



HE'S AUDITIONING FOR A PART IN  
"CONAN THE OCTAGENARIAN"

## Langer op eigen benen

### Sarcopenie bij ouderen en zwaargewichten

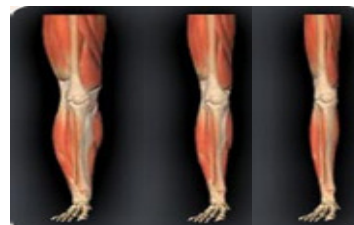
Dr. Dieneke van Asselt  
Klinisch geriater

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leeuwarden

Stuurgroep  
Ondervoeding



## Sarcopenie?



Letterlijk: Verlies (penie) van vlees (sarx)  
bij gezond ouder worden (1989)

Gebruikelijk: verlies van spiermassa en  
spierfunctie (dynapenie) bij gezond ouder  
worden

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# Spiere



50% van menselijk lichaam

Belangrijk orgaan voor kracht en beweging, metabolisme van glucose en eiwit (aanmaak en afbraak)

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# Spiere



Spiermassa

Spiersfunctie: kracht en power (kracht i.r.t snelheid)

Spierskwaliteit

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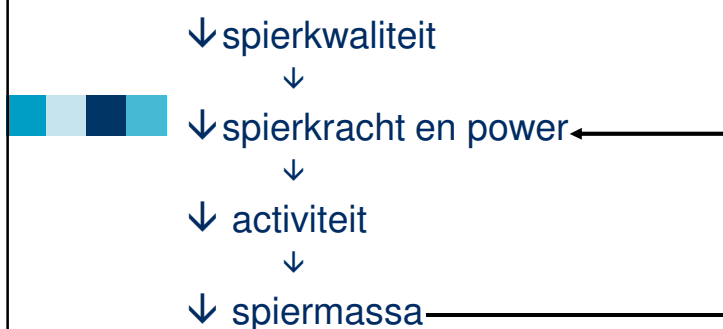


## Veroudering



- Verlies van 1-2% spiermassa vanaf 50<sup>ste</sup> levensjaar, onafhankelijk van leefstijl
- Verlies van spierkracht 3%
  - 2-5 maal meer dan spiermassa
- Afname van spierkwaliteit cq toename van spiervet (↑40%)

### Veroudering

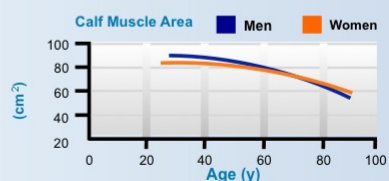
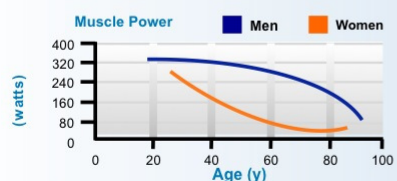
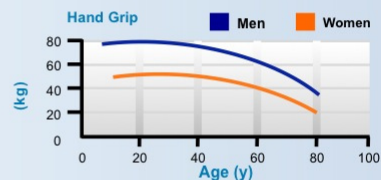
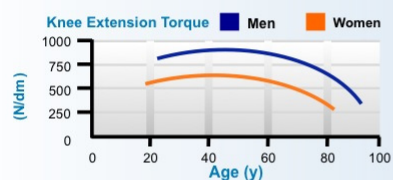


Spiertrofie is gevolg van verminderde spierkracht



## Muscle Strength and Power Decline With Aging

### Three Measures of Muscle Function and One of Muscle Mass in Men and Women



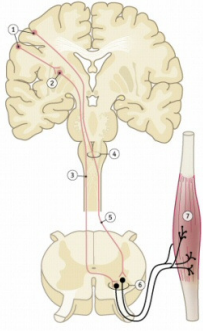
Lauretani F, et al. *J Appl Physiol*. 2003;95:1851-1860.

## Oorzaken

- Multifactorieel
  - Leeftijd
  - Voeding
  - Leefstijl
  - Ziekte

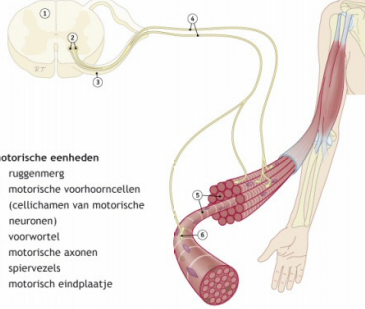
**efferente routes**

- 1 neuronen in de motorische schors
- 2 overschakeling van impulsen op extrapiramidale baan
- 3 extrapiramidale baan (motorische vezels voor de grove motoriek)
- 4 piramidekruising
- 5 piramidebaan (fijne motoriek)
- 6 overschakeling naar motorische neuronen
- 7 skeletspier






**motorische eenheden**


- 1 ruggenmerg
- 2 motorische voorhoornen (cellikamen van motorische neuronen)
- 3 voorwortel
- 4 motorische axonen
- 5 spiervezels
- 6 motorisch eindplaatje



5 en 6 = motorische eenheid  
 5 spiervezels:  
 - Type I rood, traag, duurzaam  
 - Type II wit, snel + kracht=power

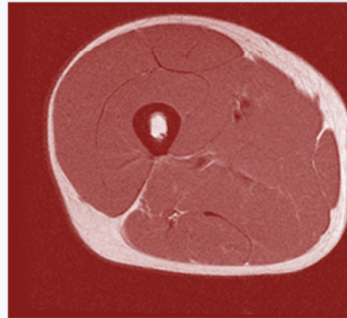
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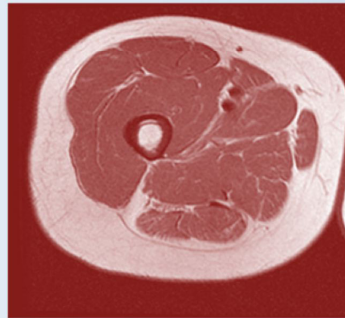
## Verandering spiervezels bij het ouder worden

- Afname spiervezels met name type II (minder power, moeite met opstaan, traplopen, balans)
- Neurodegeneratie motorische hersenschors, ruggenmerg, zenuw en motorische eindplaat
- Minder eiwitaanmaak in spieren dus spierafbraak
- Omnipotente spiercel verandert in vetcel

## Intramuscular Fat Accumulation Increases With Aging



Thigh of younger adult

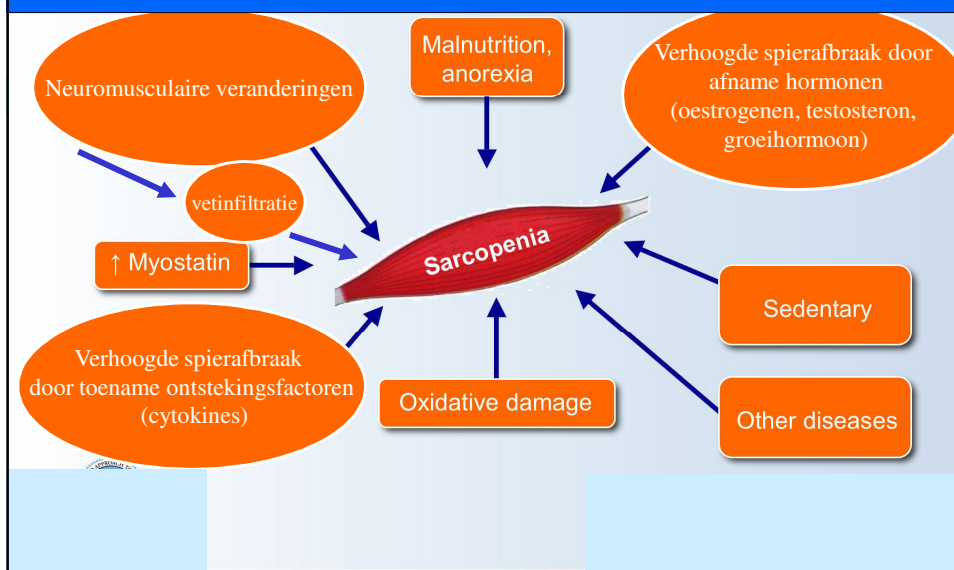


Thigh of older adult with sarcopenic obesity



Mazzali G, et al. *Am J Clin Nutr.* 2006;84:1193-1199.

## Leeftijdsafhankelijke factoren



## Prevalentie

- 5-50% van 65 plussers
  - Afhankelijk van definitie sarcopenie
  - Afhankelijk van populatie



## Gevolgen (mn **verminderde kracht**)

- Afname functionele status
  - ADL/IADL
  - Mobiliteit
    - Loopsnelheid, opstaan stoel, traplopen
- Vaker vallen
- Verhoogde mortaliteit
- Hogere kosten (15 miljard euro VS)



# The 2010 European Consensus Definition of Sarcopenia

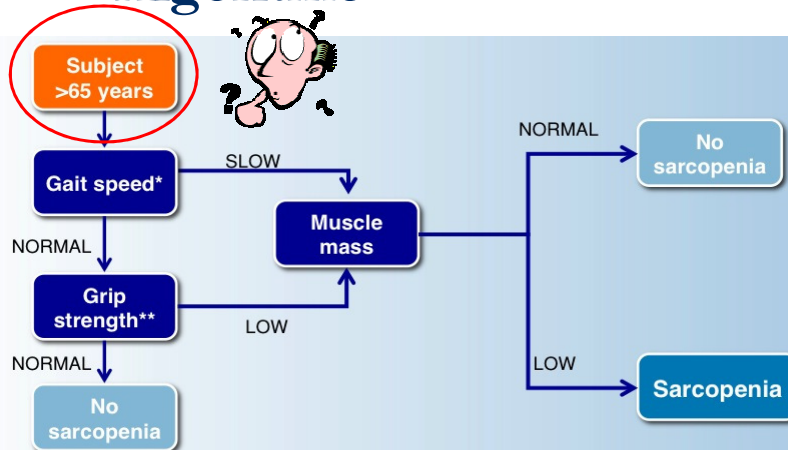
## Criteria for the Diagnosis of Sarcopenia



A syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes, such as physical disability, poor quality of life, and death



## Algorithme



\* Indicates physical strength.  
 \*\* Indicates muscle strength.  
 Cruz-Jentoft AJ, et al. Age Ageing. 2010;39:412-423.



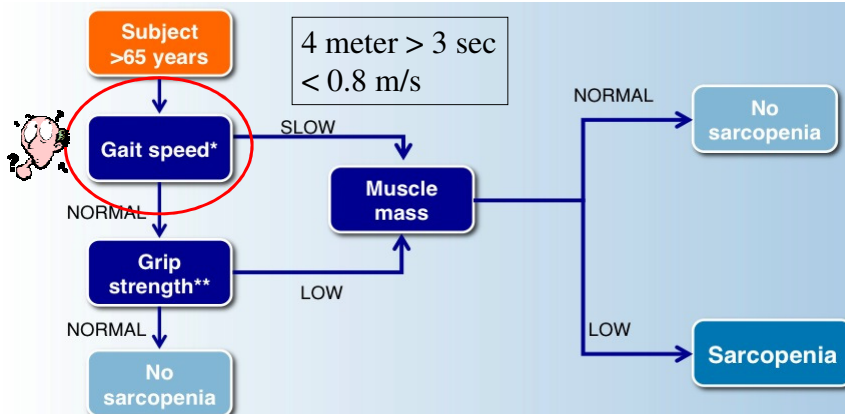
## Welke 65-plussers?

- Decline in function, strength or overall "health"
- Reduced physical activity
- Self-reported mobility-related difficulty (eg, inability to get out of bed or independently rise from a chair)
- History of recurrent falls
- Recent weight loss (>5%)
- Post-hospitalization
- Measured gait speed  $<1.0 \text{ m/s}^{-1}$
- Other chronic conditions (eg, type 2 diabetes, congestive heart failure, chronic obstructive pulmonary disease)



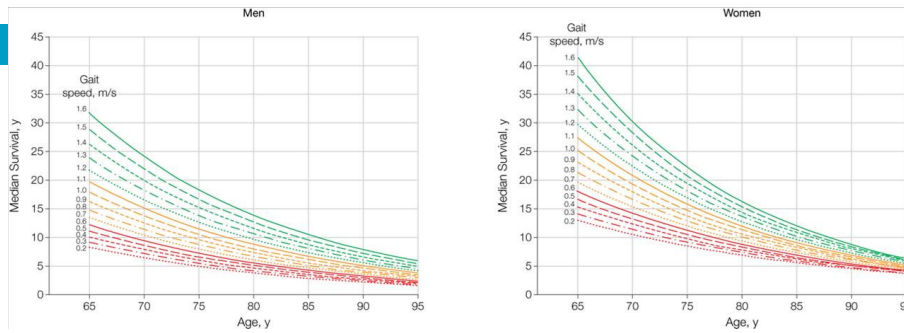
Fielding RA, et al. *J Am Med Dir Assoc.* 2011;12:249-256.  
Morley JE. *J Am Med Dir Assoc.* 2011;12:243-246.

## Algoritme

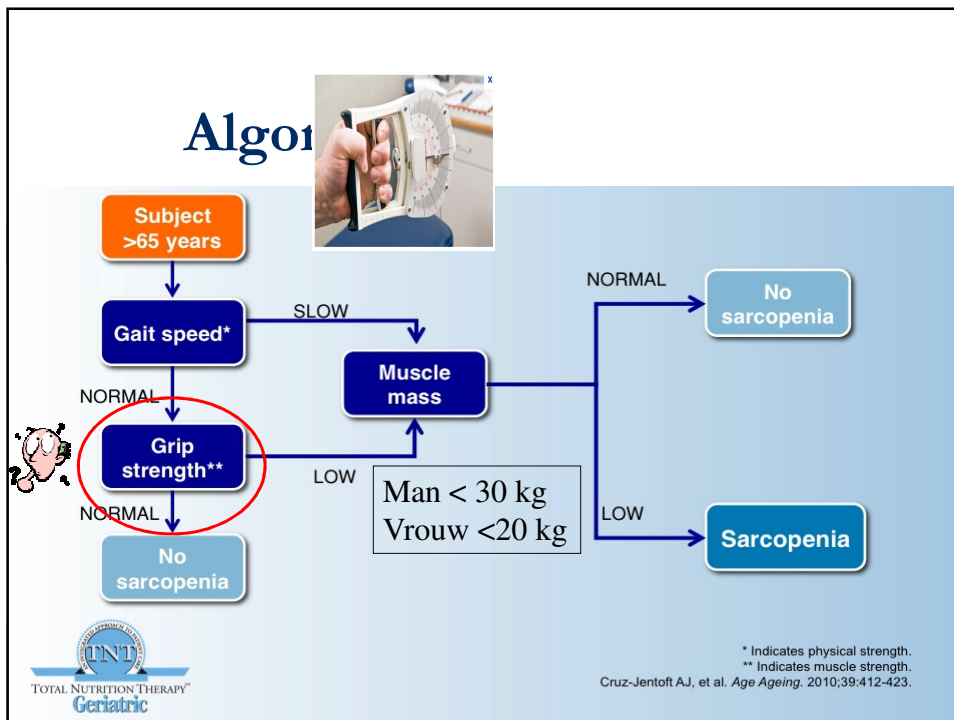


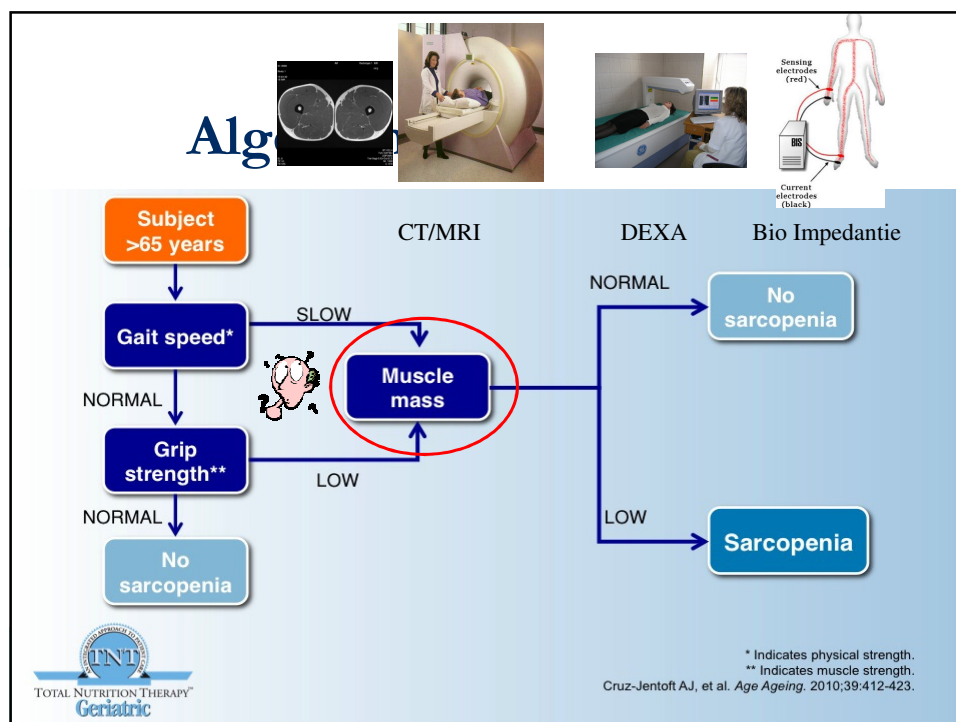
\* Indicates physical strength.  
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Cruz-Jentoft AJ, et al. *Age Ageing.* 2010;39:412-423.

# Loopsnelheid en overleving



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## Behandeling

- Multifactorieel
  - Beweging
    - Weerstandstraining (30 min 2xweek)
  - Voeding
    - Vitamine D
    - Essentiële aminozuren (leucine) en eiwitten
  - Metabole en anabole drugs
    - Testosteron
    - Myostatine blokkers

## Behandeling

Table 2 Studies examining various interventions for age-related muscle loss

Study	Population	Gender	Age	N	Intervention	Findings
Solerte et al. (2008) [149]	S	M, F	66-84	41	AA supp.	↑Lean mass, ↑IGF-1, ↓TNF-α ↓ Insuline resistentie
Trappe et al. (2000) [150]	E	M	74±2	7	RT	↑S; ↑MHC I
Trappe et al. (2001) [151]	E	F	74±2	7	RT	↑S
Slivka et al. (2008) [152]	E	M	80-86	6	RT	↑S, ↑CSA
Fiatarone et al. (1990) [93]	E	M	90±3	10	HIRT	↑S, ↑CSA
Kryger et al. (2007) [153]	E	M, F	85-97	11	RT	↑S, ↑CSA
Frontera et al. (2003) [154]	E	F	68-79	14	RT	↑S, ↑CSA
Wittert et al. (2003) [155]	E	M	60-86	76	TE	↔S, ↑CSA

S sarcopenia, E elderly, Myo-29 a myostatin inhibiting drug, AA Supp amino acid supplement, RT resistance training, HIRT high-intensity resistance training, TE testosterone, S strength, CSA muscle cross-sectional area, IGF-1 insulin-like growth factor 1, TNF-α tumor necrosis factor alpha, MHC I, myosin heavy chain type I isoform

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Lang T, Osteoporos Int 2010;21:543-59



## 100 verpleeghuis bewoners, 87 jaar oud



10 weken  
High intensity, 3xweek 45 min  
Heup en knie extensoren

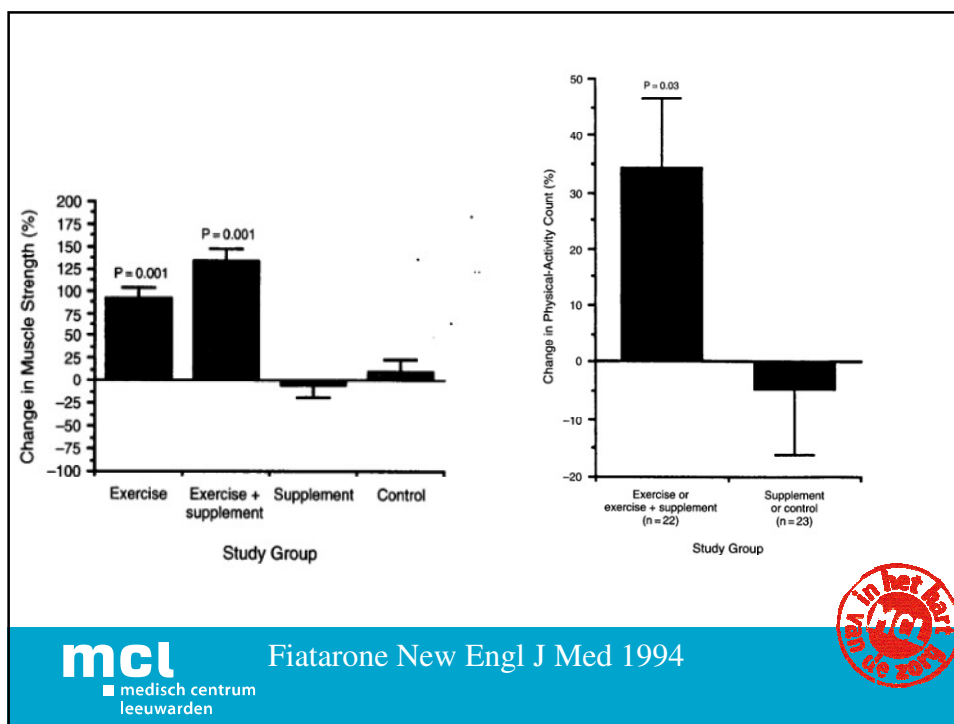


240 ml supplement  
360 kcal  
17% plantaardig eiwit

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Fiatarone New Engl J Med 1994





## RCT sarcopene vrouwen 75+

- 155 sarcopene Japanse vrouwen
- gemiddeld 79 jaar
- BMI 19
- 4 groepen
  - Exercise en EAA
  - Exercise
  - EAA
  - Gezondheidsinformatie

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Kim JAGS 2012;60:16-23

UVA in het hart 170 16 2012

## RCT sarcopene vrouwen 75+

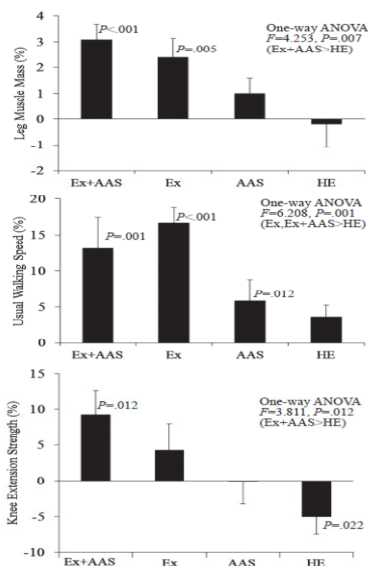
- EAA

- Mn leucine
- 3 g tweemaal daags



- Exercise (2xweek, 60 minuten, matig intensief)

- Kracht
- Balans
- Loop



Toename spiermassa 3%

Toename spierkracht 9%



## Samenvatting sarcopenie



- Sarcopenie: afname spierkracht en spiermassa
- Gaat gepaard met lichamelijke beperkingen en afhankelijkheid dus duur
- Weerstandstraining in combinatie met EAA lijkt effectief

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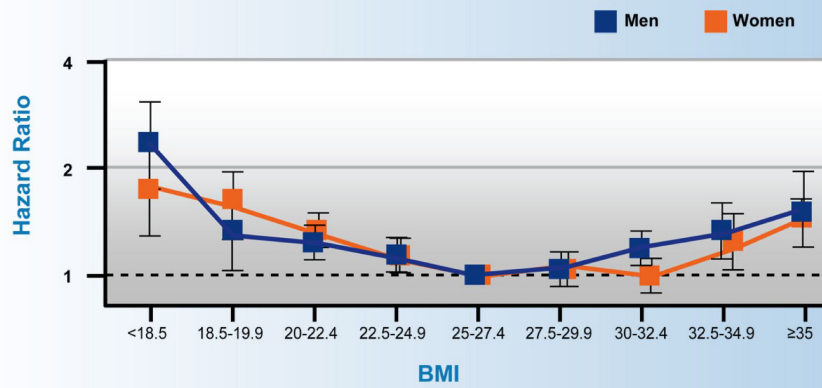
## Sarcopene obesitas



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## The Relationship Between BMI and Mortality Risk is U-shaped in Older People

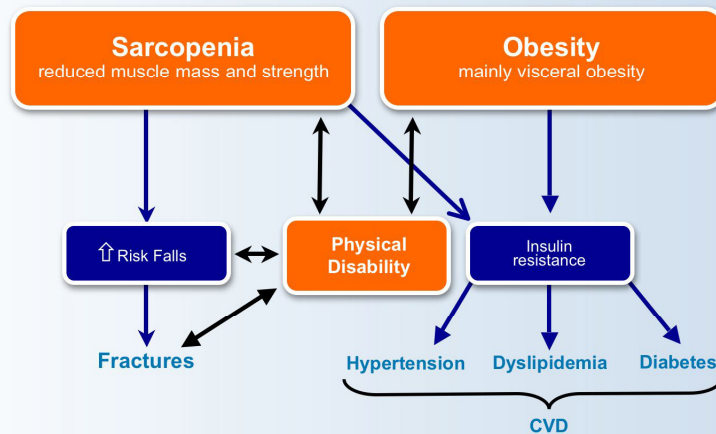


Adjusted HRs (95% CI) for total mortality rate by body mass index (BMI: kg/m<sup>2</sup>) category in older men and women

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Kvamme J-M, et al. *Epidemiol Community Health*. doi:10.1136/jech.2010.123232.

## Health Consequences of Sarcopenia and Obesity



Zamboni M, et al. *Nutr Metab Cardiovasc Dis*. 2008;18:388-395.



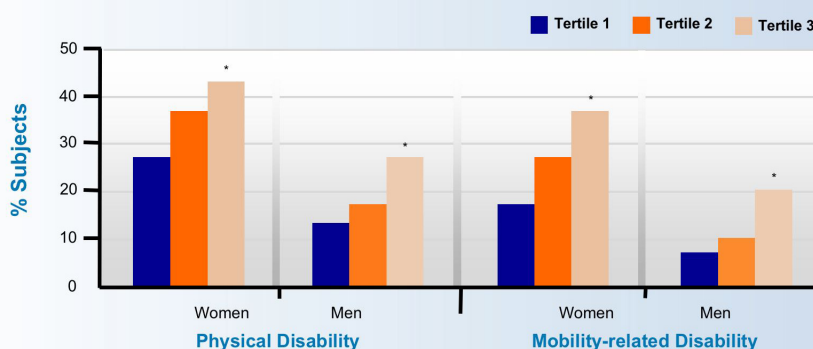
## Prevalence of Sarcopenic Obesity Varies According to Definition

	DEFINITIONS OF SARCOPENIA AND OBESITY	N	MEAN AGE	SARCOPENIC OBESITY PREVALENCE (%)
<b>New Mexico Aging Process Study, 2007</b>	Sarcopenia: skeletal muscle mass -2 SD below mean of young population or < 7.26 kg/m <sup>2</sup> in men, < 5.45 kg/m <sup>2</sup> in women <b>Obesity: body fat % &gt; median or &gt; 27% in men, 38% in women</b>	831	≥ 60	M: 4.4 F: 3.0
<b>NHANES III, 1999-2000</b>	Sarcopenia: two lower quintiles of muscle mass (< 9.12 kg/m <sup>2</sup> in men and < 6.53 kg/m <sup>2</sup> in women) <b>Obesity: two highest quintiles of fat mass (&gt; 37.16% in men, &gt; 40.01% in women)</b>	M: 1391 F: 1591	M: 76.3 F: 77.3	M: 9.6 F: 7.4
<b>Zoico et al, 2008</b>	Sarcopenia: two lower quintiles of muscle mass (< 5.7 kg/m <sup>2</sup> ) <b>Obesity: two highest quintiles of fat mass (&gt; 42.9%)</b>	F: 167	71.7	12.4



Stenholm S, et al. *Curr Opin Clin Nutr Metab Care.* 2008;11:693-700.

## Obesity Predisposes Older People to Disability

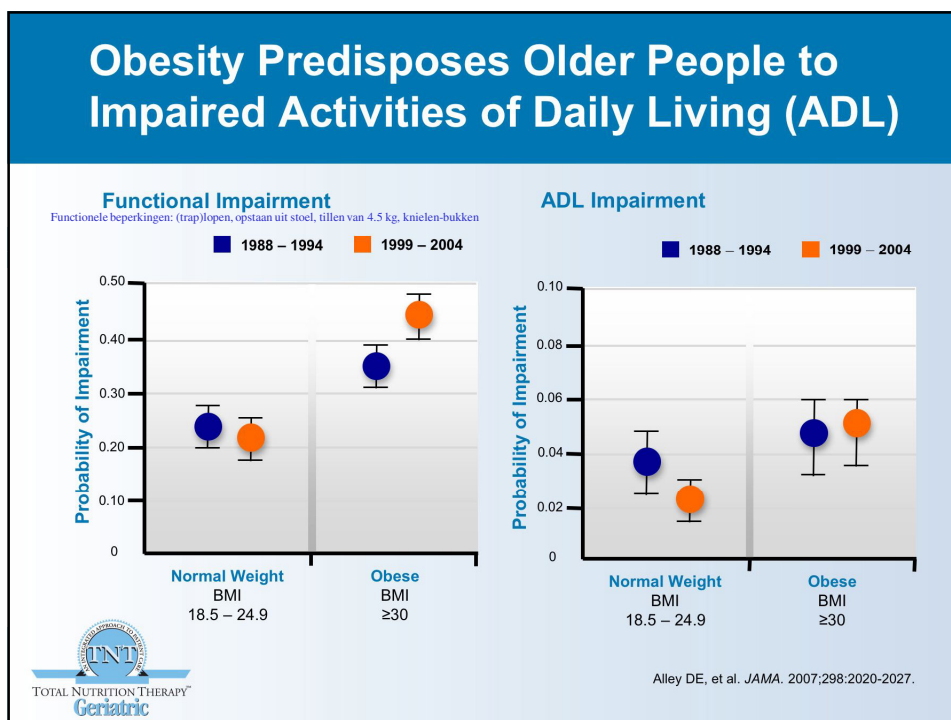


- Tertile 1: low → muscle body mass = 32.8 ± 0.2 and body fat = 37.8 ± 0.6
- Tertile 2: mid → muscle body mass = 37.1 ± 0.2 and body fat = 39.9 ± 0.6
- Tertile 3: high → muscle body mass = 42.1 ± 0.2 and body fat = 41.6 ± 0.6



Visser et al. *J Gerontol A Biol Sci Med Sci.* 1998;53:M214-M221.

## Obesity Predisposes Older People to Impaired Activities of Daily Living (ADL)



## Baseline Characteristics of Frail, Obese Older Adults

**DESIGN** 65+, BMI>30, mild tot matig kwetsbaar

- Study participants: 27 frail, obese, older volunteers
- Assigned to treatment or control groups
- Treatment: behavioral WL therapy, 6 mnd  
exercise training 3xweek trainen  
90 min

**RESULTS**

All subjects had evidence of frailty as defined by meeting two of three criteria:

- PPT score of 18/32
- Peak oxygen consumption 11/18 per kg body weight
- Assistance in two ADL or IADL

## Diet and Exercise

### Promote Weight Loss, Decrease Fat Mass

VARIABLE CONTROL	CONTROL GROUP	TREATMENT GROUP	P VALUE
<b>Body weight, kg</b>			
Baseline	103.2 ± 19.8	99.7 ± 13.6	< 0.001
Final	103.9 ± 21.3	91.5 ± 15.4*	
Absolute change	0.7 ± 2.7	-8.2 ± 5.7	
<b>Fat mass, kg</b>			
Baseline	47.5 ± 8.9	42.6 ± 7.9	< 0.001
Final	49.1 ± 13.4	35.9 ± 10.1*	
Absolute change	1.7 ± 4.1	-6.6 ± 3.4	
<b>Fat-free mass, kg</b>			
Baseline	55.7 ± 13.1	57.1 ± 10.9	0.75
Final	54.7 ± 12.8	55.9 ± 10.9†	
Absolute change	-1.0 ± 3.5	-1.2 ± 2.1	

Data are given as mean ± SD. Obese older adults in the control group received no lifestyle changes; those in the treatment group received 6 months of weekly behavioral therapy for weight loss in conjunction with exercise training 3 times a week.

\*Final value significantly different from baseline.  $P < 0.001$  †Final value significantly different from baseline.  $P = 0.04$



Villareal DT, et al. *Arch Intern Med* 2006;166:860-866.

## Diet and Exercise

### Improve Strength, Gait and Balance

- Treatment improved all objective measures of physical function and strength
  - Strength, gait and balance improved in the treatment group
  - For obese, older adults, moderate weight loss and exercise training improves physical function and ameliorates frailty
- Primary therapy for frail, obese, older adults: diet and exercise



Villareal DT, et al. *Arch Intern Med* 2006;166:860-866.

## Samenvatting sarcopene obesitas

- Obese ouderen die tevens sarcopenen zijn hebben meer lichamelijke beperkingen mbt mobiliteit
- Gewichtsreductie in combinatie met training verbeterd spierkracht en functie

