Sarcopenia , nutrició i exercici fisic
Estratègies d´intervenció

Mª Antonia Lizarraga

UNIVERSITAT DE BARCELONA

Diseñados para el movimiento

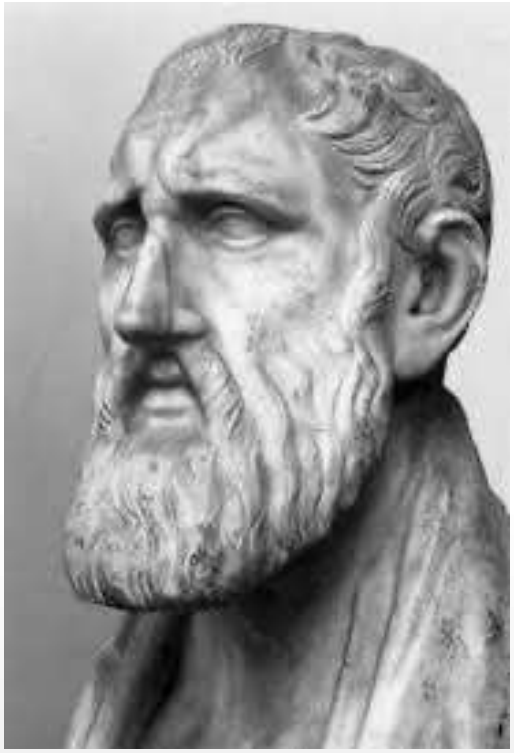
Nuestra mejor versión moviéndonos

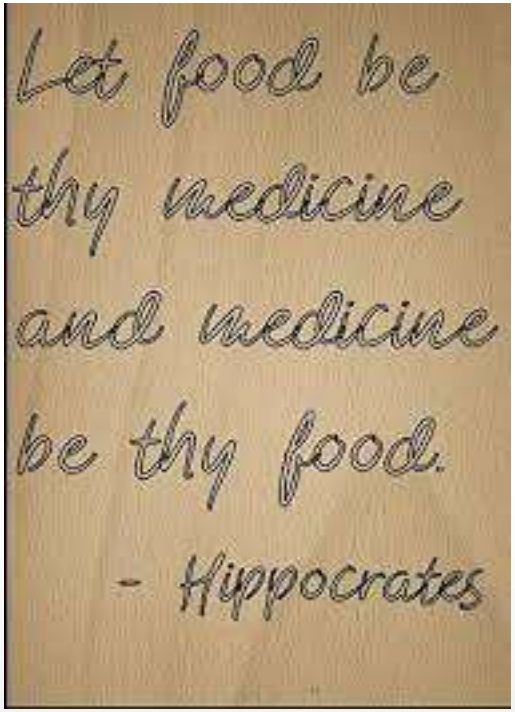
¿Epigenética ?

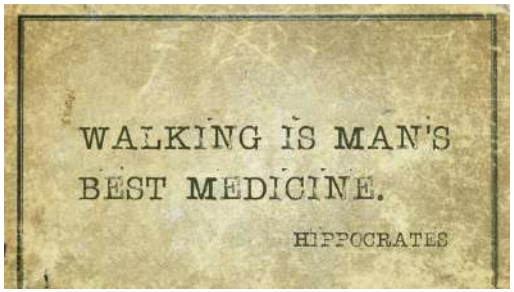
HUNTER GATHERERS

If you did not run, you did not eat

Our early ancestors predominately consisted of hunter-gatherer types ensuring the "Running Man" as a standard of fitness for their survival. If you did not run, you did not eat. Individuals who could out-run & out-plan their peers would survive



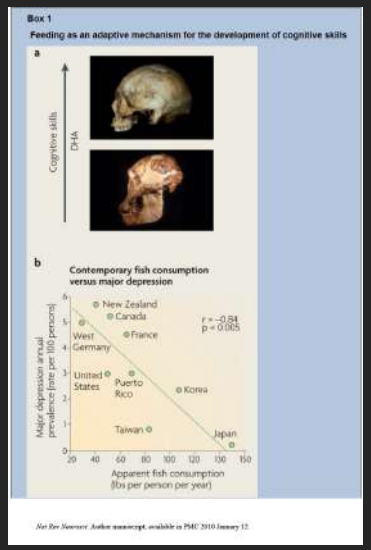

Let food be
thy medicine
and medicine
be thy food.
- Hippocrates

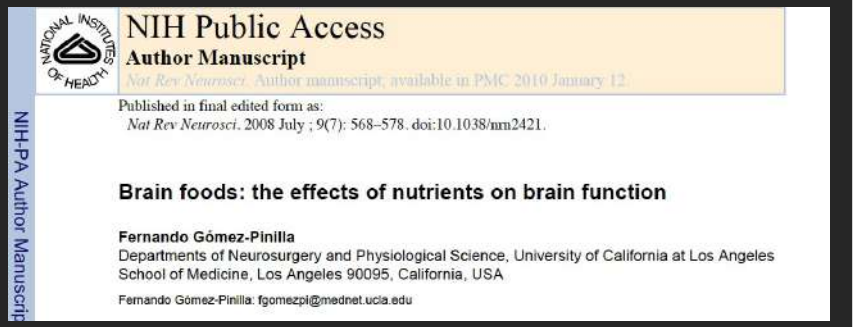

WALKING IS MAN'S
BEST MEDICINE.
HIPPOCRATES

Beneficios del ejercicio

Healthy brain

- Movimiento
- Descanso y sueño de calidad
- Mantener un peso saludable
- Aprender cada día algo nuevo..
- Relaciones sociales
- Propósito …





NIH Public Access
Author Manuscript
Nat Rev Neurosci. Author manuscript; available in PMC 2010 January 12.

Published in final edited form as:
Nat Rev Neurosci. 2008 July ; 9(7): 568–578. doi:10.1038/nrn2421.

Brain foods: the effects of nutrients on brain function

Fernando Gómez-Pinilla
Departments of Neurosurgery and Physiological Science, University of California at Los Angeles School of Medicine, Los Angeles 90095, California, USA

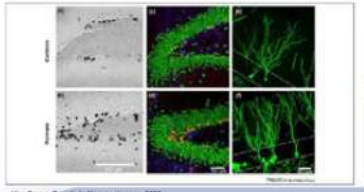
Fernando Gómez-Pinilla: fgomezpi@mednet.ucla.edu

NIH-PA Author Manuscrip

Muscle -Brain BDNF

Ejercicio y neuroplasticidad

More Exercise: More Neurogenesis



Cell Metabolism
Article

Exercise Induces Hippocampal BDNF through a PGC-1α/FNDC5 Pathway

Christiane D. Wrann,[1] James P. White,[1] John Salogiannnis,[2] Dina Laznik-Bogoslavski,[1] Jun Wu,[1] Di Ma,[3] Jiandie D. Lin,[3] Michael E. Greenberg,[2,*] and Bruce M. Spiegelman[1,*]
[1]Dana-Farber Cancer Institute and Department of Cell Biology, Harvard Medical School, 44 Binney Street, Boston, MA 02115, USA
[2]Department of Neurobiology, Harvard Medical School, 220 Longwood Avenue, Boston, MA 02115, USA
[3]Life Sciences Institute and Department of Cell and Developmental Biology, University of Michigan Medical Center, Ann Arbor, MI 48109, USA
*Correspondence: michael_greenberg@hms.harvard.edu (M.E.G.), bruce_spiegelman@dfci.harvard.edu (B.M.S.)
http://dx.doi.org/10.1016/j.cmet.2013.09.008

“Neuroplasticidad”

Habilidad del cerebro de adaptarse, aprender y reorganizarse mediante el crecimiento y reconexion de las neuronas.

The Secrets of Long Life

“Longevity versus Healthy aging”

Healthy aging

HHS Public Access
Author manuscript
Cell. Author manuscript; available in PMC 2017 May 05.

Published in final edited form as:
Cell. 2016 May 5; 165(4): 1002–1011. doi:10.1016/j.cell.2016.03.022.

Whole Genome Sequencing of a Healthy Aging Cohort

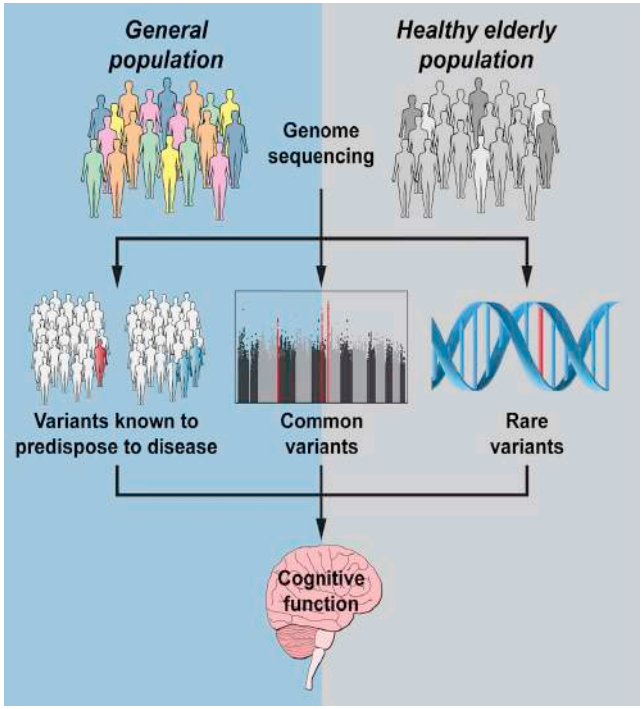
Galina A. Erikson[a,1], Dale L. Bodian[b,1], Manuel Rueda[a], Bhuvan Molparia[a], Erick R. Scott[a], Ashley A. Scott-Van Zeeland[d], Sarah E. Topol[a], Nathan E. Wineinger[a], John E. Niederhuber[b,c], Eric J. Topol[a,1], and Ali Torkamani[a,d,1]

[a]The Scripps Translational Science Institute, Scripps Health and The Scripps Research Institute, La Jolla, California, 92037, USA

[b]Inova Translational Medicine Institute, Inova Health System, Falls Church, Virginia, 22042 USA

[c]Department of Oncology, Johns Hopkins University School of Medicine, Baltimore, Maryland 21205, USA

[d]Cypher Genomics, Inc., San Diego, California, 92121, USA



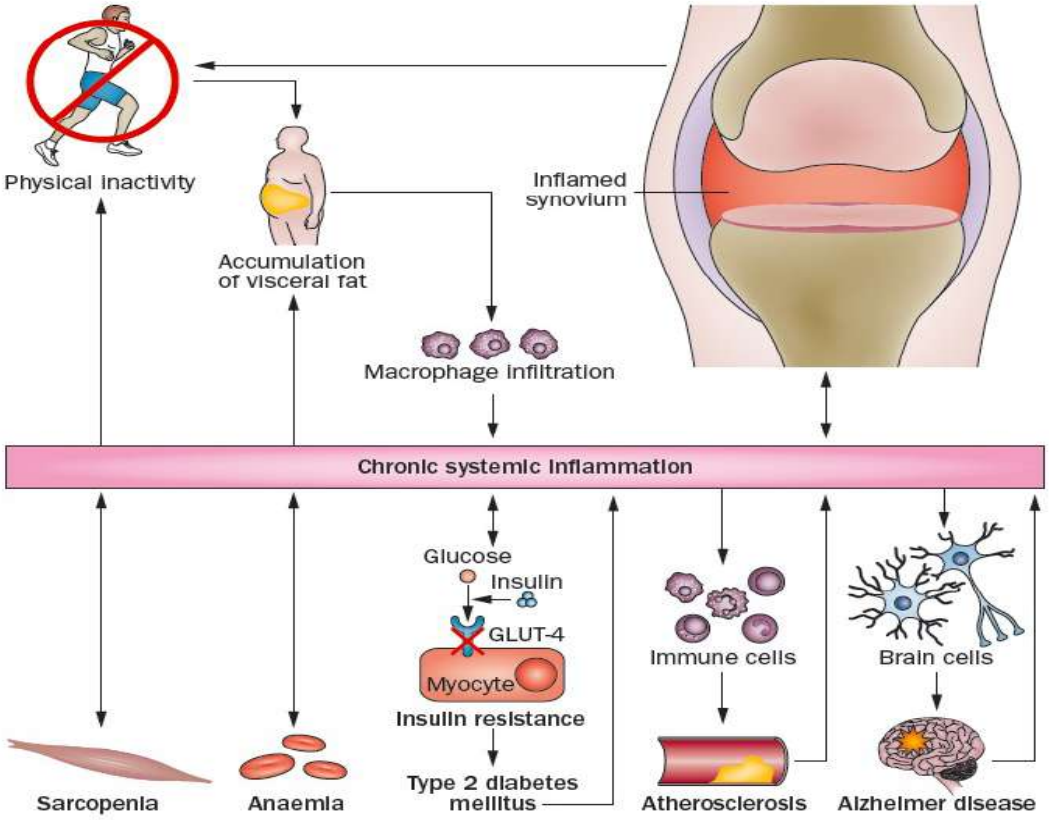
2016 165, 1002-1011DOI: (10.1016/j.cell.2016.03.022)
Terms and Conditions

wellderly

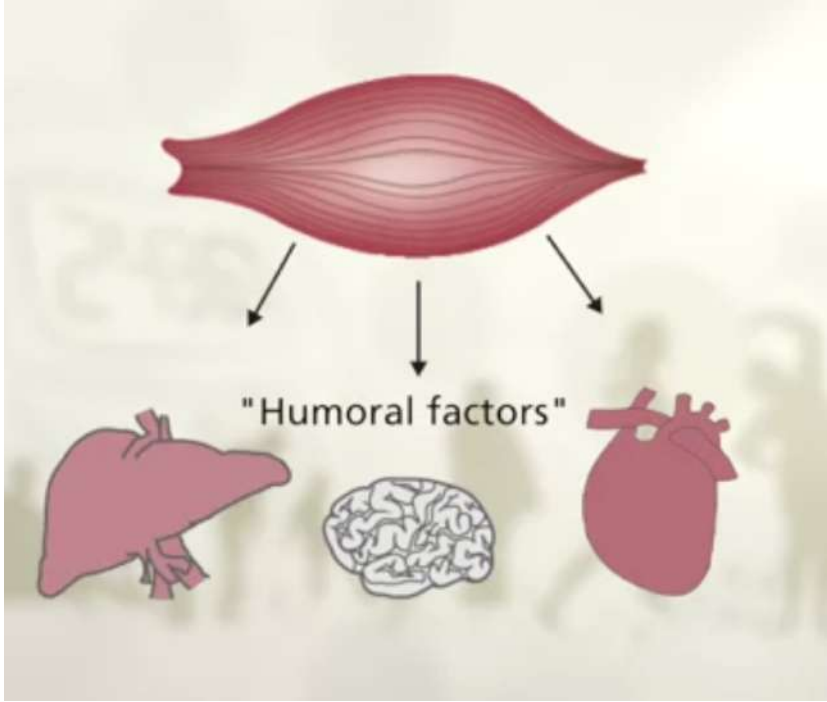
Los Wellderly son individuos excepcionales que viven en su novena década y más allá, sin desarrollar una condición médica crónica

Salutogénesis

INACTIVIDAD E INFLAMACIÓN

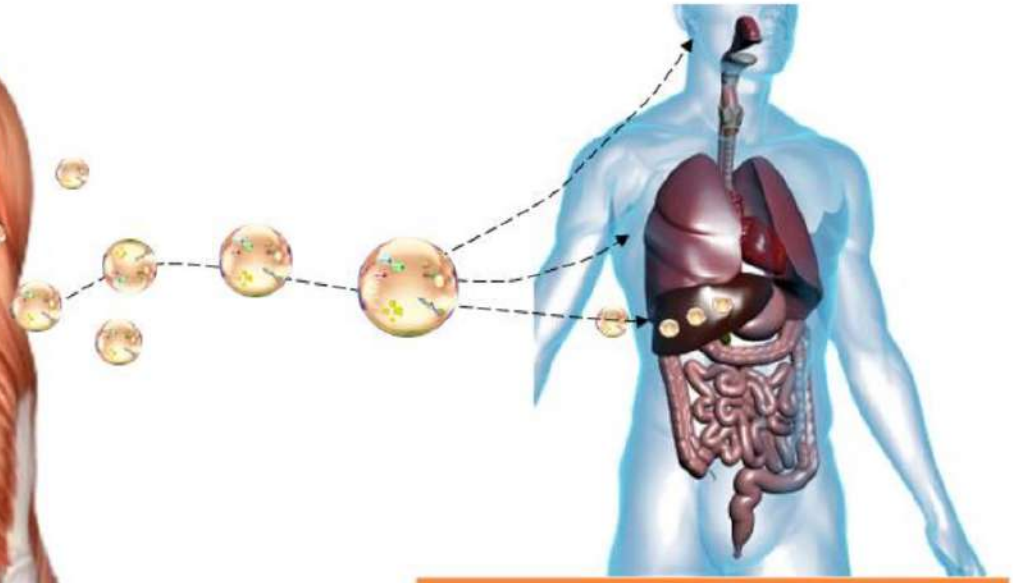


¿Cómo conecta ? Mioquinas



Extracellular Vesicles (EVs)

Inter-tissue cellular 'cross-talk' with exercise



Potential Effects
Glycogen → Glucose
Transcription of genes
Myokine transport e.g. BDNF to the brain
Anabolic/Growth Factors
Oncogene (Cancer) Gene Suppression
Anti-inflammatory factors

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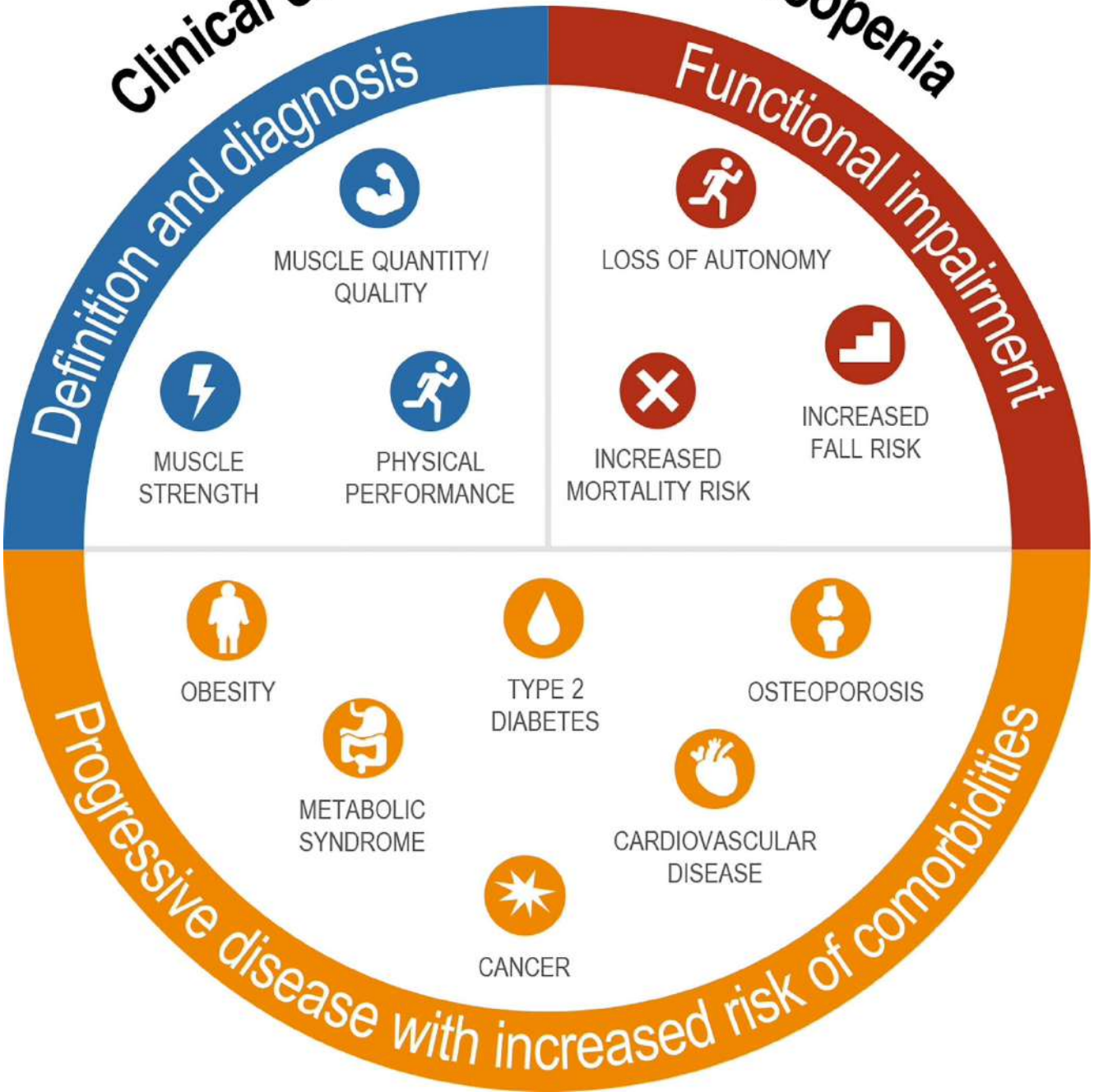
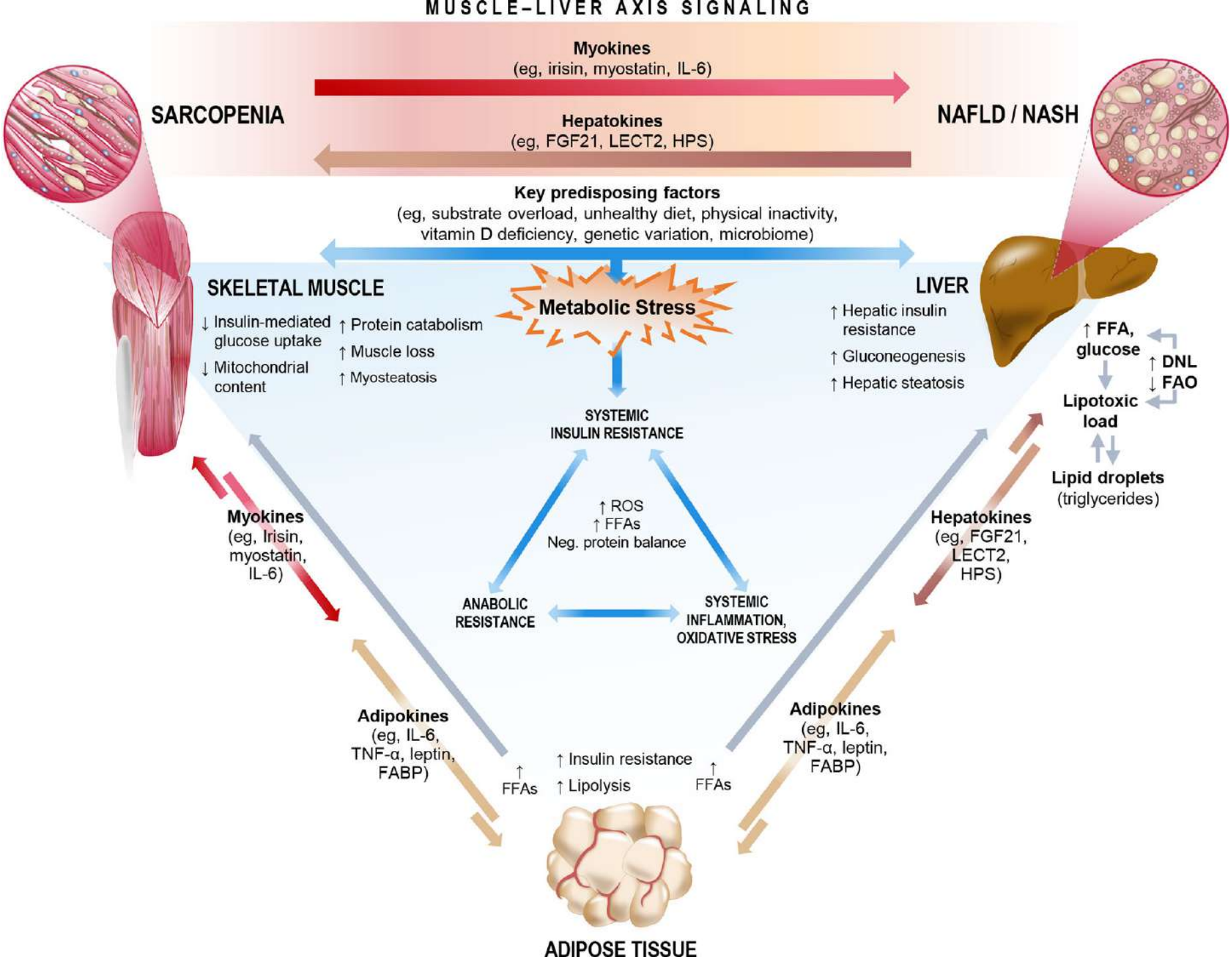
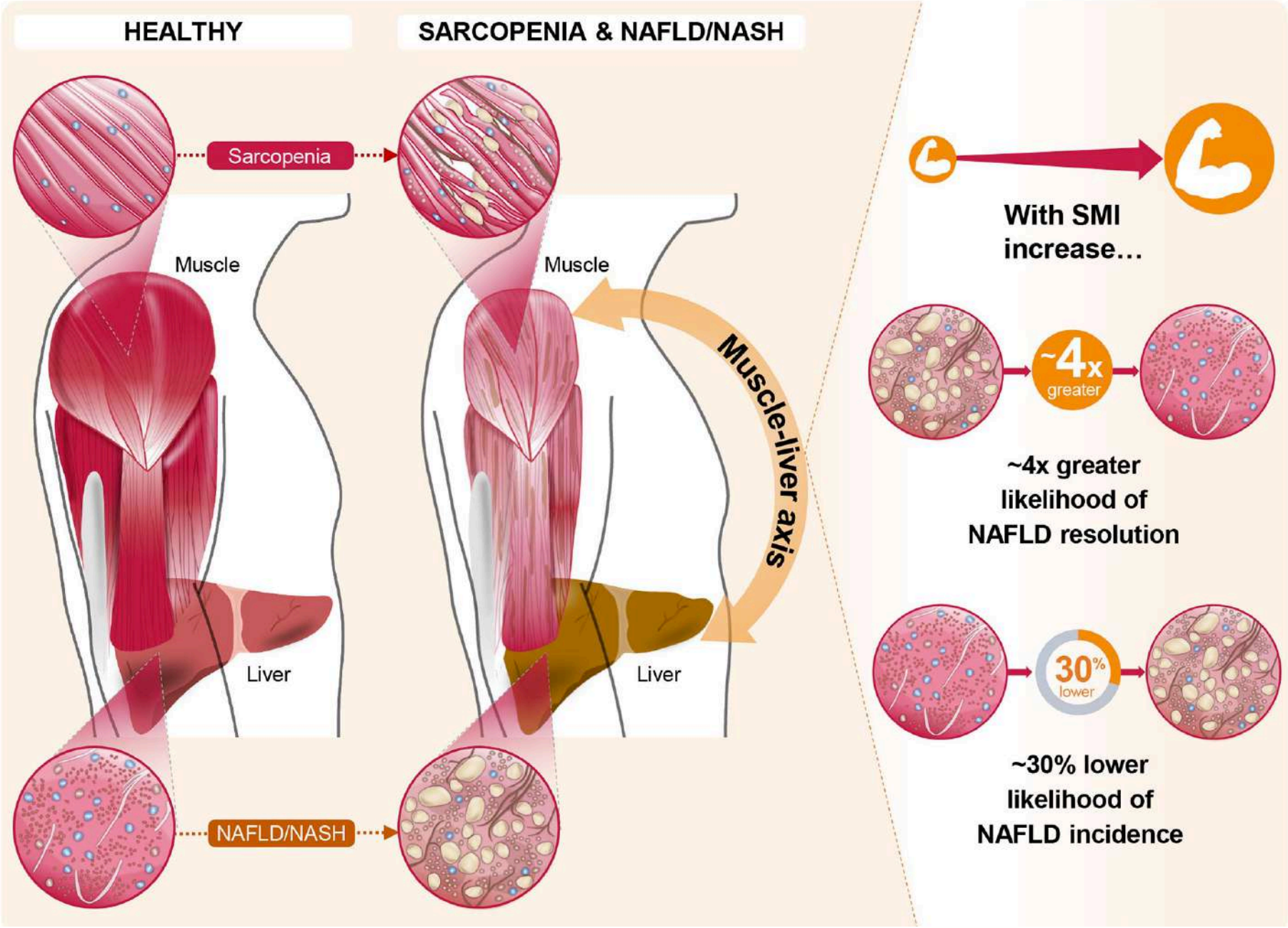
Clinical characteristics of sarcopenia




MUSCLE–LIVER AXIS SIGNALING
Myokines
(eg, irisin, myostatin, IL-6)
SARCOPENIA
NAFLD / NASH
Hepatokines
(eg, FGF21, LECT2, HPS)
Key predisposing factors
(eg, substrate overload, unhealthy diet, physical inactivity, vitamin D deficiency, genetic variation, microbiome)
SKELETAL MUSCLE
↓ Insulin-mediated glucose uptake
↓ Mitochondrial content
↑ Protein catabolism
↑ Muscle loss
↑ Myosteatosis
Metabolic Stress
LIVER
↑ Hepatic insulin resistance
↑ Gluconeogenesis
↑ Hepatic steatosis
↑ FFA, glucose
↑ DNL
↓ FAO
Lipotoxic load
Lipid droplets
(triglycerides)
SYSTEMIC INSULIN RESISTANCE
↑ ROS
↑ FFAs
Neg. protein balance
ANABOLIC RESISTANCE
SYSTEMIC INFLAMMATION, OXIDATIVE STRESS
Myokines
(eg, Irisin, myostatin, IL-6)
Hepatokines
(eg, FGF21, LECT2, HPS)
Adipokines
(eg, IL-6, TNF-α, leptin, FABP)
Adipokines
(eg, IL-6, TNF-α, leptin, FABP)
↑ FFAs
↑ Insulin resistance
↑ Lipolysis
↑ FFAs
ADIPOSE TISSUE


HEALTHY
SARCOPENIA & NAFLD/NASH
Sarcopenia
Muscle
Muscle
Muscle-liver axis
Liver
Liver
NAFLD/NASH
With SMI increase…
~4x
greater
~4x greater likelihood of NAFLD resolution
30%
lower
~30% lower likelihood of NAFLD incidence

- *Normal Weight Obesity – weight within normal limits but high body fat percentage.*

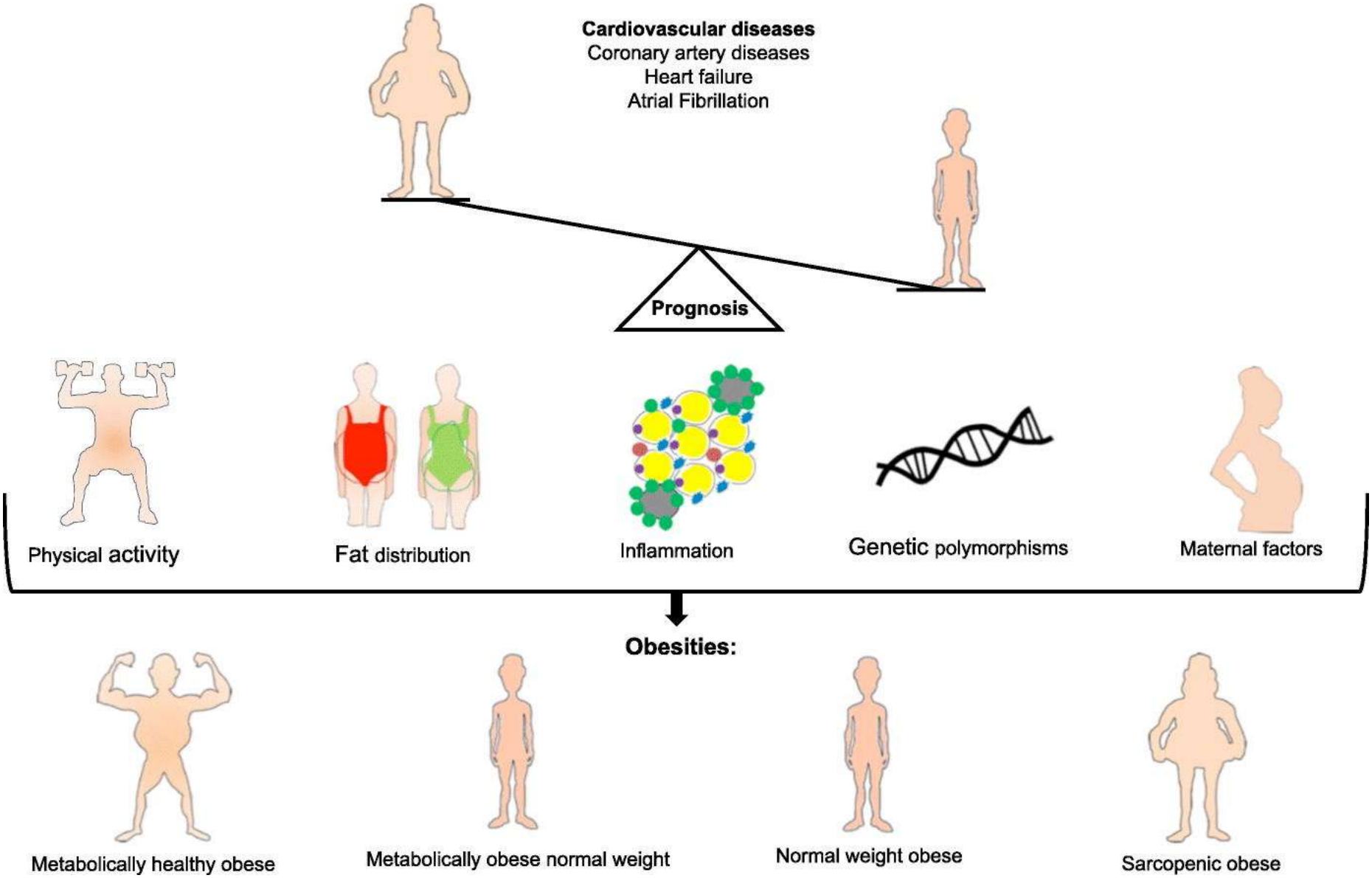
¿Obesos con peso normal?

MAYO CLINIC

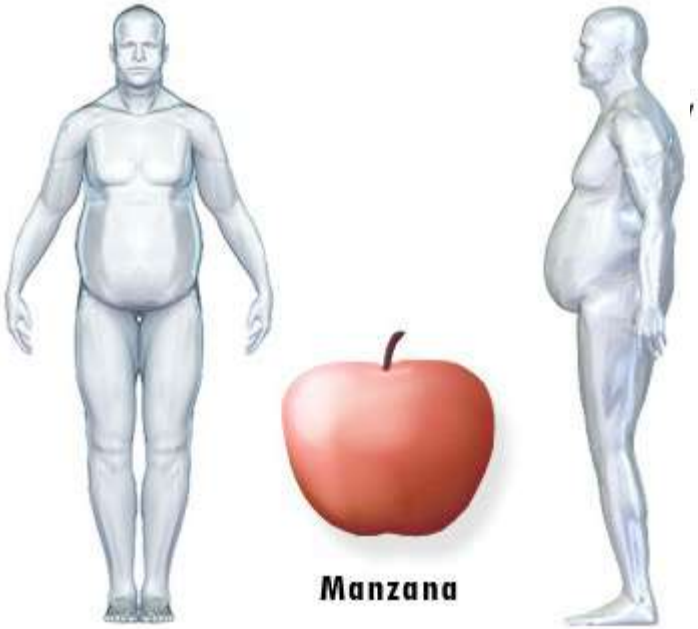
Obesidad con peso normal: naciente factor de riesgo para problemas cardíacos y metabólicos

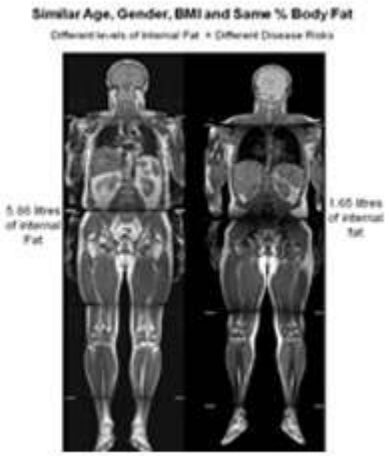
27 de marzo de 2008

"Utilizar los términos de 'obesidad con peso normal' es realmente una manera de ser más puntuales respecto a cambiar la conceptualización de la obesidad, porque la verdadera definición de obesidad es exceso de grasa corporal", señala el Dr. Francisco López Jiménez, cardiólogo del equipo de investigación de Mayo. "Nuestro estudio demuestra que incluso las personas con peso normal podrían tener exceso de grasa corporal y en ese caso, tendrían riesgo de sufrir anomalías metabólicas que los conduciría a la diabetes y, por último, a una enfermedad cardíaca".

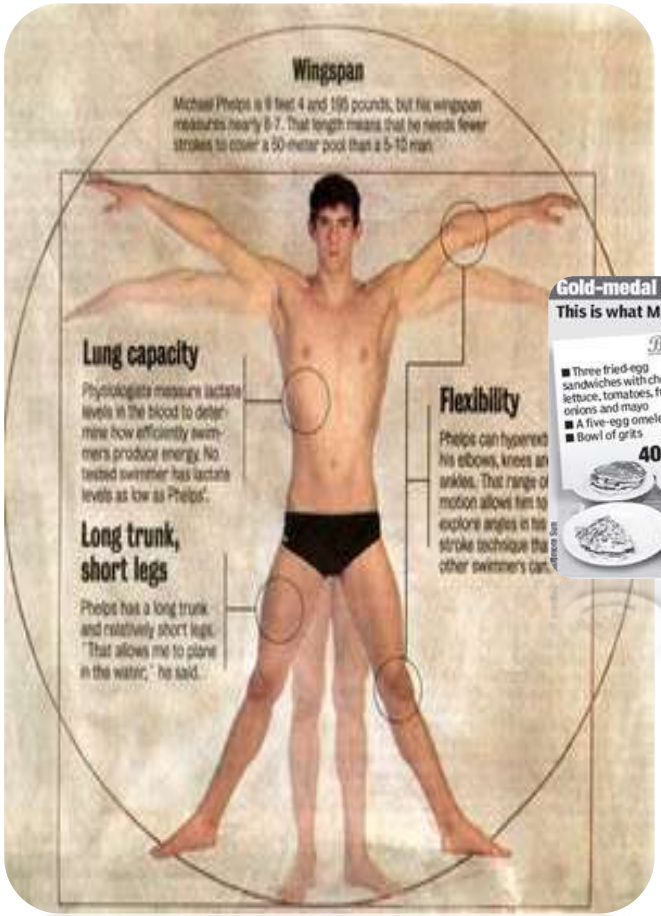

Cardiovascular diseases
Coronary artery diseases
Heart failure
Atrial Fibrillation
Prognosis
Physical activity
Fat distribution
Inflammation
Genetic polymorphisms
Maternal factors
Obesities:
Metabolically healthy obese
Metabolically obese normal weight
Normal weight obese
Sarcopenic obese

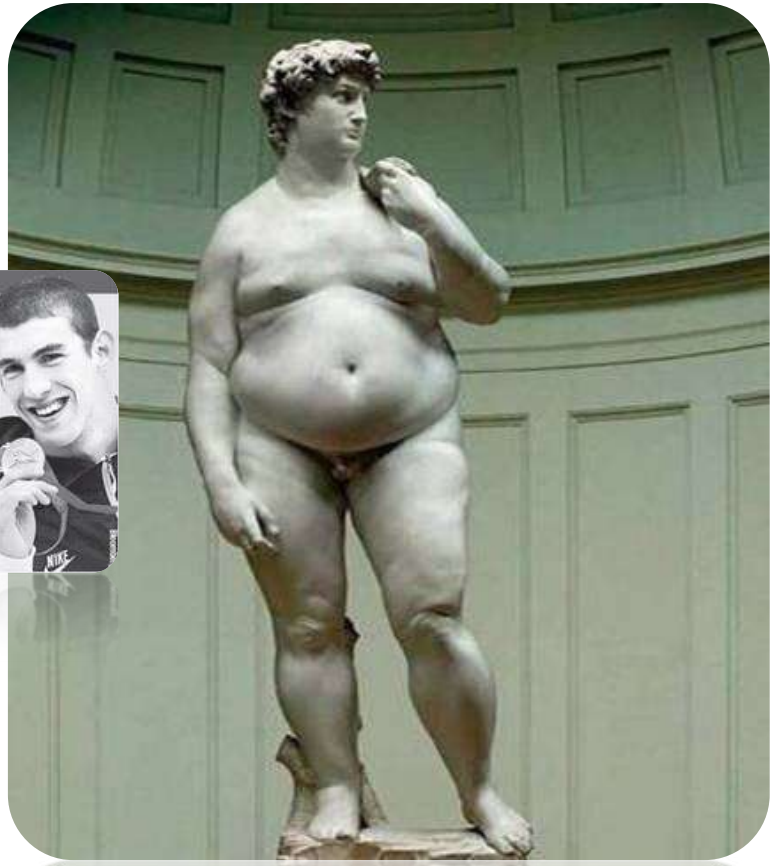
Aumento de grasa abdominal y disminución de músculo apendicular



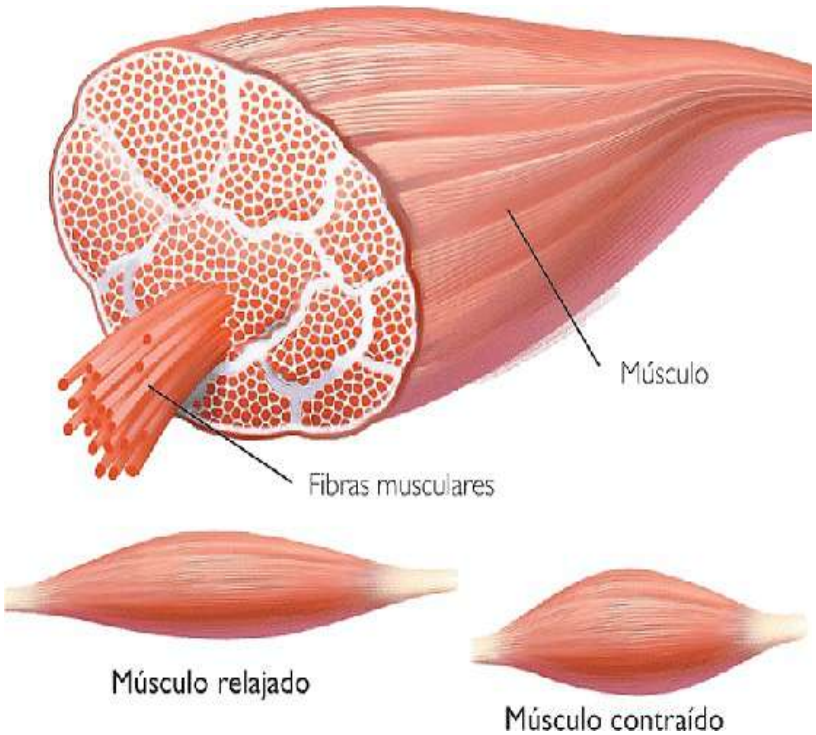


Flexibilidad metabólica
Se pierde….





Tejido muscular esquelético



Universitat de Barcelona

Hombre de referencia

Edad: 20 – 24
Talla: 170 cm
Peso: 70 kg
Grasa total: 15%
Grasa esenc.: l3%
Músculo: 44,8%
Hueso: 14,9%
Residual: 25,3%

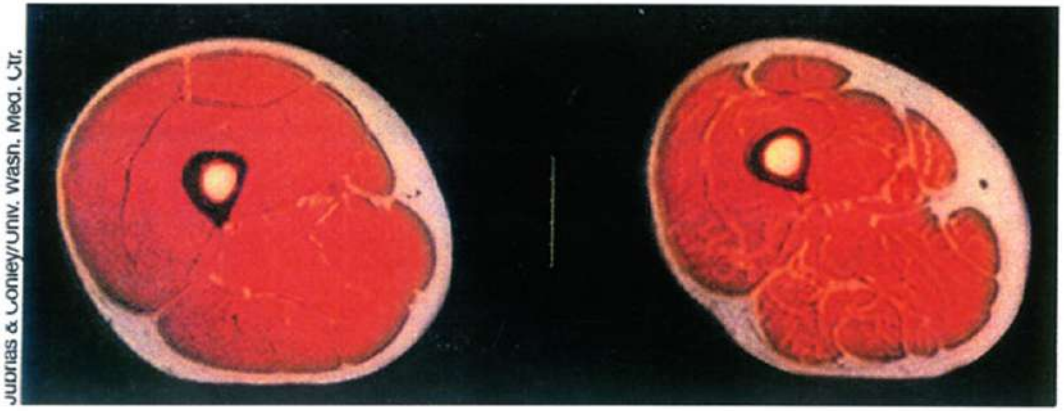
Mujer de referencia

Edad: 20 - 24
Talla: 163,8 cm
Peso: 56,7 kg
Grasa total: 27%
Grasa esenc: 12%
Músculo: 36,0%
Hueso: 12,0%
Residual: 25,0%

Fibras musculares y envejecimiento

TABLA 1. Cambios anatómicos en el músculo relacionados con el envejecimiento

1. Disminución de la masa muscular
2. Infiltración por grasa y tejido conectivo
3. Disminución del tamaño de las fibras tipo II sin cambios en el tipo I
4. Disminución del número de fibras tipo II
5. Reducción de la razón capilar/fibra
6. Acumulación de núcleos internos, fibras en anillo y fibras rotas
7. Desestructuración de miofilamentos y líneas Z
8. Proliferación del retículo sarcoplásmico y del sistema de t-túbulos
9. Acumulación de lipofuscina y estructuras en bastón
10. Disminución del número de unidades motoras



Received: 4 December 2020 | Accepted: 7 December 2020
DOI: 10.1111/obr.13190

SUPPLEMENT ARTICLE

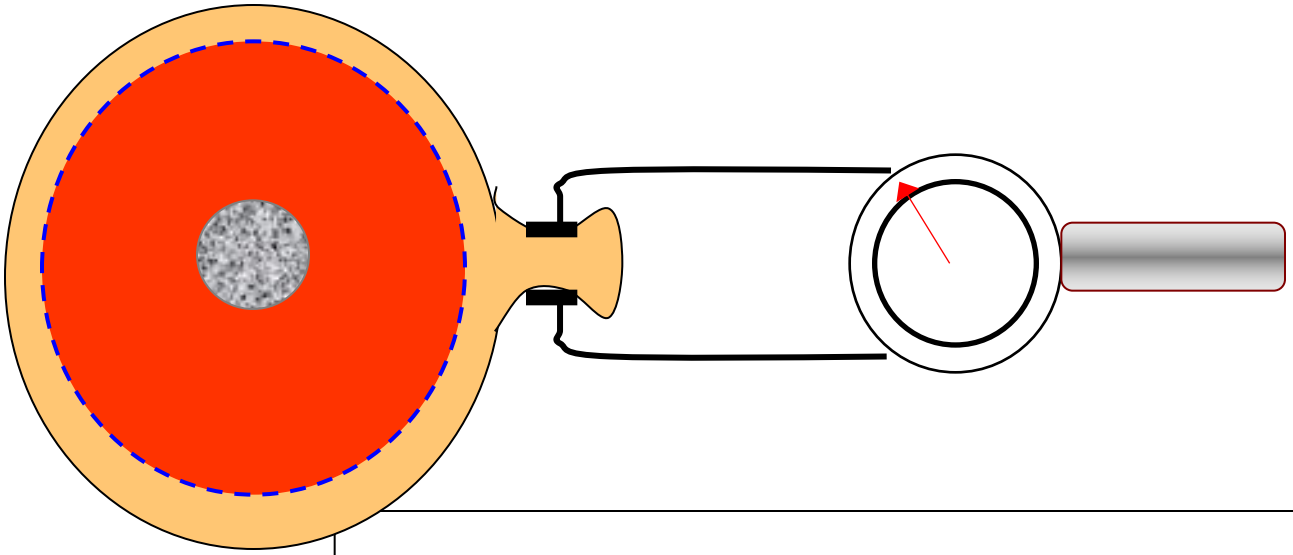
OBESITY Reviews WILEY

Diagnosis of obesity based on body composition-associated health risks—Time for a change in paradigm

Anja Bosy-Westphal | Manfred J. Müller

THE IMPORTANCE OF LEAN MASS FOR DIAGNOSIS OF OBESITY-ASSOCIATED RISK ACROSS THE LIFE CYCLE AND IN HEALTH AND DISEASE

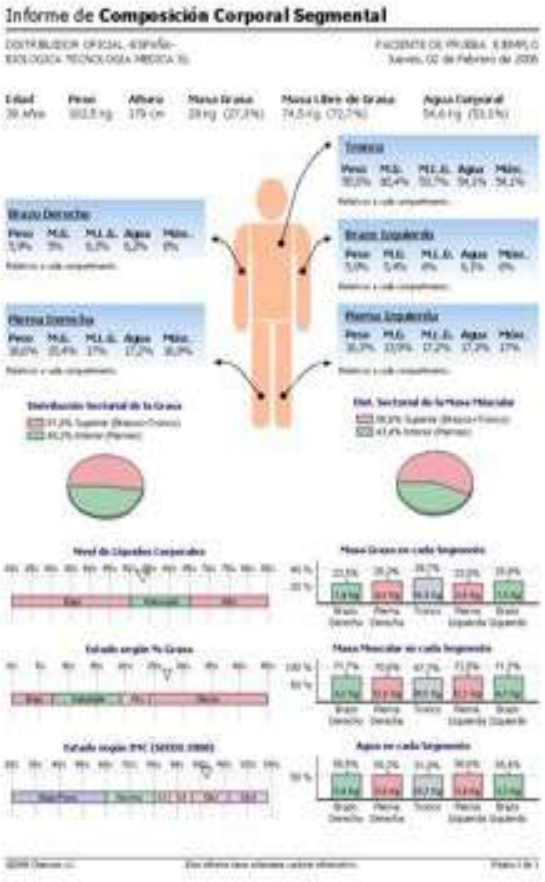
Cálculo de perímetros y áreas musculares



Perímetro musc (cm)= Perímetro externo -3,14Xpliegue(cm)

Martin, A.D., Spenst, L.F., Drinkwater, D.T. and Clarys, J.P. (1990). Anthropometric estimation of muscle mass in men. *Med. Sci. Sports Exerc.* **22**, 729–733.

Impedancia y DXA : Valoran Grasa Total



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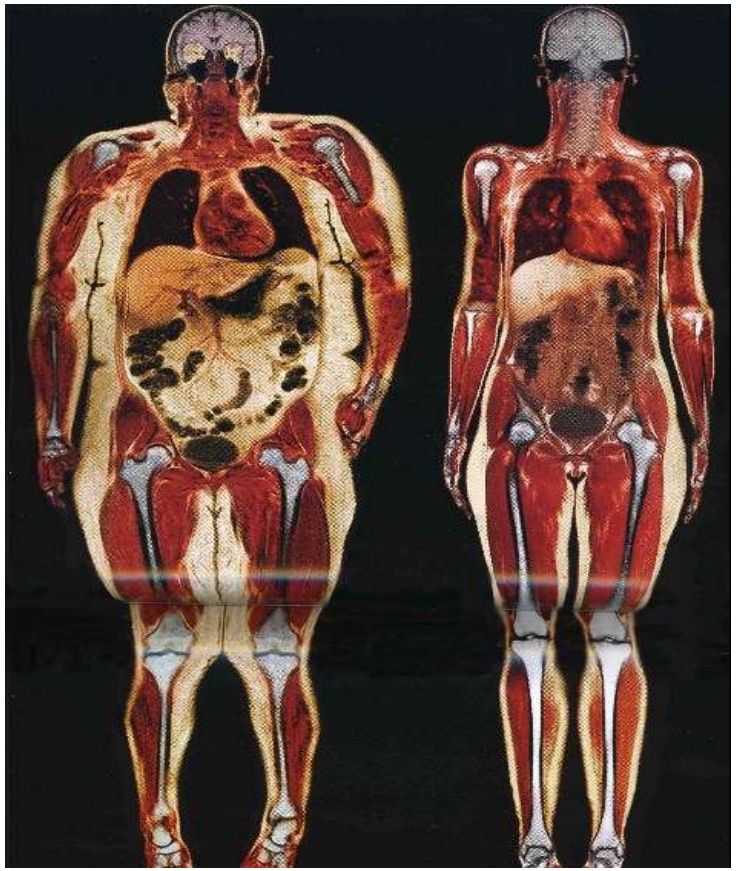


Otros Métodos de Valoración de grasa y músculo

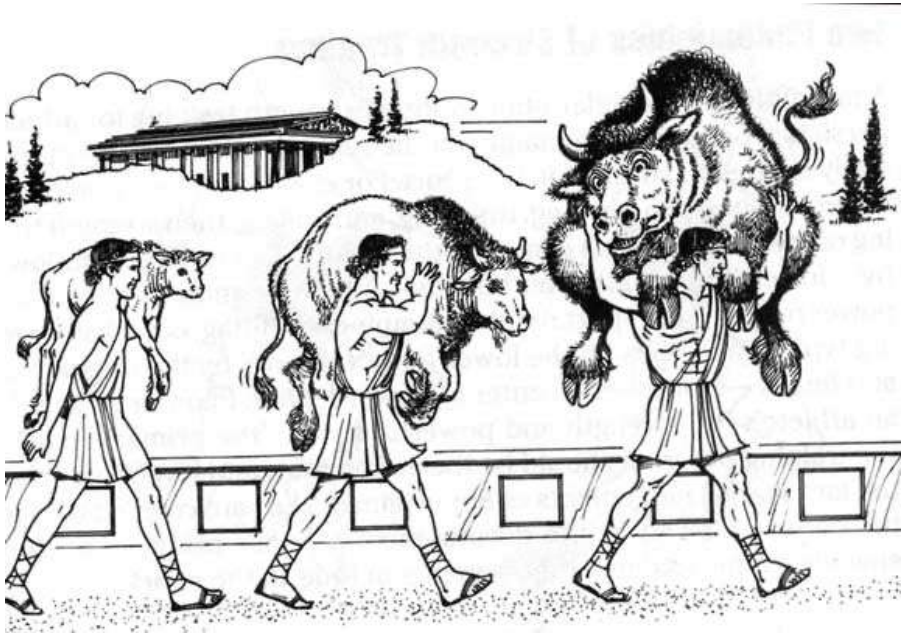
DEXA

- Fat mass FM
- Lean mass FFM
- Fat Mass Index (<6)
- FFM I
- ***Apendicular Index***

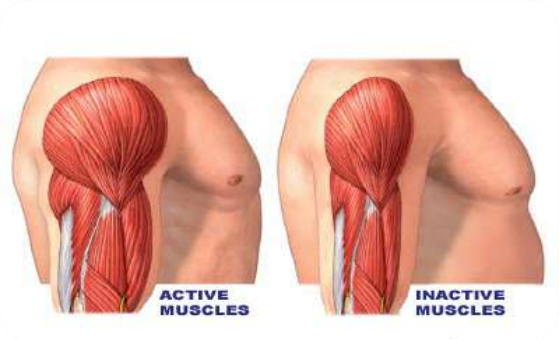
Absorción Dual de Rayos X

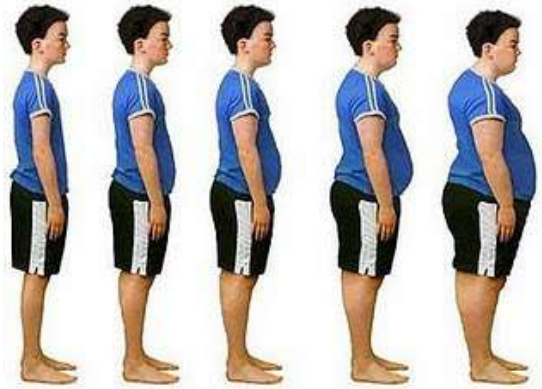
Milón de Crotona

“ Proteína y fuerza progresiva”



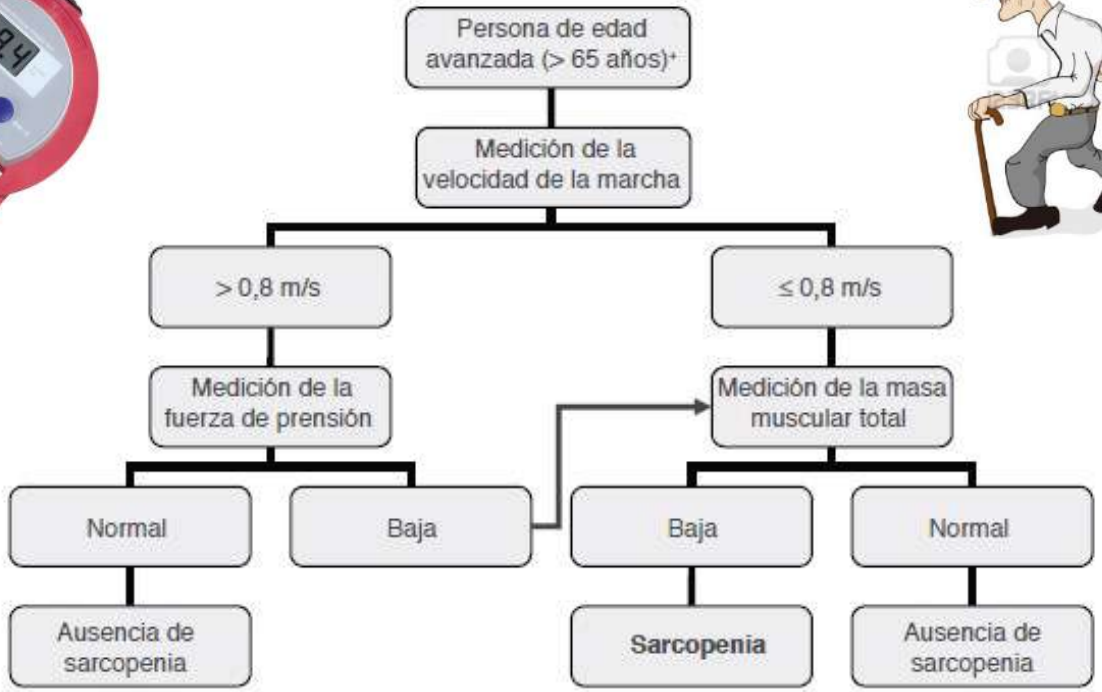
Pérdida de masa muscular
“En busca del músculo perdido”
¿Estamos a tiempo de recuperarlo?





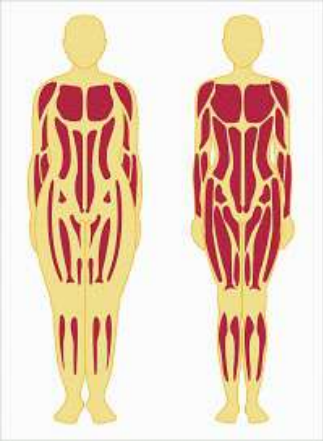
La sarcopenia (del griego “sarx” carne, “penia” perdida) es la pérdida de masa muscular y fuerza al envejecer o al llevar una vida sedentaria.

Sarcopenia



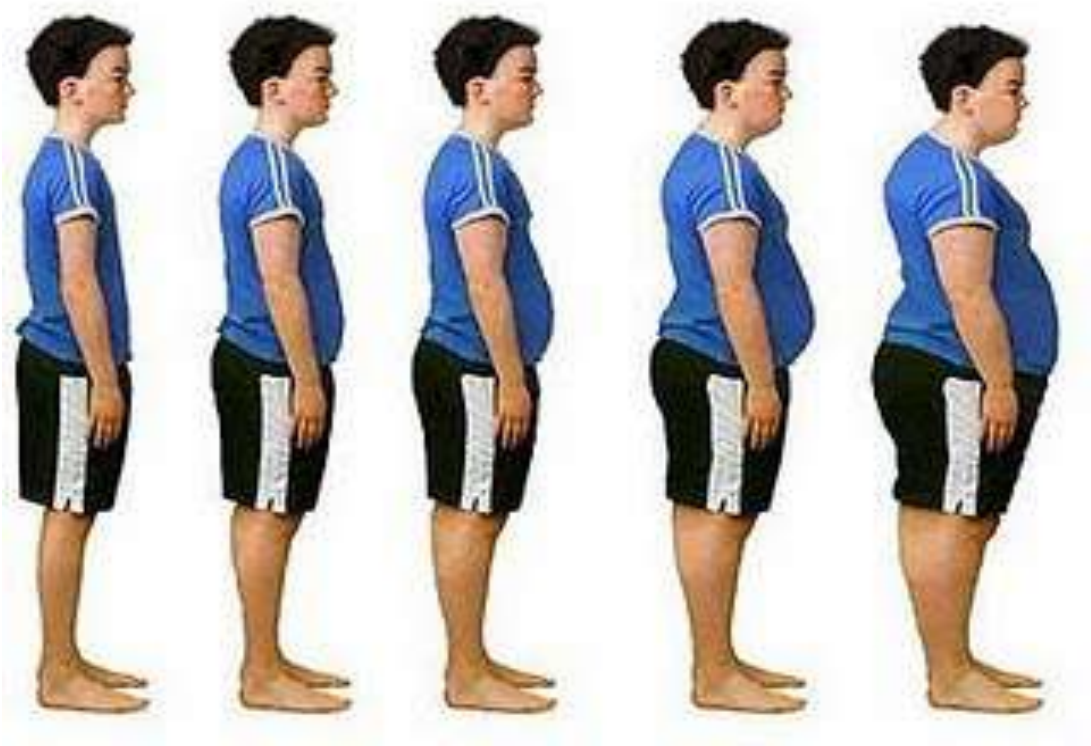
* Han de tenerse en cuenta la comorbilidad y las circunstancias individuales que podrían explicar cada resultad

• Este algoritmo también puede aplicarse a pacientes más jóvenes con riesgo



Sarcopenia y menopausia

Obesidad Sarcopénica



High Visceral and Low Abdominal Subcutaneous Fat Stores in the Obese Adolescent Determinant of an Adverse Metabolic Phenotype

Taksali *DIABETES, VOL. 57, FEBRUARY 2008*

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

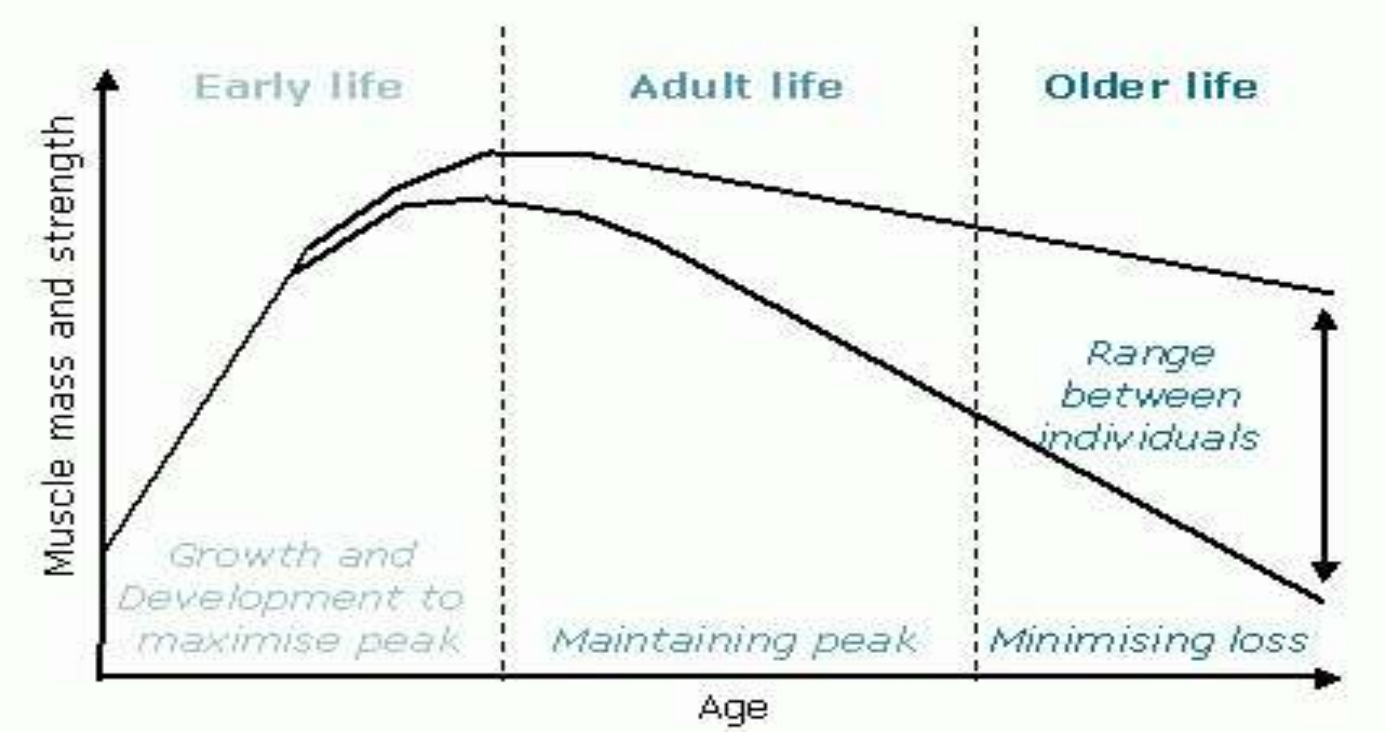
Human Skeletal Muscle Possesses an Epigenetic Memory of Hypertrophy

Received: 31 October 2017
Accepted: 16 January 2018
Published online: 30 January 2018

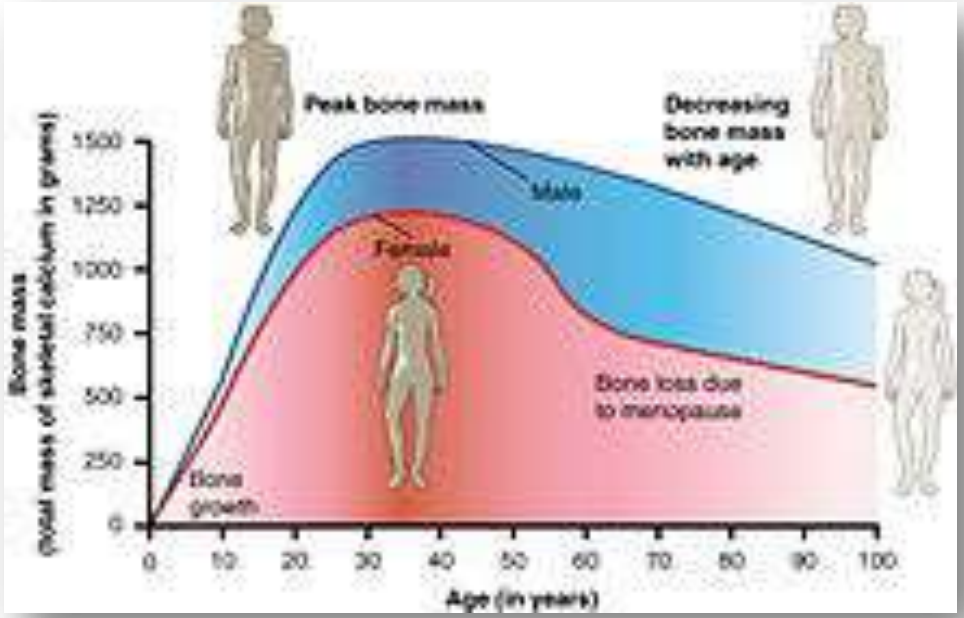
Robert A. Seaborne[1,2], Juliette Strauss[2], Matthew Cocks[2], Sam Shepherd[2], Thomas D. O'Brien[2], Ken A. van Someren[3], Phillip G. Bell[3], Christopher Murgatroyd[4], James P. Morton[2], Claire E. Stewart[2] & Adam P. Sharples[1,2]

The capacity of skeletal muscle to respond differently to environmental stimuli in an adaptive or maladaptive manner if the stimuli have been previously encountere

Cambios a lo largo de la vida
¿Son importantes las primeras etapas de la vida?



¿Van músculo y hueso en paralelo?



Músculo y fuerza
Sarcopenia y dinapenia

¿ Es útil hacer un test de fuerza?

BMJ

Association between muscular strength and mortality in men: prospective cohort study

Jonatan R Ruiz, Xuemei Sui, Felipe Lobelo, James R Morrow, Jr, Allen W Jackson, Michael Sjöström and Steven N Blair

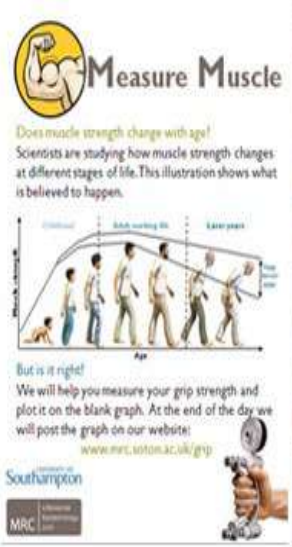
BMJ 2008;337:a439
doi:10.1136/bmj.a439

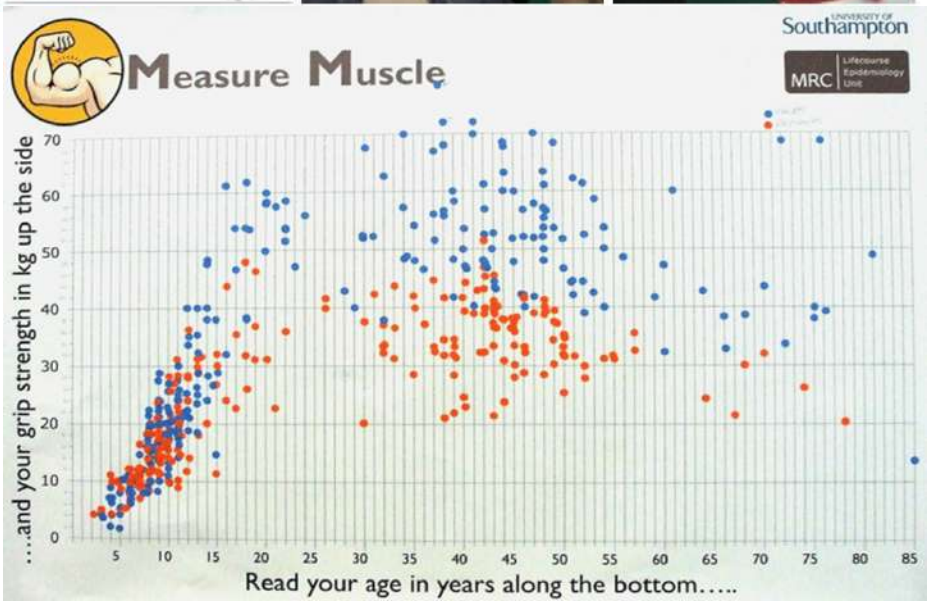
Músculo y fuerza

Fuerza

A review of the measurement of grip strength in clinical and epidemiological studies: towards a standardised approach

Músculo y fuerza en primeras etapas..





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BIRTH WEIGHT AND MUSCLE STRENGTH: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract: *Objective:* Lower muscle strength is associated with a range of adverse health outcomes in later life. The variation in muscle strength between individuals is only partly accounted for by factors in adult life such as body size and physical activity. The aim of this review was to assess the strength of the association between intrauterine development (indicated by birth weight) and subsequent muscle strength. *Design:* Systematic review and meta-analysis of studies that assessed the association between birth weight and subsequent muscle strength. *Results:* Nineteen studies met inclusion criteria with 17 studies showing that higher birth weight was associated with greater muscle strength. Grip strength was used as a single measure of muscle strength in 15 studies. Meta-analysis (13 studies, 20 481 participants, mean ages 9.3 to 67.5) showed a 0.86 kg (95% CI 0.58, 1.15) increase in muscle strength per additional kilogram of birth weight, after adjustment for age, gender and height at the time of strength measurement. *Conclusion:* This review has found consistent evidence of a positive association between birth weight and muscle strength which is maintained across the lifecourse. Future work will be needed to elucidate the biological mechanisms underlying this association, but it suggests the potential benefit of an early intervention to help people maintain muscle strength in later life.

Key words: Birth weight, muscle strength, sarcopenia, muscle development, developmental origins of health and disease hypothesis.

Introduction

Lower handgrip strength is associated with a range of negative outcomes in later life, including greater risk of functional impairment (1), falls (2), impaired glucose tolerance and diabetes (3), and higher all cause mortality rates (4). Factors known to affect muscle strength include age, gender, body size and physical activity but these do not fully account for the variation in muscle strength between individuals. Evidence from several observational epidemiological studies (5-9) suggests that poor intrauterine growth (as assessed by birth weight) is associated with lower handgrip strength, even after adjustment for potential modifying and confounding factors such as height. A lasting effect of poor early growth on muscle tissue is suggested by the findings of altered muscle morphology in humans of lower birth weight (10, 11) and in sheep with poor prenatal nutrition (12).

A previous review published in 2008 found an unadjusted effect size based on six studies of a 2.06 kg (95% CI 1.77, 2.35) increase in grip strength per additional kilogram of birth weight (13). However this review was not a systematic review and did not synthesise all the relevant literature. Added to that, a number of studies have been published since. Thus a systematic review is now warranted. We aimed to assess the strength of the evidence for the association between poor early growth and lower muscle strength, taking into account important modifying and confounding factors (height, gender and age). We contacted authors asking for results in a standardised form, allowing us to limit the possibility that differences between studies could be attributed to differences in analytical strategy. This paper reports the results related to the measure of early growth utilised most frequently, birth weight.

Methods

We used the methods recommended by the Centre for Reviews and Dissemination (CRD), University of York (14) and followed the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guidelines (15) and the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement (16).

Literature search and eligibility criteria

Eligible observational studies were those which reported a relationship between birth weight, size or growth in the first two years of life and a measure of later muscle strength (full review protocol available on request; exposure limited to birth weight only in this report). We limited our search to articles published in English and excluded animal studies. We searched MEDLINE and EMBASE for articles which included terms related to early growth and muscle strength (for a complete list of search terms used, see Appendix 1) from January 1980 to October 2011.

Figure 1 shows how studies were identified. Two authors (RD and HD) independently screened all 10 365 abstracts and assessed the text of 48 papers (including their reference lists for any further potentially relevant articles), leading to the identification of 19 papers which were eligible for inclusion.

We also screened abstracts for studies from selected birth cohorts (see Appendix 2), although this did not yield any

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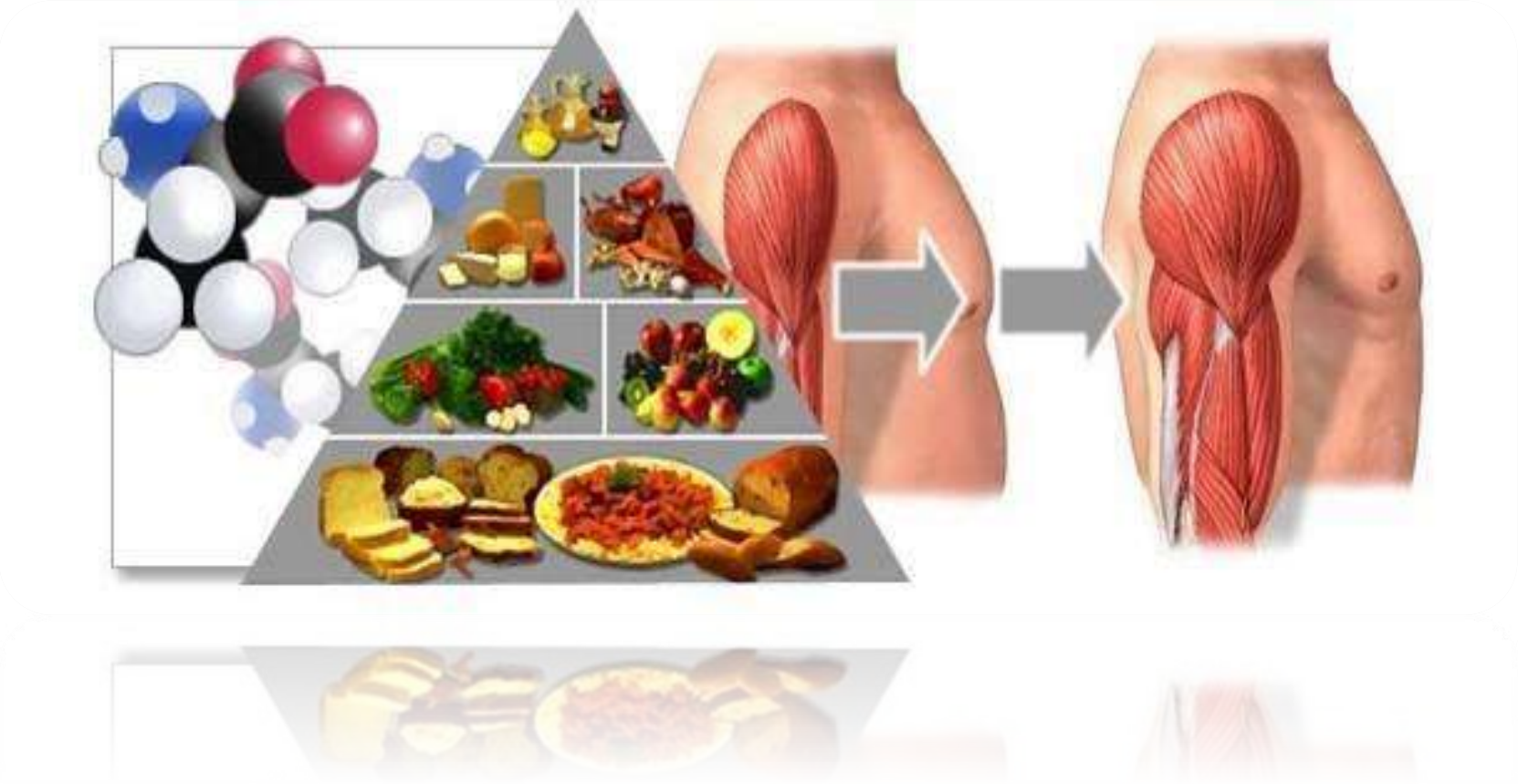
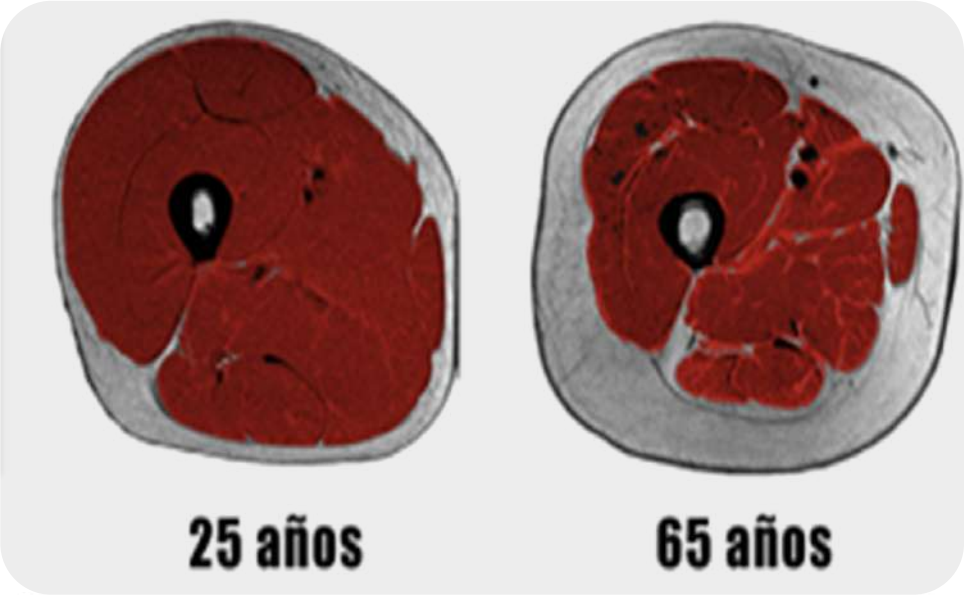
Estrategias nutricionales y de ejercicio



Pérdida de masa muscular
Resistencia anabólica



BJCP British Journal of Clinical Pharmacology

Interactions between exercise and nutrition to prevent muscle waste during ageing

Leigh Breen & Stuart M. Phillips

Department of Kinesiology, McMaster University, Hamilton, Ontario, Canada.

In summary, older adults seeking non-pharmacological interventions to assist in the maintenance or addition of muscle mass would be best advised to implement a combination of resistance-type exercise combined with a source of amino acids/protein. Given the thesis that maximal muscle fibre recruitment, achieved by completing an exercise protocol of sufficiently high intensity or volume, is the centrally important mechanism for achieving hypertrophy, older adults performing resistance exercise may be best advised to perform low load lifting to near failure or, alternatively, with a greater number of sets (for example, six sets) or a slower lifting cadence (for example, 6 s) than a typical exercise regimen. First and foremost, this approach will almost certainly reduce the number of injuries/complaints and increase compliance in older adults, although it remains to be seen as to which regimen is most effective for maintaining or restoring muscle mass and strength in older adults. In addition, low load resistance exercise performed to achieve a high volume or intensity may confer other benefits not typically found when lifting heavier loads, such as improved aerobic capacity, as evidenced in the acute phase by an increase in the synthesis of mitochondrial proteins [72]. Focusing on protein intake, to achieve sustained periods of NPB it appears the elderly may be required to distribute dietary protein equally with each meal throughout the day, as opposed to ingesting the majority of their dietary protein with dinner. To potentiate resistance exercise-induced rates of MPS it is recommended that the elderly ingest a high quality, rapidly digested, leucine-rich protein source (for example, whey, chicken or soy) in close proximity to resistance exercise. However, immediate post-exercise protein intake may not be required to optimize the hypertrophic response to training in the elderly. Instead, consistent protein ingestion over the day after training may be all that is required to facilitate exercise-induced hypertrophy in older adults.

- Digestibilidad
- Reparto a lo largo día
- Contenido en leucina
- Ejercicio de fuerza

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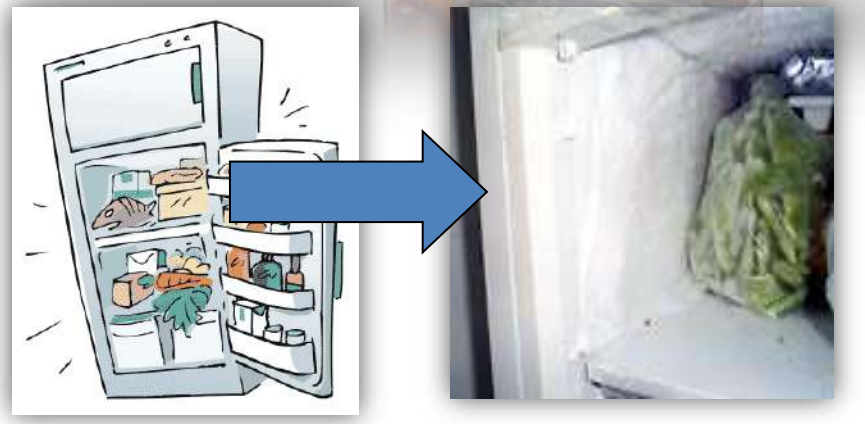
Puesta a punto del motor

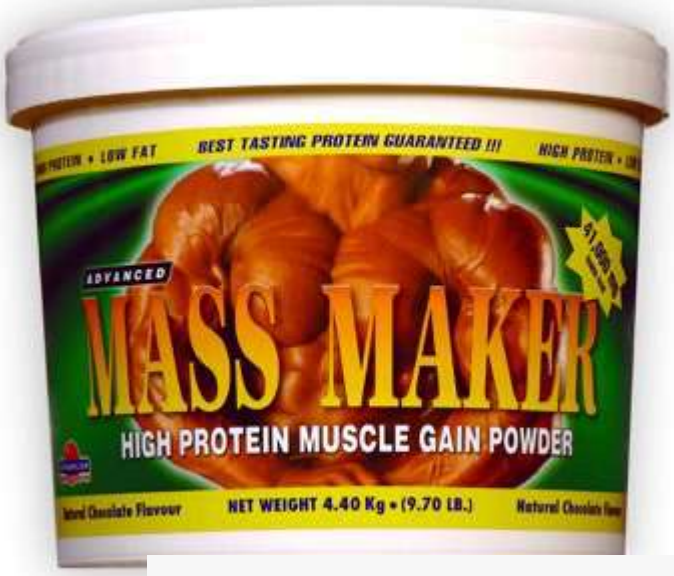


- Ejercicio para utilizar grasa intramuscular y mejorar la resistencia muscular a la insulina
- Trabajo combinado:
- Aeróbico+ **<u>Fuerza</u>**

Proteínas y deporte : controversia

-

Proteínas en gente mayor



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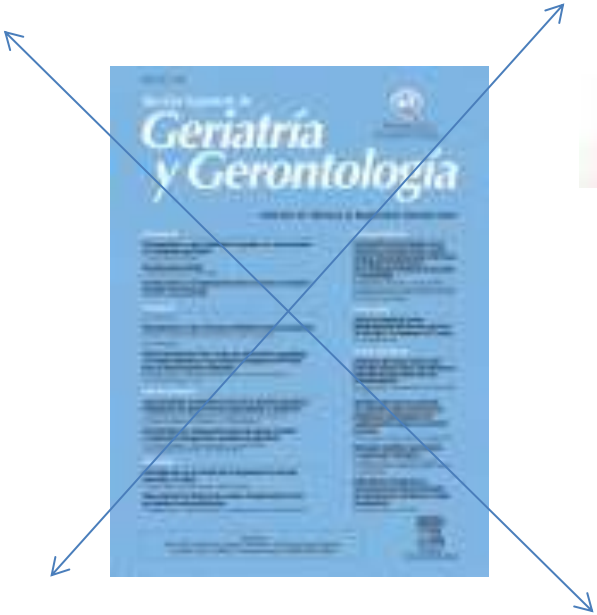
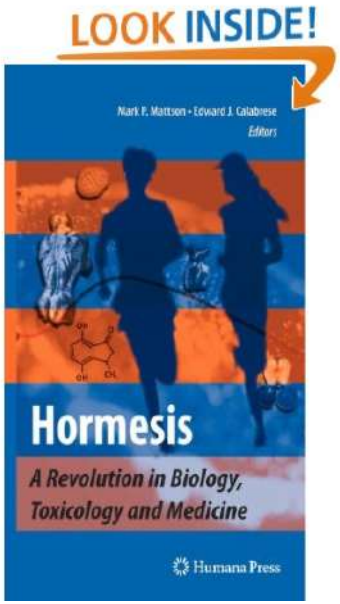
¿De quién hablamos?





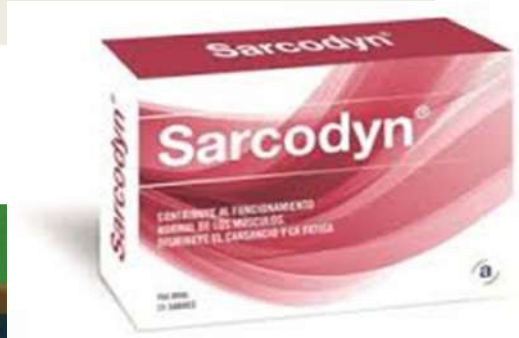
Estrategias

- Trabajo de fuerza
- Mejorar la vascularización al músculo
- Cantidad óptima de proteína y timing
- Control de balance energético y grasa corporal
- Ayudas : Vitamina D, HMB, Leucina, omega 3, creatina, etc

H
OH
H_2N
O
LEUCINE

SUPPLEMENT SCIENCE ///
LEUCINE
LOWDOWN
BUILD MUSCLE THE SMART WAY WITH
THIS AMINO POWERHOUSE

HMB , del gimnasio a la farmacia



Otras ayudas.. Vitamina D

Vitamin D may boost physical function for seniors: Study

By Stephen Daniells, 26-Apr-2010

Related topics: Vitamins & premixes, Bone & joint health, Energy & endurance

Seniors with higher blood levels of vitamin D are also likely to have better physical function, suggests a new study that suggests higher recommended levels may be needed to ensure muscle health.

Physical function was highest in people with the highest blood levels of 25-hydroxyvitamin D (25(OH)D) – the

Low vitamin D may mean fatter, weaker muscles: Study

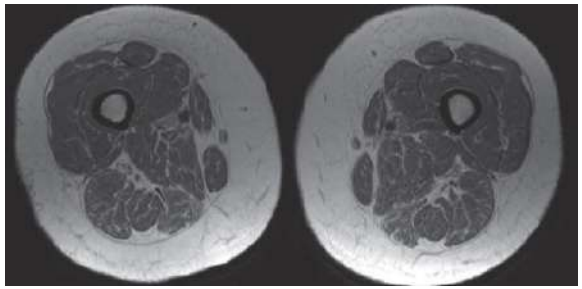
By Stephen Daniells, 09-Mar-2010

Related topics: Vitamins & premixes, Energy & endurance, Women's health

Insufficient blood levels of vitamin D may be associated with the accumulation of fat in muscle tissue, study.

Musculoskeletal Imaging • Original Research

Relationship Between Fatty Degeneration of Thigh Muscles and Vitamin D Status in the Elderly: A Preliminary MRI Study



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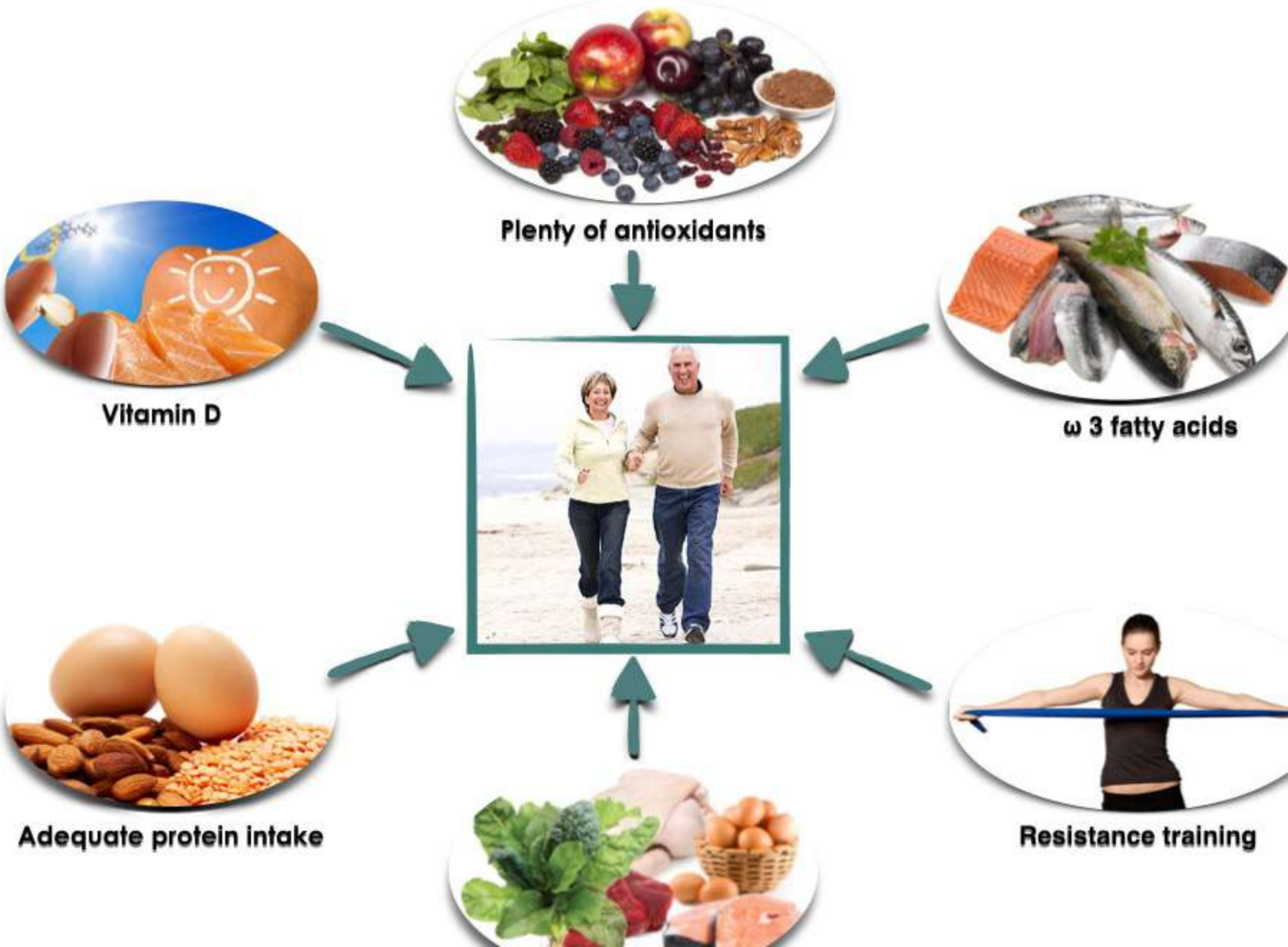
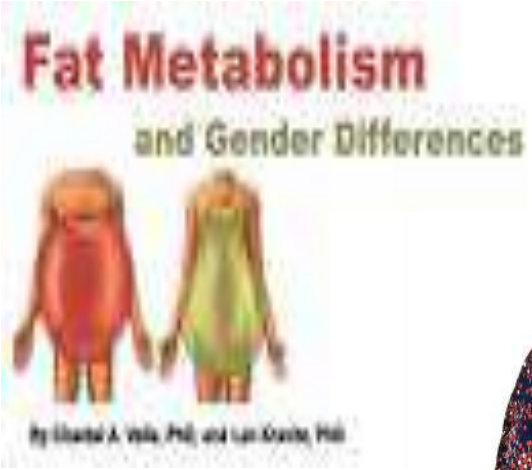
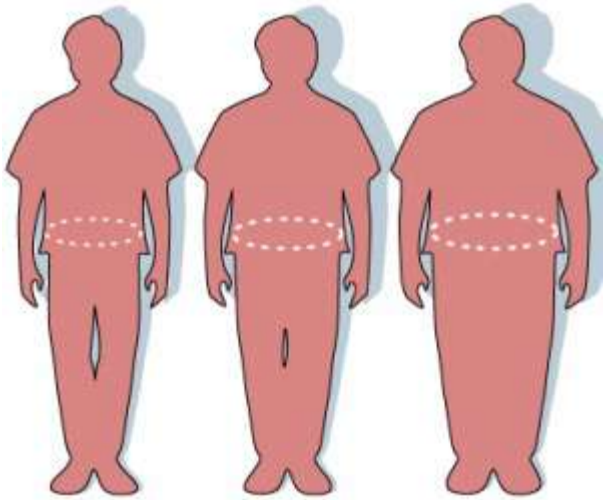
6 Winning strategies to preserve long term muscle health



Traje a medida





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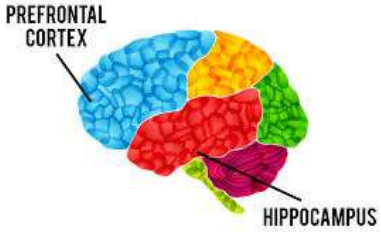
PLOS | BIOLOGY

Exceptional Evolutionary Divergence of Human Muscle and Brain Metabolomes Parallels Human Cognitive and Physical Uniqueness

Katarzyna Bozek[1,2], Yuning Wei[1,3], Zheng Yan[1], Xiling Liu[1], Jieyi Xiong[1,3], Masahiro Sugimoto[4], Masaru Tomita[4], Svante Pääbo[2], Raik Pieszek[2], Chet C. Sherwood[5], Patrick R. Hof[6], John J. Ely[7], Dirk Steinhauser[8], Lothar Willmitzer[8], Jens Bangsbo[9], Ola Hansson[10], Josep Call[2]*, Patrick Giavalisco[8]*, Philipp Khaitovich[1,2]*

Evolución nos quitó músculo y dió cerebro



Visceral fat is associated with lower brain volume in healthy middle-aged adults

Stéphanie Debette, MD, PhD[1], Alexa Beiser, PhD[1,2], Udo Hoffmann, MD[3], Charles DeCarli, MD[4], Christopher J. O'Donnell, MD, MPH[5], Joseph M. Massaro, PhD[2], Rhoda Au, PhD[1], Jayandra J. Himali, MS[1,2], Philip A. Wolf, MD[1], Caroline S. Fox, MD, MPH[3,5], and Sudha Seshadri, MD, DM[1]

MUCHAS GRACIAS