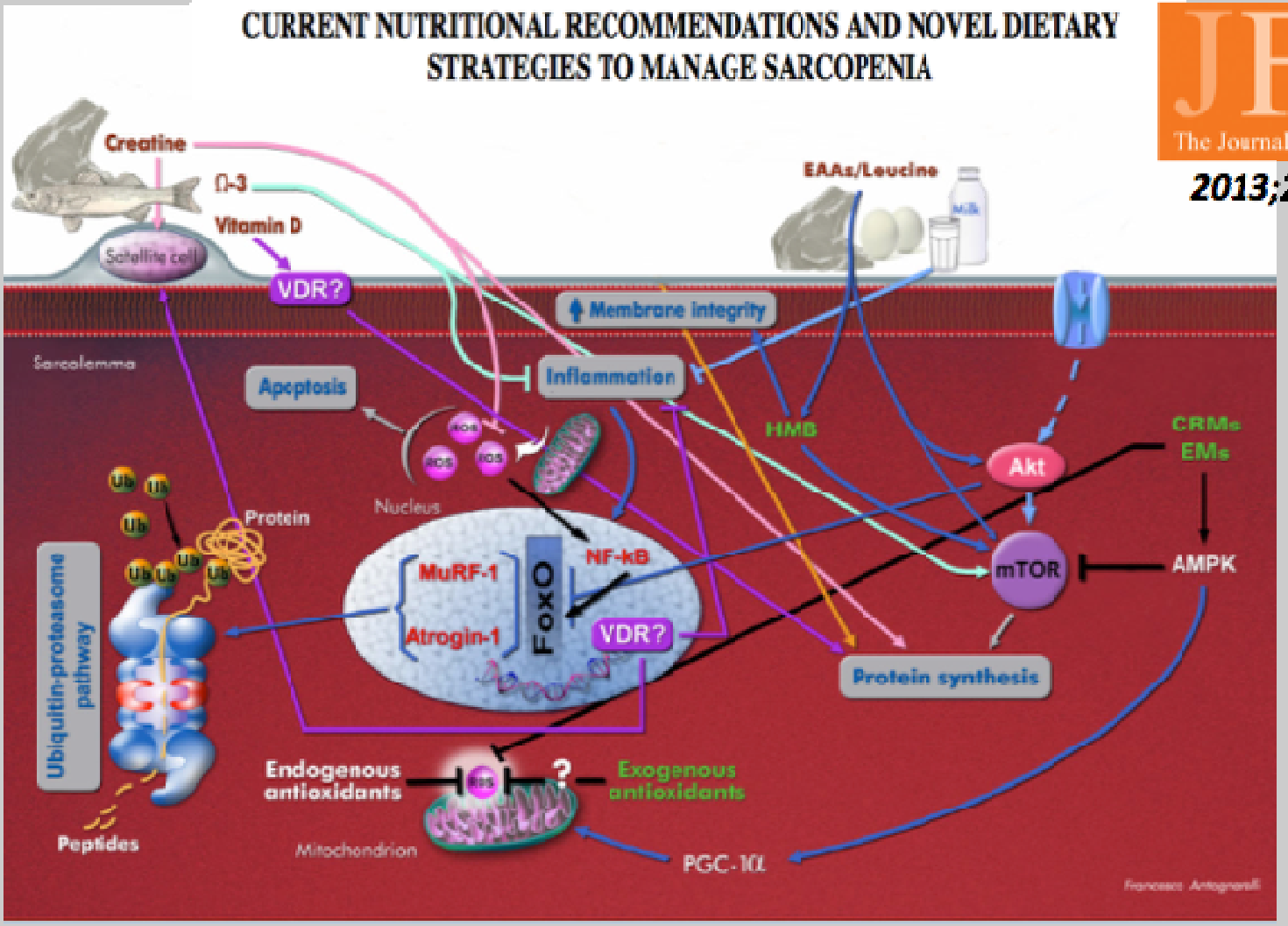

JFA
The Journal of Frailty & Aging
2013;2(1):38-53

MILANO | 11-12 MAGGIO | 2017

Nutrition-muscle connection

Dietary protein

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Università Cattolica del Sacro Cuore
Gemelli

Review

Protein Intake and Muscle Health in Old Age: From Biological Plausibility to Clinical Evidence

Francesco Landi *, Riccardo Calvani, Matteo Tosato, Anna Maria Martone, Elena Ortolani, Giulia Savera, Emanuela D'Angelo, Alex Sisto and Emanuele Marzetti

nutrients

Nutrients 2016 May 14;8(5).

- Protein: The principal component of all muscles
- Dietary intake required for muscle maintenance
- High quality protein to help support adults' protein needs; most aging adults do not consume enough protein[4]
- Inadequate levels reduce muscle reserves and immune function; increase skin fragility

The importance of protein

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journal homepage: www.jamda.com

Perspective: Protein: What Kind, How Much, When?

Francesco Landi, MD, PhD
Emanuele Marzetti, MD, PhD
Roberto Bernabei, MD
Department of Geriatrics
Catholic University of the Sacred Heart
Rome, Italy

DIETARY PROTEIN REQUIREMENTS:

HOW MUCH PROTEIN IS ENOUGH FOR OLDER ADULTS?

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Università Cattolica del Sacro Cuore
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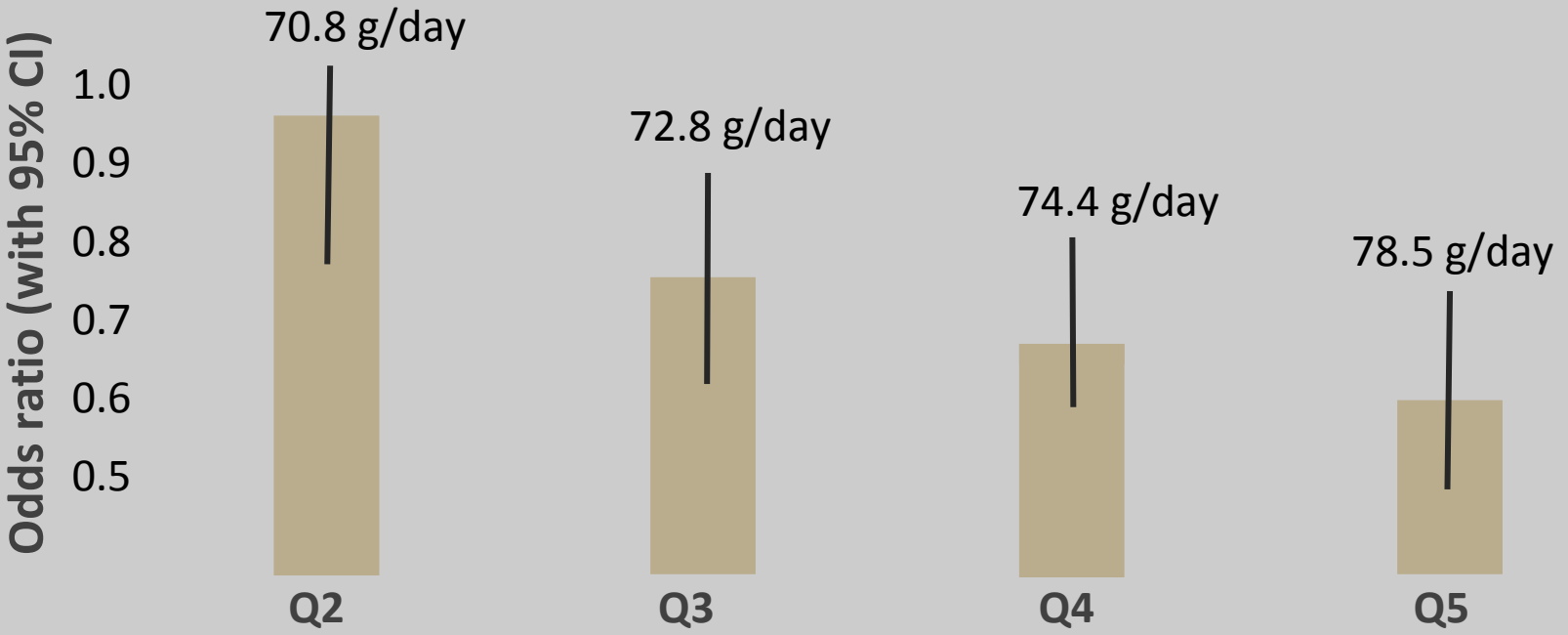
Lower quintiles of protein intake are associated with higher risk of frailty



Risk of frailty by quintile of protein intake (% kcal) (n= 24,417)

Increasing dietary protein intake, % of kcal

DIETARY PROTEIN REQUIREMENTS:

HOW MUCH PROTEIN IS ENOUGH FOR OLDER ADULTS?

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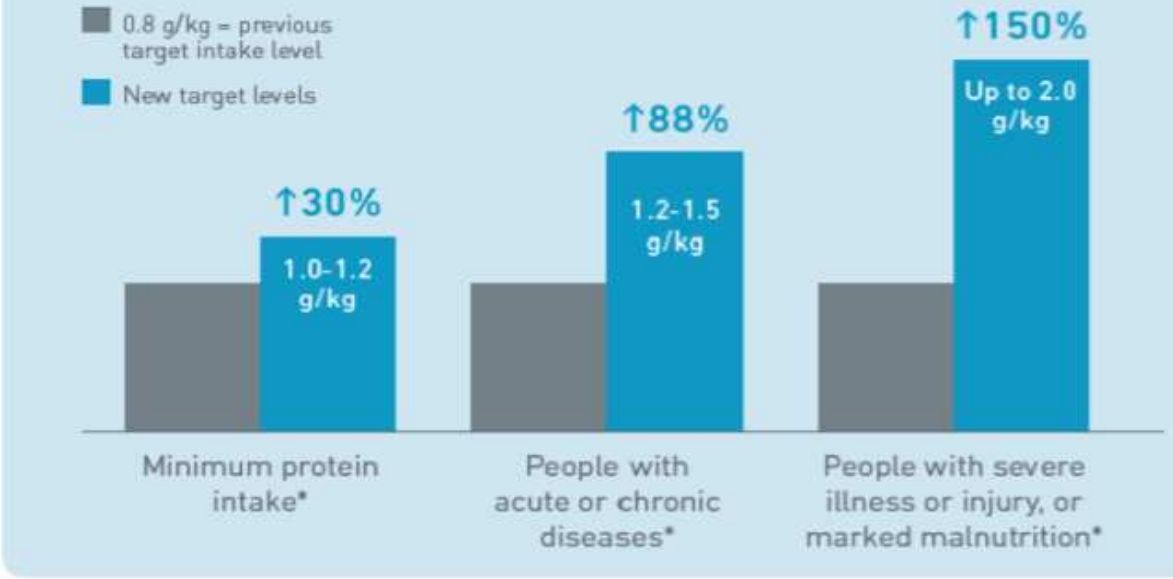
PROT-AGE summary

New recommendations call for higher protein intake (g per kg of bodyweight) in those aged >65 years[1]



*Caution needed among those with severe kidney disease (i.e. estimated Glomerular Filtration Rate <30mL/min/1.73m²), calculating their needs differently.

PROTEIN DISTRIBUTION

WHEN IS IT BETTER TO CONSUME PROTEIN?

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Università Cattolica del Sacro Cuore
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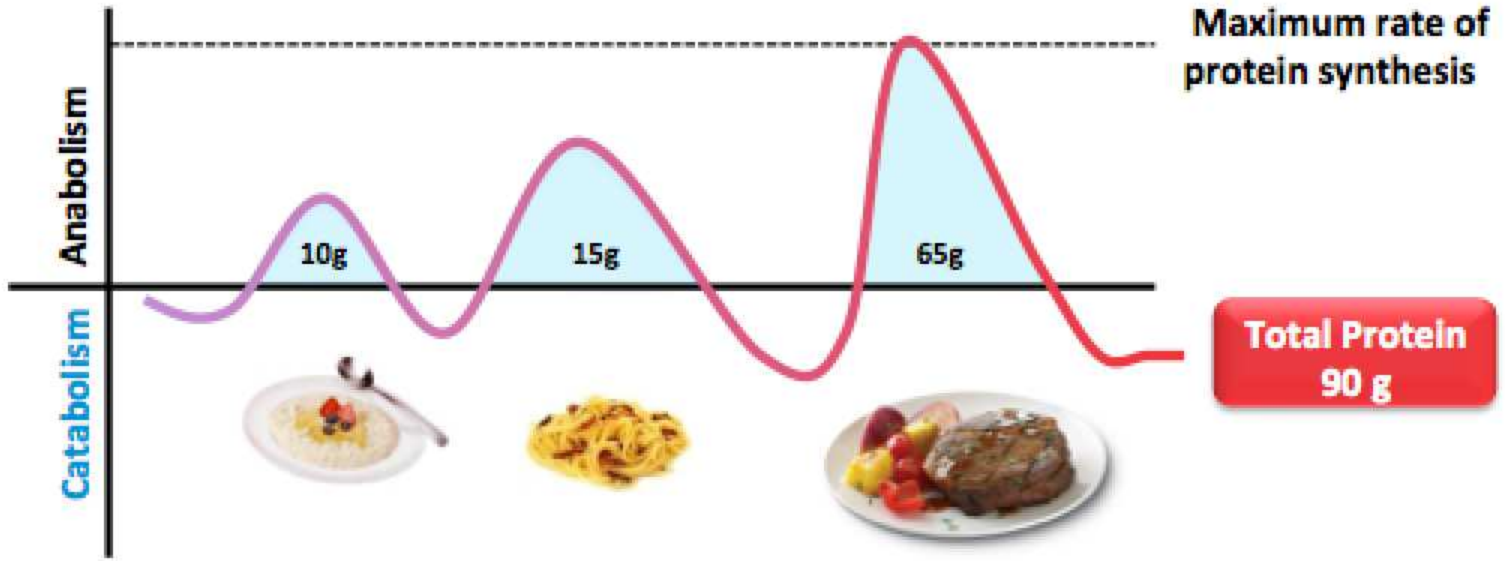
Daily protein distribution – typical?



A skewed daily protein distribution fails to maximize potential for muscle growth

PROTEIN DISTRIBUTION

WHEN IS IT BETTER TO CONSUME PROTEIN?

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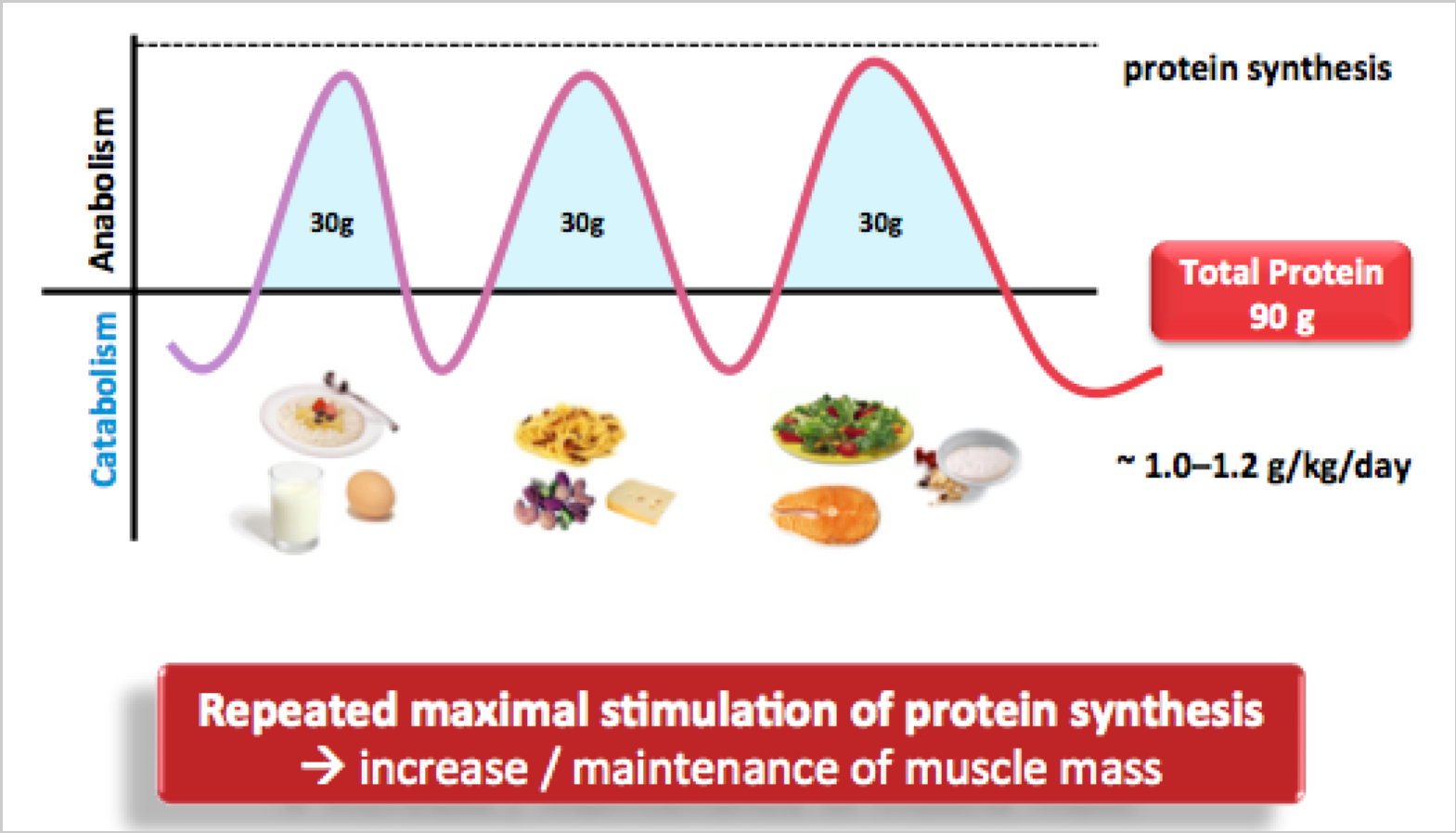
Daily protein distribution – optimal



PROTEIN INTAKE AND PHYSICAL EXERCISE

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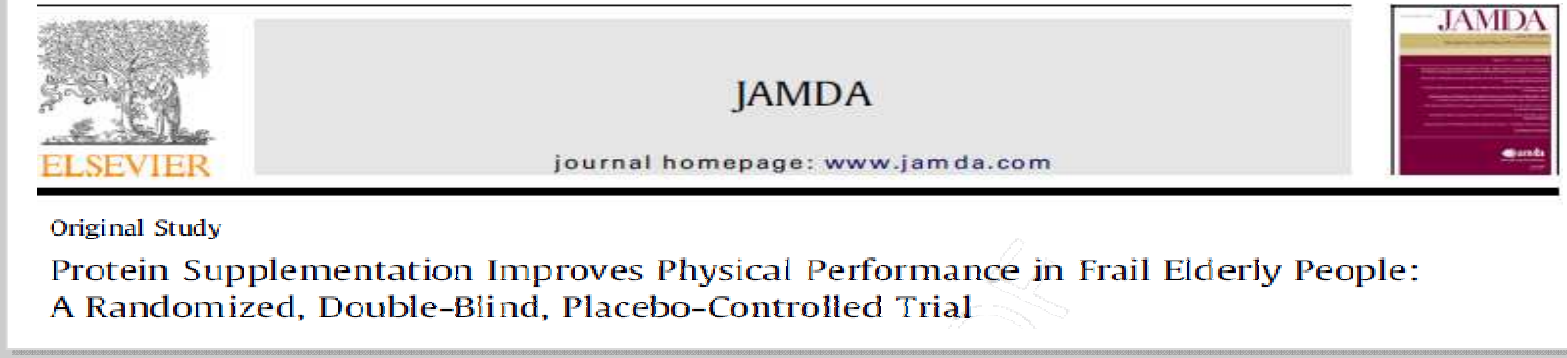
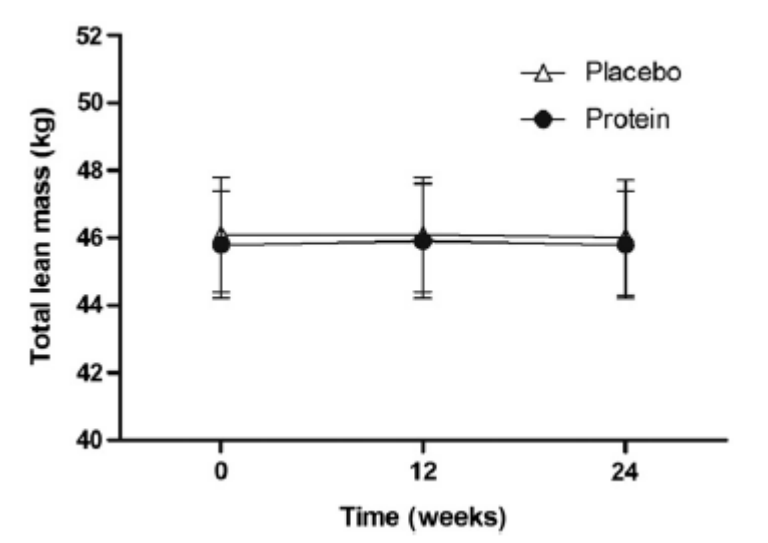
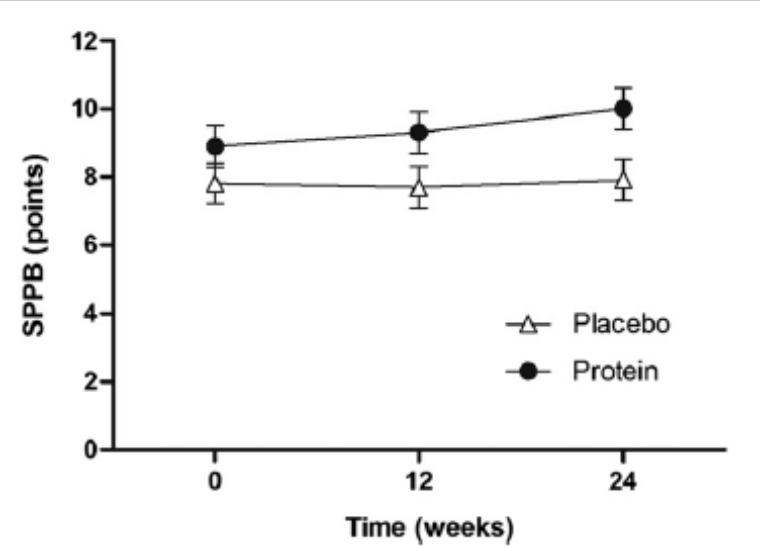


Original Study

Protein Supplementation Improves Physical Performance in Frail Elderly People: A Randomized, Double-Blind, Placebo-Controlled Trial





Tieland et al. JAMDA 2012, 13(8):720-726

PROTEIN INTAKE AND PHYSICAL EXERCISE

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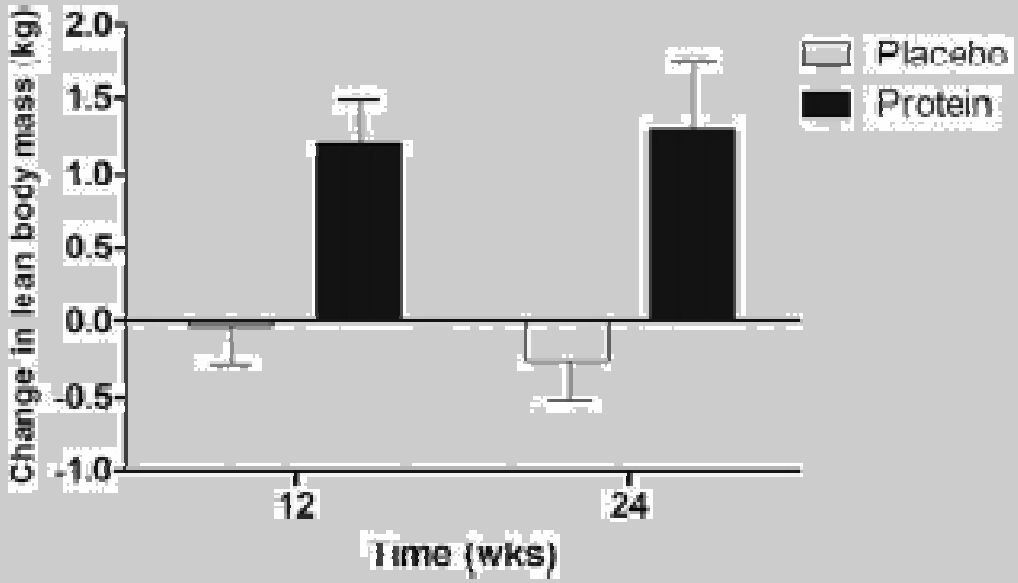
journal homepage: www.jamda.com

Original Study

Protein Supplementation Increases Muscle Mass Gain During Prolonged Resistance-Type Exercise Training in Frail Elderly People: A Randomized, Double-Blind, Placebo-Controlled Trial

Michael Tieland Msc[a,b,*], Marlou L. Dirks MSc[c], Nikita van der Zwaluw MSc[b], Lex B. Verdijk PhD[a,c], Ondine van de Rest PhD[b], Lisette C.P.G.M. de Groot PhD[a,b], Luc J.C. van Loon PhD[a,c]



PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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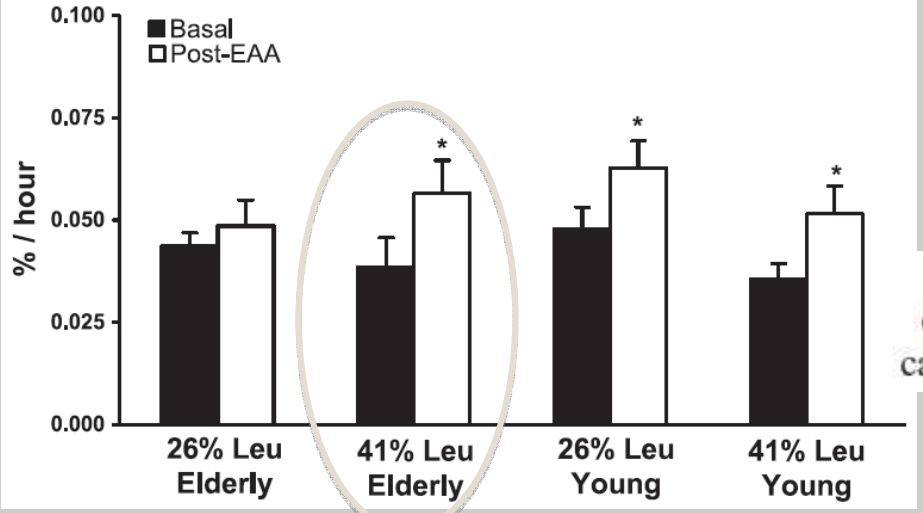
Università Cattolica del Sacro Cuore
Gemelli

Elderly muscle are less responsive to anabolic effect of EAA/Leucine

A high proportion of leucine is required for optimal stimulation of the rate of muscle protein synthesis by essential amino acids in the elderly

Christos S. Katsanos,[1] Hisamine Kobayashi,[2] Melinda Sheffield-Moore,[3]
Asle Aarsland,[4] and Robert R. Wolfe[1]

Am J Physiol Endocrinol Metab 291: E381–E387, 2006.
First published February 28, 2006; doi:10.1152/ajpendo.00488.2005.



In conclusion, this study demonstrates for the first time in elderly humans that attenuated response of muscle protein can be reversed by ingestion of extra leucine.nts of amino acids

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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Original Study

Effects of a Vitamin D and Leucine-Enriched Whey Protein Nutritional Supplement on Measures of Sarcopenia in Older Adults, the PROVIDE Study: A Randomized, Double-Blind, Placebo-Controlled Trial

Jürgen M. Bauer MD, PhD[a,*], Sjors Verlaan MSc[b,c], Ivan Bautmans PhD[d], Kirsten Brandt PhD[e], Lorenzo M. Donini MD, PhD[f], Marcello Maggio MD, PhD[g], Marion E.T. McMurdo MD, PhD[h], Tony Mets MD, PhD[d], Chris Seal PhD[e], Sander L. Wijers PhD[b], Gian Paolo Ceda MD[g], Giuseppe De Vito MD, PhD[i], Gilbert Donders MD, PhD[j], Michael Drey MD[k], Carolyn Greig PhD[l], Ulf Holmbäck PhD[m], Marco Narici PhD[n], Jamie McPhee PhD[o], Eleonora Poggiogalle MD[f], Dermot Power MD, PhD[p], Aldo Scafoglieri PhD[d], Ralf Schultz MD, PhD[q], Cornel C. Sieber MD[r], Tommy Cederholm MD, PhD[m]

JAMDA 16 (2015) 740e747

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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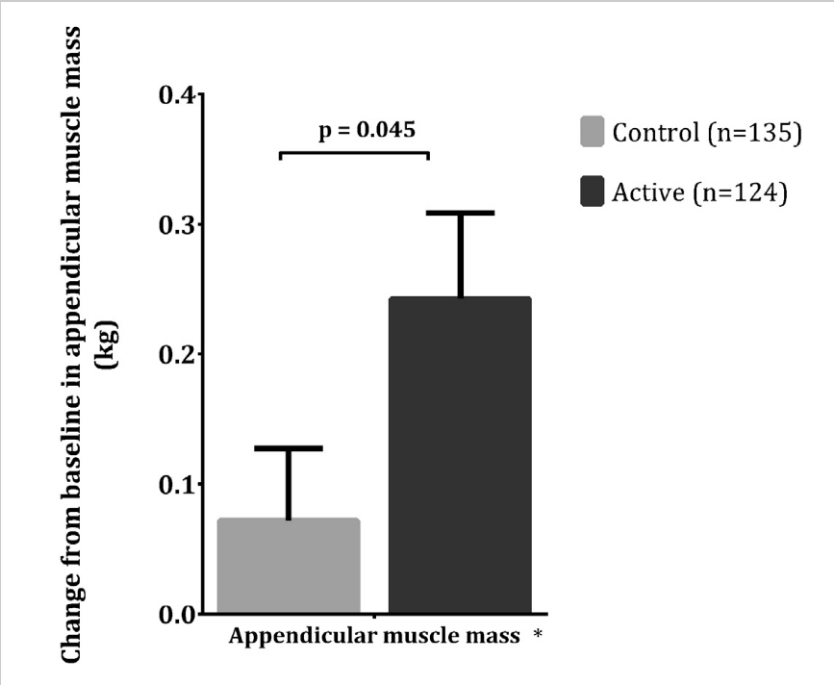

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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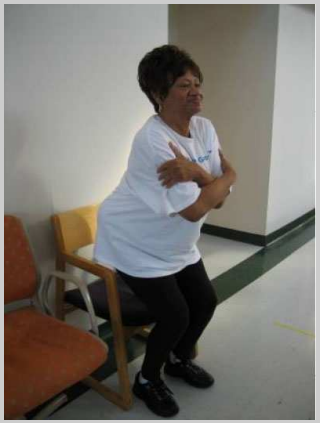
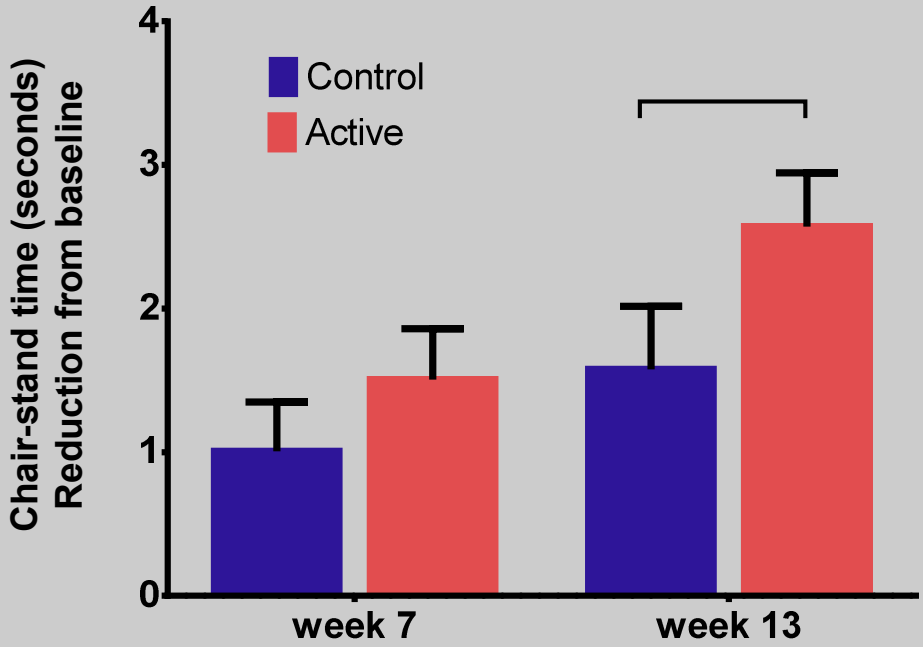




***p<0.001*

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

HMB is an active metabolite of the amino acid leucine

- Calcium beta-hydroxy beta-methylbutyrate (CaHMB) is a source of HMB
- HMB regulates protein in muscle cells
  - Supports muscle protein synthesis and slows down muscle protein breakdown
  - Helps rebuild muscle mass lost naturally over time
  - Helps rebuild LBM to support muscle strength and functionality

Effects of HMB in non-exercising older adults

- **Objective:**

  Evaluate the effect of HMB on LBM and strength in older adults (with and without resistance training (RT) exercise)

- **Study Design:**

  –Prospective, randomized, placebo-controlled trial

  –Older adults (age≥ 65 y), n=27/group- 4 groups

  –**HMB at 3g/day** vs. placebo (with or without progressive RT)

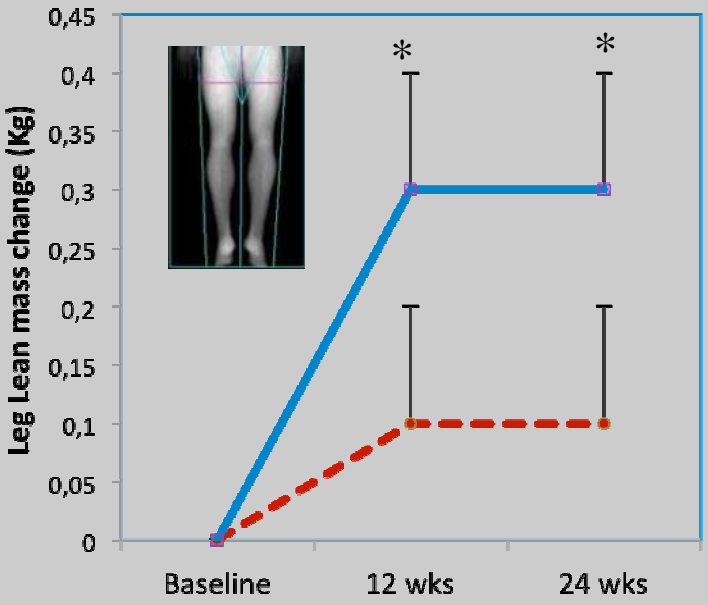
  –24-wks supplementation; Outcomes: lean mass and leg strength

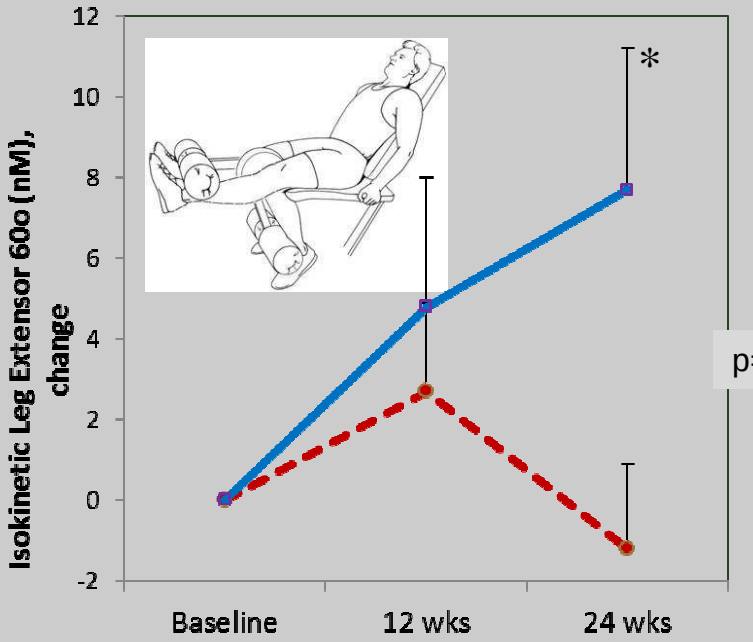
Stout J et al (2013) *Exp. Gerontol*. 48; 1303-1310

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

Policlinico Agostino Gemelli
Università Cattolica del Sacro Cuore
Gemelli

Results: HMB increased lean mass and strength in non-exercising older adults





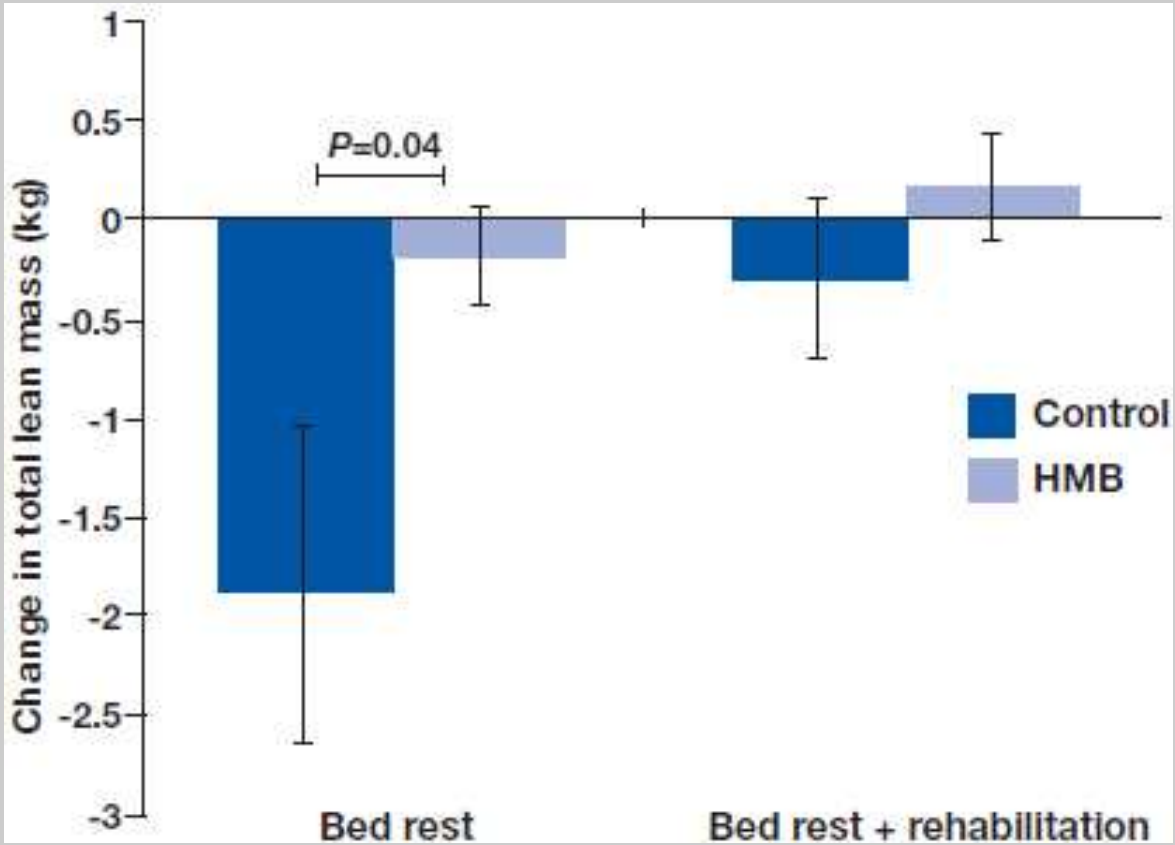
p=0.04

* p<0.05, Change from baseline by paired t-test

Stout J et al (2013) *Exp. Gerontol*. 48; 1303-1310

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

Lean body mass is maintained by β-hydroxy-β-methylbutyrate (HMB) during 10 days of bed rest in elderly women



J Nutrition 2013

PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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JAMDA 17 (2016) 1044–1055

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journal homepage: www.jamda.com

Original Study

Impacts of High-Protein Oral Nutritional Supplements Among Malnourished Men and Women with Sarcopenia: A Multicenter, Randomized, Double-Blinded, Controlled Trial

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PROTEIN SUPPLEMENTATION: NEW EVIDENCE

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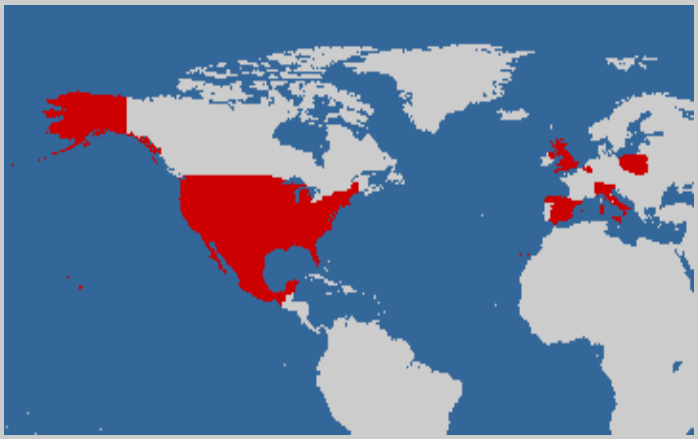
Screening and recruitment



Screened N=800
Men and women 65 yr+

N=643
Malnutrition (SGA)

N=488
Low gait speed or
Low grip strength

76% of malnourished subjects had reduced physical performance

Grip strenght was not recorded in those with lowgait speed

N=368
Low muscle mass (DEXA)

At least 57% of malnourished subjects have sarcopenia

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Baseline Characteristics of Study Subjects

	CONS Group n = 165	ECONS Group n = 165
Age, y	77 (71, 81)	77 (71, 81)
Gender, % women	62%	62%
Weight, kg	70 (60, 78)	68 (58, 78)
BMI, $kg \cdot m^{-2}$	26 (24, 29)	25 (23, 29)
Leg strength, Nm	57 (37, 77)	56 (37, 73)
Grip strength, kg	19 (15, 26)	19 (15, 27)
Gait speed, $m \cdot s^{-1}$	0.8 (0.7, 0.9)	0.7 (0.6, 0.9)
FM, kg	25 (20, 30)	25 (18, 30)
LMM, kg*	12 (10, 15)	12 (10, 14)
RSMI, %	25 (23, 31)	26 (23, 30)
MQ, $Nm \cdot kg^{-1}$	9.1 (7.0, 12.1)	9.2 (6.7, 12.4)
Daily energy intake, $kcal \cdot d^{-1}$	1620 (1257, 2012)	1627 (1253, 1971)
Daily protein intake, $g \cdot kg^{-1} \cdot d^{-1}$	0.97 (0.73, 1.30)	0.94 (0.70, 1.20)
Serum vitamin D, $nmol \cdot L^{-1}$	60 (40, 78)	65 (45, 85)

Values are percentages or median (25th, 75th IQR). There were no significant differences ($P > .05$) between groups at baseline.

*LMM data represent the sum of left and right LMMs acquired from the DXA.

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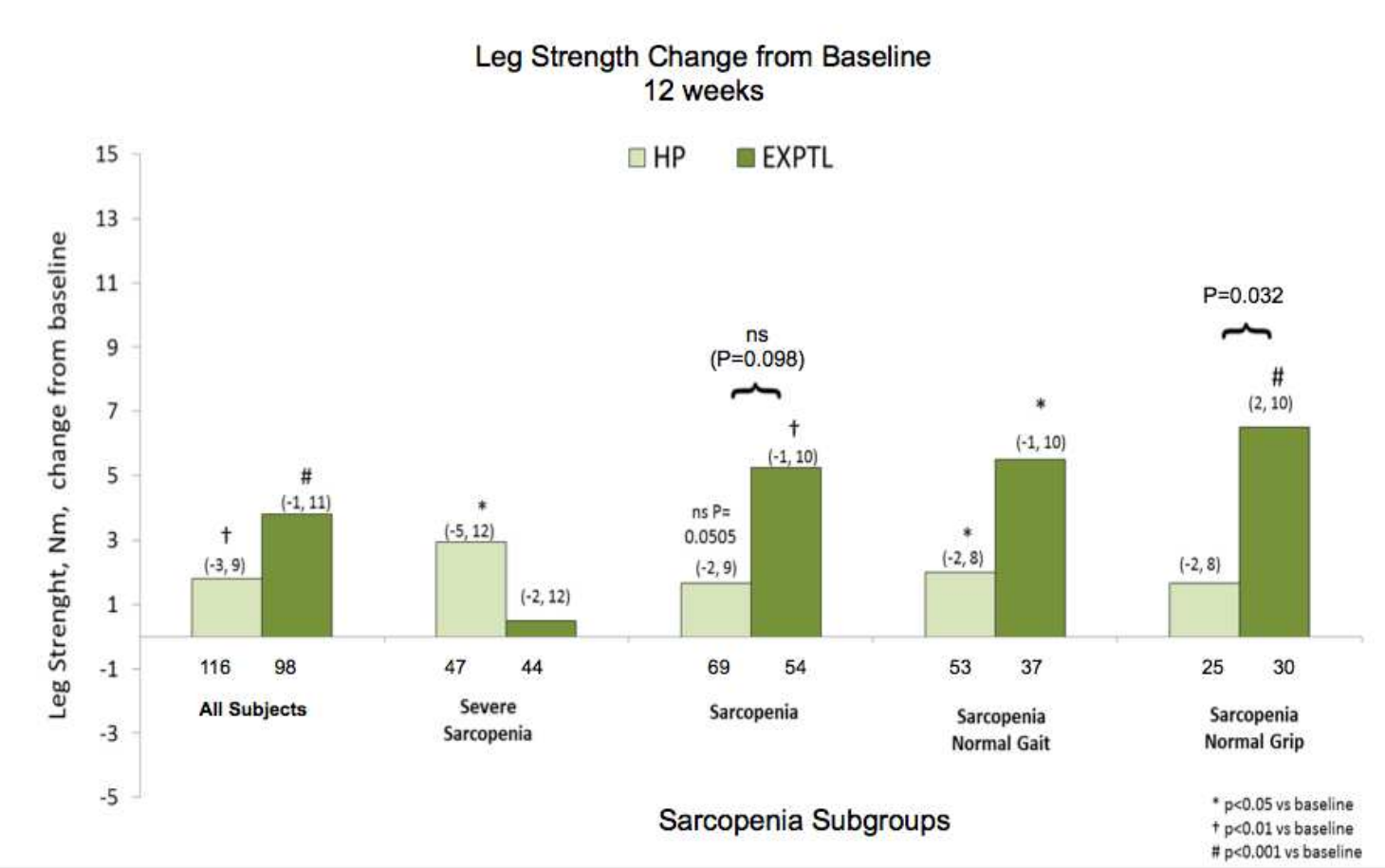
Results - Leg Strength (Nm), Change from Baseline at 12 weeks



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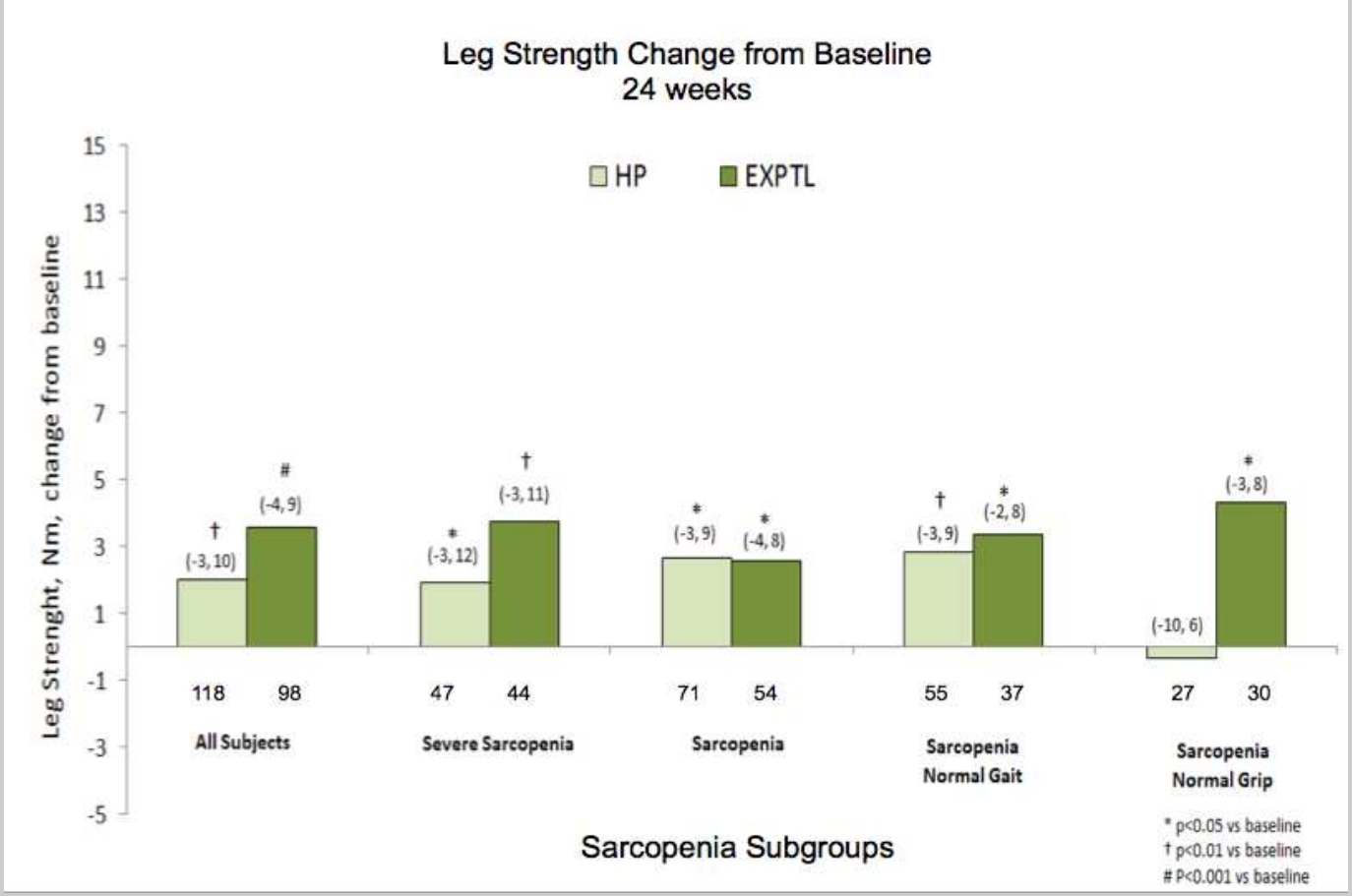
Results - Leg Strength (Nm), Change from Baseline at 24 weeks



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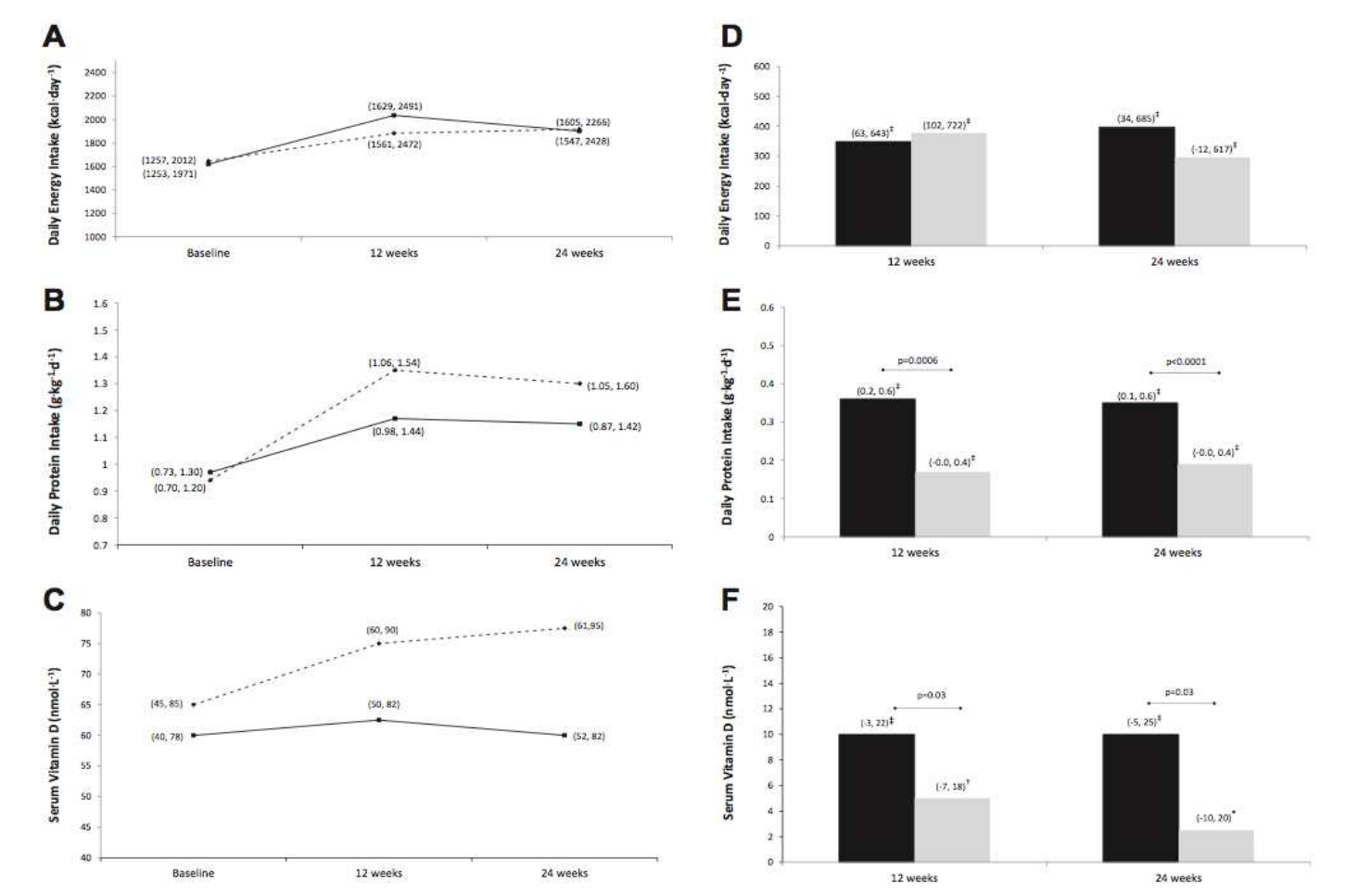
Dietary intakes of energy, protein, and serum vitamin D at baseline and 12 and 24 weeks



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Aging and muscle

Loss of muscle mass, strength and function

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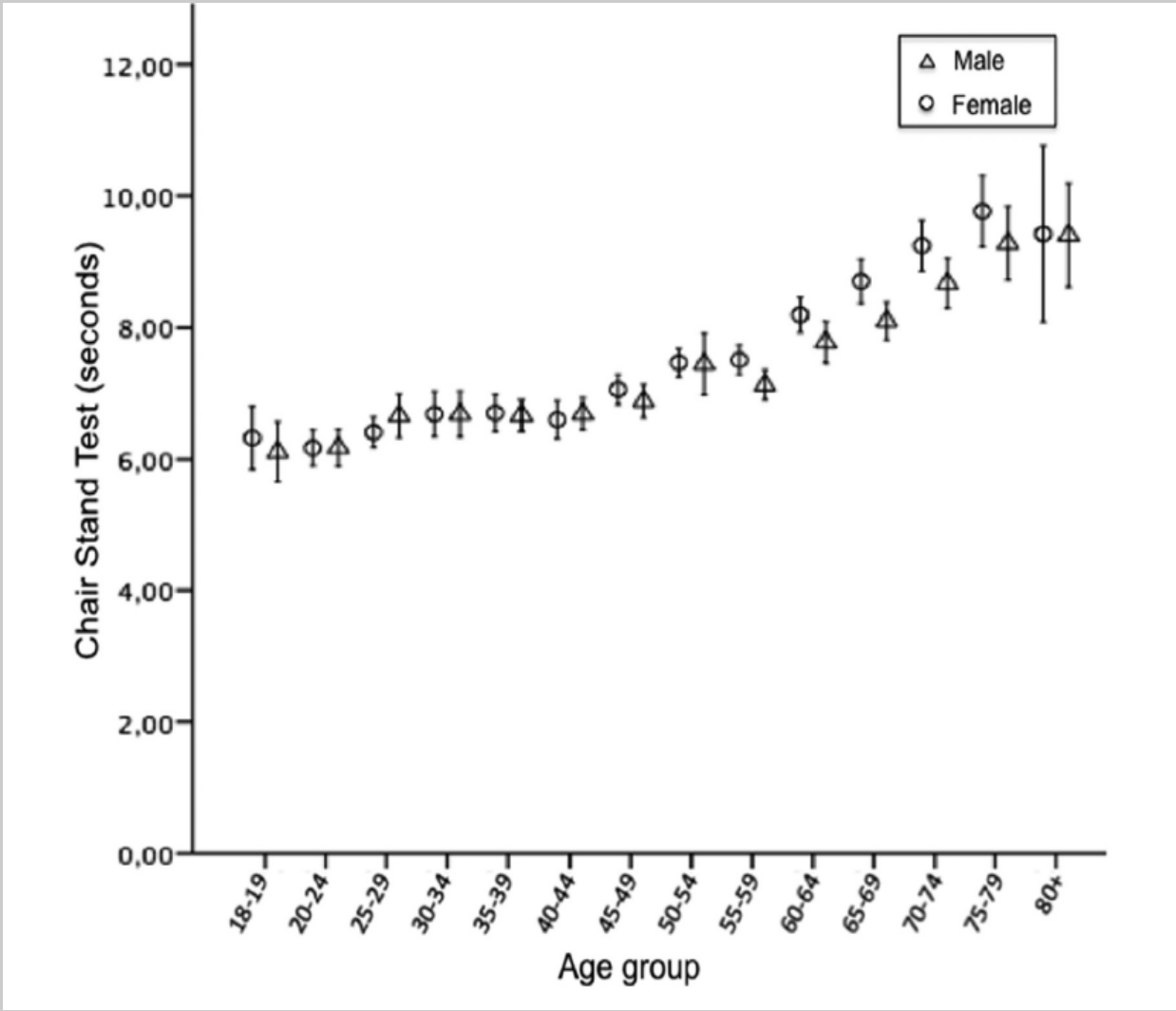

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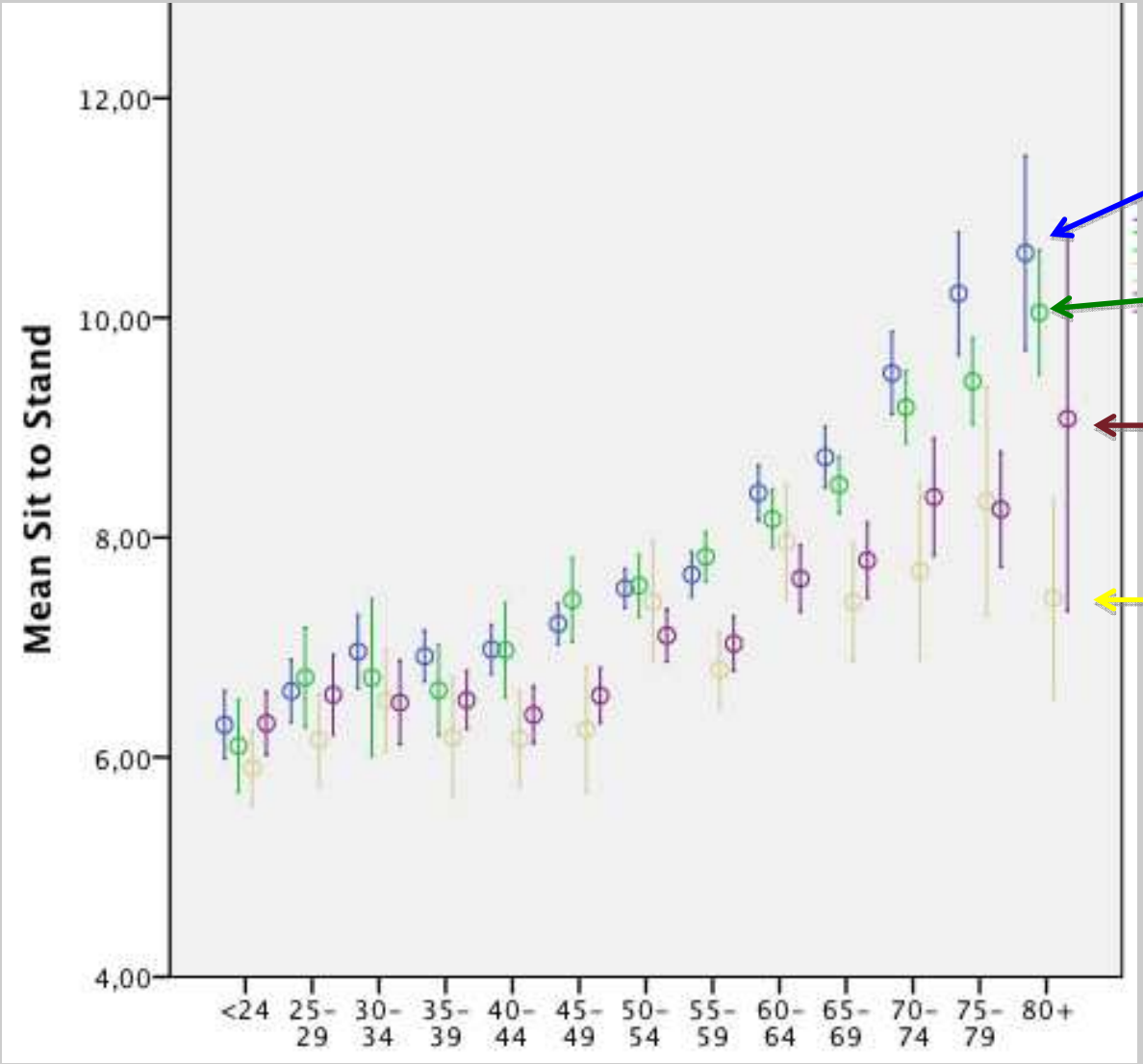

No exercise

Walking

Aerobic Exercise

Resistance Exercise

Nutrition-muscle connection
The “Pachinko Model”

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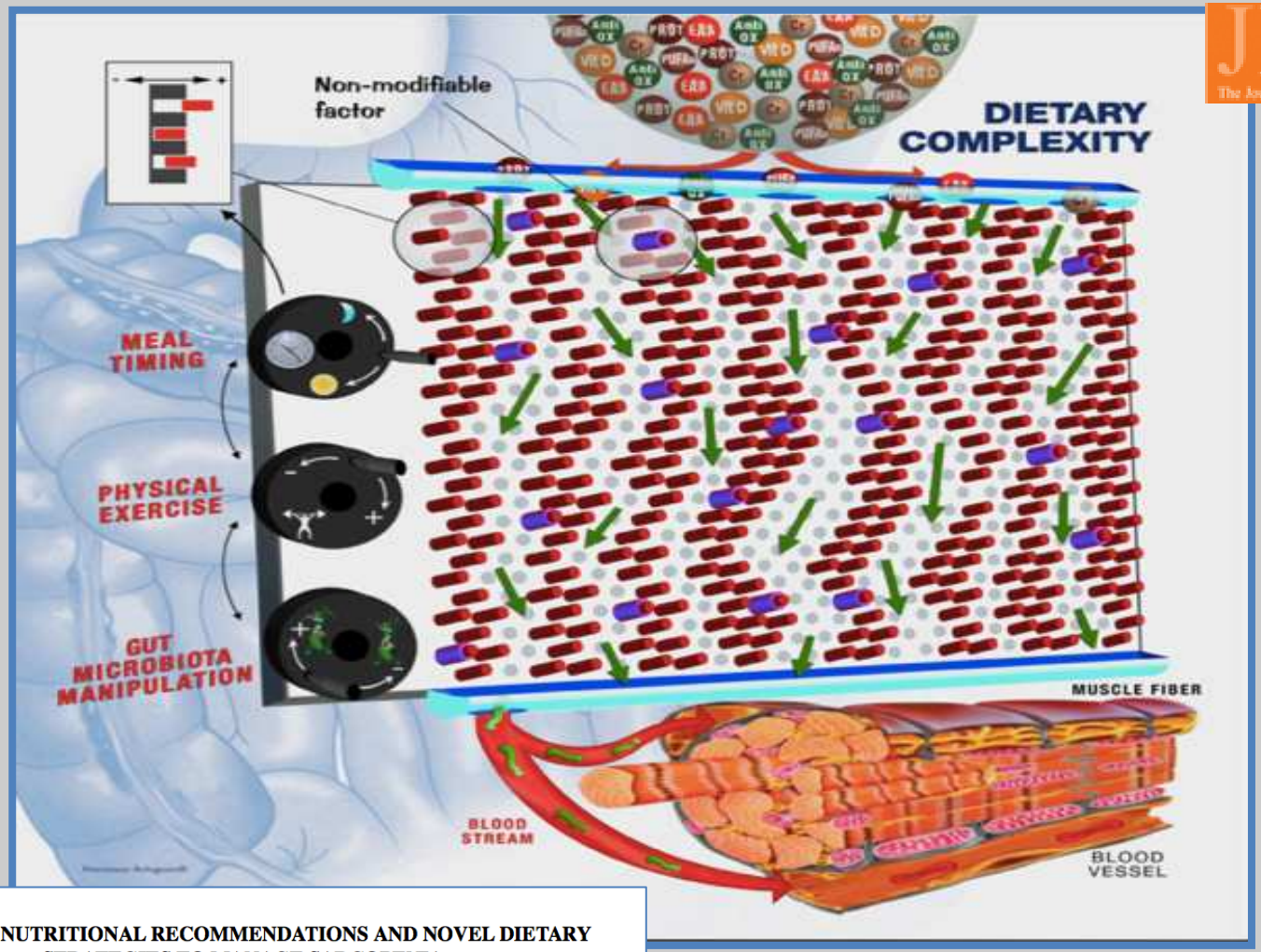

JFA The Journal of Frailty & Aging 2013;2(1):38-53

CURRENT NUTRITIONAL RECOMMENDATIONS AND NOVEL DIETARY STRATEGIES TO MANAGE SARCOPENIA

Take home messages

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Sarcopenia	• **The consequences of sarcopenia** (and generally loss of muscle mass) **warrant screening and treatment**
Proteins and Vitamin D	• **Adequate intake of proteins** (≥1 g/kg/d), **energy and vitamin D along with adequate physical activities may help prevent sarcopenia**
Leucine/HMB + exercise	• **Leucine/HMB and exercise should be considered as interventions in the management of sarcopenia**
Evidence Base Medicine	• **Importance of continuity of nutritional care following discharge from hospital and during rehabilitation**