AVALIACIÓN DA CONDICIÓN FÍSICA SAUDABLE CON DAFIS :

FUNDAMENTO DO PROTOCOLO DE VALORACIÓN

Eliseo Iglesias Soler
Santiago de Compostela
21 de Enero de 2017

GALICIA SAUDABLE

XUNTA DE GALICIA

¡¡LA ACTIVIDAD FÍSICA (DE CALIDAD) ES UNA HERRAMIENTA PREVENTIVA Y TERAPÉUTICA EFICAZ!!

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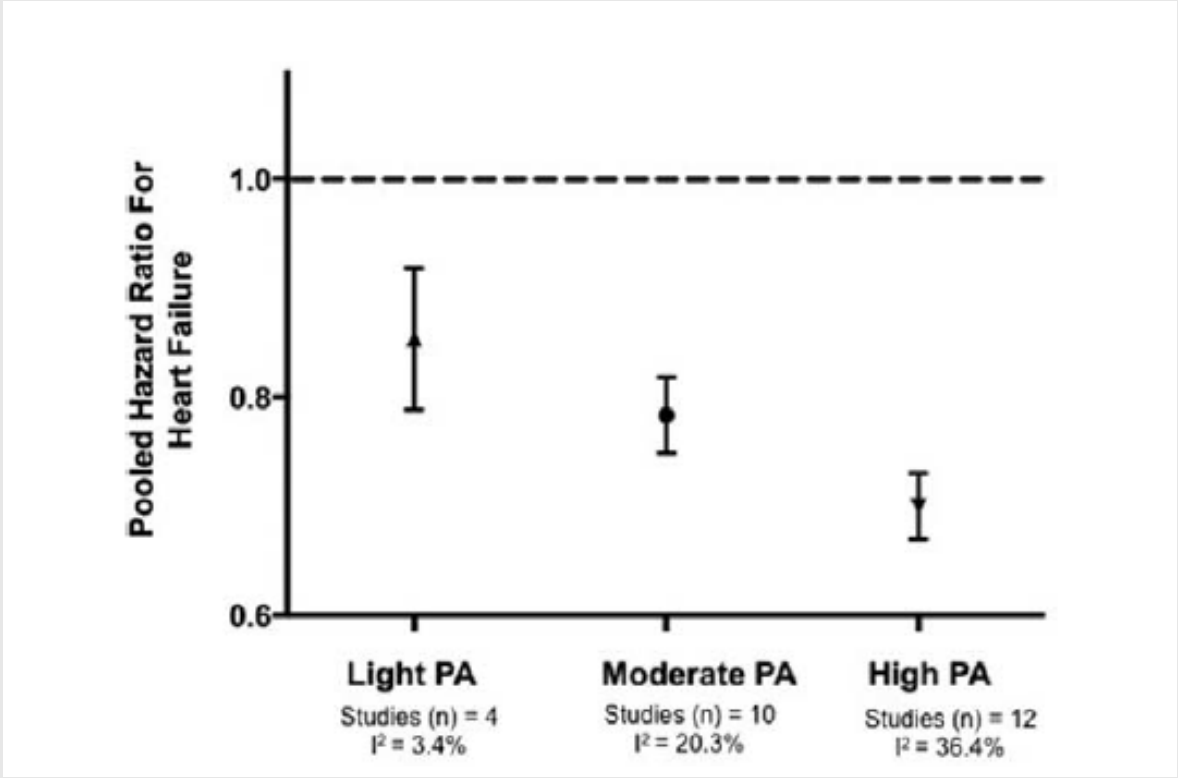
Dose–Response Relationship Between Physical Activity and Risk of Heart Failure

A Meta-Analysis

Ambarish Pandey, MD; Sushil Garg, MD; Monica Khunger, MD; Douglas Darden, MD; Colby Ayers, MS; Dharam J. Kumbhani, MD, SM; Helen G. Mayo, MLS; James A. de Lemos, MD; Jarett D. Berry, MD, MS

(*Circulation*. 2015;132:1786-1794. DOI: 10.1161/CIRCULATIONAHA.115.015853.)



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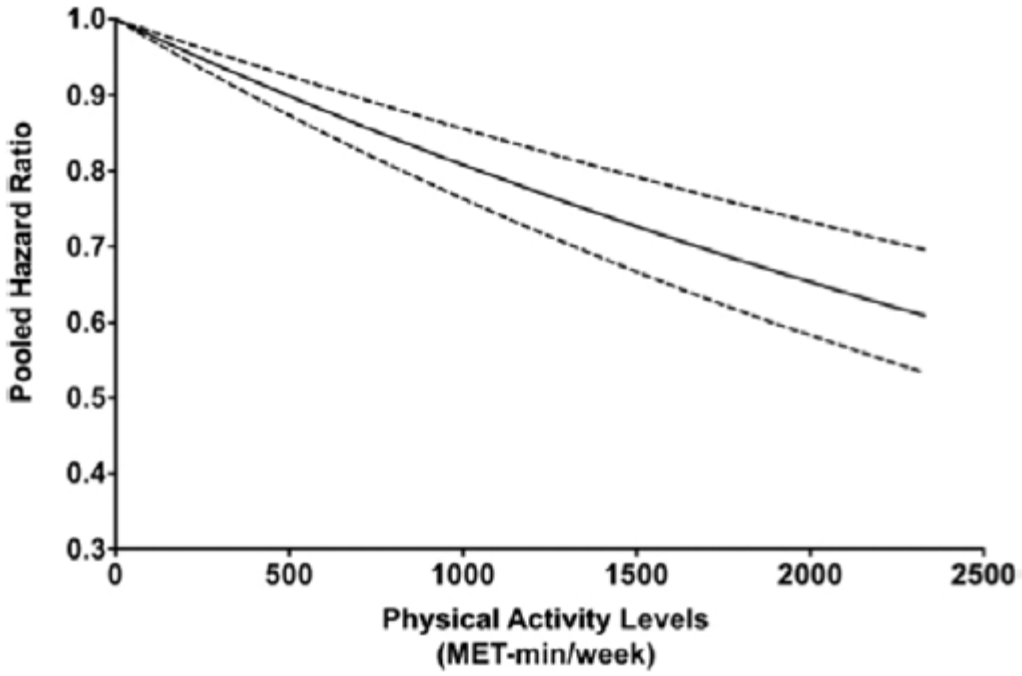

Figure 3. Dose–response association between physical activity and heart failure risk. The graph here shows spline (smoothed fit) and 95% confidence interval of pooled relative risk of heart failure by metabolic equivalent (MET)–min/wk.

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Updating ACSM's Recommendations for Exercise Preparticipation Health Screening

Med. Sci. Sports Exerc., Vol. 47, No. 8, pp. 2473–2479

DEBORAH RIEBE[1], BARRY A. FRANKLIN[2], PAUL D. THOMPSON[3], CAROL EWING GARBER[4], GEOFFREY P. WHITFIELD[5], MEIR MAGAL[6], and LINDA S. PESCATELLO[7]

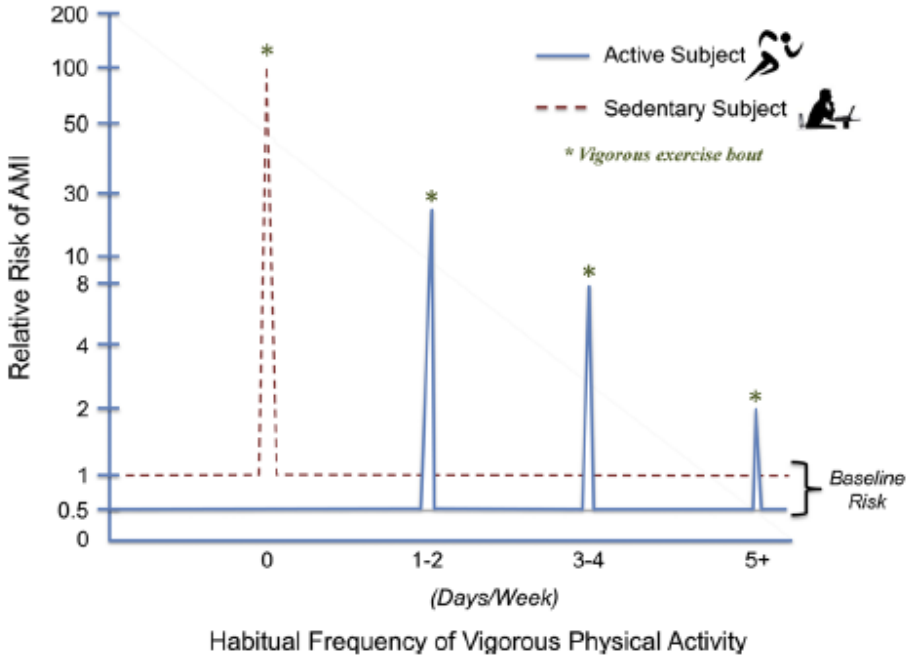

FIGURE 1—Relative risk of AMI at rest (baseline risk) and during vigorous physical activity (≥6 METs) in sedentary and physically active individuals, with specific reference to the habitual frequency of vigorous exertion (d·wk^{-1}). (Adapted from Mittleman MA, Maclure M, Tofler GH, Sherwood JB, Goldberg RJ, Muller JE. Triggering of acute myocardial infarction by heavy physical exertion. Protection against triggering by regular exertion. Determinants of Myocardial Infarction Onset Study Investigators. N Engl J Med. 1993;329(23):1677–1683. Used with permission. Adapted from Franklin BA. Preventing exercise-related cardiovascular events: is a medical examination more urgent for physical activity or inactivity? Circulation. 2014;129:1081–1084. Used with permission.)

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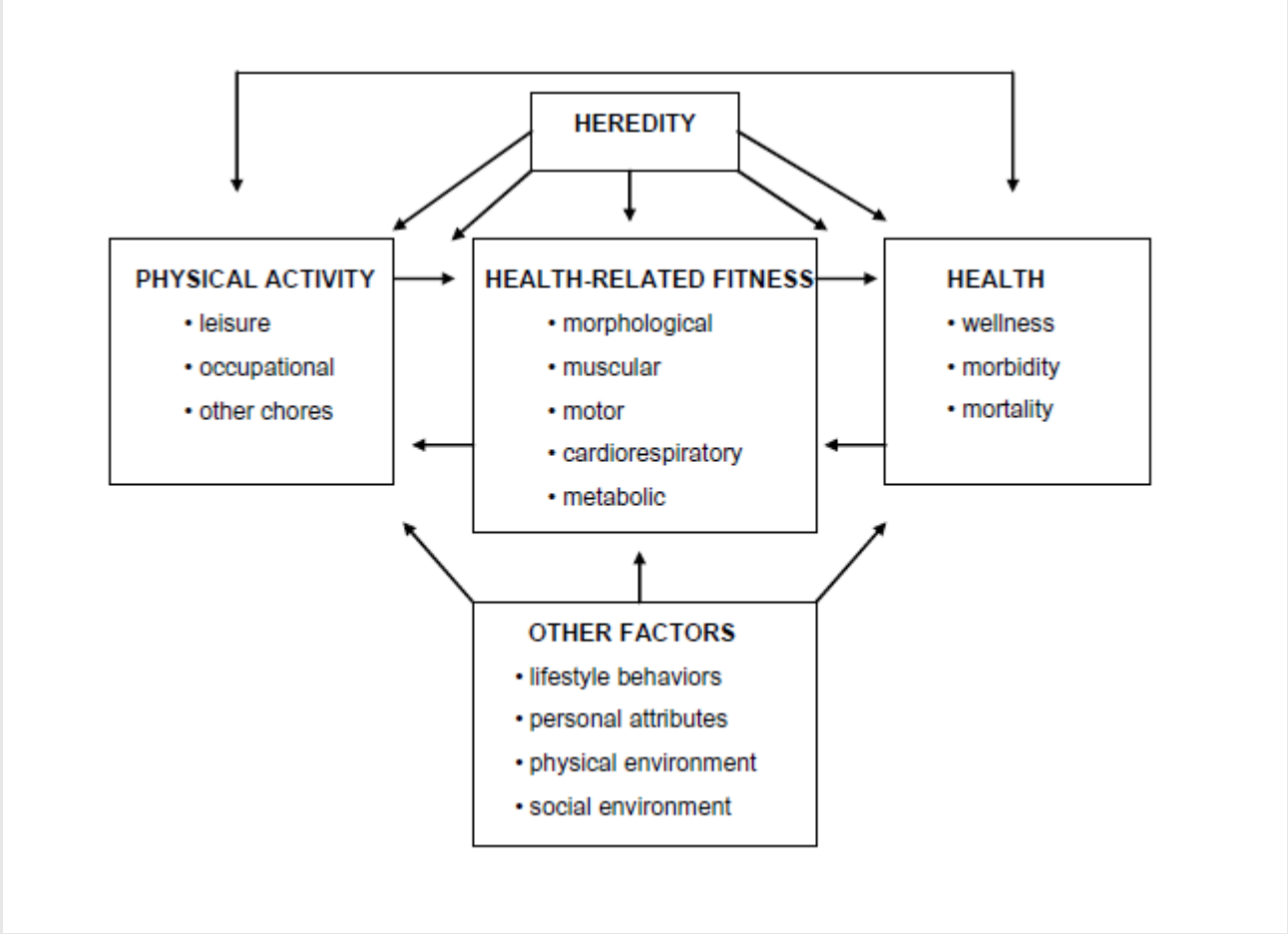
¿ENTRENAR LA SALUD?



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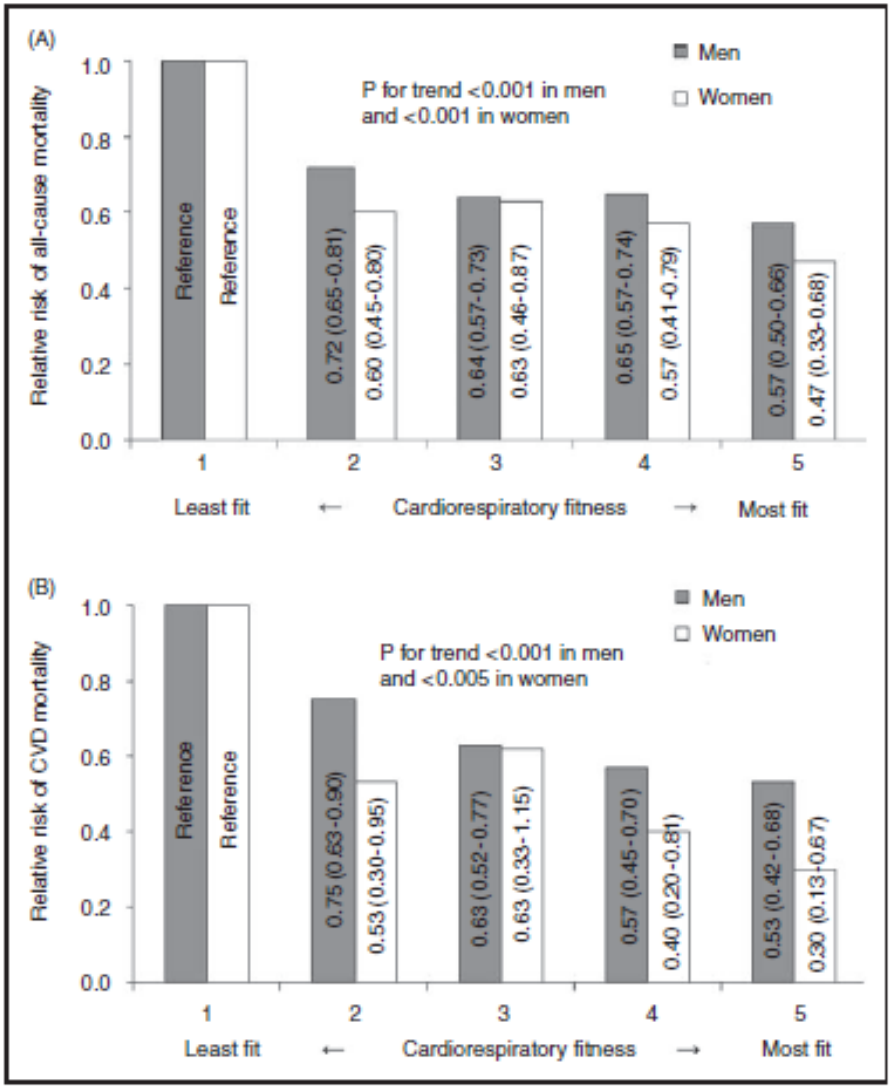

Review

Psychopharm

Journal of Psychopharmacology
24(11) Supplement 4. 27-35
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DOI: 10.1177/1359786810382057
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SAGE

Mortality trends in the general population: the importance of cardiorespiratory fitness

Duck-chul Lee[1], Enrique G Artero[2], Xuemei Sui[1] and Steven N Blair[3]

Abstract

¿ENTRENAR LA SALUD?

GALICIA SAUDABLE

International Journal of Obesity (2008) 32, 1–11

0307-0565/08 $30.00
www.nature.com/ijo

PEDIATRIC REVIEW

Physical fitness in childhood and adolescence: a powerful marker of health

FB Ortega[1,2], JR Ruiz[1,2], MJ Castillo[1] and M Sjöström[2]

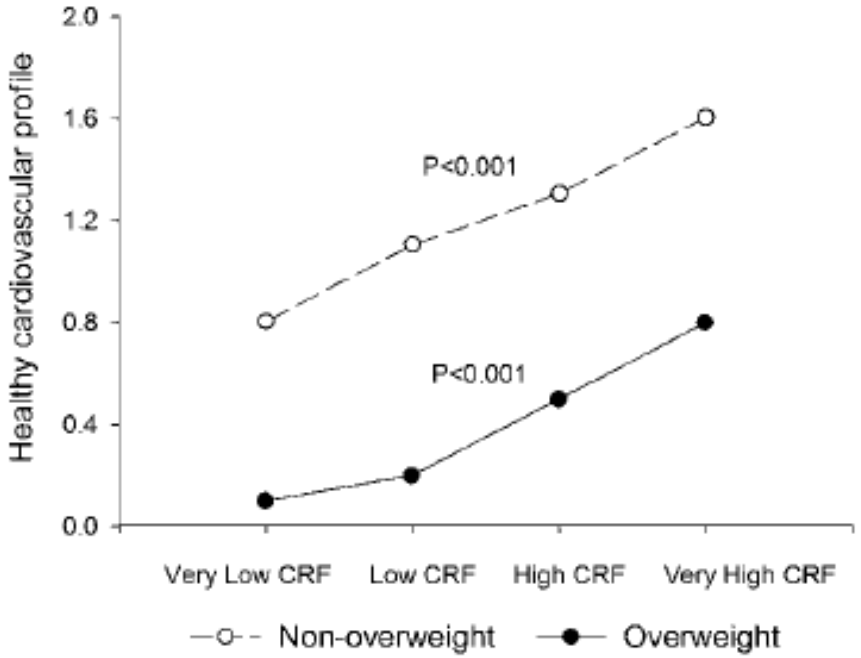

Figure 3 Association between cardiovascular profile (calculated from age- and gender-specific standardized values of triglycerides, LDLc, HDLc and fasting glycemia) and CRF quartiles in non-overweight and overweight Spanish adolescents. A higher score implies a healthier profile (data from the AVENA study; Castillo *et al.*[40]). AVENA, Alimentación y Valoración del Estado Nutricional de los Adolescents [Food and Assessment of the Nutritional Status of Spanish Adolescents]; CRF, cardiorespiratory fitness; HDLc, high-density lipoprotein cholesterol; LDLc, low-density lipoprotein cholesterol.

GALICIA SAUDABLE

¿ENTRENAR LA SALUD?

Review

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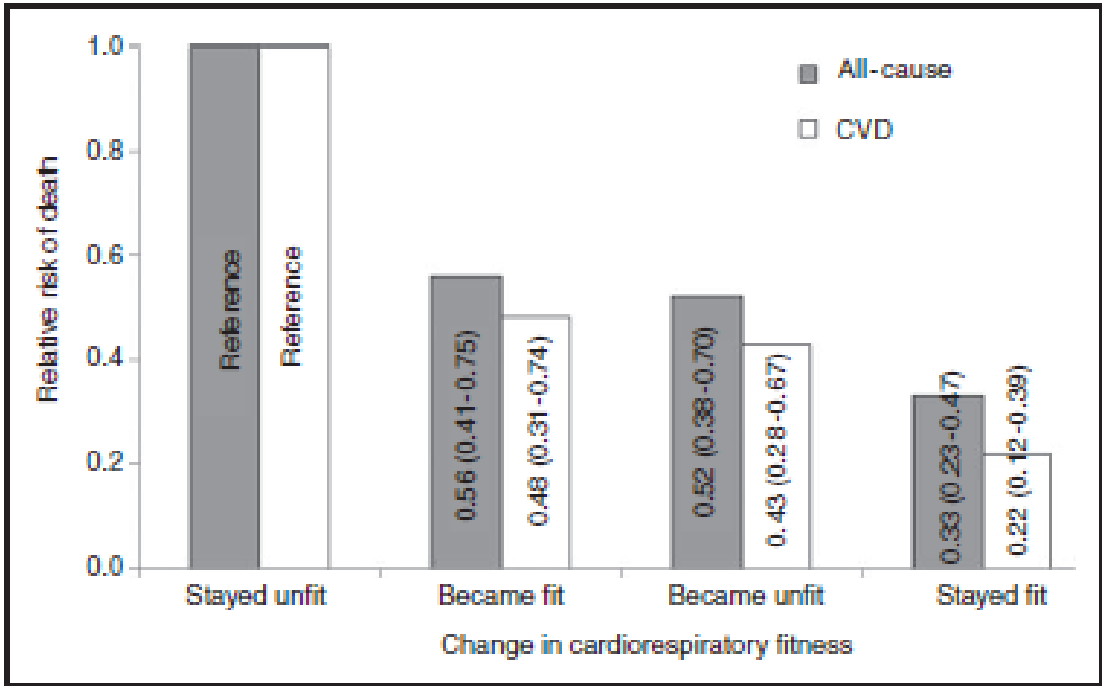

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EJERCICIO/ACTIVIDAD ⟷ CONDICIÓN FÍSICA (SALUDABLE)

Non-modifiable	Modifiable
Age	Physical activity
Gender	Smoking
Genotype	Obesity
	Medical condition

GALICIA SAUDABLE

Sports Med. 2001; 31 (14)

Prescription of Resistance Training for Healthy Populations

Christopher J. Hass,[1,2] *Matthew S. Feigenbaum*[3] and *Barry A. Franklin*[4]

Table II. Comparison of the effects of aerobic endurance training to resistance training on health and fitness variables (from Pollock & Vincent,[1] with permission)

Variable	Aerobic exercise	Resistance exercise
Bone mineral density	↑↑	↑↑
Risk of falls	↔↓	↓
Osteoarthritis	↓↔	↓
% fat	↓↓	↓
LBM	↔	↑↑
Strength	↔	↑↑↑
Local muscle endurance	↑↑	↑↑↑
Glucose metabolism		
Insulin response to glucose challenge	↓↓	↓↓
Basal insulin levels	↓	↓
Insulin sensitivity	↑↑	↑↑
Serum lipids		
HDL	↑↑	↑↔
LDL	↓↓	↓↔
Resting heart rate	↓↓	↔
Stroke volume	↑↑	↔
Blood pressure at rest		
Systolic	↓↓	↔
Diastolic	↓↓	↓↔
$\dot{V}O_{2max}$	↑↑↑	↑
Endurance time	↑↑↑	↑↑
Physical function	↑↑	↑↑↑
Independent living/mobility	↑↑	↑↑↑
Basal metabolism	↑	↑↑

HDL = high-density lipoprotein; **LBM** = lean body mass; **LDL** = low-density lipoprotein; $\dot{V}O_{2max}$ = maximal oxygen uptake; **% fat** = percentage body fat; ↑ = increase; ↑↑ = marked increase; ↑↑↑ = very marked increase; ↓ = decrease; ↓↓ = marked decrease; ↔ = no change.

Fig. 1a

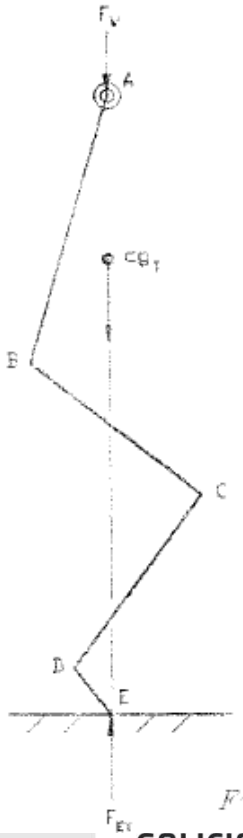

Fig. 1b

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ENTRENAMIENTO DE FUERZA Y METABOLISMO

Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults

AMERICAN COLLEGE of SPORTS MEDICINE

POSITION STAND

This pronouncement was written for the American College of Sports Medicine by Joseph E. Donnelly, Ed.D. (Chair); Steven N. Blair, PED; John M. Jakicic, Ph.D.; Melinda M. Manore, Ph.D., R.D.; Janet W. Rankin, Ph.D.; and Bryan K. Smith, Ph.D.

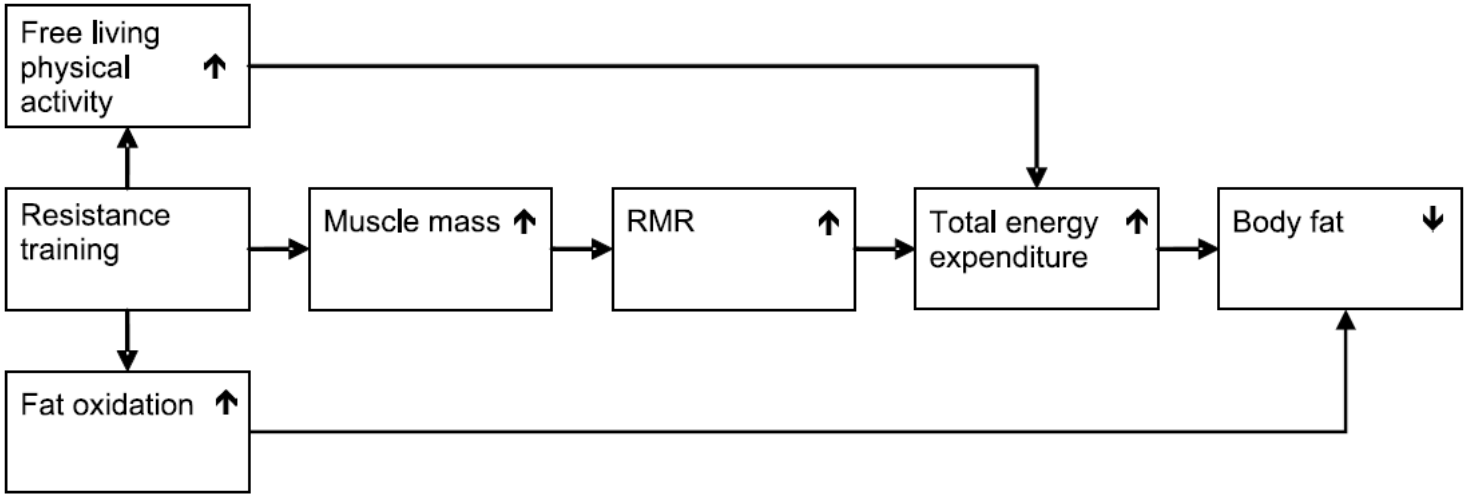

FIGURE 1—Conceptual model of resistance training and the potential effect on energy expenditure. A conceptual model that includes both the energy expenditure from increased muscle mass and the potential energy expenditure from increased activities of daily living. RMR, resting metabolic rate.

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International Diabetes Federation

DIABETES RESEARCH AND CLINICAL PRACTICE

Review

Resistance training improves metabolic health in type 2 diabetes: A systematic review

B.A. Gordon *, A.C. Benson, S.R. Bird, S.F. Fraser

Exercise Metabolism Group, School of Medical Sciences, RMIT University, Melbourne, Australia

ALICIA SALUDABLE

International Journal of Obesity (2008) 32, 1–11

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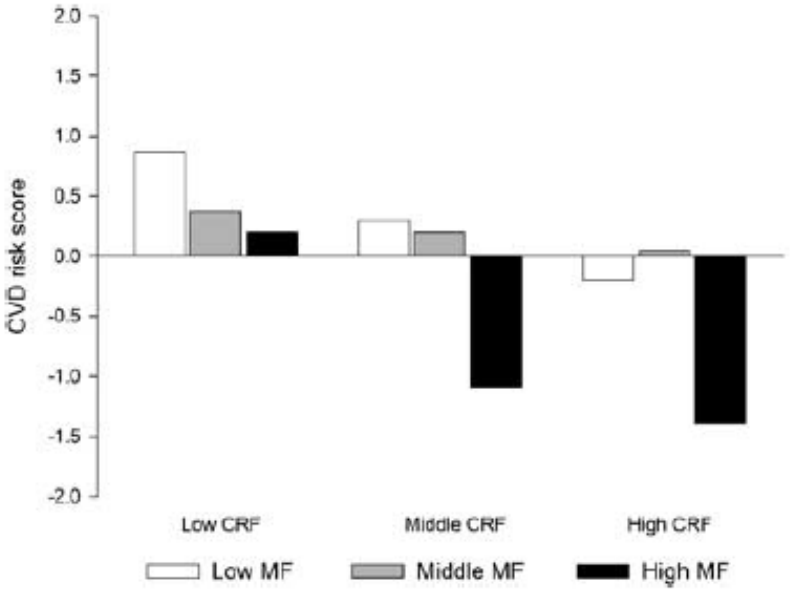

Figure 4 Associations between CVD risk score (an average value from the standardized triglycerides, LDLc, HDLc and glucose) and muscular fitness for a given level of CRF in adolescents. A higher score implies greater CVD risk. Data from the AVENA study, García-Artero *et al.*[54]. AVENA, Alimentación y Valoración del Estado Nutricional de los Adolescents [Food and Assessment of the Nutritional Status of Spanish Adolescents]; CRF, cardiorespiratory fitness CVD, cardiovascular disease; HDLc, high-density lipoprotein cholesterol; LDLc, low-density lipoprotein cholesterol; MF, muscular fitness.

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¿ENTRENAR LA SALUD?

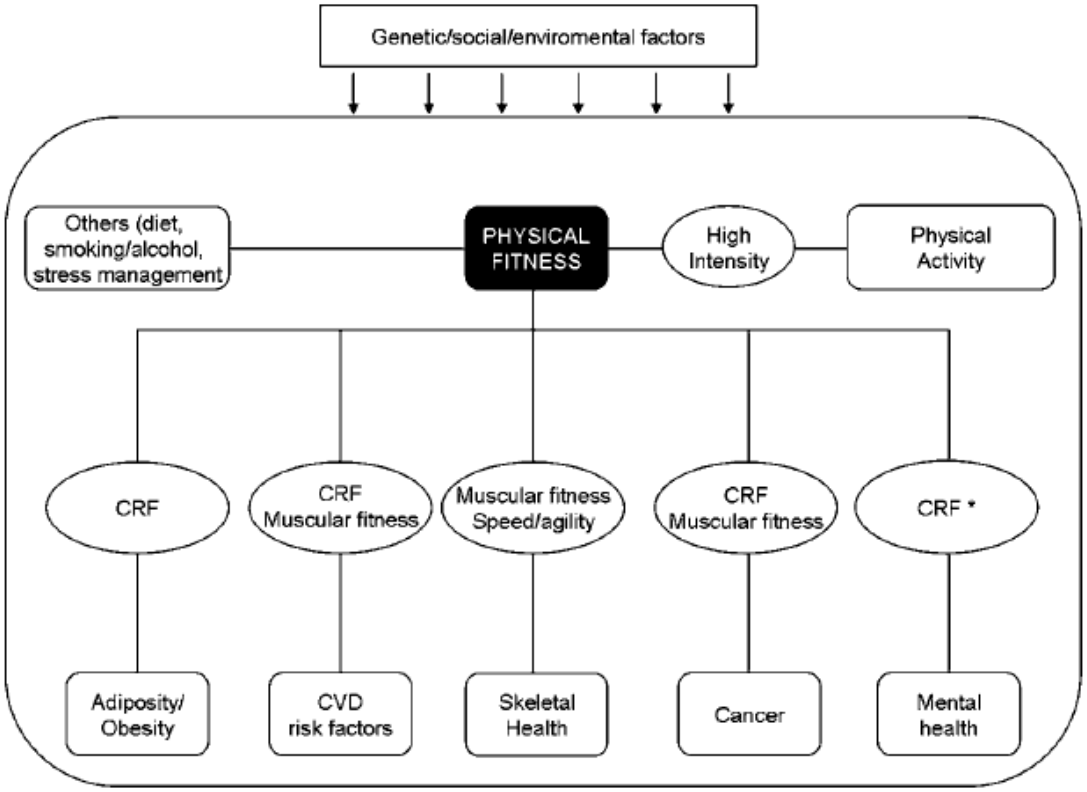

Figure 5 Associations between physical fitness and several health outcomes, showing the main health-related physical fitness components involved in those associations. * No information has been found about the other fitness components.

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CFS

- Capacidad para realizar actividad física
- Medición integrada de la mayoría de funciones corporales implicadas en la realización de actividad física (funcionalidad de sistemas)
- Producto del ejercicio físico
- Factor asociado de forma independiente al estado de salud (modulador del efecto de la actividad física)

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¿PARA QUÉ VALORAMOS LA CFS?

- Evaluar/Caracterizar
  - Norma
  - Criterio
- Establecer objetivos
- Promover/Incentivar
- Monitorizar

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CONFIGURACIÓN DE LA CFS

COMPONENTE MORFOLÓGICO	- Masa corporal en función de la talla - Composición corporal - Distribución de la grasa subcutánea - Grasa intra-abdominal - Densidad ósea - Flexibilidad
COMPONENTE MUSCULAR	- Potencia - Fuerza - Resistencia
COMPONENTE MOTOR	- Agilidad - Equilibrio - Coordinación - Velocidad de movimiento
COMPONENTE CARDIORRESPIRATORIO	- Capacidad submáxima de ejercicio - Potencia aeróbica máxima - Función cardíaca - Función pulmonar - Presión sanguínea
COMPONENTE METABÓLICO	- Tolerancia a la glucosa - Sensibilidad insulínica - Metabolismo de los lípidos y lipoproteínas - Características de la oxidación de sustratos

(Bouchard, Sheperd, & Stephens, 1994)

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¿QUÉ VALORAR?

Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents

Br J Sports Med 2011;**45**:518–524. doi:10.1136/bjsm.2010.075341

Jonatan R Ruiz,[1,2] José Castro-Piñero,[3] Vanesa España-Romero,[1,2] Enrique G Artero,[1] Francisco B Ortega,[1,2] Magdalena M Cuenca,[1] David Jimenez-Pavón,[1] Palma Chillón,[4] María J Girela-Rejón,[4] Jesús Mora,[3] Ángel Gutiérrez,[1] Jaana Suni,[5] Michael Sjöström,[2] Manuel J Castillo[1]

- **Fitness Cardiorrespiratorio**
- **Fitness Muscular**
- **Fitness Motor**
- **Composición corporal**

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SELECCIÓN DE INSTRUMENTOS DE MEDICIÓN

- **Fundamentos de la medida y de la evaluación**
  - **Validez**
  - **Fiabilidad**
  - **Otras: precisión, objetividad, sensibilidad, rango, especificidad**

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SELECCIÓN DE INSTRUMENTOS DE MEDICIÓN

- **Validez**
  - **Requisitos de fiabilidad y relevancia**
  - **Tipos de Validez en función de su determinación:**
    - **Contenido: mediante procedimiento lógico**
    - **Predictiva: procedimientos estadísticos**
    - **Criterio: procedimientos estadísticos**
      - **Correlación con "Gold Standard" (r>0.6)**
      - **Comparación con "Gold Sandard" (p>0.05)**
      - **Bland-Altman Plot (sesgo y límites de acuerdo)**

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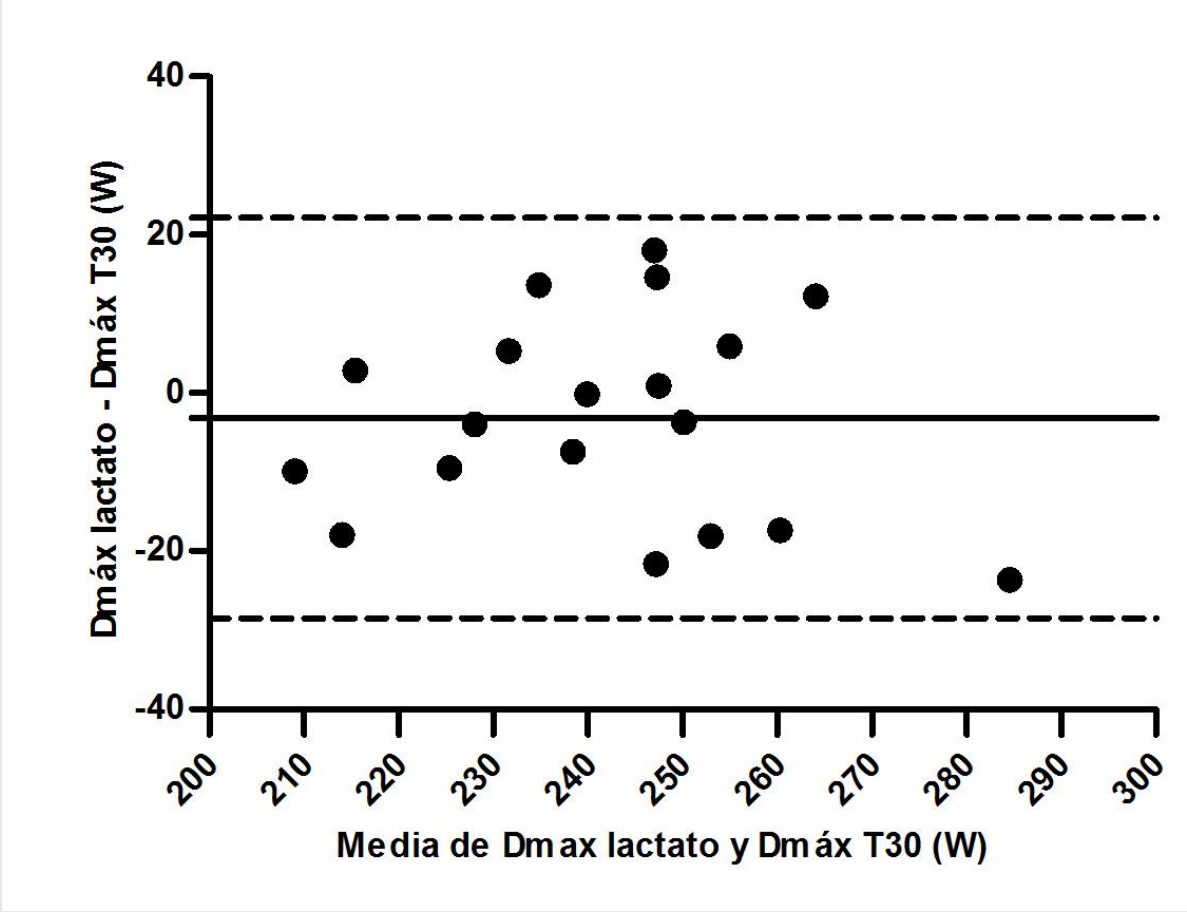
BLAND-ALTMAN PLOT



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SELECCIÓN DE INSTRUMENTOS DE MEDICIÓN

- **Fiabilidad**
  - **Replicabilidad**
  - **Determinación:**
    - **Interclase: Correlación (Pearson) entre los resultados obtenidos en dos momentos (>0.80)**
    - **Intraclase (ICC): propoción de la varianza observada atribuible a la varianza verdadera**
      - **>0.90**
      - **0.80-0.89**
      - **<0.80**

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SELECCIÓN DE INSTRUMENTOS DE MEDICIÓN

- **Otros aspectos a considerar**
  - **Precisión**
  - **Sensibilidad y rango**
  - **Objetividad**
  - **Especificidad**
  - **Facilidad de administración**

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CRITERIOS CONSIDERADOS EN LA SELECCIÓN FINAL

- ✓ Validez/Fiabilidad
- ✓ Minimización de requerimientos materiales, humanos y procedimentales:
  - ✓ Viabilidad
- ✓ Sostenibilidad
- ✓ Comparabilidad de los resultados:
  - ✓ Pruebas/Procedimientos empleados en contextos similares a los contemplados no PGS
  - ✓ Valores de referencia obtenidos en poblaciones asimilables :
    - ✓ Proyectos estatales
    - ✓ Proyectos europeos

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ANTECEDENTES

Table 1 Existing field-based physical fitness test batteries for children and adolescents

Age (years)	Acronym	Society/Organisation	Country/Region
6–18	EUROFIT[31]	Council of Europe Committee for the Development of Sport	Europe
5–17	FITNESSGRAM[32]	The Cooper Institute	USA
6–17	PCHF[33]	President's Challenge: Health Fitness. The President's Council on Physical Fitness and Sports/American Association for Health, Physical Education, and Recreation (AAHPER)	USA
6–17	PCPF[34]	President's Challenge: Physical Fitness. The President's Council on Physical Fitness and Sports/American Association for Health, Physical Education, and Recreation (AAHPER)	USA
6–17	AAUTB[35]	Amateur Athletic Union Test Battery. Chrysler Foundation/Amateur Athletic Union	USA
6–17	YMCAYFT[36]	YMCA Youth Fitness Test	USA
5–17	NYPFP[37]	National Youth Physical Program. The United States Marines Youth Foundation	USA
5–18	HRFT[38]	Health-Related Fitness Test, American Association for Health, Physical Education, and Recreation (AAHPER)	USA
5–18	Physical Best[39]	American Association for Health, Physical Education, and Recreation (AAHPER)	USA
9–19	IPFT[40]	International Physical Fitness Test (United States Sports Academic/General Organization of Youth and Sport of Bahrain)	USA
7–69	CAHPER-FPT II[41]	Fitness Performance Test II. Canadian Association for Health, Physical Education and Recreation (CAHPER)	Canada
15–69	CPAFLA[42]	The Canadian Physical Activity, Fitness & Lifestyle Approach (Canadian Society for Exercise Physiology)	Canada
9–19+	NFTP-PRC[43]	National Fitness Test Program in the Popular Republic China (China's National Sport and Physical Education Committee)	China
6–12	NZFT[44]	New Zealand Fitness Test. Rusell/Department of Education	New Zealand
9–19	AFEA[45]	Australian Fitness Education Award. The Australian Council for Health, Education and Recreation, ACHER	Australia

Modified from Castro-Piñero *et al*.[2]

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ANTECEDENTES: PROYECTOS DE REFERENCIA

Alimentación y Valoración del Estado Nutricional en Adolescentes (AVENA) (2000-2008)

Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA)

Assessing Levels of Physical Activity

The ALPHA Health-Related Fitness Test Battery for Children and Adolescents

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- ✓ **Asociación con parámetros de salud**
- ✓ **Valor predictivo de CFS futura**
- ✓ **Validez de criterio**
- ✓ **Fiabilidad (Replicabilidad)**

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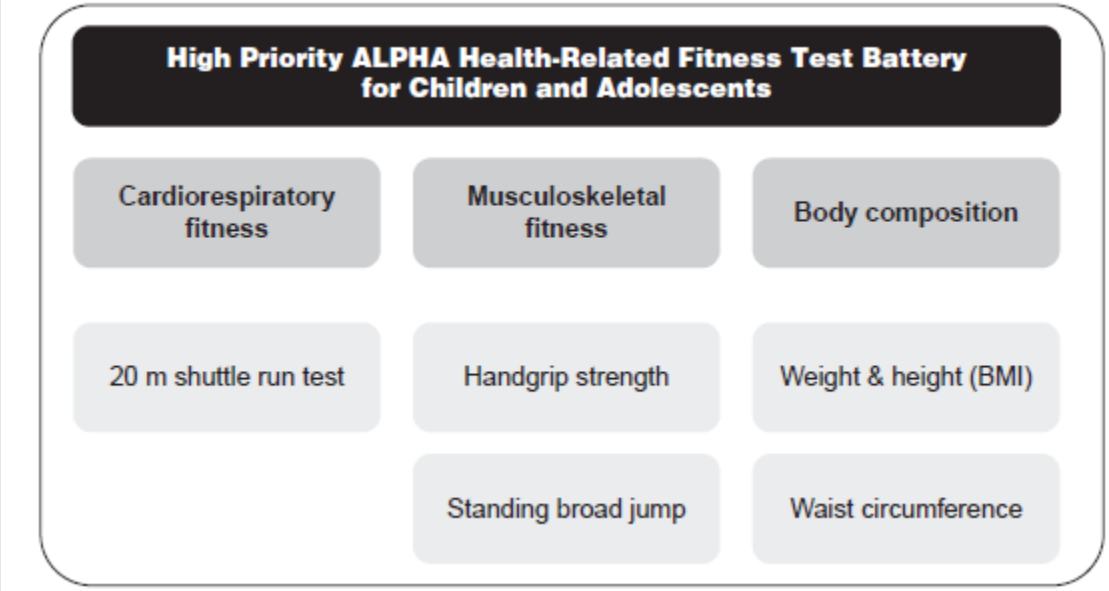
Assessing Levels of Physical Activity

The ALPHA Health-Related Fitness Test Battery for Children and Adolescents



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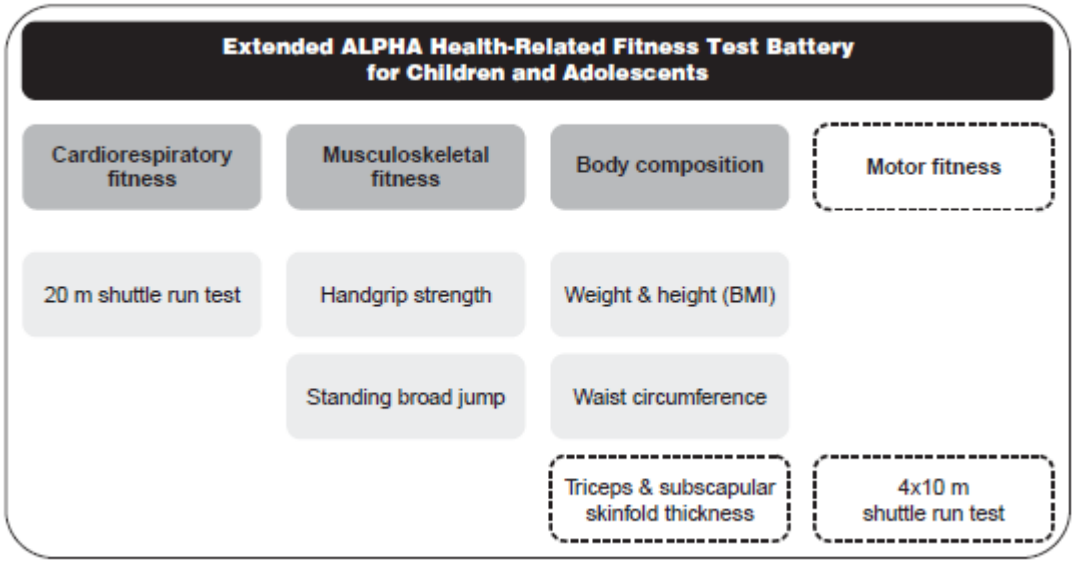
Assessing Levels of Physical Activity

The ALPHA Health-Related Fitness Test Battery for Children and Adolescents



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COMPONENTE	FACTOR	DENOMINACIÓN PRUEBA	MATERIAL	FUENTE VALORES DE REFERNCIA	INFORMACIÓ (OUTPUT)
Composición corporal	Masa Corporal	IMC	Tallímetro, báscula, cinta métrica	Cole et al. 2000	Kg/m^2
	Distribución grasa corporal	Perímetros: Cintura; Cadera; Ratio (ICC)	Cinta métrica	Serra-Majem y Aranceta, 2001	Cm
Cardiorrespiratorio	Potencia aeróbica	Course Navette	Superficie llana 20 m . CD de audio Lector de CD.	10-12 años : Finessgram standards healthy zones 13-18 años:Ortega et al. 2005; datos AVENA y HELENA study	Nº Periodos completados VO_{2max}
Muscular	Fuerza máxima	Prensión manual	Dinamómetro manual	6-12 años: Marrodán Serrano et al. 2009 13-18 años: Ortega et al. 2005; datos AVENA y HELENA study	Kg
	Fuerza explosiva tren inferior	Salto horizontal pies juntos	Colchoneta Cinta métrica	6-12 años: Castro-Piñeiro et al. 2009 13-18 años: Ortega et al. 2005; datos AVENA y HELENA study	Cm
	Resistencia a la fuerza tren superior	Suspensión con flexión de brazos	Cronómetro Barra cilíndrica	6-12 años: Castro-Piñeiro et al. 2009 13-18 años: Ortega et al. 2005; datos AVENA y HELENA study	Seg.
	Flexibilidad	Back Saver Sit and Reach	Cajón calibrado Cronómetro	5-12 años: Finessgram standards healthy zones 13-18 años:Ortega et al. 2005; datos AVENA y HELENA study	Cm
Motor	Velocidad-Agilidad-Coordinación	4x10 m	Cronómetro 3 esponjas	13-18 años : Ortega et al. 2005;	Seg.

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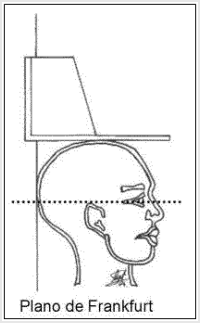
COMPOSICIÓN CORPORAL



- **IMC. Aceptable indicador de adiposidad especialmente en niveles altos**
- **IMC. No discrimina origen del peso**
- **Existe fuerte evidencia de la utilidad del perímetro de la cintura como estimador de adiposidad central**
- **ICC. La asociación con adiposidad central es inferior a la hallada para el perímetro de la cintura**

(Castro Piñeiro et al. 2010)

ALPHA

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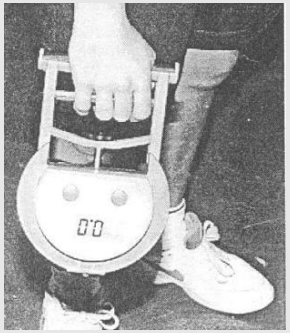
COMPONENTE MUSCULAR: PRENSIÓN MANUAL



- **Información sobre desórdenes musculares, nerviosos u óseos**
- **Predictor de mortalidad y autonomía funcional**
- **AVENA: correlación negativa con Colesterol Total/HDL**

(Ruiz et al. 2006)

- **Validez de criterio respecto a 1RM en press banca en niños 7-12 años**
- **Existe fuerte evidencia de que el "hand-grip strength test" con codo extendido y con la anchura de agarre ajustada al tamaño de la mano (usando TKK dynamometer) es una prueba válida para medir la fuerza isométrica máxima.**

(Castro Piñeiro et al. 2010)

Alpha

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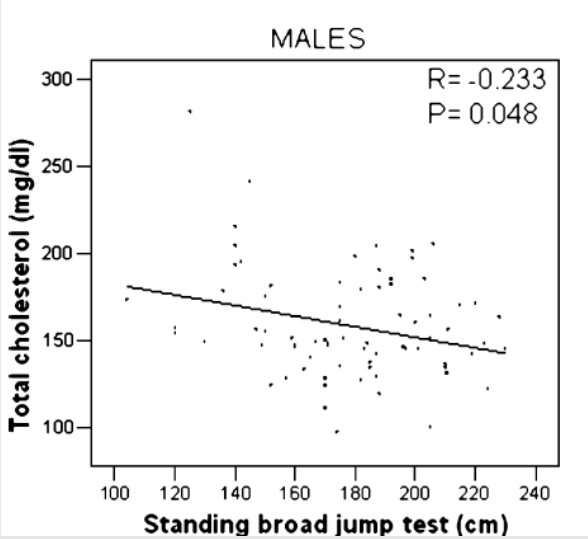
COMPONENTE MUSCULAR: SALTO HORIZONTAL A PIES JUNTOS (SH)

- **Correlación positiva con masa ósea de la cadera y a nivel lumbar**
- **Datos AVENA: correlación negativa con Colesterol Total en adolescentes con sobrepeso u obesidad**
- **Asociación con 1RM en prensa de piernas (Ruiz et al. 2006; Castro Piñeiro et al. 2010)**



Alpha

GALICIA SAUDABLE

COMPONENTE MUSCULAR: SUSPENSIÓN CON CODOS FLEXIONADOS

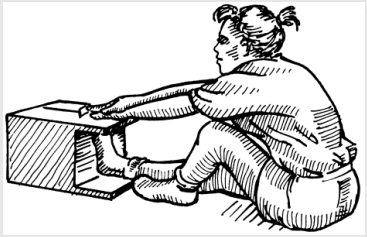
- Índices de fiabilidad aceptables
- Datos AVENA: correlación negativa con Colesterol Total en adolescentes
- Predictivo de CFS adulta (estudio con chicas finlandesas de 9-21 años)
- Muy afectado el resultado por el peso del sujeto (39% de chicas y 28% de chicos no son capaces de mantenerse más de 0")

(Ruiz et al. 2006; Ortega et al. 2008; Castro Piñeiro et al. 2010)

SUSPENSIÓN BARRA

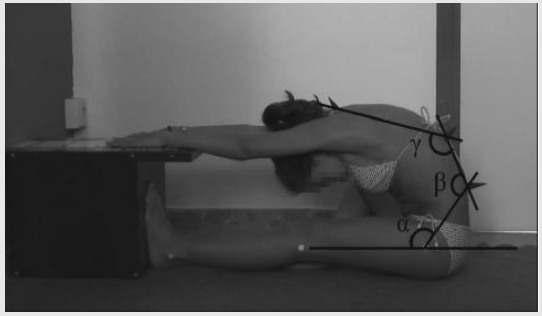
GALICIA SAUDABLE

COMPONENTE MUSCULAR (FLEXIBILIDAD): "BACK SAVED SEAT AND REACH"



- Factor preventivo de lesiones y enfermedades del aparto locomotor
- No incorporada a ALPHA
- La rodilla flexionada limita la flexión del tronco (estrés zona lumbar) (¿?)
- Evaluación diferenciada de cada pierna, permitiendo detección de asimetrías
- A nivel articular, fundamentalmente dependiente de la flexibilidad de la cadera
- Índices de replicabilidad aceptables

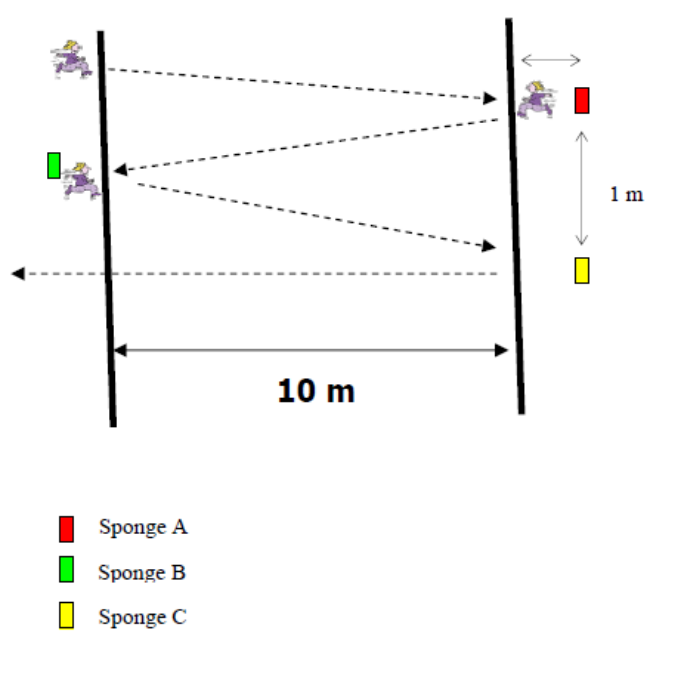
(Ruiz et al. 2006; Ortega et al. 2008; Castro Piñeiro et al. 2010, Chillón et al. 2010)



SEAT AND REACH

GALICIA SAUDABLE

COMPONENTE MOTOR: 4X10 M



- **Avena:** correlaciona con contenido mineral óseo
- Predictivo de densidad ósea durante la etapa puberal temprana
- Índices de replicabilidad aceptables

(Ruiz et al. 2006; Ortega et al. 2008)

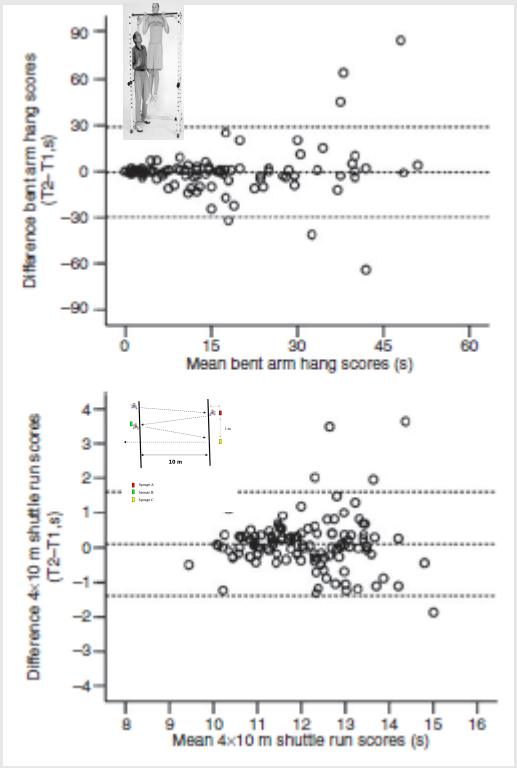
Alpha

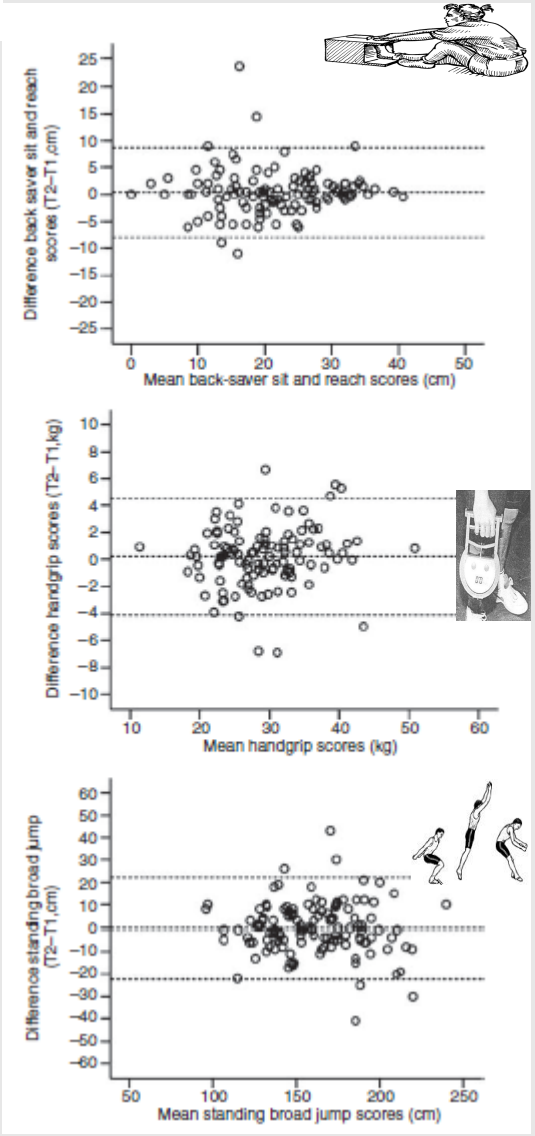
GALICIA SAUDABLE

Reliability of health-related physical fitness tests in European adolescents. The HELENA Study

FB Ortega[1,2], EG Artero[1], JR Ruiz[2], G Vicente-Rodriguez[3], P Bergman[2], M Hagströmer[2], C Ottevaere[4], E Nagy[5], O Konsta[6], JP Rey-López[3], A Polito[7], S Dietrich[8], M Plada[9], L [illegible] the HELENA Study Group[11]

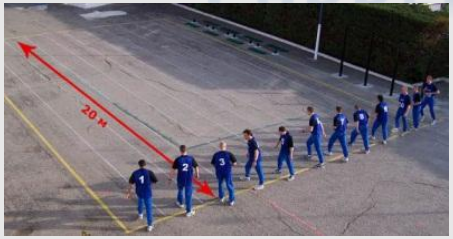
International Journal of Obesity (2008) 32, S49–S57





GALICIA SAUDABLE

COMPONENTE CARDIORRESPIRATORIO: CARRERA 20M IDA Y VUELTA (CN)



- **Aptitud cardiorrespiratoria:**
  - **Perfil saludable**
  - **Correlación negativa con factores asociados al síndrome metabólico y a enfermedades cardiovasculares**
- **Herramienta válida para la condición cardiorrespiratoria**
- **Validez dependiente de ecuación empleada para estimar $VO_{2máx}$**
- **Índices de fiabilidad aceptable**

(Ruiz et al. 2006; Ortega et al. 2008; Castro Piñeiro et al. 2010)

Alpha

GALICIA SAUDABLE

Aerobic physical fitness in relation to blood lipids and fasting glycaemia in adolescents: Influence of weight status

Nutrition, Metabolism & Cardiovascular Diseases (2006) 16, 285–293

José L. Mesa [a,*], Jonatan R. Ruiz [a], Francisco B. Ortega [a], Julia Wärnberg [b], Domingo González-Lamuño [c], Luis A. Moreno [d], Ángel Gutiérrez [a], Manuel J. Castillo [a]

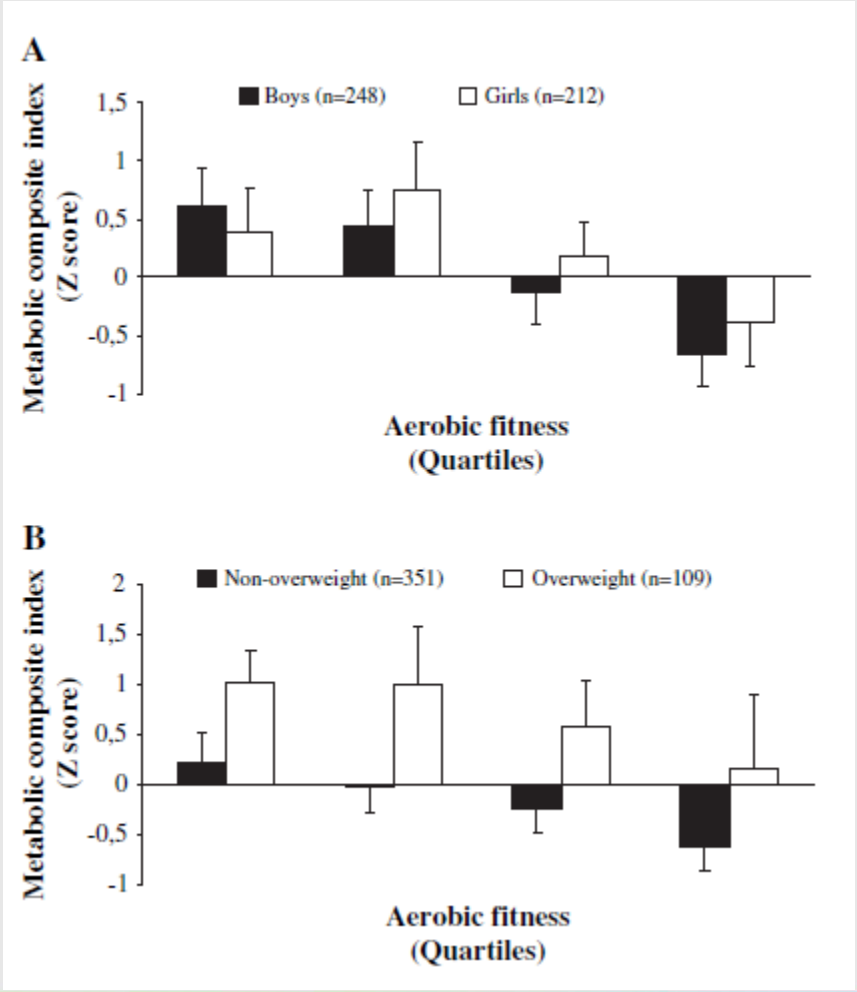


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Table 3 Aerobic fitness standards required to present a healthy lipid cardiovascular profile in males

	Age (years)					True positive rate (%)	False negative rate (%)
	13–14	14–15	15–16	16–17	17–18.5		
Aerobic fitness standard	6.4	7.0	7.5	7.8	7.8	73.4	26.6
Percentage of population above the standard	49.7	51.9	49.2	52.1	51.6		

Aerobic fitness standard values are expressed in steps scored in the 20-m shuttle run test. The aerobic fitness standards for presenting a healthy lipid profile were settled defining the best tradeoff between true-positive and false-positive rates [34].

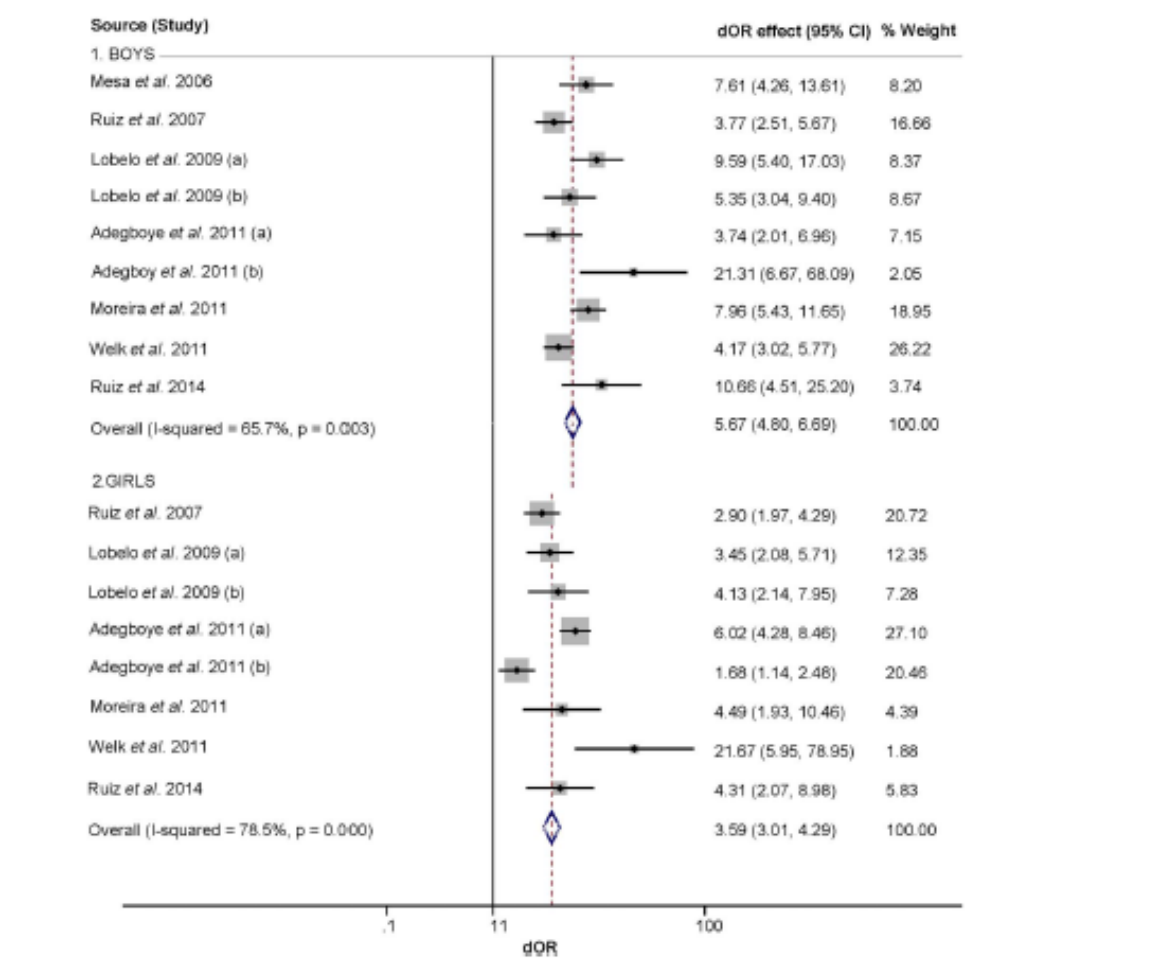
GALICIA SAUDABLE

BJSM

Cardiorespiratory fitness cut points to avoid cardiovascular disease risk in children and adolescents; what level of fitness should raise a red flag? A systematic review and meta-analysis

Jonatan R Ruiz, Ivan Cavero-Redondo, Francisco B Ortega, Gregory J Welk, Lars B Andersen and Vicente Martinez-Vizcaino

Br J Sports Med published online September 26, 2016



GALICIA SAUDABLE

BJSM

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Table 3 Twenty meter shuttle run stages that need to be met to fall within the healthy cardiorespiratory fitness level by age and gender

	Boys				Girls			
Age (years)	Lower stage (41.8 mL/kg/min)	Speed (km/hour)	Upper stage (47.0 mL/kg/min)	Speed (km/hour)	Lower stage (34.6 mL/kg/min)	Speed (km/hour)	Upper stage (39.5 mL/kg/min)	Speed (km/hour)
8	1	8.5	3	9.5	1	8.5	1	8.5
9	2	9	4	10	1	8.5	1	8.5
10	2	9	5	10.5	1	8.5	1	8.5
11	3	9.5	5	10.5	1	8.5	2	9
12	4	10	6	11	1	8.5	3	9.5
13	5	10.5	7	11.5	2	9	4	10
14	5	10.5	7	11.5	2	9	4	10
15	6	11	8	12	3	9.5	5	10.5
16	6	11	8	12	4	10	6	11
17	7	11.5	9	12.5	4	10	6	11
18	7	11.5	9	12.5	5	10.5	7	11.5

Estimations are made using the equation reported by Leger *et al*.[32]

GALICIA SAUDABLE

Updating ACSM's Recommendations for Exercise Preparticipation Health Screening

DEBORAH RIEBE[1], BARRY A. FRANKLIN[2], PAUL D. THOMPSON[3], CAROL EWING GARBER[4], GEOFFREY P. WHITFIELD[5], MEIR MAGAL[6], and LINDA S. PESCATELLO[7]

Med. Sci. Sports Exerc., Vol. 47, No. 8, pp. 2473–2479

Although the *relative* risks of SCD and AMI are higher during sudden vigorous physical exertion versus those at rest, the *absolute* risk of these events is very low. Prospective evidence from the Physicians' Health Study and Nurses' Health Study suggests that SCD occurs every 1.5 million episodes of vigorous physical exertion in men (1) and every 36.5 million hours of moderate-to-vigorous exertion in women (47). Retrospective analyses also support the rarity of these events. Thompson et al. (41) reported one death per 396,000 h of jogging. An analysis of exercise-related cardiovascular events among participants at YMCA sports centers found one death per 2,897,057 person-hours, although exercise intensity was not documented (30). Kim et al. (25) studied more than 10 million marathon and half-marathon runners and identified an overall cardiac arrest incidence rate of one per 184,000 runners and an SCD incidence rate of one per 256,000 runners, which translate to 0.20 cardiac arrests and 0.14 SCD per 100,000 estimated runner-hours. Collectively, these studies illustrate the rarity of CVD events during exercise and suggest that exercise is safe for most people. Because there are few data regarding cardiovas-

SEGURIDAD DE LAS PRUEBAS

GALICIA SAUDABLE

Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents

Jonatan R Ruiz,[1,2] José Castro-Piñero,[3] Vanesa España-Romero,[1,2] Enrique G Artero,[1] Francisco B Ortega,[1,2] Magdalena M Cuenca,[1] David Jimenez-Pavón,[1] Palma Chillón,[4] María J Girela-Rejón,[4] Jesús Mora,[3] Ángel Gutiérrez,[1] Jaana Suni,[5] Michael Sjöström,[2] Manuel J Castillo[1]

Br J Sports Med 2011;**45**:518–524. doi:10.1136/bjsm.2010.075341

it is important to be alert to the subjective symptoms such as skin pallor, dizziness, syncope and dyspnoea. The tests should be immediately interrupted if there is any sign of problem or risk (see the standard operating procedure for specification).

During the above mentioned reliability study performed in the school setting,[21] we recorded the following safety items: (1) instrument allergy, in the case of anthropometric and handgrip assessments; (2) sick feeling, in all the tests; (3) pain in hand or forearm in handgrip test; (4) musculoskeletal injuries during or after the physical fitness assessment; and (5) delayed-onset muscle soreness. We observed that all the safety items assessed presented a 'positive' score in 99% of the cases. No complications occurred during the testing procedure, and only one participant interrupted the 20mSRT because of lower body muscle cramp.

Our group has extensive experience in assessing physical fitness in young people. We have been involved in a number of population based studies[22] namely the AVENA study,[23 24] the EYHS study,[25] the HELENA study[26 27] and the IDEFICS study,[28] where more than 10 000 children and adolescents have been measured. So far, we did not experience any safety issue.

SEGURIDAD DE LAS PRUEBAS

GALICIA SAUDABLE

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XUNTA DE GALICIA