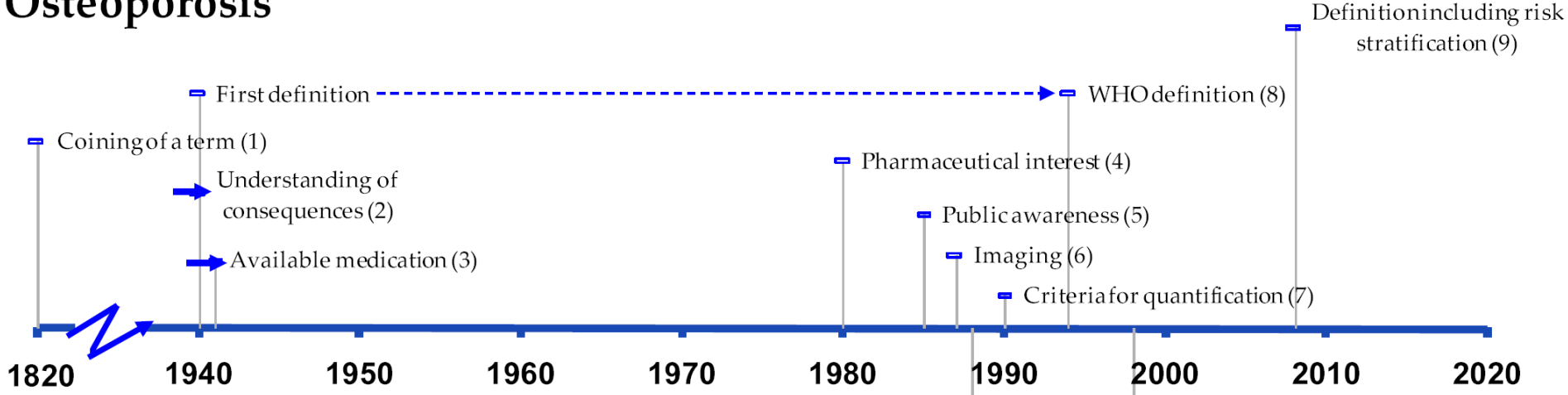




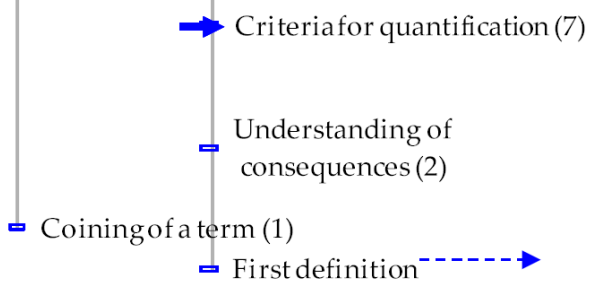
Sarcopenia, what's new?

Osteoporosis

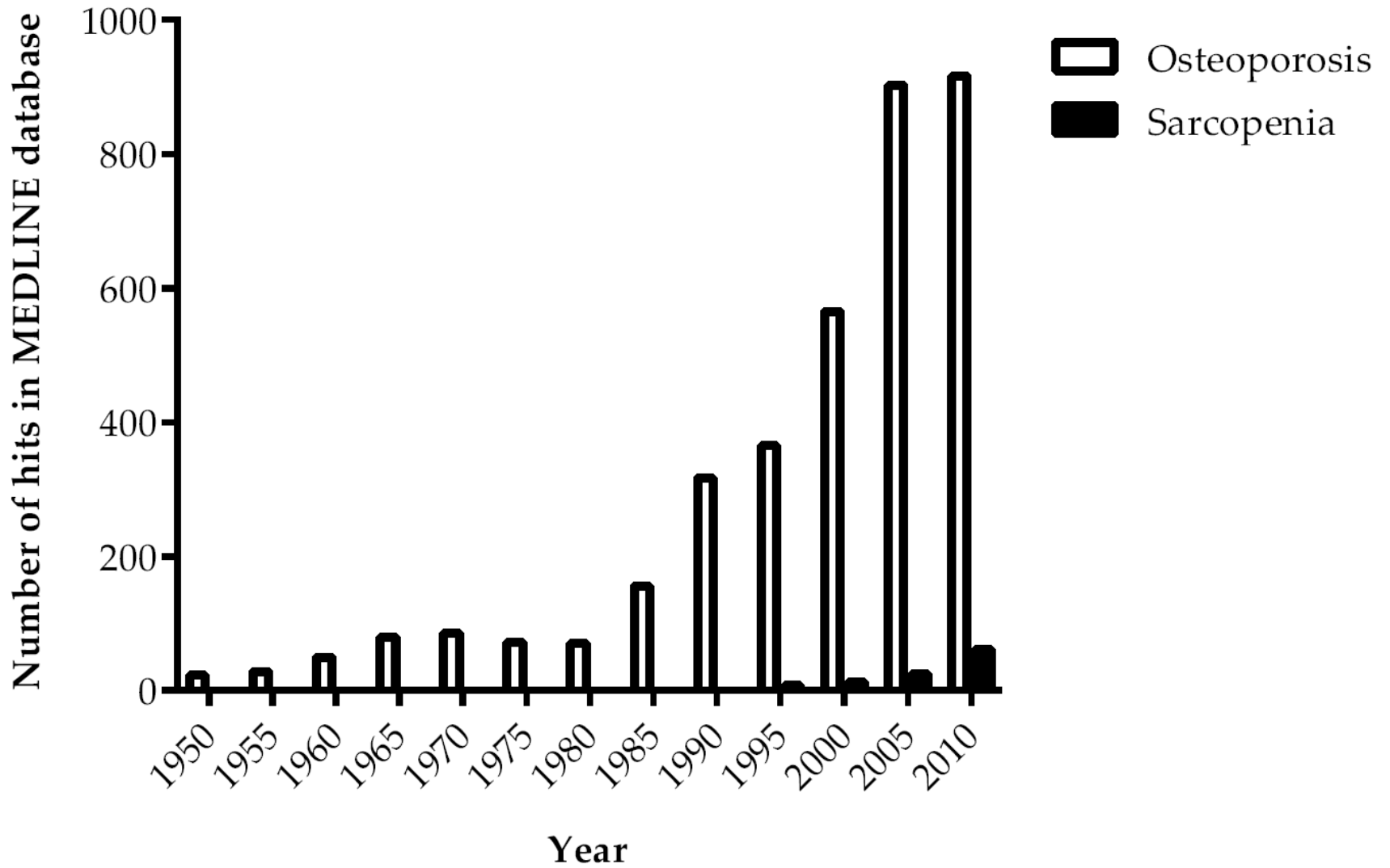


Sarcopenia

→ = Ongoing process



13.11.2015 N=3415



Muscle

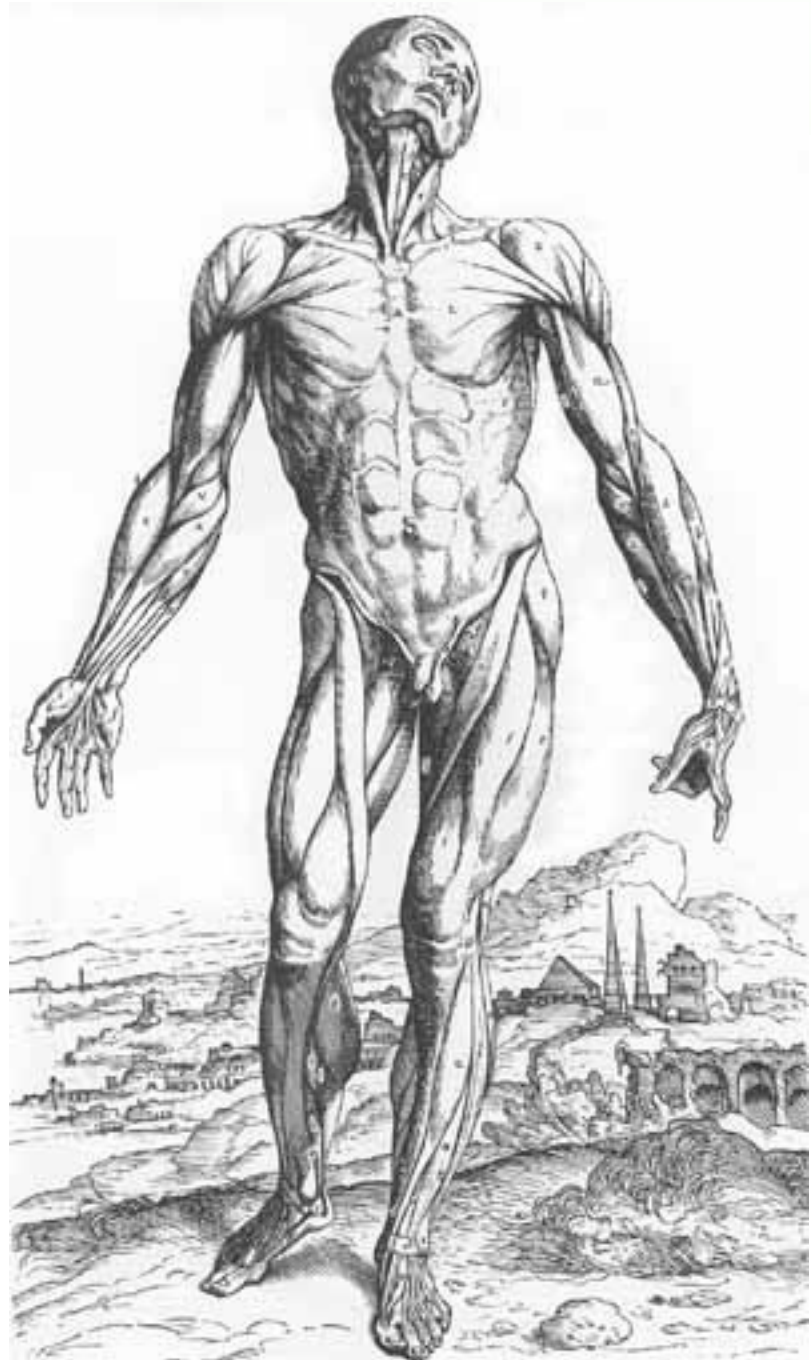
640 muscles

contraction =
movement

glucose metabolism

protein storage

Modifyable!



Sarcopenia



sarx flesh

penia deminished

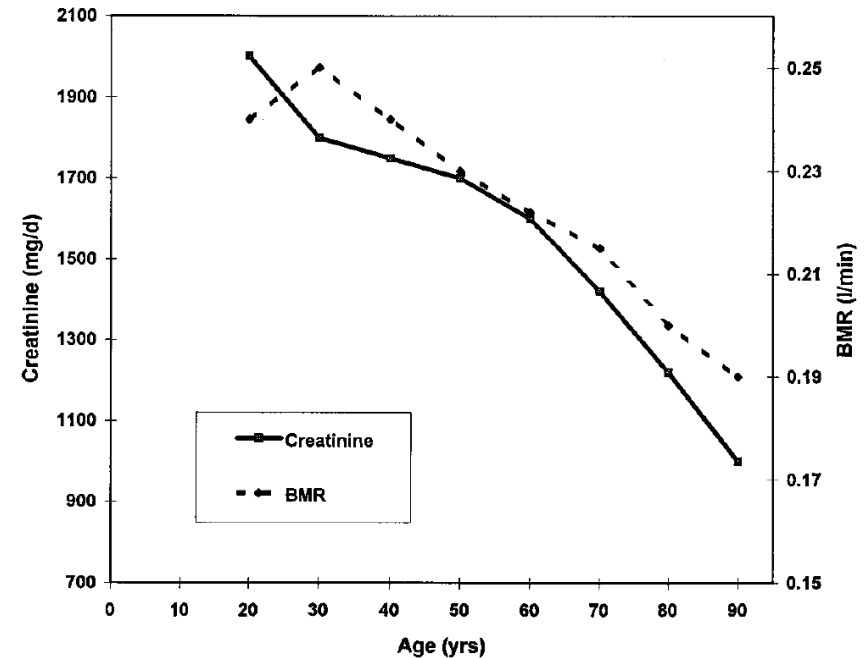
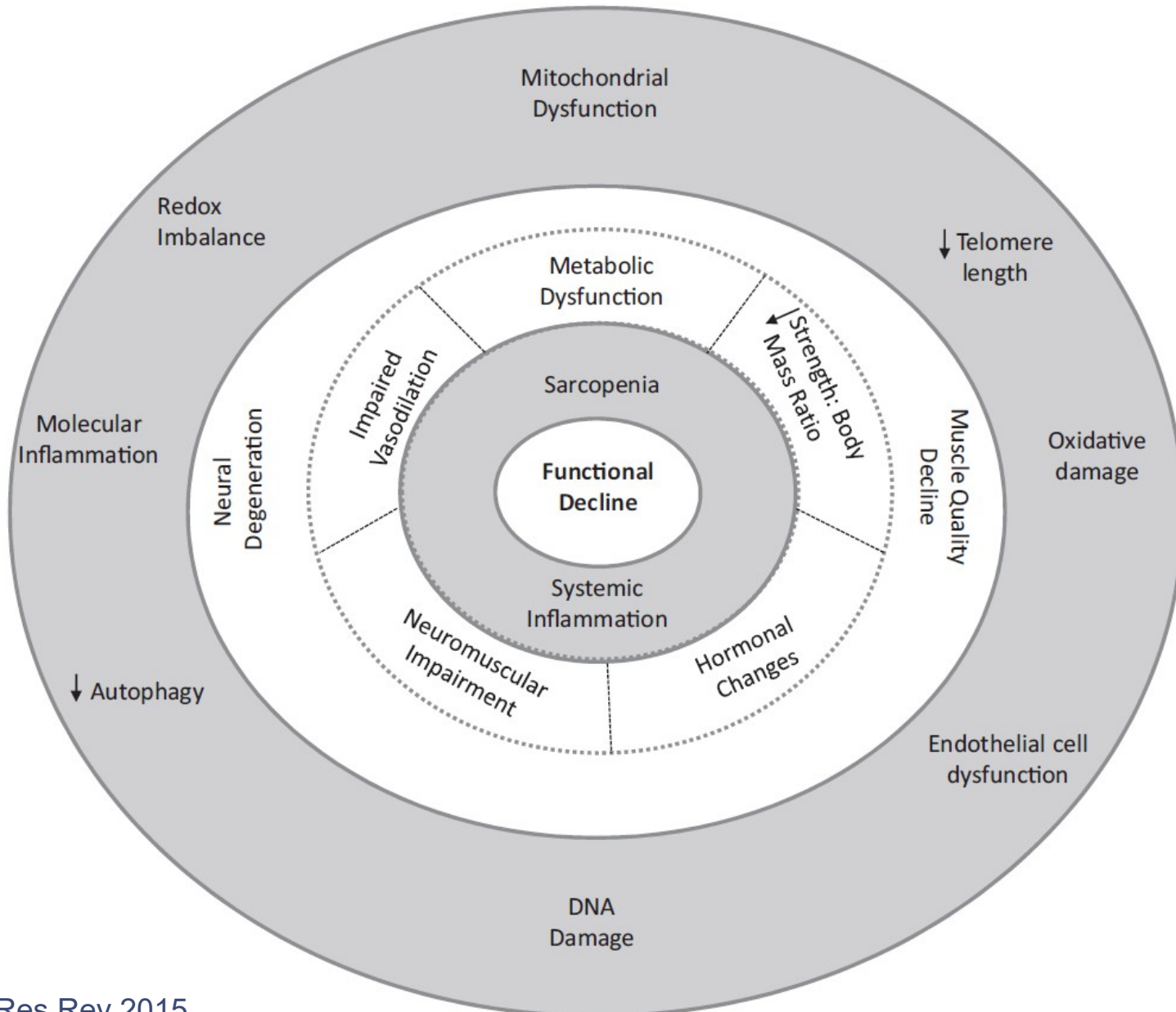


FIGURE 1 Creatinine excretion, a measure of muscle mass, and basal metabolic rate (BMR) as a function of age. Based on original studies of Tzankoff and Norris (1977).

low skeletal muscle mass

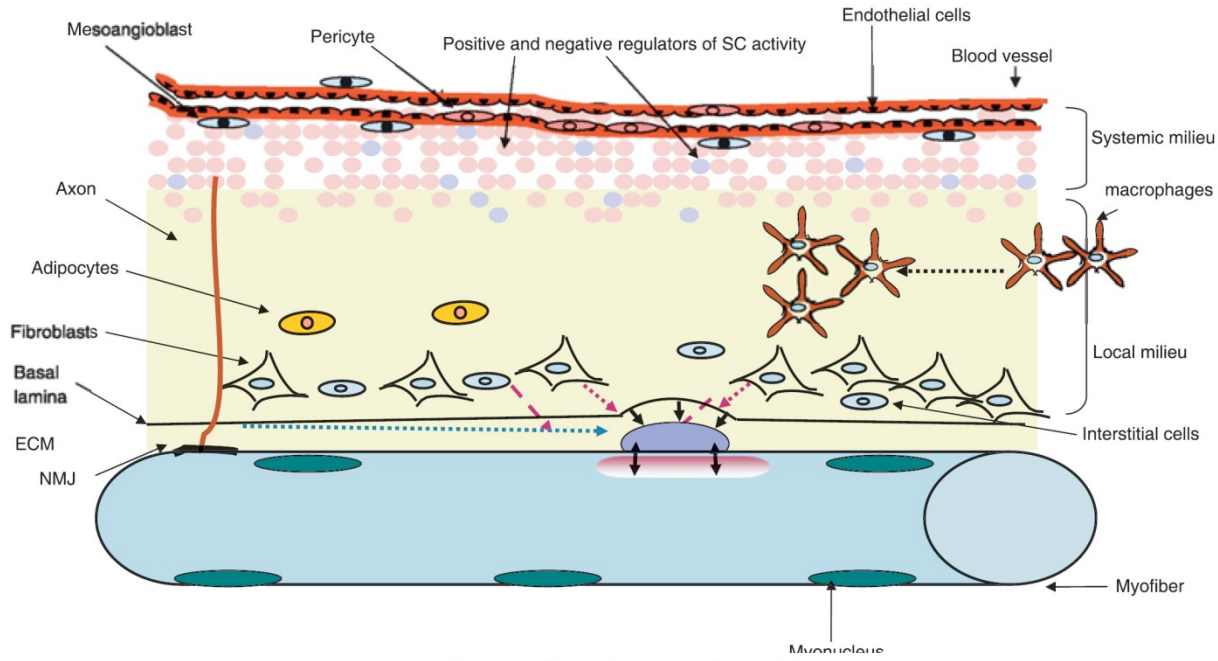
Pathophysiology of functional decline



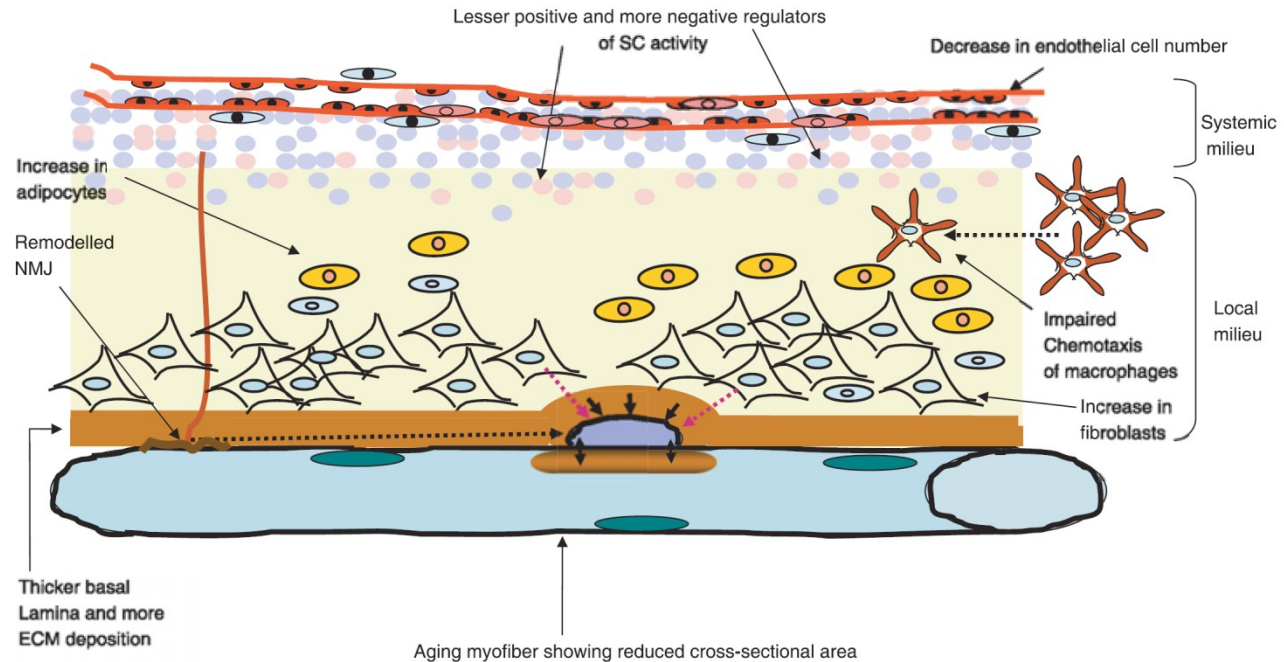


Stem cell niche

young



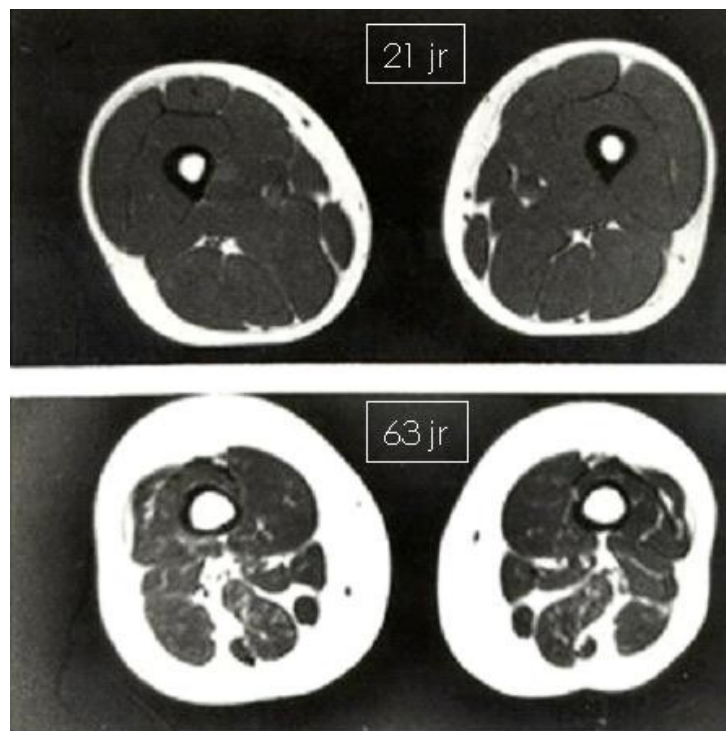
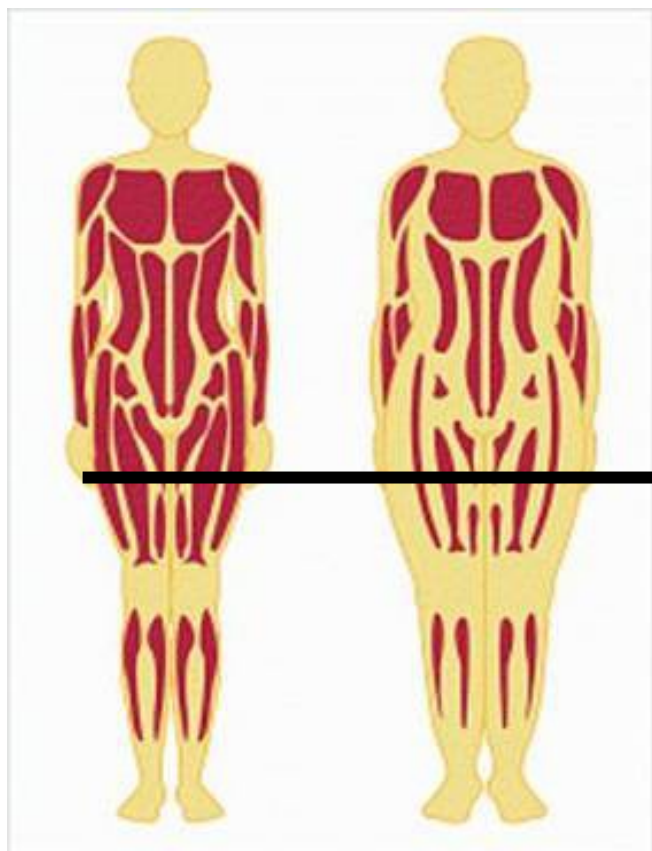
old





21 jr

63 jr



Muscle mass



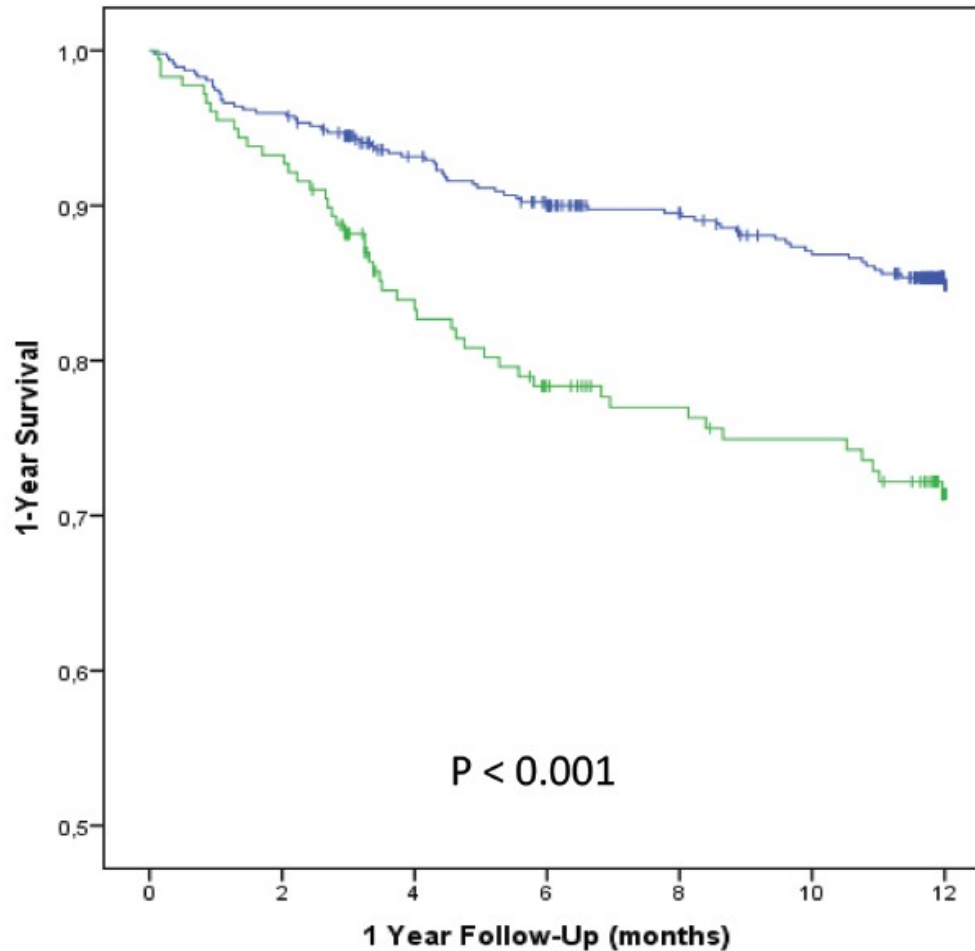
Ling et al., J Nutr 2011; Ling et al., Age 2011

Sarcopenia and mortality

770 in hospital patients, 1 yr mortality follow up

Mean 81 yrs

28% sarcopenic (BIA)



— No Sarcopenia
— Sarcopenia

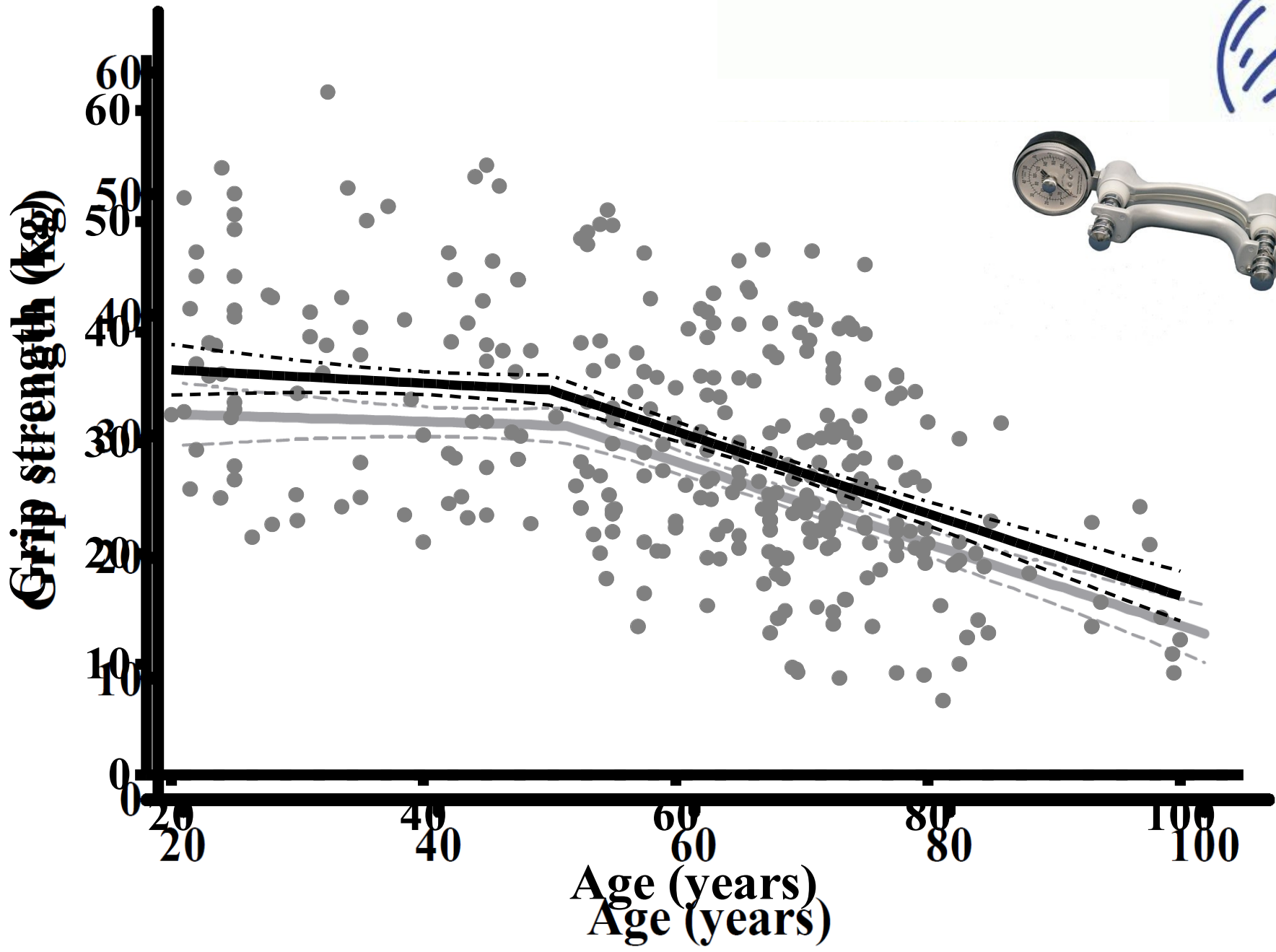
Muscle strength



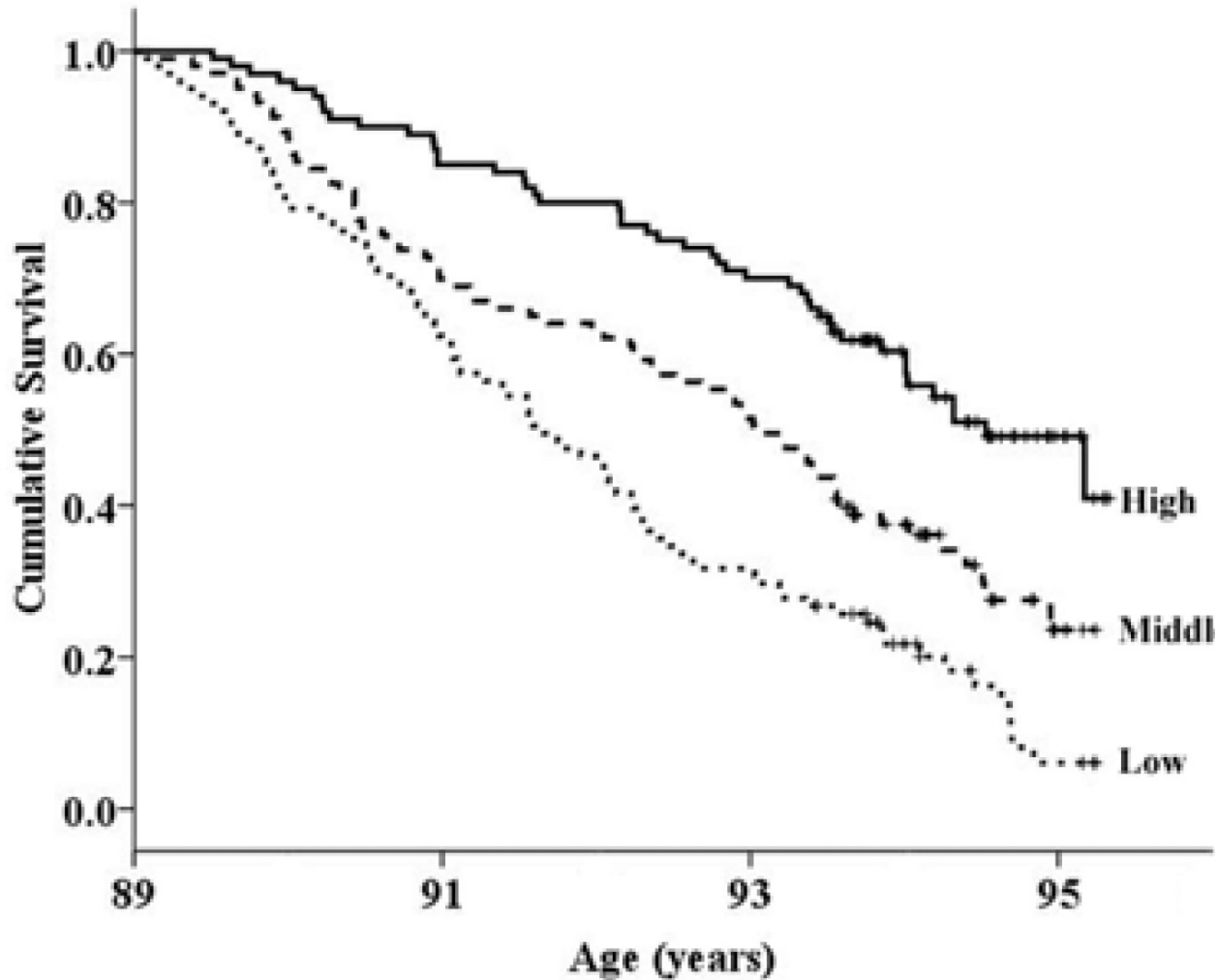
Grip
strength

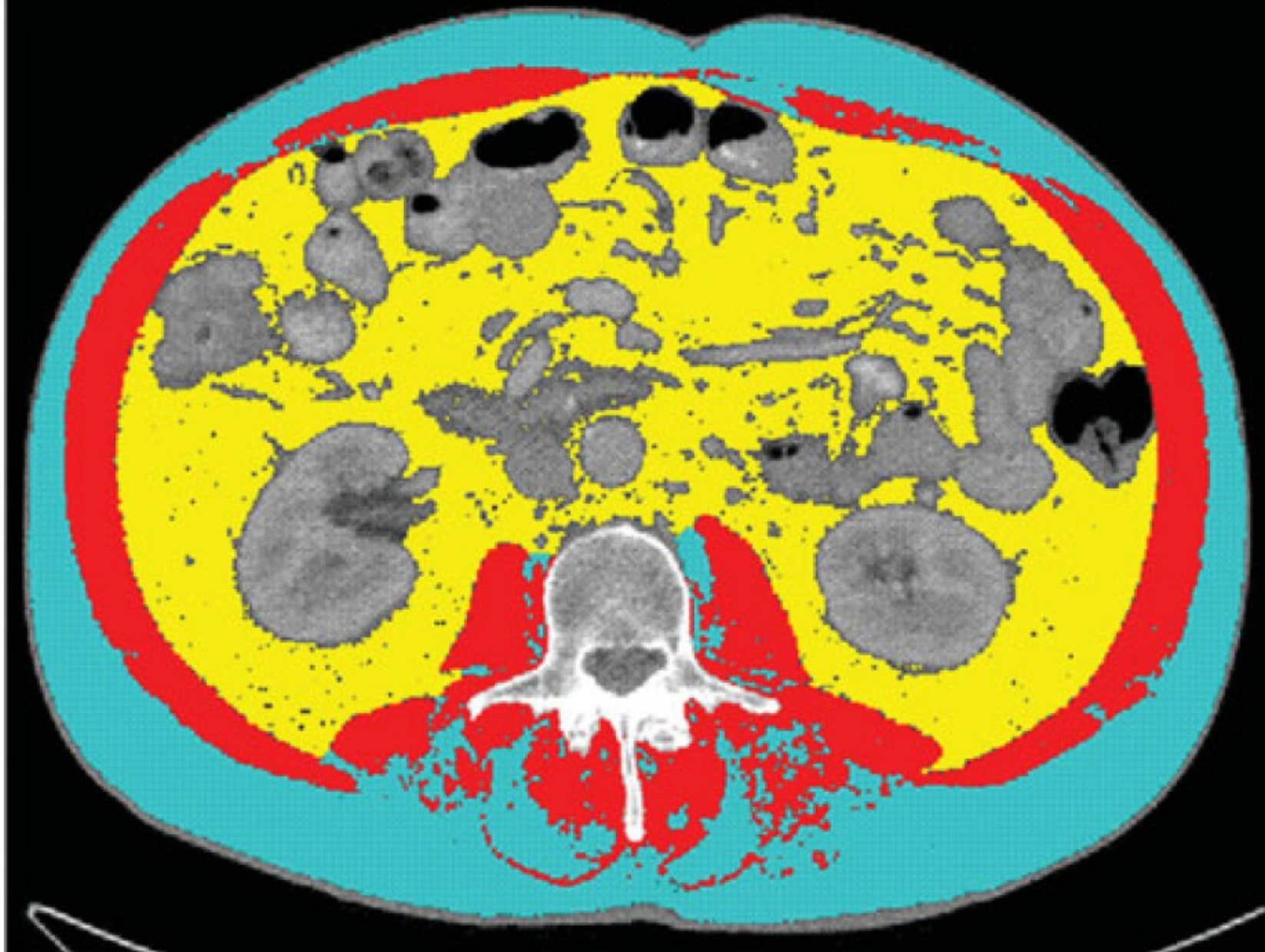
Quadriceps
strength





Muscle strength and survival





Visceral Adipose tissue

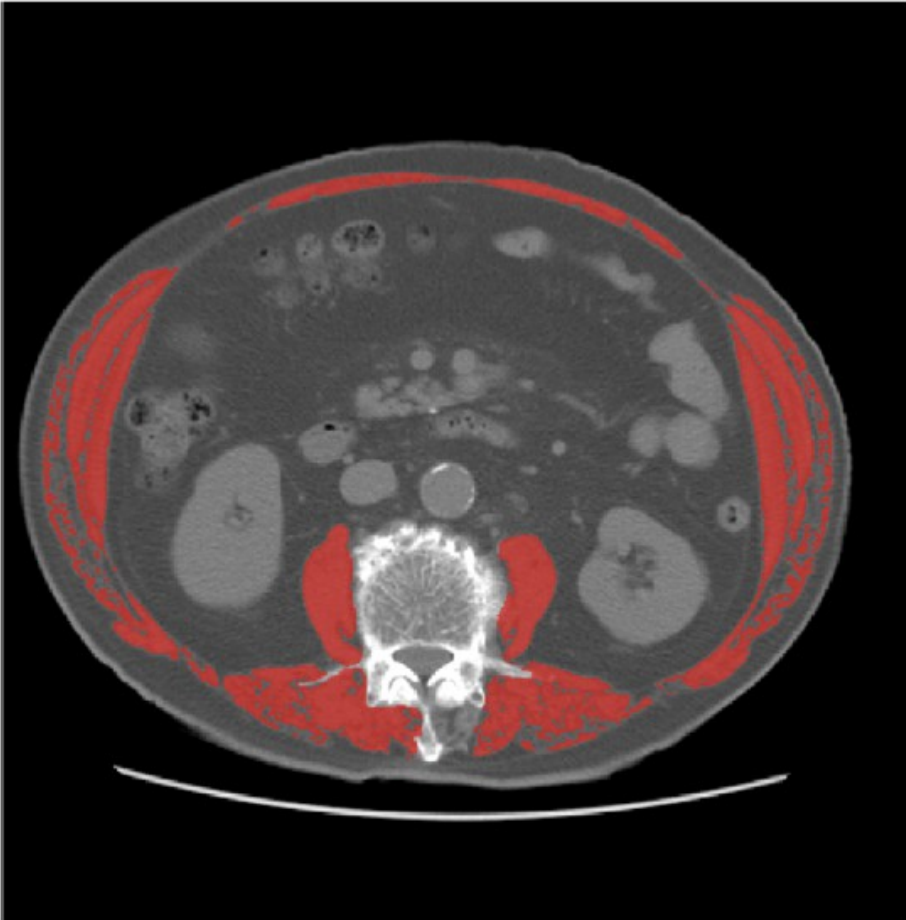


Sub cutaneous Adipose tissue

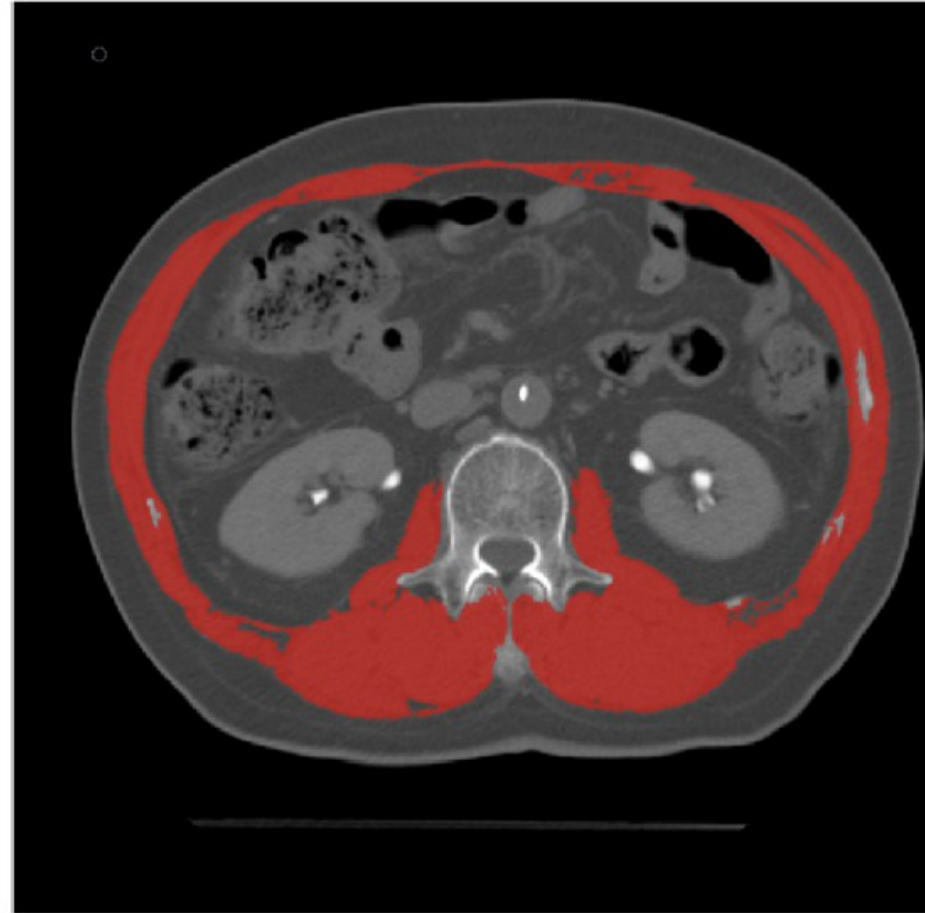


Muscle tissue

L3 SMI = 32.3 cm²/m²



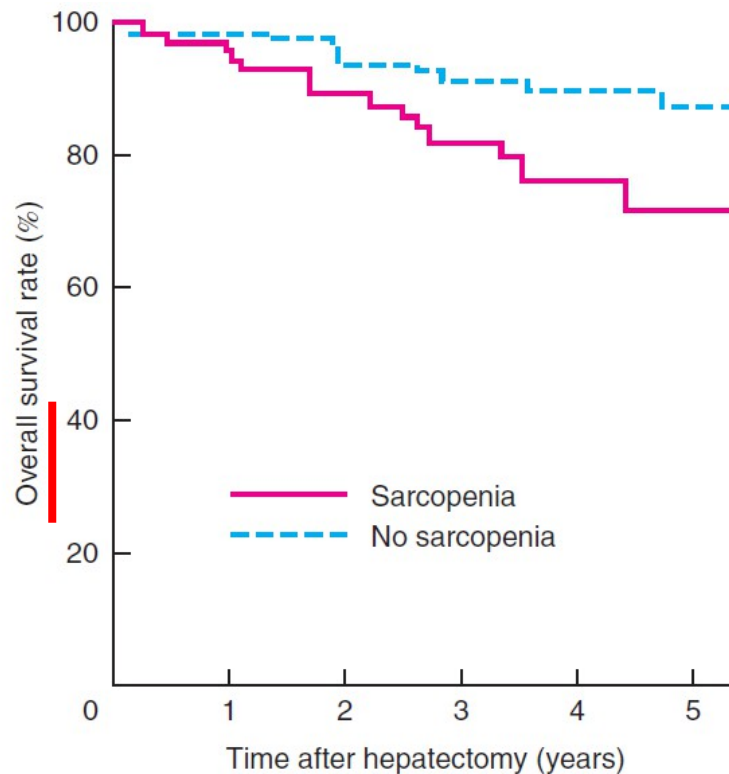
L3 SMI = 51.1 cm²/m²



Hepatocellular carcinoma - survival

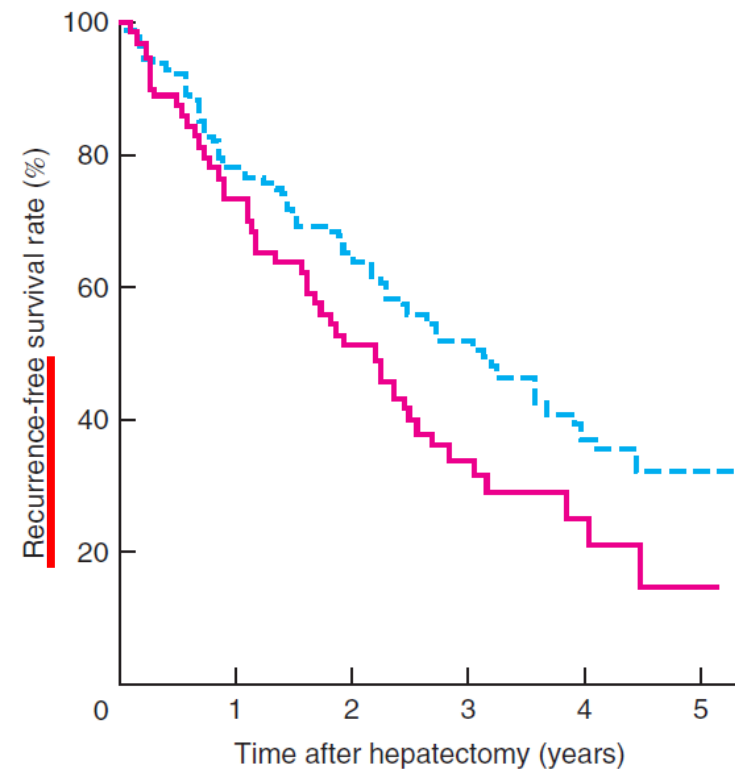


196 pt hepatocellular carcinoma undergoing hepatectomy, CT L3, 40% sarcopenic



No. at risk	0	1	2	3	4	5
Sarcopenia	75	66	53	35	23	12
No sarcopenia	111	102	84	64	50	35

a Overall survival



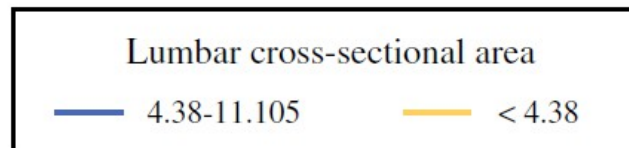
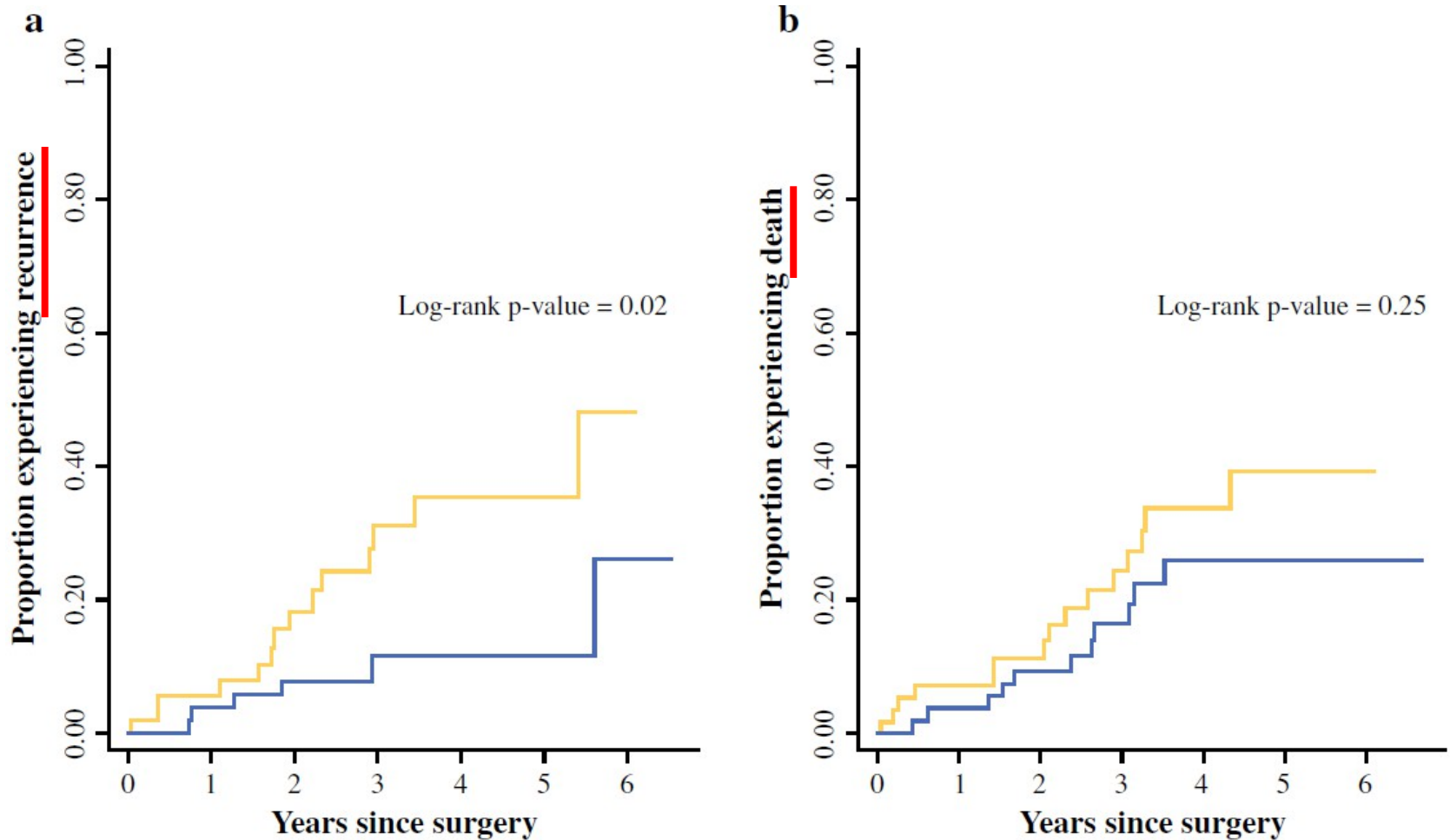
No. at risk	0	1	2	3	4	5
Sarcopenia	75	45	30	14	7	2
No sarcopenia	111	80	61	40	22	12

b Recurrence-free survival

Endometrial cancer - survival

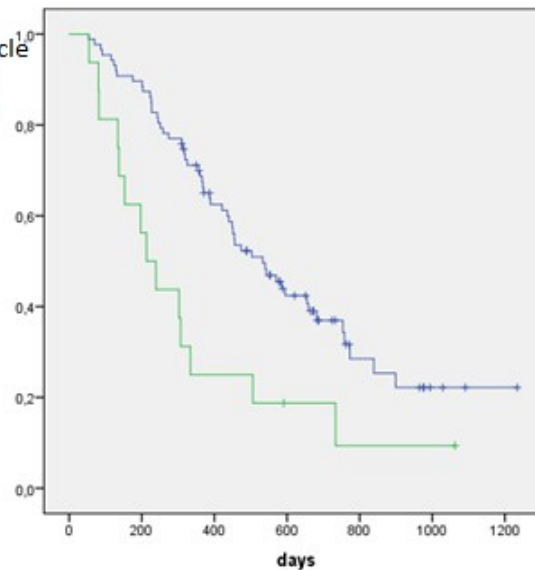
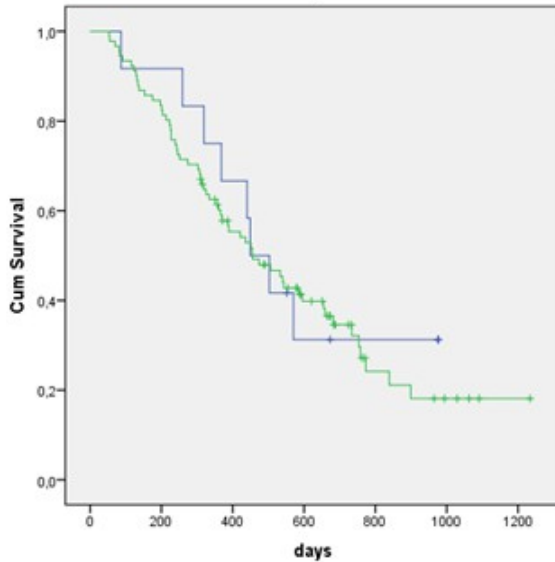
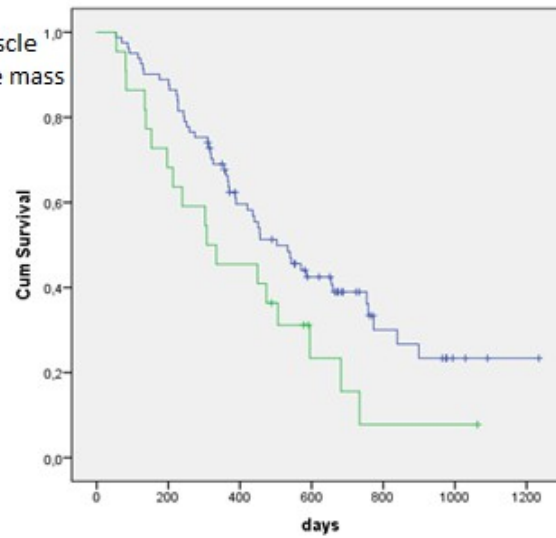
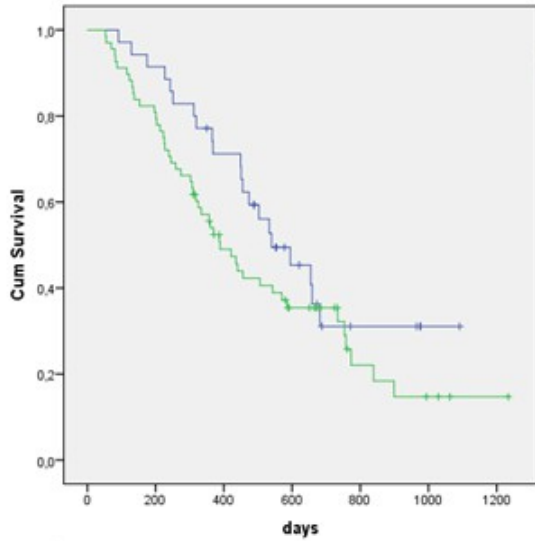


122 pt endometrial cancer, L3 CT, 50% sarcopenic

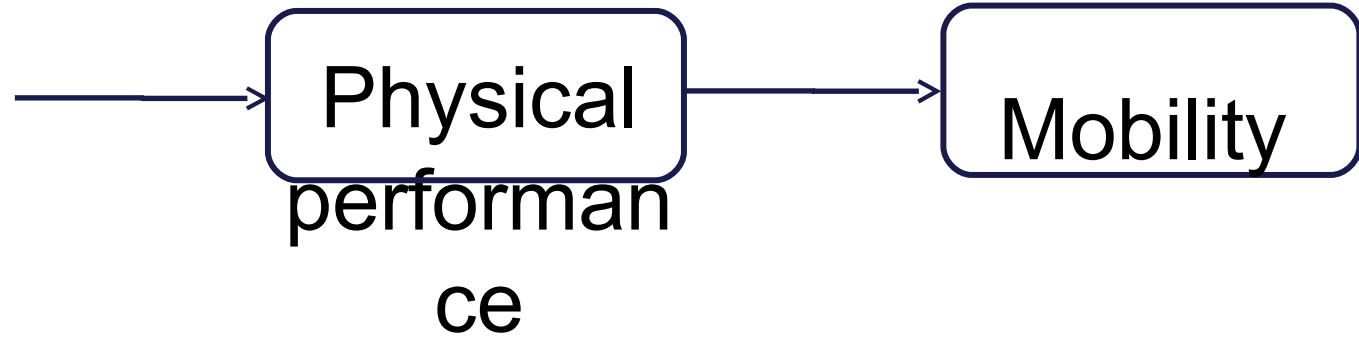


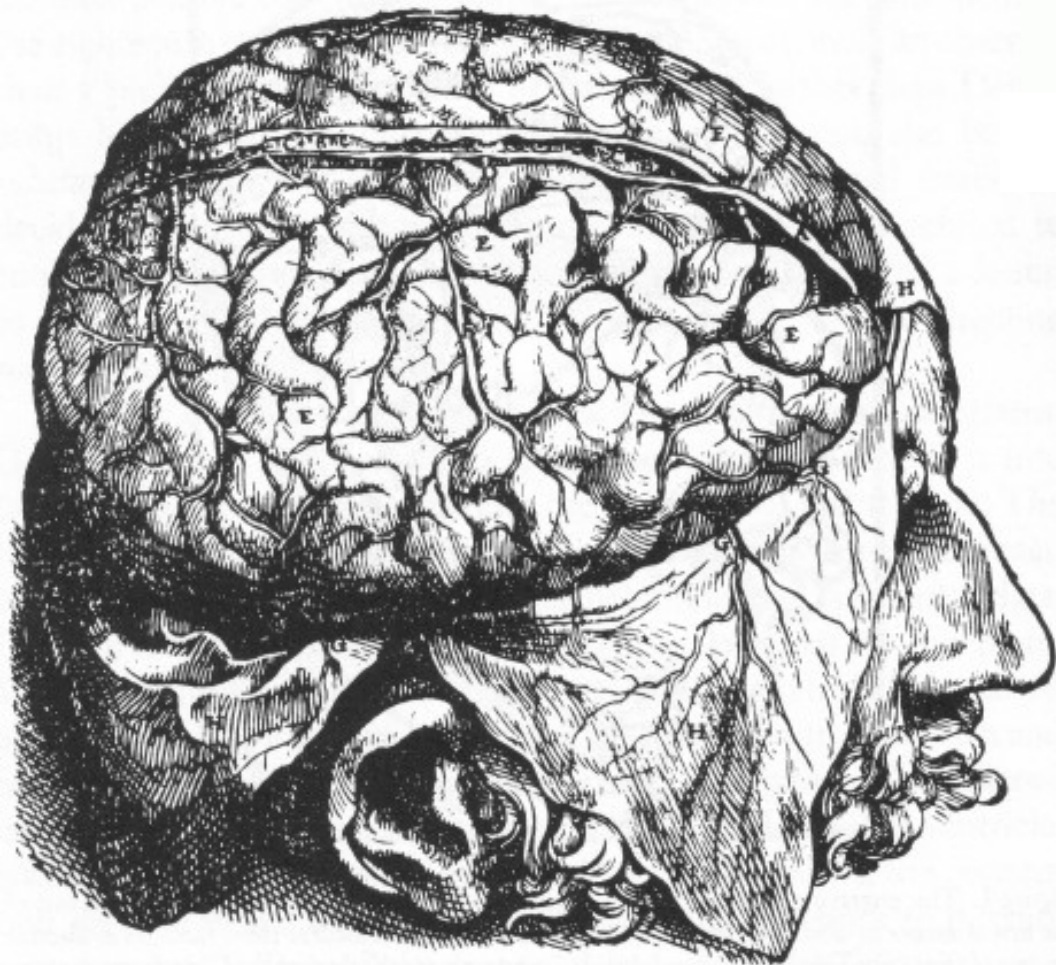
Mixed cancer group - survival

103 pt, 70 yrs, L3 CT



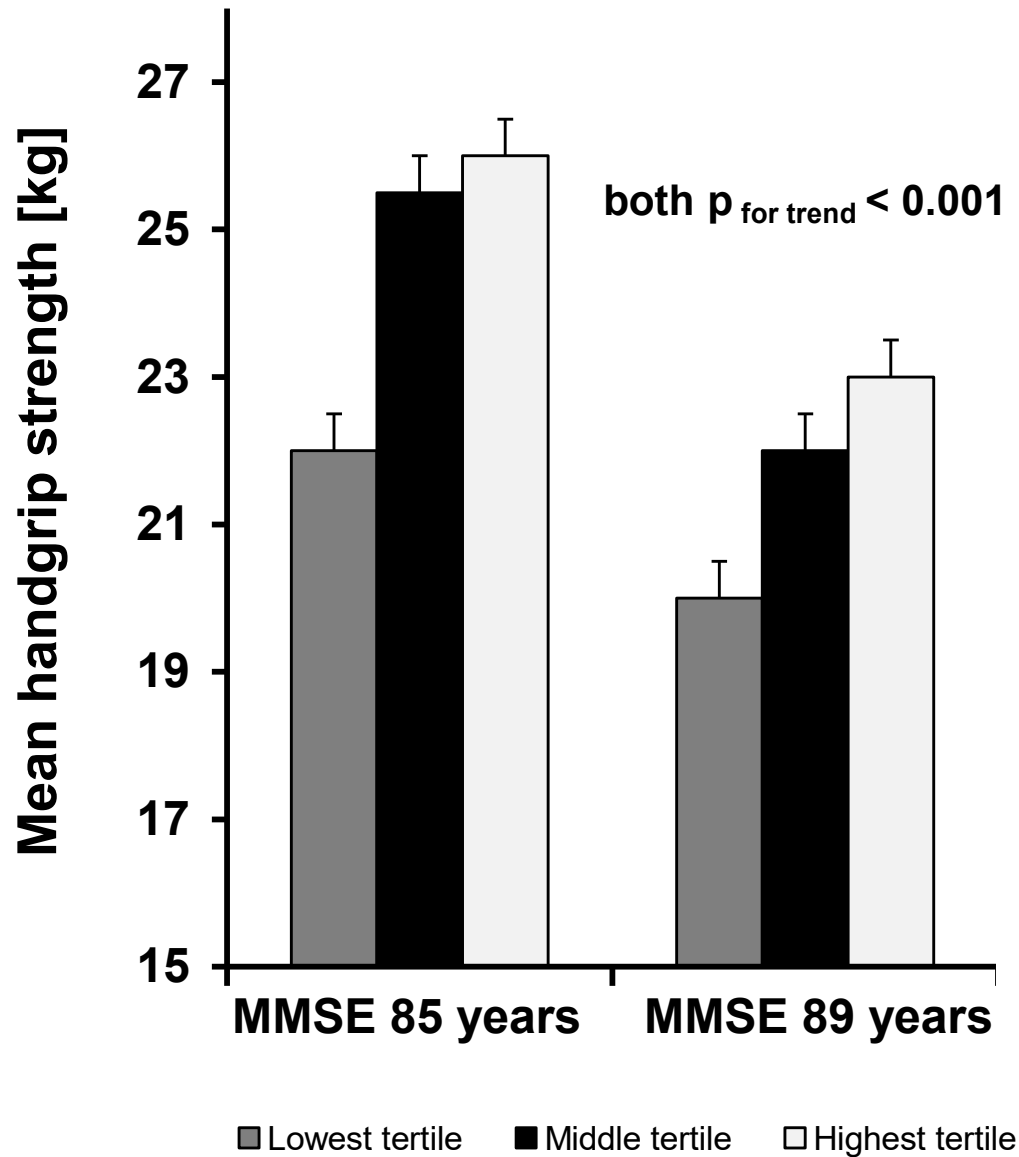
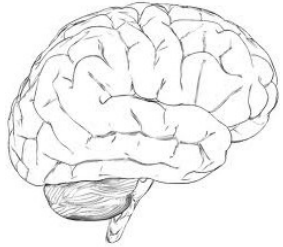
Physical performance



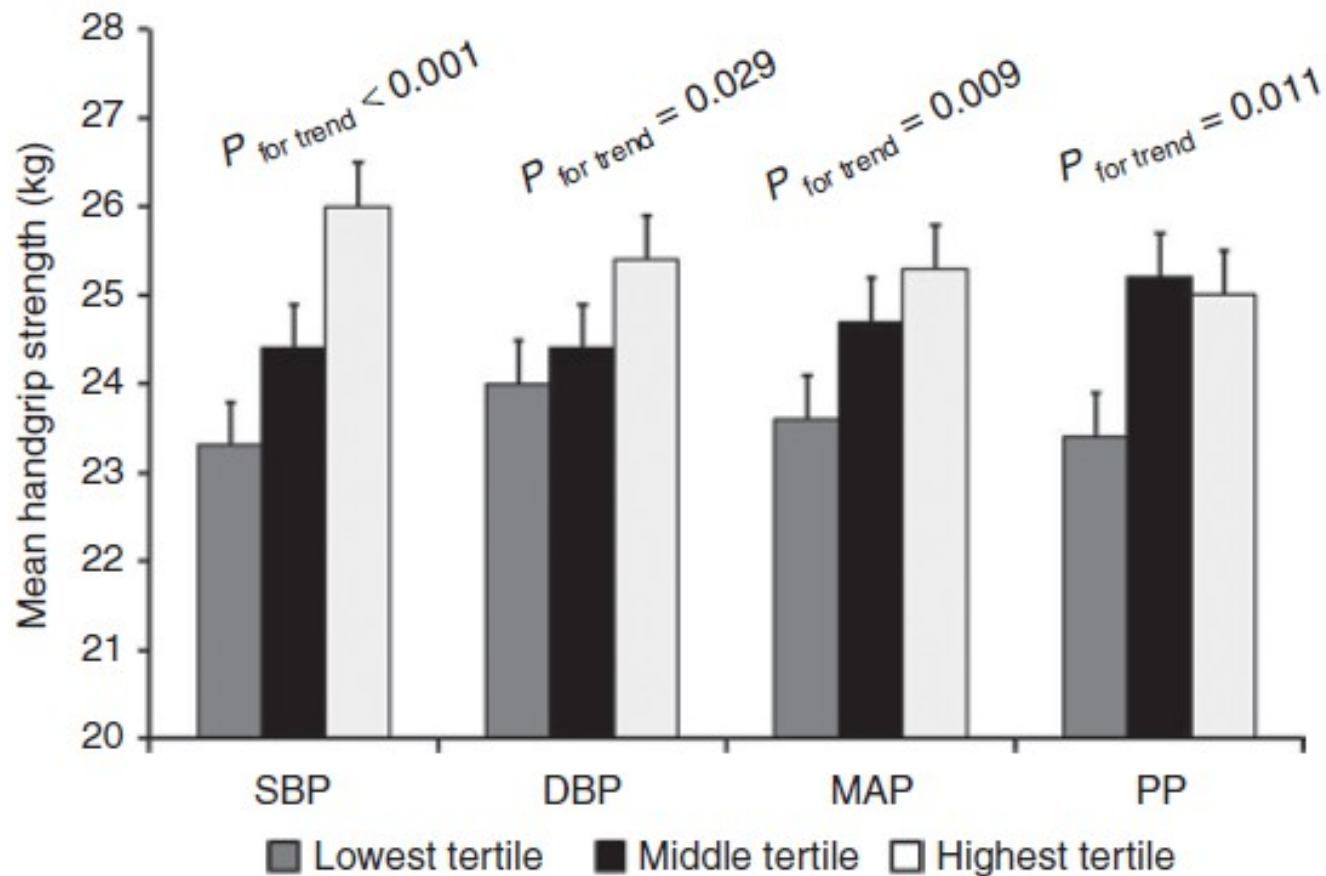


Andreas Vesalius 1514-1564

Muscle strength and cognition

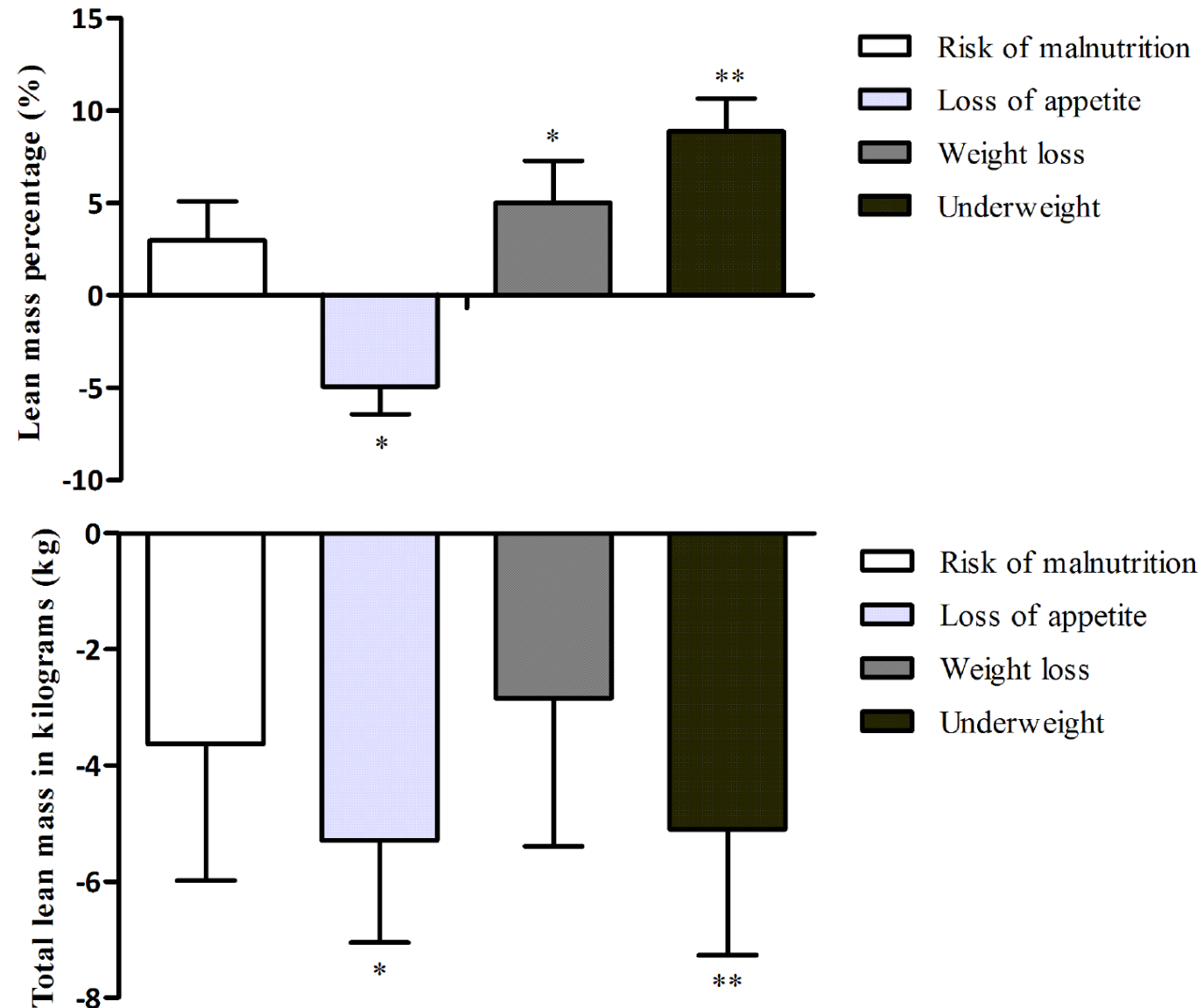


Handknijpkracht en bloeddruk



Malnutrition and body composition

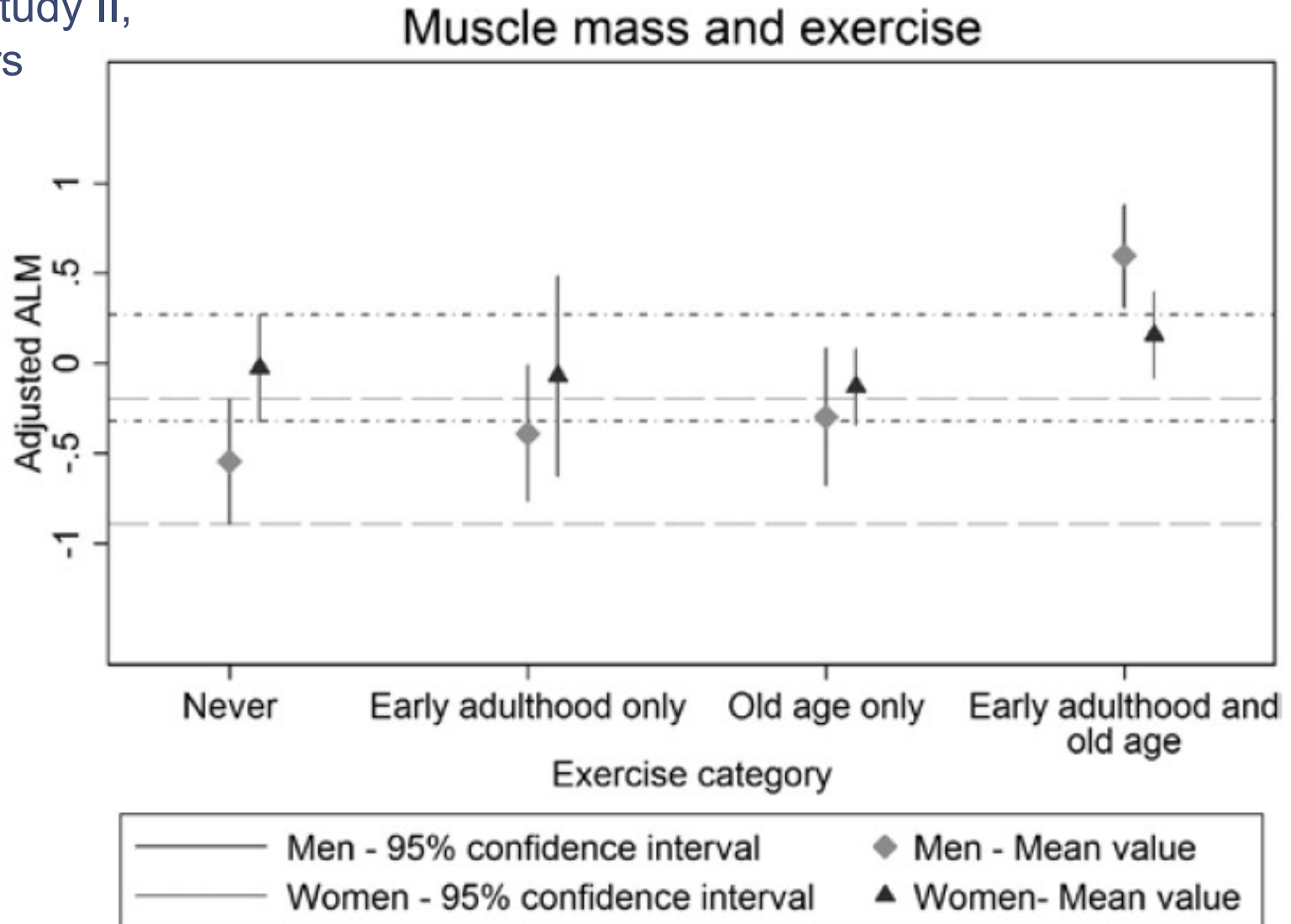
185 geriatric outpatients, mean 82 years, SNAQ and BIA



Exercise and muscle mass



Berlin Aging Study II,
N=891, 60+ yrs



Exercise and grip strength



Berlin Aging Study II,
N=891, 60+ yrs



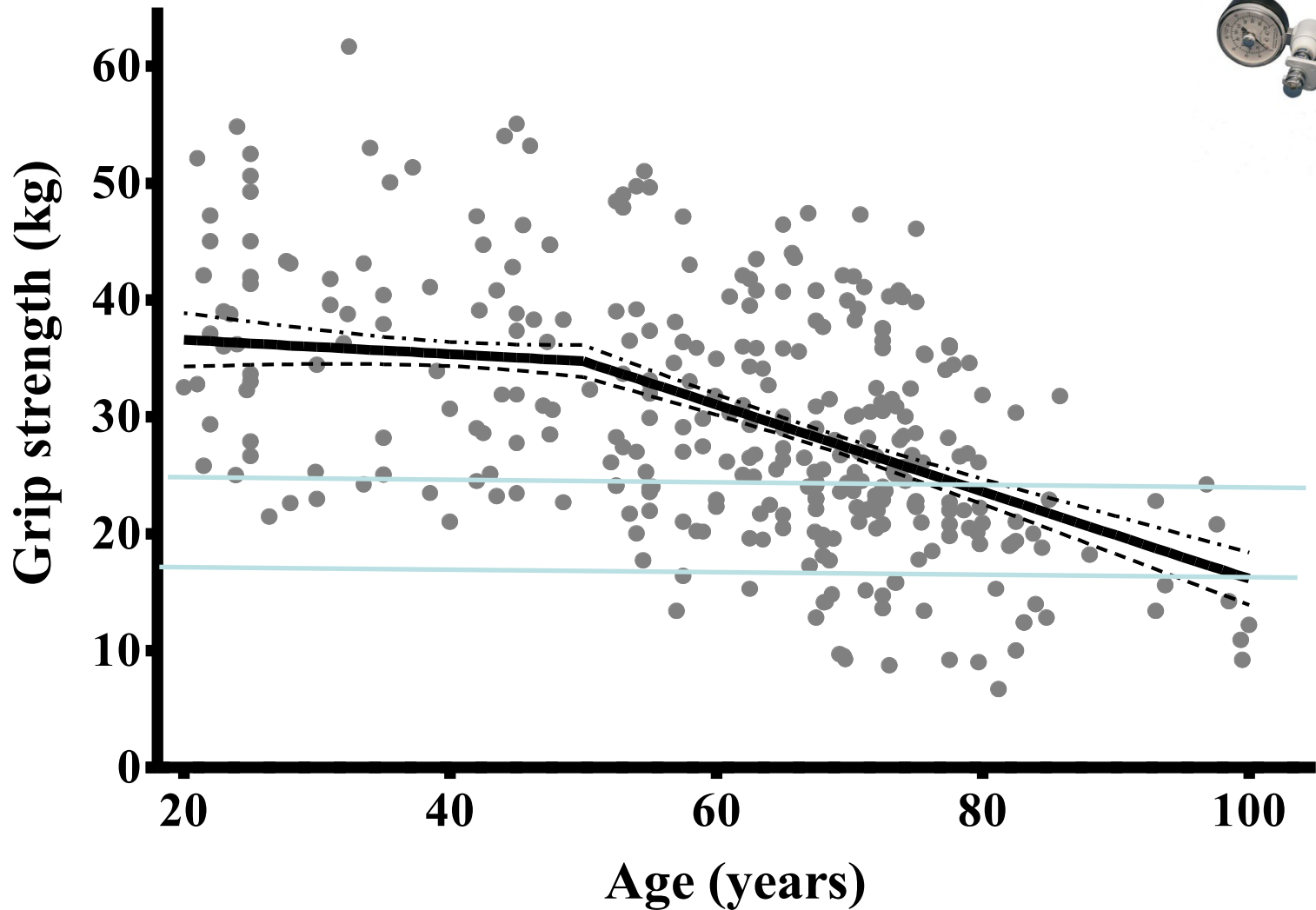


Kennis en diagnostiek

	Vooraf	Achteraf
Kennis		
Bekend met definitie, n (%)	154 (69.7)	n.v.t.
Vermoeden op sarcopenie*, n (%)	181 (82.6)	n.v.t.
Weet hoe te diagnosticeren, n (%)	46 (21.4)	214 (97.3)
Diagnostische meetinstrumenten		
Geen, n (%)	83 (37.6)	10 (4.5)
Spiermassa, n (%)	20 (9.0)	64 (29.1)
Spierkracht, n (%)	75 (33.9)	175 (79.5)
Loopsnelheid, n (%)	43 (19.5)	167 (75.9)

*Vraag: "Heeft u in de afgelopen maand patiënten gezien waarbij u vermoedde dat er sprake zou kunnen zijn van sarcopenie?"

Muscle strength and age



?

Used definitions



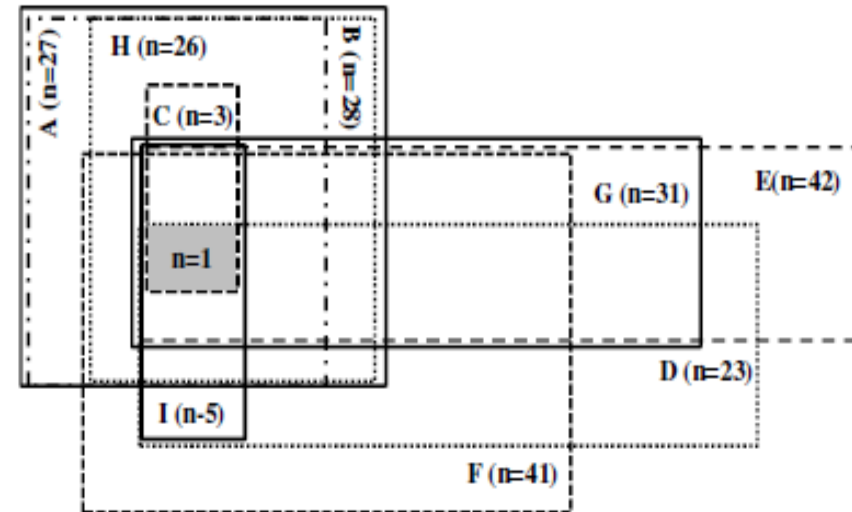
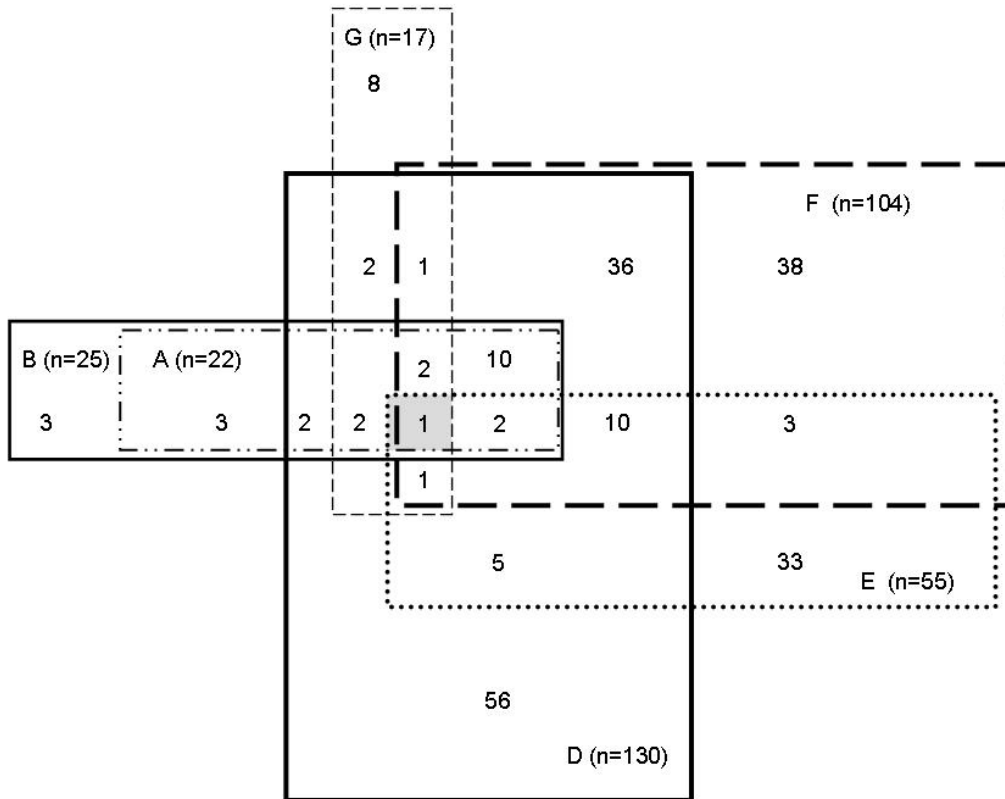
Code	Formula	Cut-off point			Cohort used as reference population	Reference†
		Sarcopenia present	Men	Women		
A	ALM/height ²	> 2 SD below RP	7.26 kg/m ²	5.45 kg/m ²	Rosetta Study (1986-1992) non-Hispanic white men and women aged 18-40 years	Baumgartner 1998
B	ALM/height ²	Under 20th percentile	7.25 kg/m ²	5.67 kg/m ²	Health ABC Study (1997/1998), 2976 men and women 70-79 years old black and white, Pittsburgh, Pennsylvania and Memphis, Tennessee	Delmonico 2007
C	ALM/height ²	> 2 SD below RP	6.19 kg/m ²	4.73 kg/m ²	NHANES survey (1999 - 2004) white men and women aged 20 years	Kelly 2009
D	ALM with height and fat mass	Under 20th percentile	NA	NA	NA	Delmonico 2007
E	Skeletal lean mass/body mass * 100%	>2 SD below RP is class II sarcopenia 1-2 SD below RP is class I sarcopenia	31% 37%	22% 28%	NHANES III (1988-1994), 6414 men and women aged 18-39 years non-Hispanic white, non-Hispanic black and Mexican-American	Janssen 2002
F	Skeletal lean mass/ height ²	ROC analysis	8.50 10.75 kg/m ²	5.75 6.75 kg/m ²	NHANES III (1988-1994), 60 years plus, non-Hispanic white, black and Mexican-American	Janssen 2004
G	Optimal cutpoint for grip strength, walking slower than 0.8 m/s	Below optimal cutpoint	30.3 kg	19.3 kg	InCHIANTI (1998-2000), 1030 subjects aged 20 - 102 years, ,	Lauretani 2003

'Concordance' sarcopenia



Middle aged

Elderly

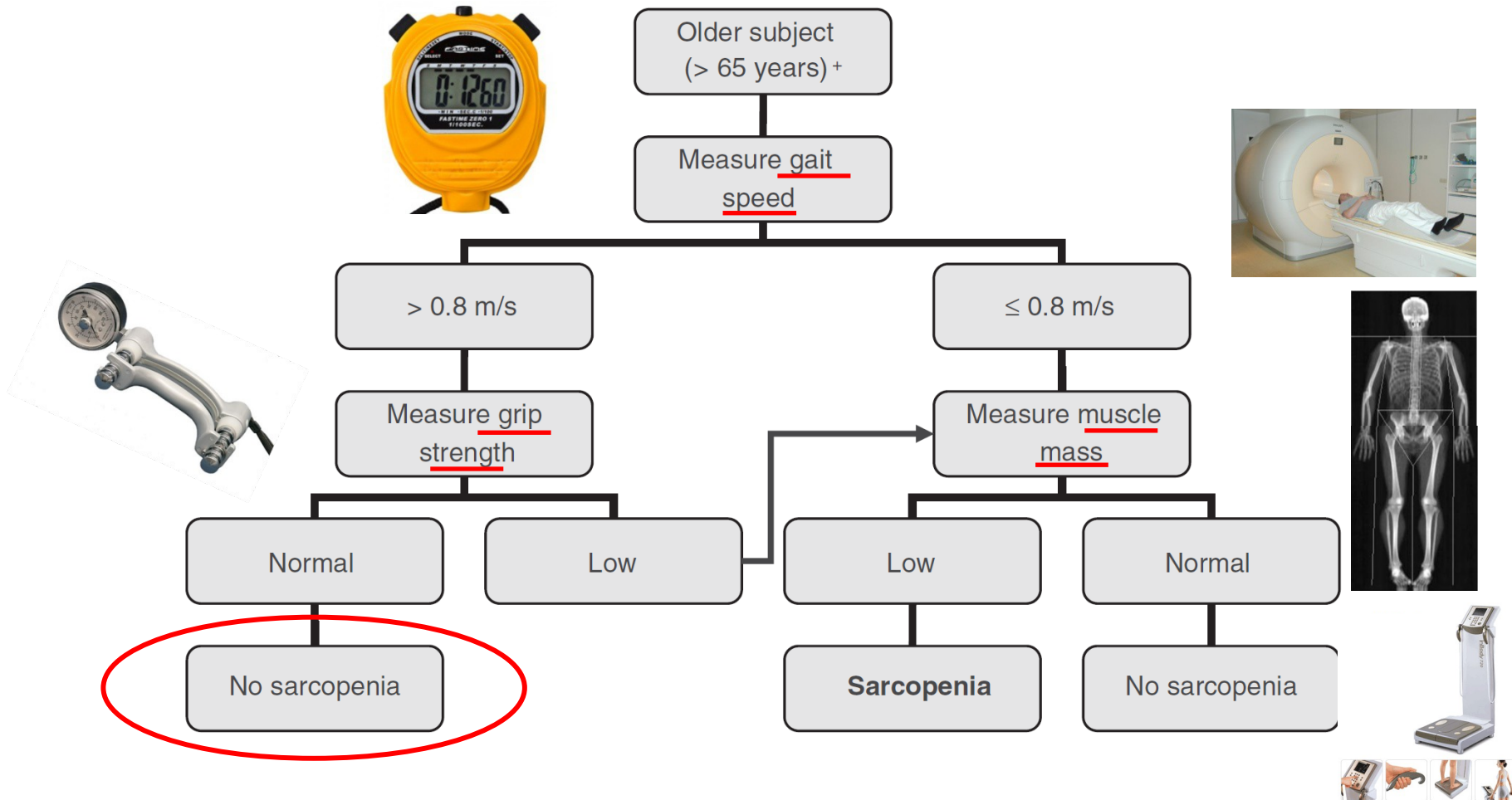


Used definitions - no concordance



Code	Formula	Cut-off point		Cohort used as reference population	Reference†
		Sarcopenia present	Men		
A	ALM/height ²	> 2 SD below RP	7.26 kg/m ²	5.45 kg/m ²	Rosetta Study (1986-1992) non-Hispanic white men and women aged 18-40 years Baumgartner 1998
B	ALM/height ²	Under 20th percentile	7.25 kg/m ²	5.67 kg/m ²	Health ABC Study (1997/1998), 2976 men and women 70-79 years old black and white, Pittsburgh, Pennsylvania and Memphis, Tennessee Delmonico 2007
C	ALM/height ²	> 2 SD below RP	6.19 kg/m ²	4.73 kg/m ²	NHANES survey (1999 - 2004) white men and women aged 20 years Kelly 2009
D	ALM with height and fat mass	Under 20th percentile	NA	NA	NA Delmonico 2007
E	Skeletal lean mass/body mass * 100%	>2 SD below RP is class II sarcopenia 1-2 SD below RP is class I sarcopenia	31% 37%	22% 28%	NHANES III (1988-1994), 6414 men and women aged 18-39 years non-Hispanic white, non-Hispanic black and Mexican-American Janssen 2002
F	Skeletal lean mass/ height ²	ROC analysis	8.50 10.75 kg/m ²	5.75 6.75 kg/m ²	NHANES III (1988-1994), 60 years plus, non-Hispanic white, black and Mexican-American Janssen 2004
G	Optimal cutpoint for grip strength, walking slower than 0.8 m/s	Below optimal cutpoint	30.3 kg	19.3 kg	InCHIANTI (1998-2000), 1030 subjects aged 20 - 102 years, , Lauretani 2003

European consensus

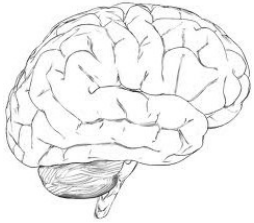


* Comorbidity and individual circumstances that may explain each finding must be considered

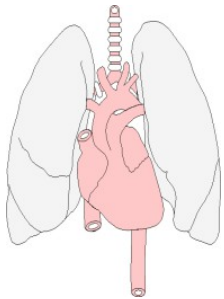
+ This algorithm can also be applied to younger individuals at risk



Assessment voor start interventies



Cognitief functioneren (MMSE + VAT), depressieve symptomen (GDS)



Bloeddruk, orthostatische hypotensie
ECG/longfunctie op indicatie



Spierkracht, functionele testen



Gewrichtsfunctie, osteoporose

EN: Voedingsstatus, vitamine status, medicatie

Sarcopenia interventions



- resistance, endurance, balance training
- Prevent inactivity!

Effects of strength and endurance training on thigh and leg muscle mass and composition in elderly women

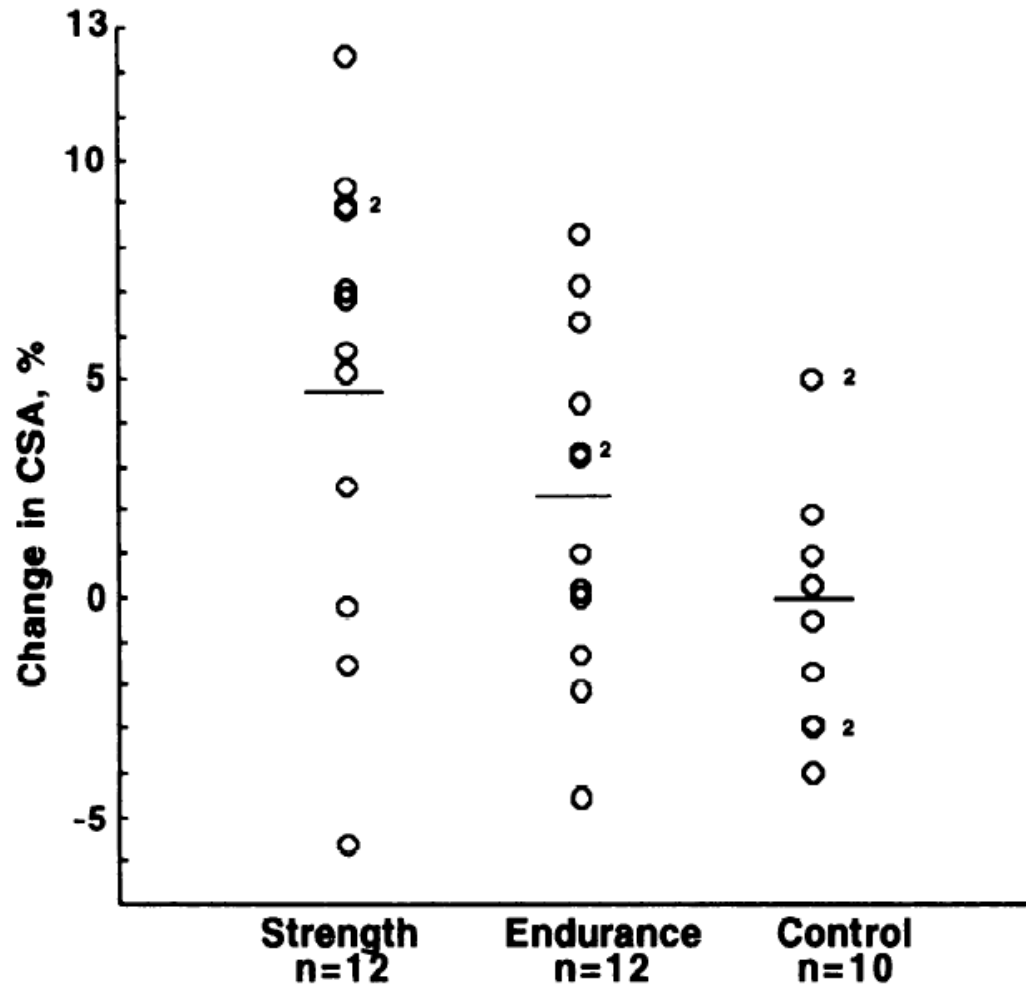
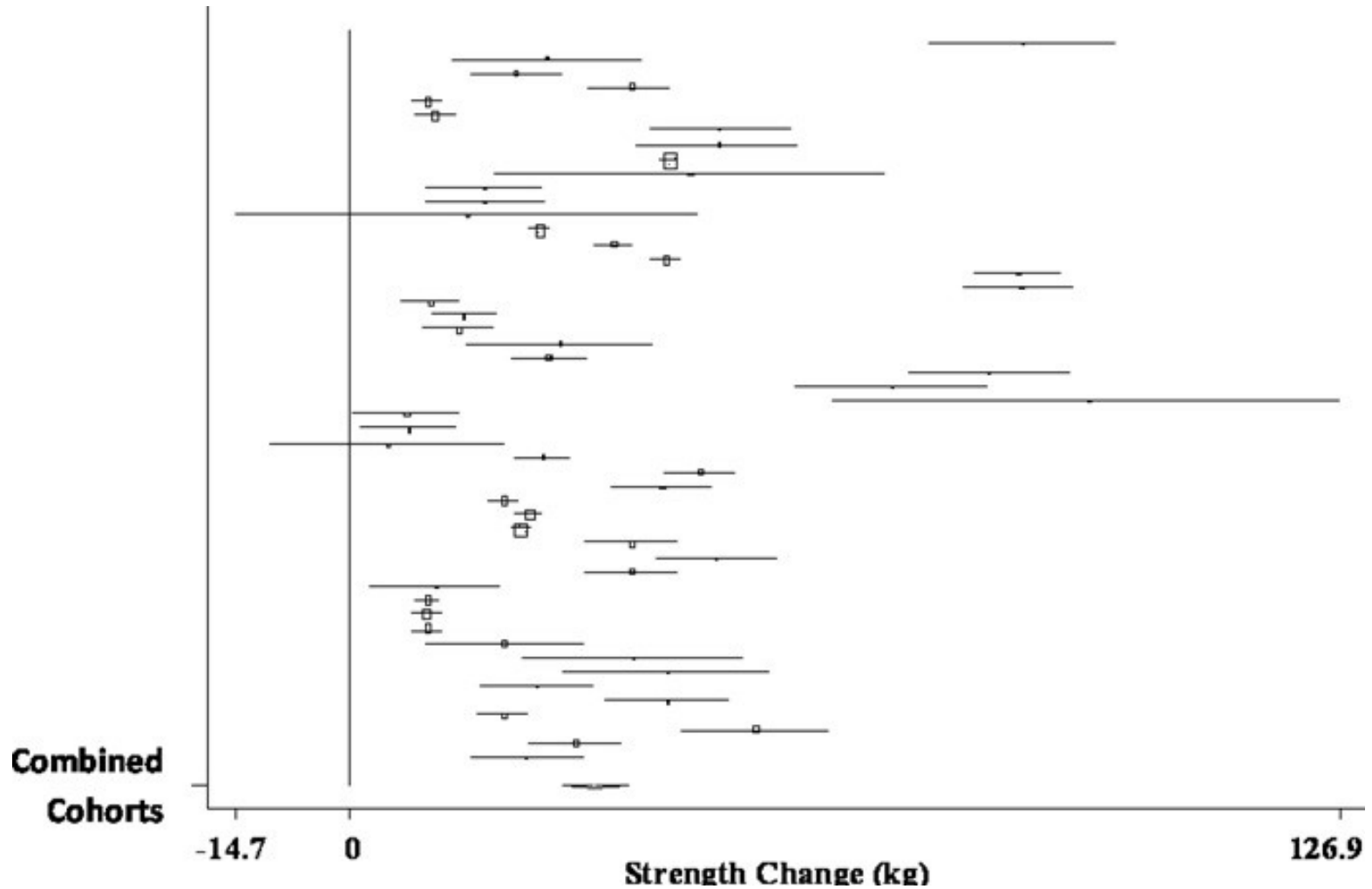


FIG. 1. Individual changes in quadriceps muscle cross-sectional area (CSA) in 76- to 78-yr-old strength-trained, endurance-trained, and control women. *n*, no. of women. —, Means.

**16 weeks
3 x /week**

Leg press after intervention



Sarcopenia interventions



- resistance, endurance, balance training
- Prevent inactivity!



- Diet, amino acids, vitamins

Oral Amino Acids in Elderly Subjects: Effect on Myocardial Function and Walking Capacity

	Group A (n = 48)		Group B (n = 47)	
	baseline	AA	baseline	placebo
6-min walk distance, m	212.5 ± 34	268.8 ± 34.9*	212 ± 36	212 ± 40
WIQ distance, %	54.2 ± 10.9	68.3 ± 12*	54 ± 12.9	53 ± 14.8
WIQ speed, %	52.2 ± 12	72.2 ± 14.4*	53 ± 12.8	52.8 ± 12
WIQ stairs, %	72.4 ± 20.6	98.2 ± 24*	72.6 ± 22	72.4 ± 22
MIMS, kg	14.6 ± 2.2	20.2 ± 2*	14.4 ± 2.4	14 ± 2.8

WIQ = Walking impairment questionnaire; MIMS = maximal isometric muscle strength; values are mean ± SD; * p < 0.001 for comparison of post intervention values between groups.

**12 g amino acids / d
3 month**

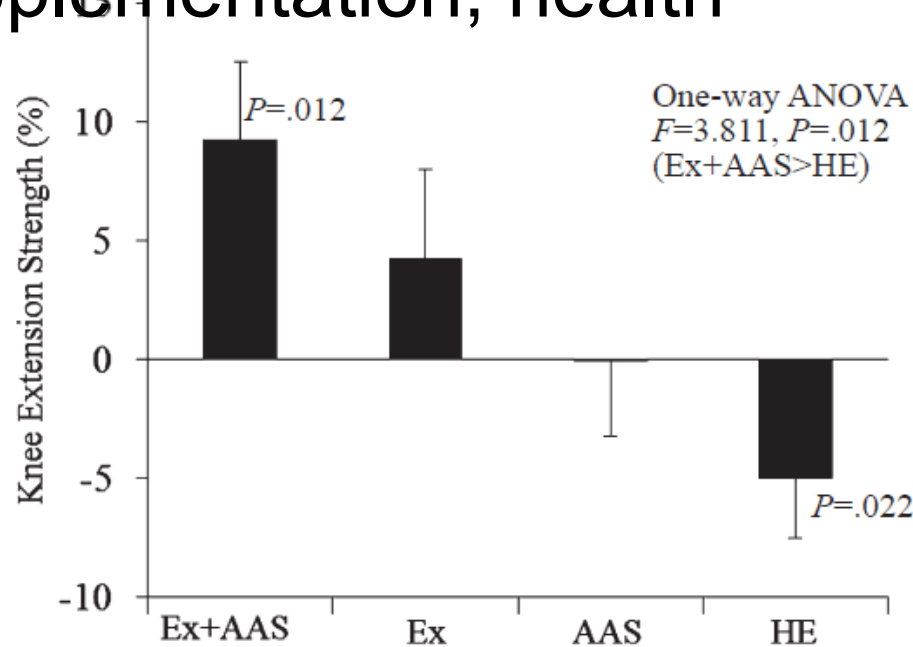
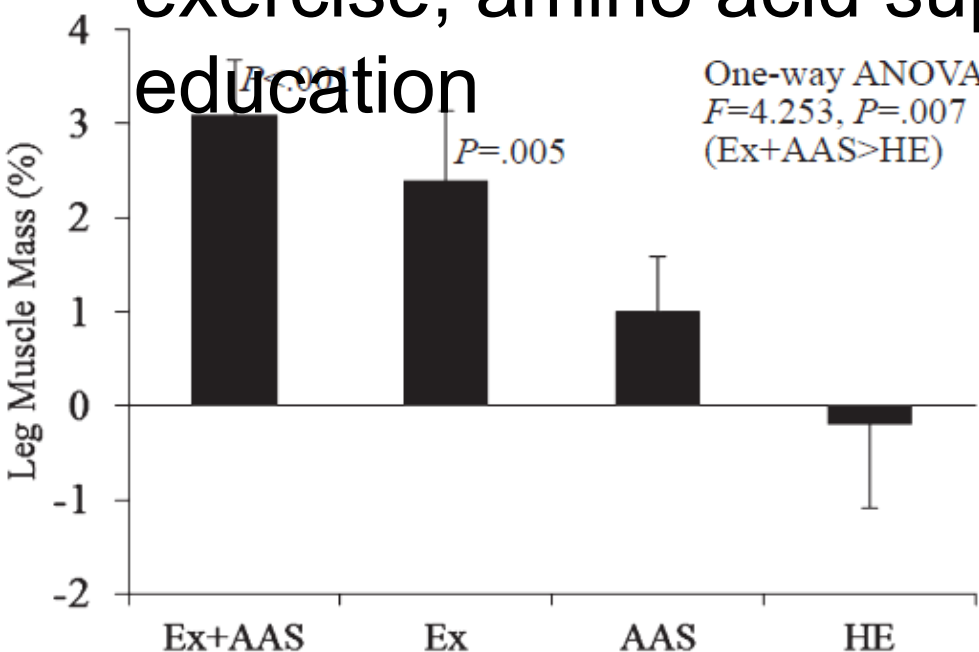
Effects of Exercise and Amino Acid Supplementation on Body Composition and Physical Function in Community-Dwelling Elderly Japanese Sarcopenic Women: A Randomized Controlled Trial

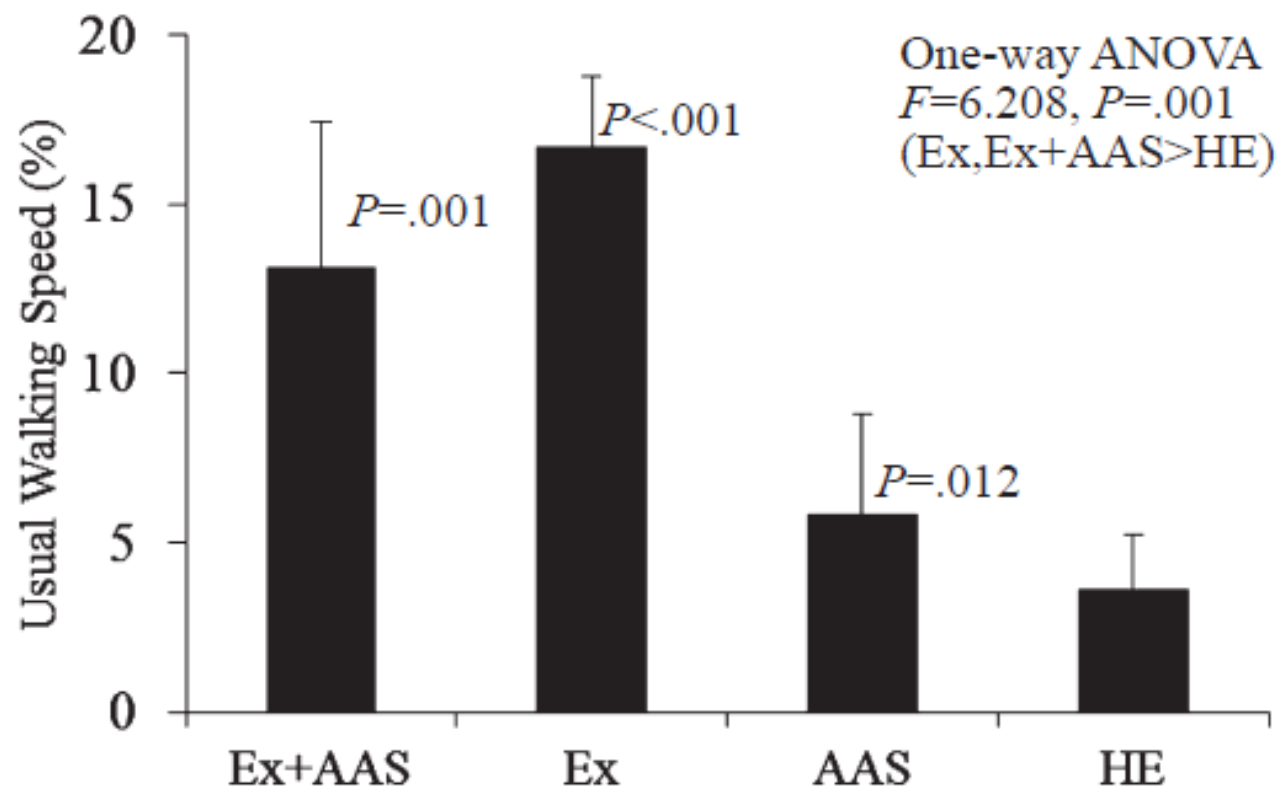


Hun Kyung Kim, PhD,* Takao Suzuki, MD, PhD,[†] Kyoko Saito, PhD,* Hideyo Yoshida, MD, PhD,* Hisamine Kobayashi, DVM,[‡] Hiroyuki Kato, MS,[‡] and Miwa Katayama, DVM[‡]

N=154, 75y+

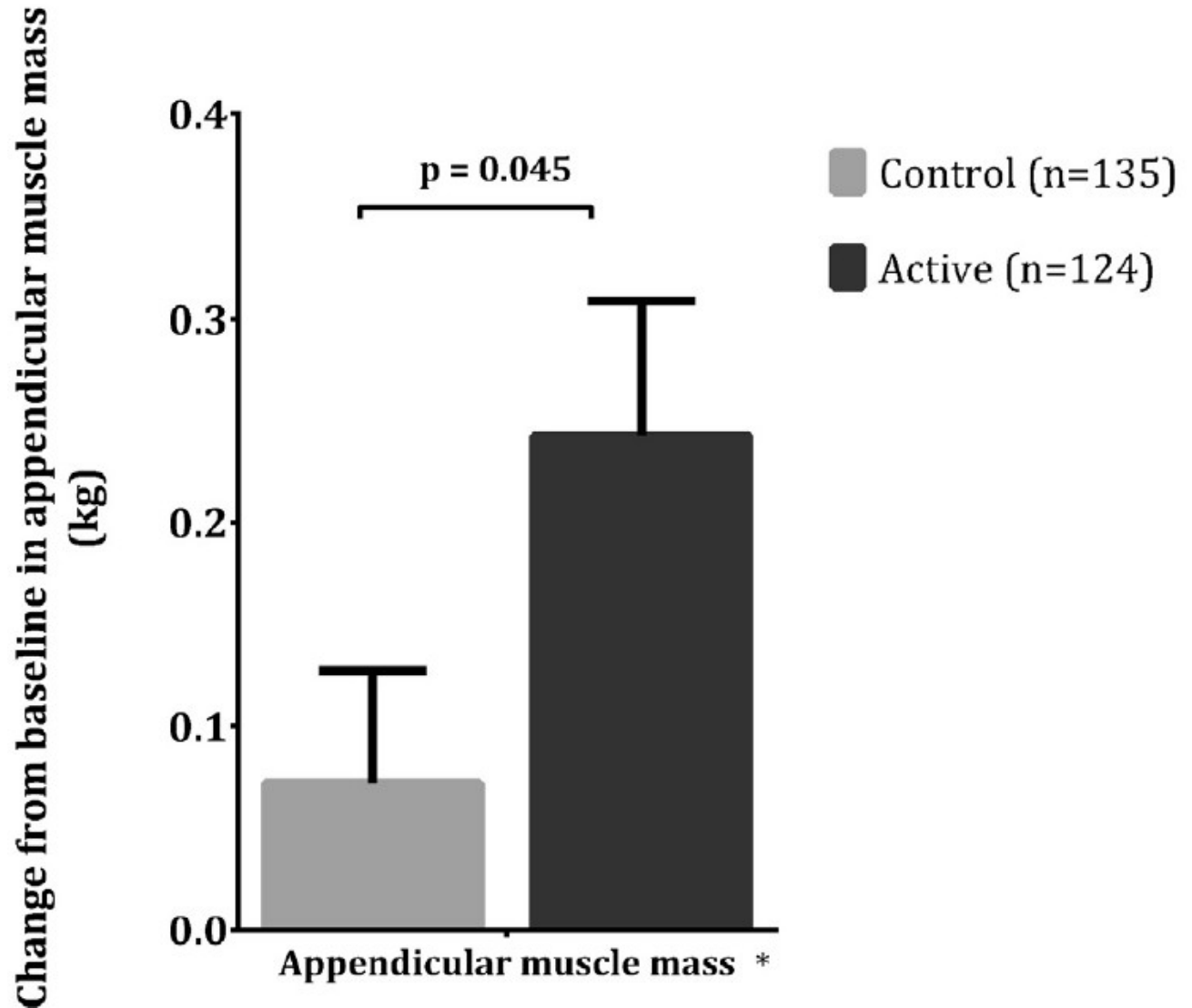
Exercise AND amino acid supplementation,
exercise, amino acid supplementation, health
education





PROVIDE study

RCT 13 wk Vit D/leucine enriched protein, SPPB primay outcome
N=380 sarcopenic elderly, 77 yrs

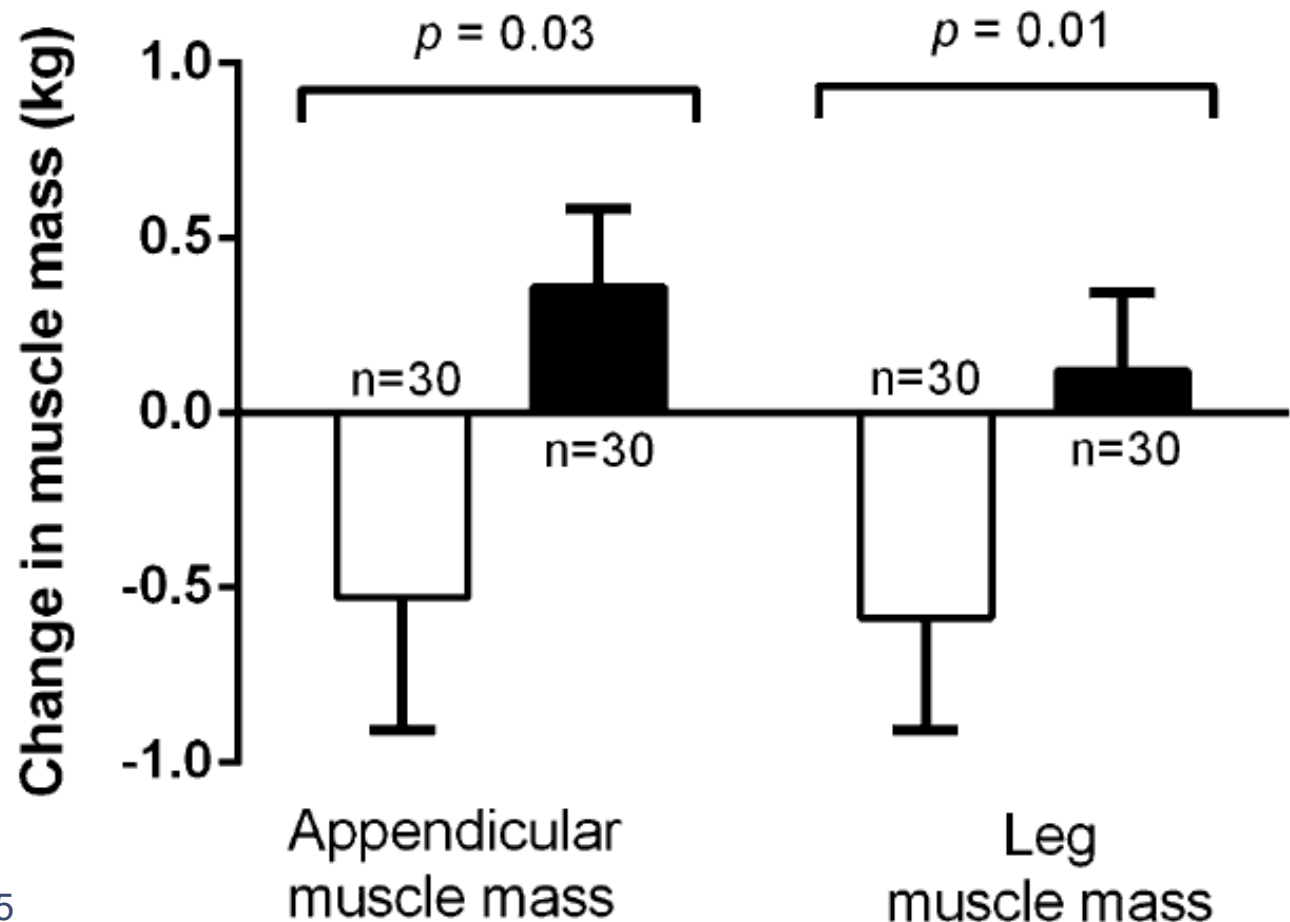


Intentional weight loss in obese adults

13 wk weight loss program,
all: hypocaloric diet and resistance training 3x wk
intervention: high protein, leucine, vitD supplement 10x wk

N=80 RCT, mean 63 yrs, BMI 33 kg/m²

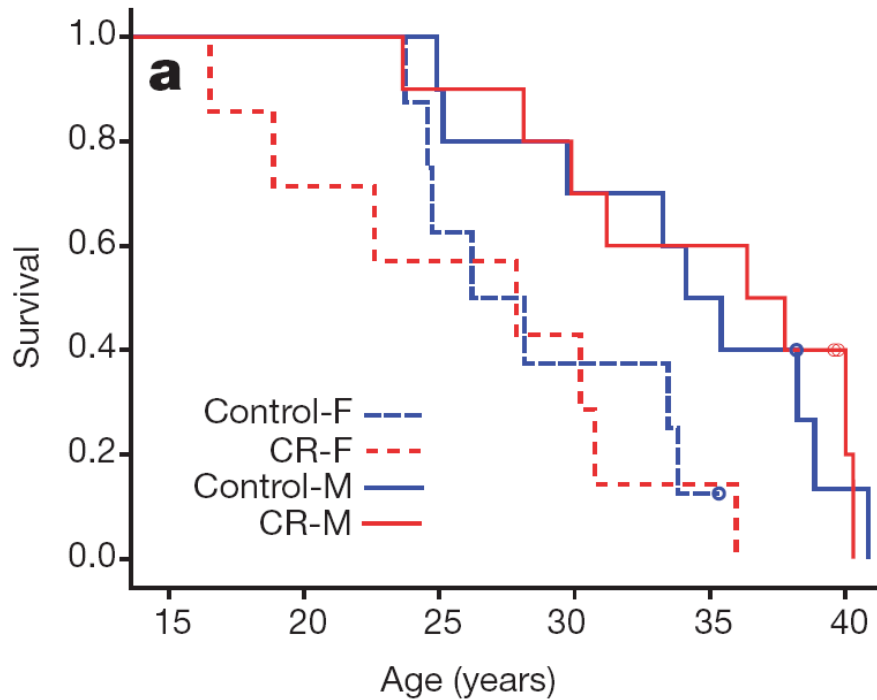
Both groups
weight and fat
mass loss!



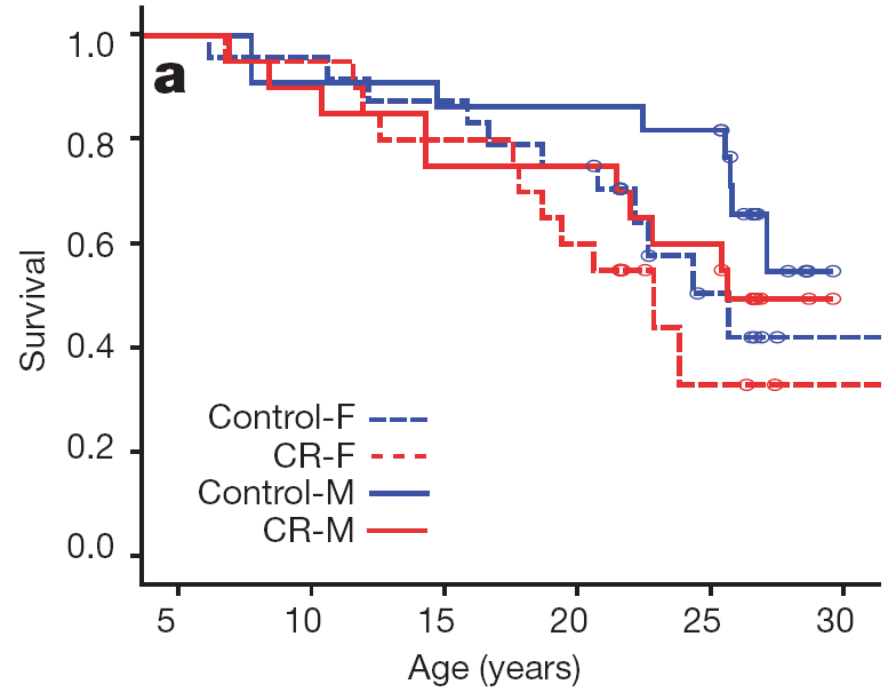


Caloric restriction - lifespan

30% decrease ad libitum feeding without malnutrition (mech via oxidative damage, mitochondrial function)



old onset
monkeys



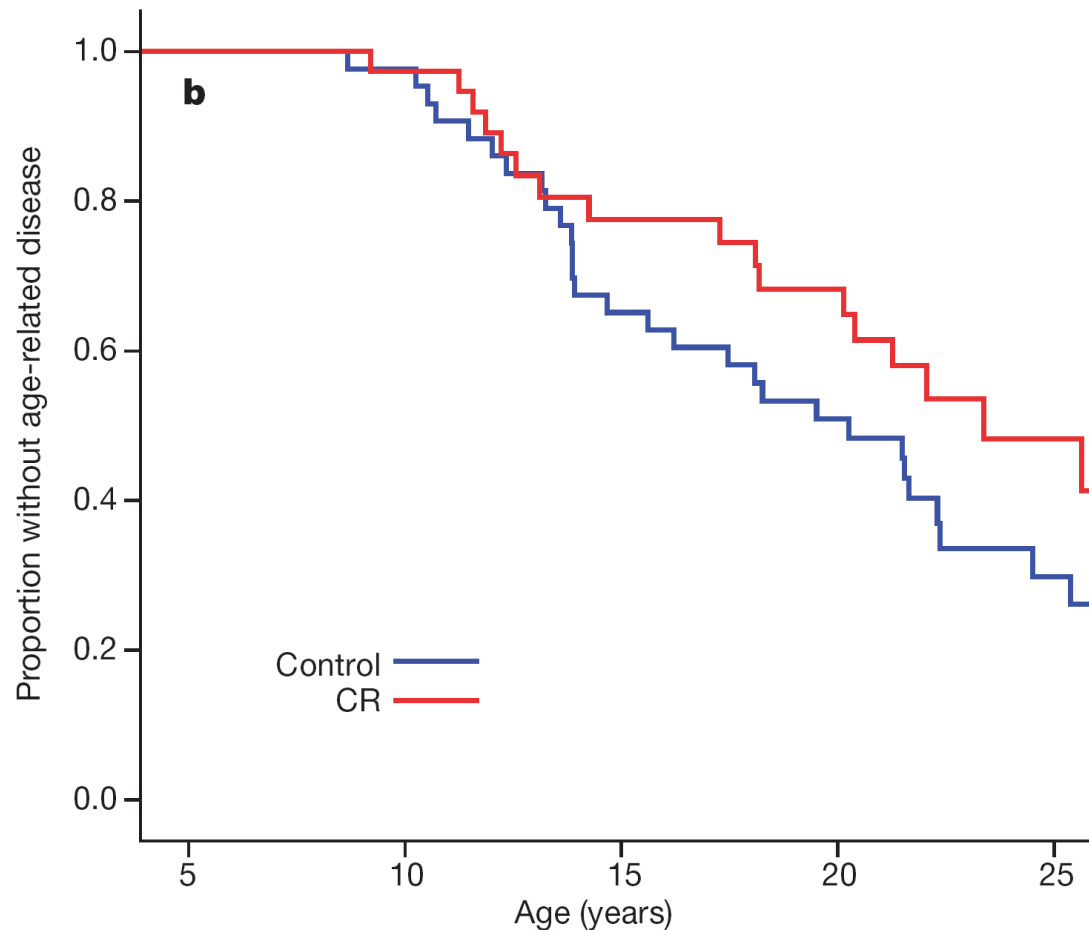
young onset
monkeys



Caloric restriction - healthspan

30% decrease ad libitum feeding without malnutrition (mech via oxidative damage, mitochondrial function)

CVD, DM,
cancer



young onset
monkeys

Sarcopenia interventions



- resistance, endurance, balance training
- Prevent inactivity!



- Diet, amino acids, vitamins
- Prevent catabolic state!



- Phase II/III trials (Wnt

SARCOPENIE HERKENNEN

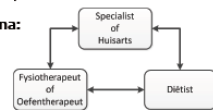
Wat is sarcopenie?

Sarcopenie is een leeftijd gerelateerde lage spiermassa en de daarmee gepaard gaande lage spierkracht en loopsnelheid. Sarcopenie komt bij ongeveer 30% van de ouderen voor.

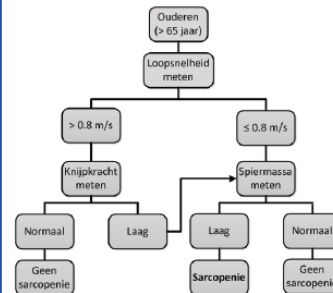
Multidisciplinaire aanpak

Een multidisciplinaire aanpak is nodig voor het herkennen van en interveniëren bij sarcopenie. De specialist (bv. internist-ouderengeneeskunde) of huisarts, fysio- of oefentherapeut en diëtist, dienen hierbij samen te werken.

Verwijsschema:



Europese consensus definitie sarcopenie



Referentie: Cruz-Jentoft et al. 2010

Handknijpkracht

Dynamometer

Mannen <30 kg
Vrouwen <20 kg

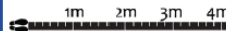


Referentie: Laurentani et al. 2003

Loopsnelheid

4-meter looptest

<1.0 m/s*



*Er worden verschillende afkapwaarden gebruikt. Gebruik dit afkappunt als alarmsymptoom.

Referentie: Fielding et al. 2011

Spiermassa

Bio-elektrische Impedantie Analyse

4-punts meting
Segmentale magere massa (armen en benen) index
Mannen: $\leq 7.26 \text{ kg/m}^2$
Vrouwen: $\leq 5.45 \text{ kg/m}^2$

2-punts meting
Vetvrije massa index
Mannen: $< 16 \text{ kg/m}^2$
Vrouwen: $< 15 \text{ kg/m}^2$

Referentie: Baumgartner et al. 1998, Stuurgroep Ondervoeding 2012

In samenwerking met:



SARCOPENIE TEGENGAAN



Fysiotherapeut of Oefentherapeut

Spierversterking

Progressieve weerstandstraining met een hoge intensiteit heeft het

meeste effect op spierkracht. Houd rekening met:

- de dosis-respons relatie
- de herstelperiode
- co-morbiditeiten (overweeg consult geriatriefysiotherapeut)

Referentie: Peterson et al. 2010



Diëtist

Voedingsinterventie

De voedingsinterventie is gericht op behoud en opbouw van spiereiwit, door middel van voldoende aanbod van eiwit, energie, calcium en vitamine D.

De diëtist vertaalt het voedingsadvies van nutriënten naar een voedingspatroon dat (langdurig) inpasbaar is in de dagelijkse praktijk.

Advies training

Oefeningen

- 8 tot 10 verschillende grote spiergroepen
- Spiergroepen van armen, benen en romp

Intensiteit

- Hoog intensief (BORG 7-8/10)
- 80% van 1RM

Frequentie

- 3 of meer keer per week

Herhalingen

- 8 tot 12 herhalingen, 1 set

Rust tussen oefeningen

- Ca. 2 minuten

Referentie: Montero-Fernandez et al. 2013

Voedingsadviezen

Eiwit

- 1.2 – 1.5 g/kg lichaamsgewicht/dag
- Gelijke hoeveelheden verdeeld over de drie hoofdmaaltijden
- Streven naar $\pm 25 \text{ g}$ per hoofdmaaltijd

Energie

- Harris & Benedict formule + 30% toeslag
- Vrouwen minimaal 1500 kcal/dag
- Mannen minimaal 1700 kcal/dag

Calcium

- 51-70 jaar: 1100 mg per dag
- > 70 jaar: 1200 mg per dag

Vitamine D suppletie

- Vrouwen 51 – 70 jaar: 10 mcg/dag
- Mannen en vrouwen > 70 jaar: 20 mcg/dag

Referentie: Deutz et al. 2014, Bauer et al. 2013, Paddon-Jones et al. 2009, Gezondheidsraad 2012 & 2000, Zakboek Diëtetiek 2014

De combinatie van krachttraining en een adequate eiwitname is het meest effectief op de spiermassa en spierkracht. Samenwerking van de fysio- of oefentherapeut en diëtist is essentieel.

Referentie: Kim et al. 2012

In samenwerking met:





