Actividad Física: una obligación !

John Duperly MD, PhD

Instituto de Medicina del Ejercicio

Universidad de los Andes – Fundación Sta. Fe de Bogotá

Conflictos de interés

Coldeportes
Colciencias
Minsalud
Universidad de los Andes
Fundación Sta Fe de Bogotá
Amgen
International Life Science Institute
Johnson & Johnson Medical
Sanofi Aventis
MSD
Merck
Bayer AG
Astra Zeneca
Pfizer
Abbott
Red Bull
Coca- Cola


Johnny Weissmuller "Tarzán"
5 medallas de ORO Olímpicas
(Paris 1924; Amsterdam 1928)


Nalini
PINARELLO
movistar


RUZ 2014
DEL CARIBE


TORONTO 2015


adidas
10

“An obligation for primary care physicians to prescribe physical activity to sedentary patients to reduce the risk of chronic health conditions.”

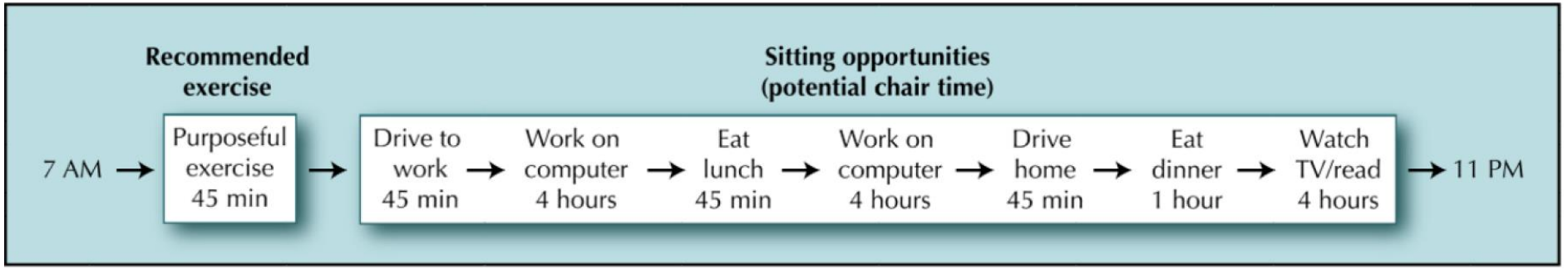
Mayo Clin Proc. 2002 Feb;77(2):165-73.

Are we facing a new paradigm of inactivity physiology?

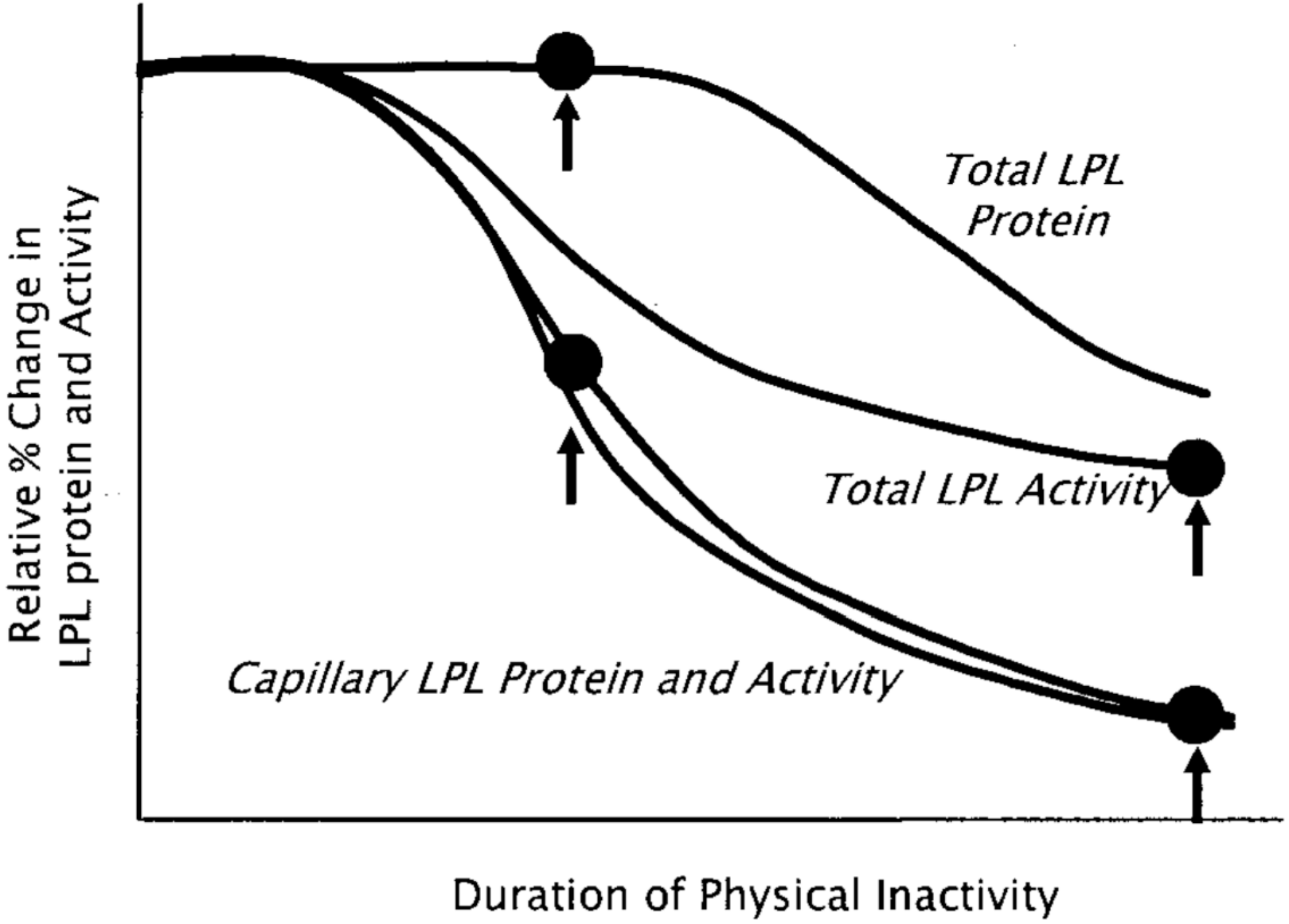
Br J Sports Med September 2010 Vol 44 No 12

Too Little Exercise and Too Much Sitting: Inactivity Physiology and the Need for New Recommendations on Sedentary Behavior

Marc T. Hamilton, PhD, **Genevieve N. Healy, PhD**, **David W. Dunstan, PhD**, **Theodore W. Zderic, PhD**, and **Neville Owen, PhD**



Curr Cardiovasc Risk Rep. 2008 July ; 2(4): 292–298.



Exerc Sport Sci Rev. 2004 October ; 32(4): 161–166.

Contribution of risk factors to achieving the 25 × 25 non-communicable disease mortality reduction target: a modelling study

Cardiovascular & Respiratory Disease, Cáncer, Diabetes

37 million premature deaths in 15 years

Risk Factors:

Physical Inactivity
Tobacco
Malnutrition
Alcohol

THE LANCET May 3; 2014

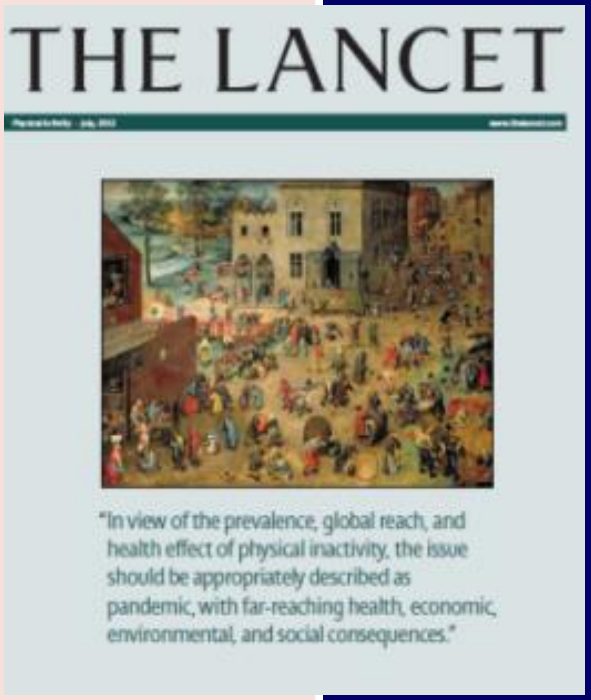
Panel 1: Health benefits of physical activity in adults[3-5]

Strong evidence of reduced rates of:

- All-cause mortality
- Coronary heart disease
- High blood pressure
- Stroke
- Metabolic syndrome
- Type 2 diabetes
- Breast cancer
- Colon cancer
- Depression
- Falling

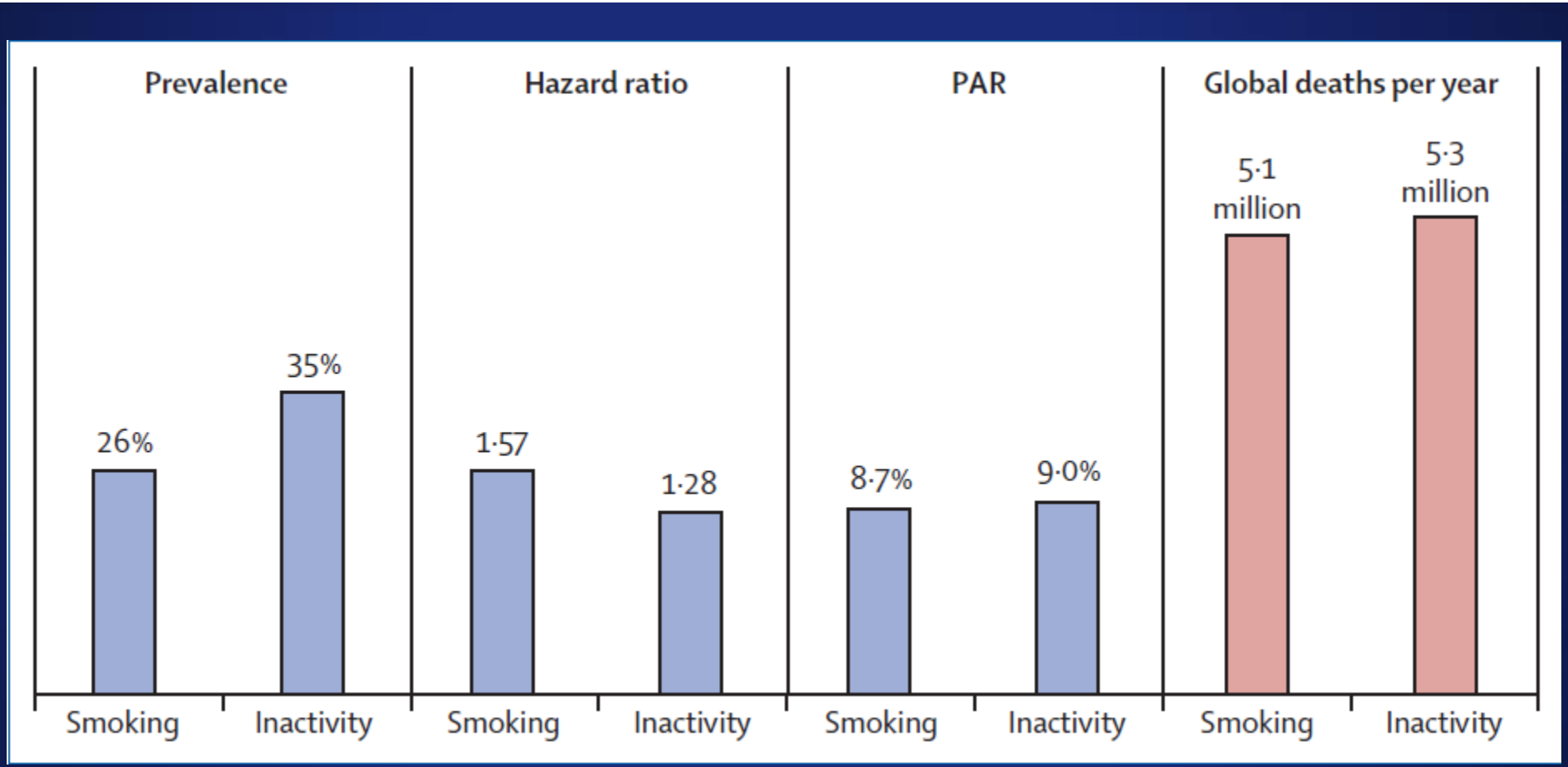
Strong evidence of:

- Increased cardiorespiratory and muscular fitness
- Healthier body mass and composition
- Improved bone health
- Increased functional health
- Improved cognitive function



Stressing harms of physical inactivity to promote exercise

*Chi Pang Wen, Xifeng Wu
National Health Research Institutes and China Medical University



THE LANCET

July, 2016 www.thelancet.com

Physical Activity 2016: Progress and Challenges

"We urge all sectors of government and society to take immediate, bold actions to help make active living a more desired, affordable, and accessible choice for all population groups."

Marco conceptual para escalar intervenciones en Actividad Fisica

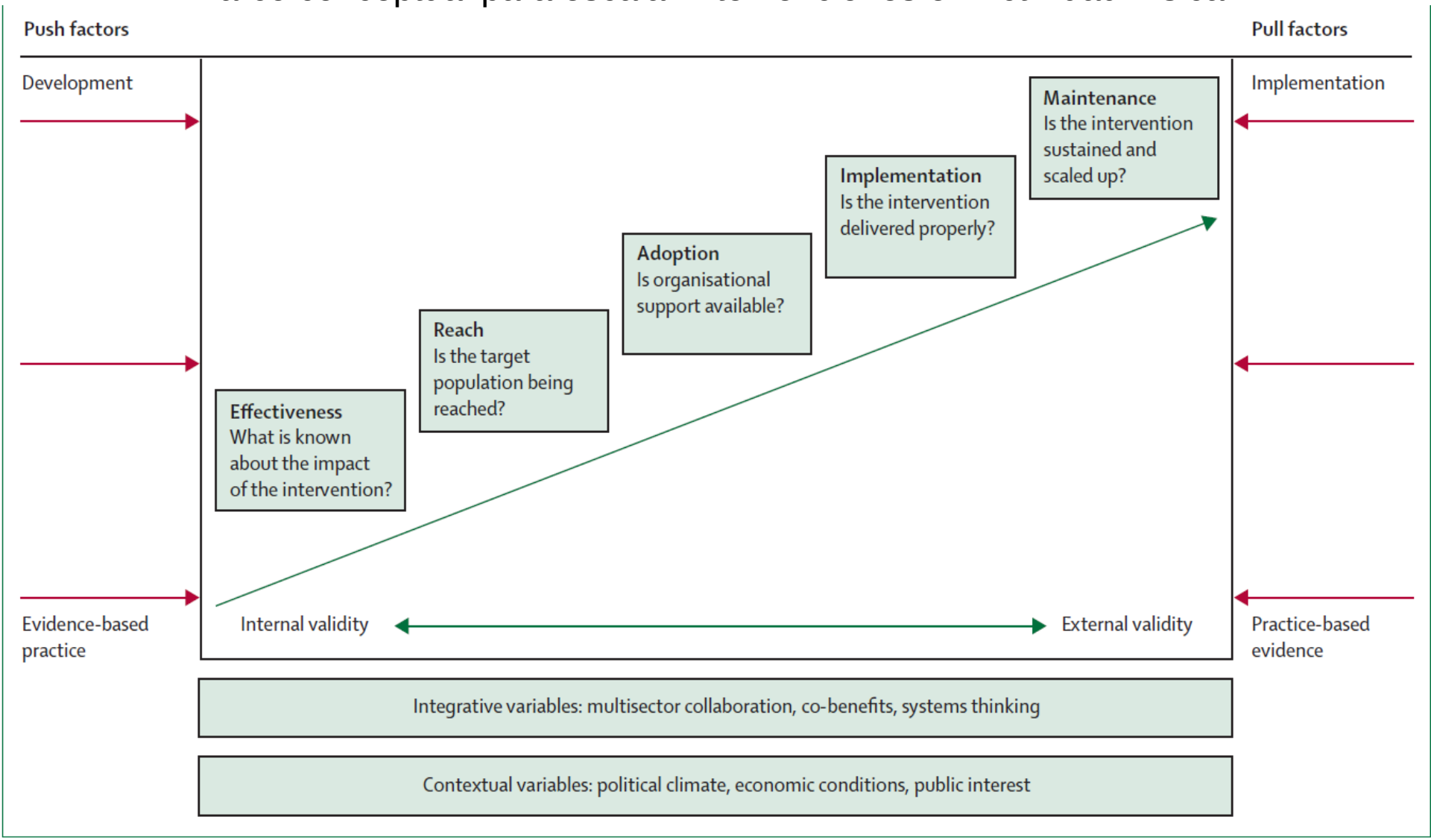


Figure 3: **Framework for scaling up physical activity interventions**

THE LANCET
Physical Activity 2016: Progress and Challenges · July 2016

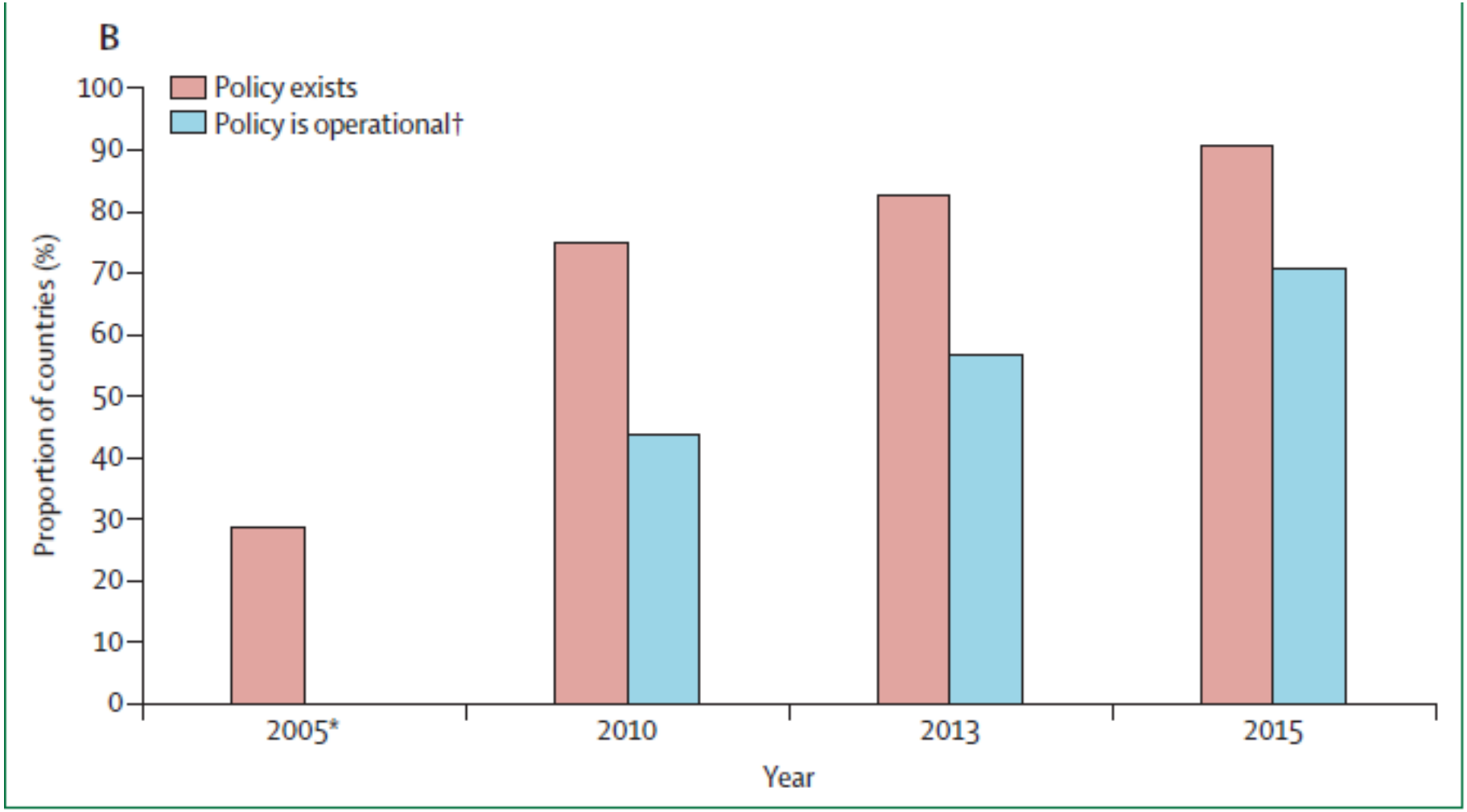


Figure 2: **Progress on national physical activity policies**

US Endocrinology

Volume 9 • Issue 1 • Summer 2013 • Extract

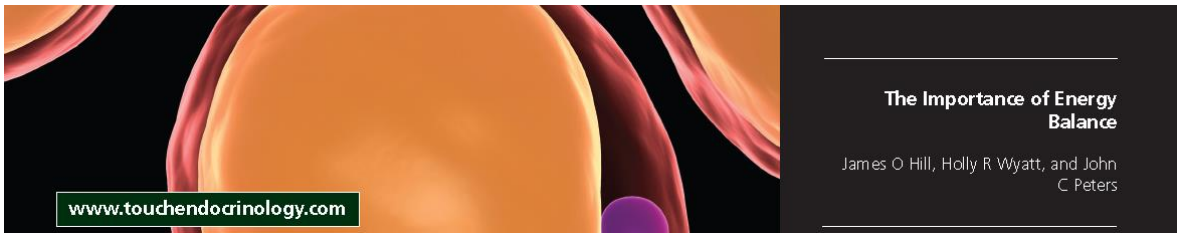
What is Causing the Worldwide Rise in Body Weight?

Robin P Shook, PhD,[1] Steven N Blair, PED,[2] John Duperly, MD, PhD,[3] Gregory A Hand, PhD, MPH,[4] Sandra M Matsudo, MD, PhD[5] and Joanne L Slavin, PhD, RD[6]

The Importance of Energy Balance

James O Hill, PhD, Holly R Wyatt, MD and John C Peters, PhD

Anschutz Health & Wellness Center, University of Colorado, Aurora, CO



Physical Inactivity

↓

Visceral fat accumulation

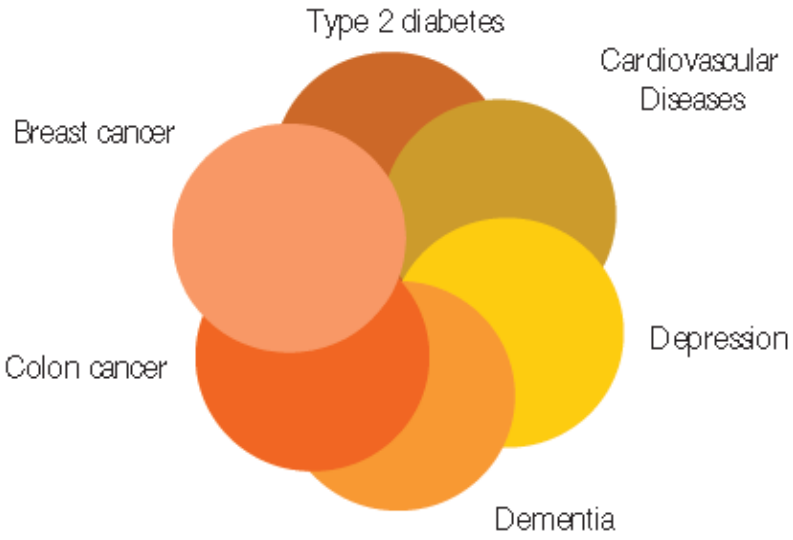
↓

Chronic Systemic Inflammation

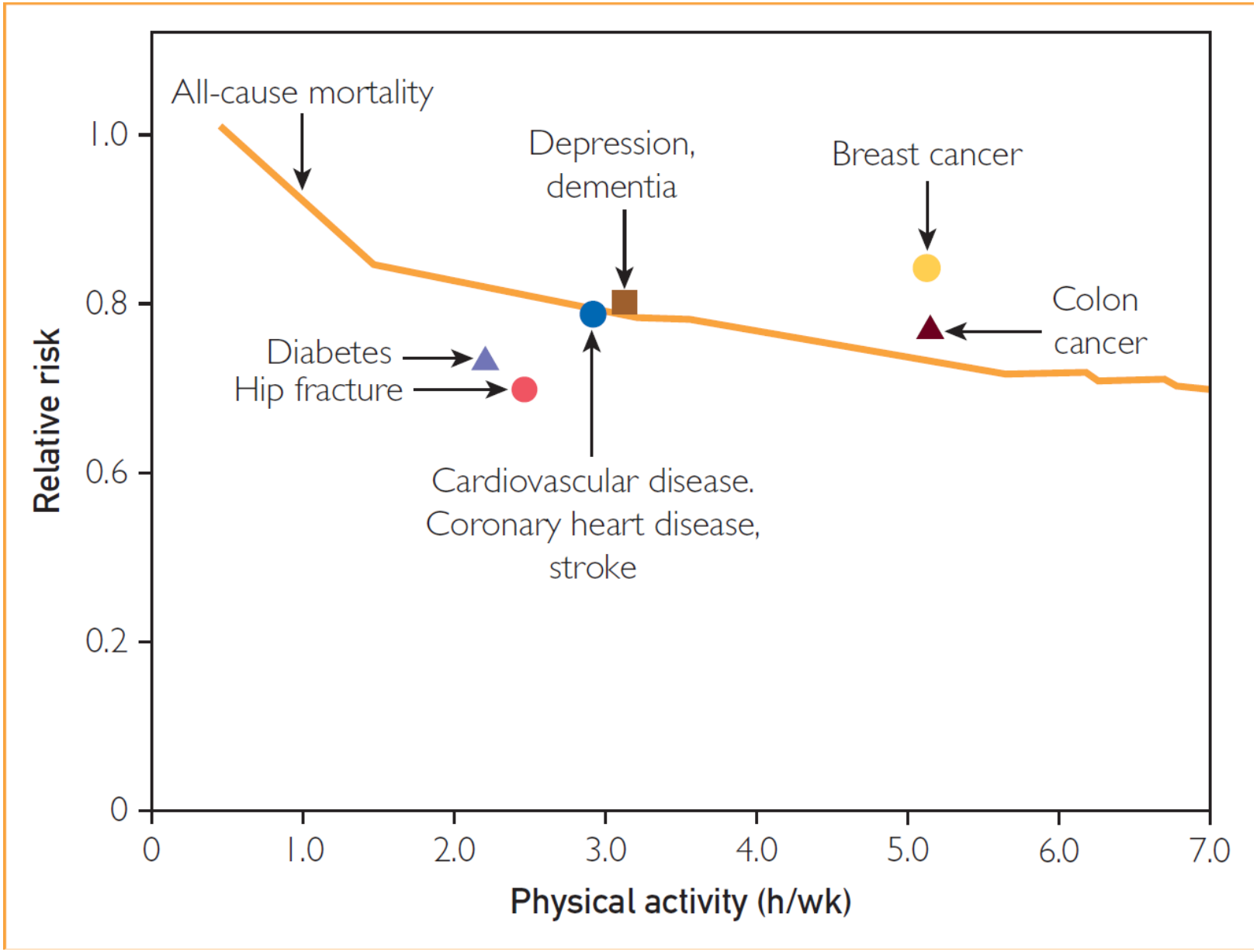
↓

Insulin Resistance, Atherosclerosis, Neurodegeneration, Tumour growth

↓



Physical Activity Promotion in the Health Care System



Ilkka M. Vuori, MD, PhD; Carl J. Lavie, MD; and Steven N. Blair, PED Mayo Clin Proc. 2013;88(12):1446-1461

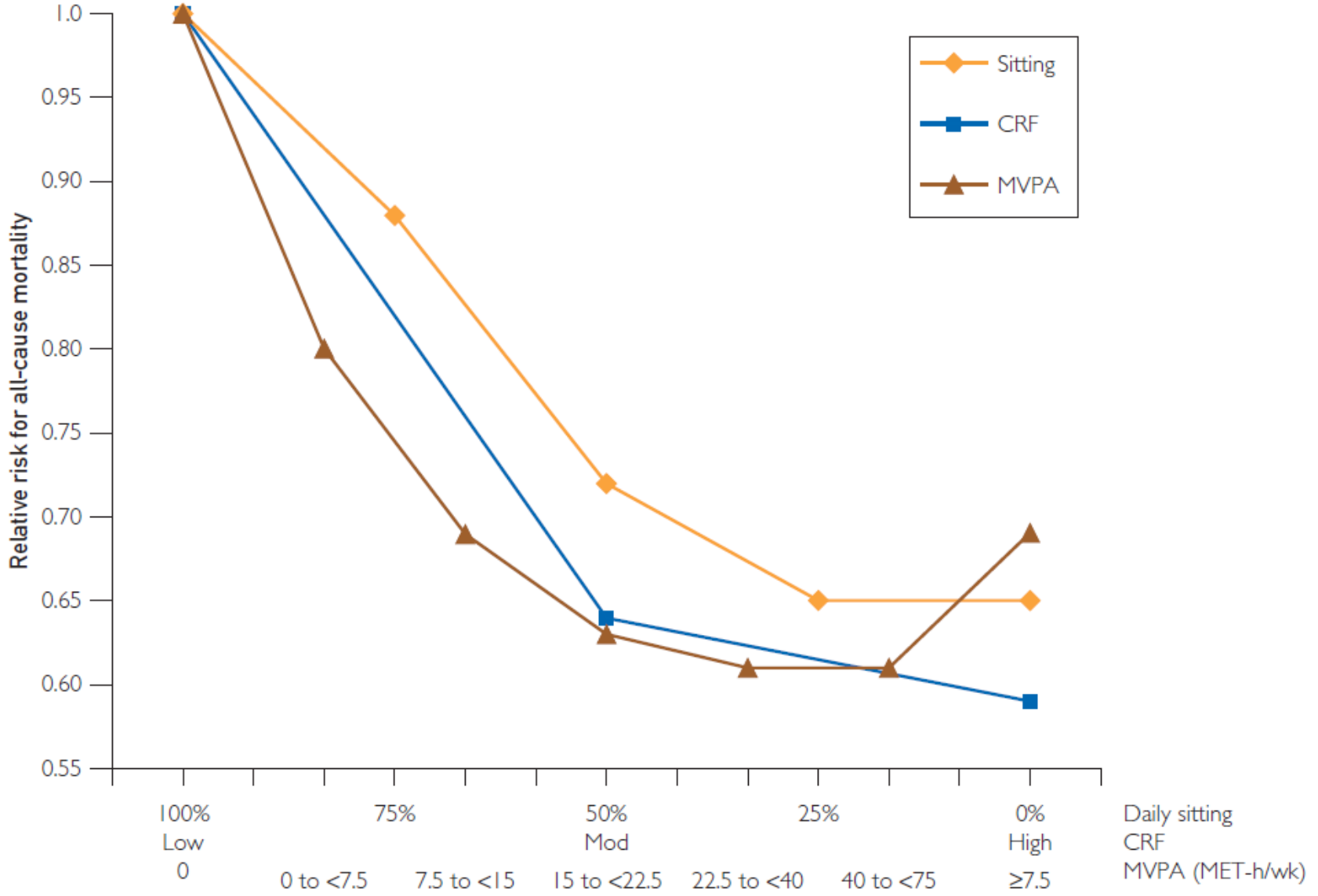
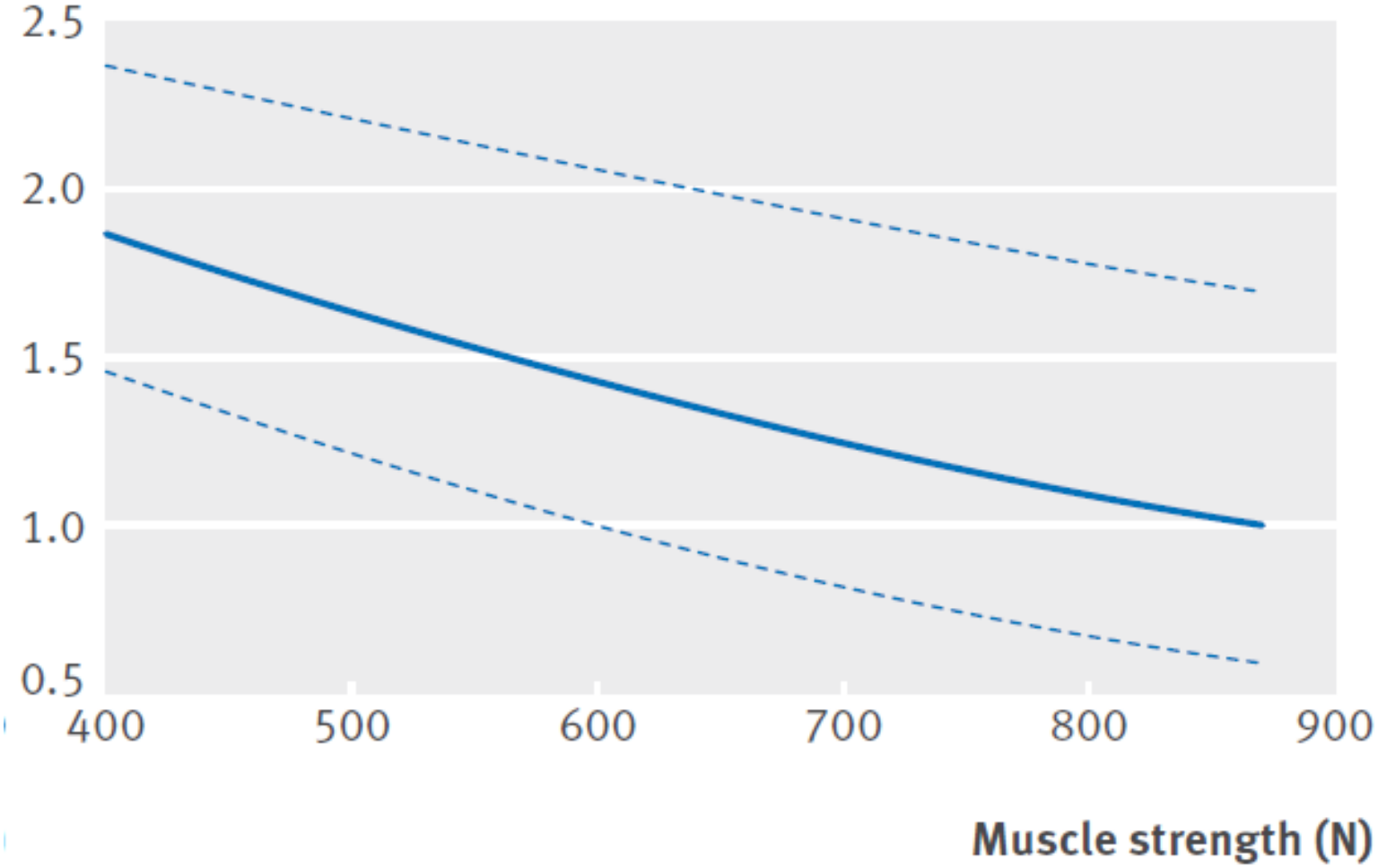


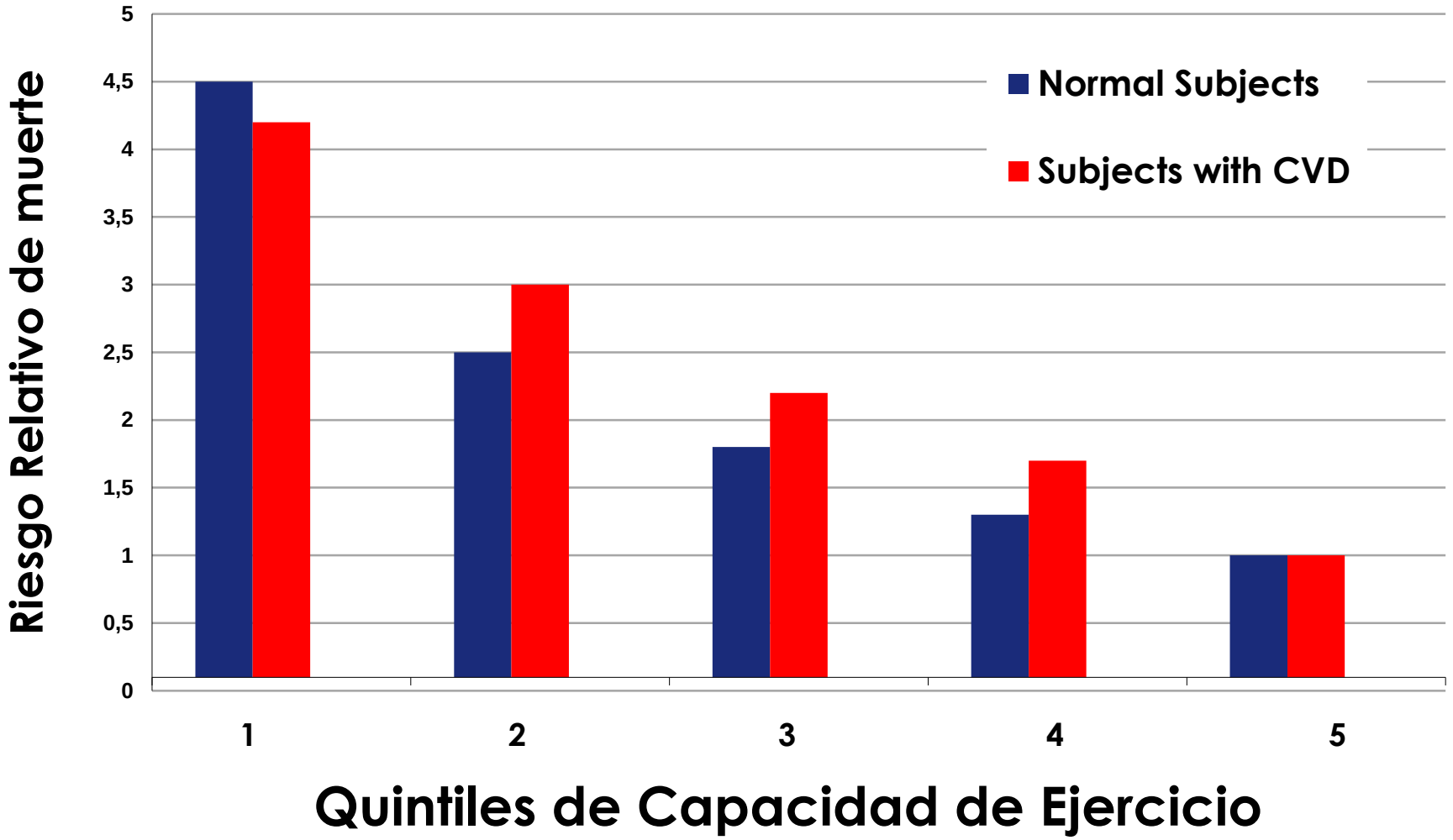
FIGURE 2. Relative risks for all-cause mortality associated with daily sitting among 17,103 men and women followed up for a mean of 12.0 years,[15] cardiorespiratory fitness (CRF) from a meta-analysis of 102,980 participants from 33 published studies,[25] and moderate to vigorous physical activity (MVPA) among 661,137 men and women from 6 cohort studies followed up for a median of 14.2 years.[21] Relative risks are from models that include a variety of covariates as described in the original studies.

Ventricular arrhythmia/sudden cardiac death



: *BMJ* 2015;351:h4543

MORTALIDAD Y CAPACIDAD DE EJERCICIO



N Engl J. Med, Vol. 346, No. 11 - March 14, 2002

ORIGINAL ARTICLE

MAYO CLINIC

Ideal Cardiovascular Health and Mortality: Aerobics Center Longitudinal Study

Enrique G. Artero, PhD; Vanesa España-Romero, PhD; Duck-chul Lee, PhD; Xuemei Sui, MD, MPH, PhD; Timothy S. Church, MD, MPH, PhD; Carl J. Lavie, MD; and Steven N. Blair, PED

1987 – 1999; 11,993 individuals (24.3% women)
Mean follow-up 11.6 years, 305 deaths

TABLE 1. Definition of Poor, Intermediate, and Ideal Levels for Each Metric of Cardiovascular Health in the ACLS[a,b]

Metric	Poor	Intermediate	Ideal
Smoking	Current	Former	Never
Body mass index, kg/m^2	≥30	25-29.9	18.5-24.9
Physical activity, MET-min/wk	0	1-499	≥500
Healthy diet score, No. of components	0-1	2	3-4
Total cholesterol, mg/dL	≥240	200-239	<200[c]
Blood pressure, mm Hg	SBP ≥140 or DBP ≥90	SBP 120-139 or DBP 80-89	SBP <120 and DBP <80[d]
Fasting plasma glucose, mg/dL	≥126	100-125	<100[e]

Mayo Clin Proc. 2012;87(10):944-952

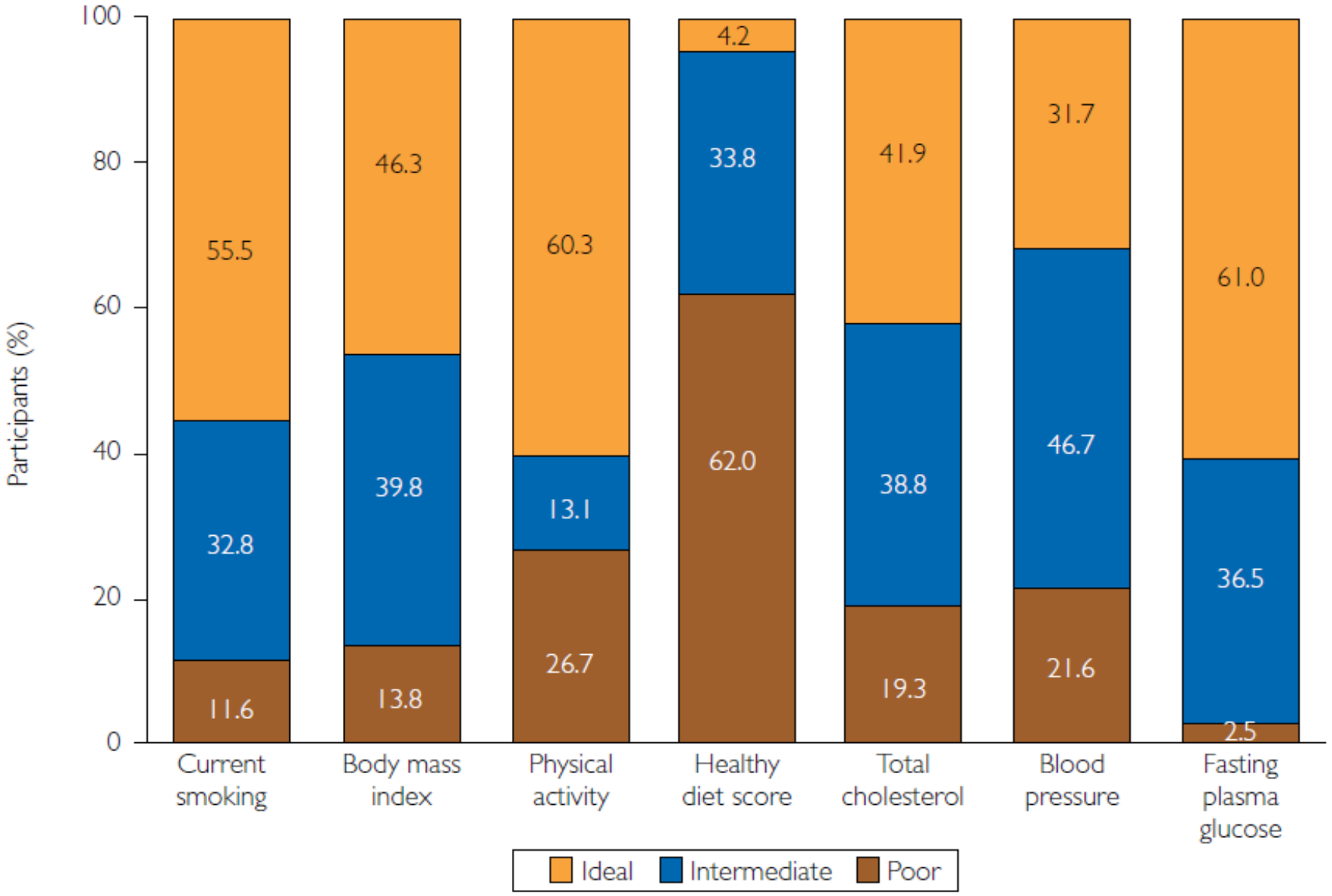
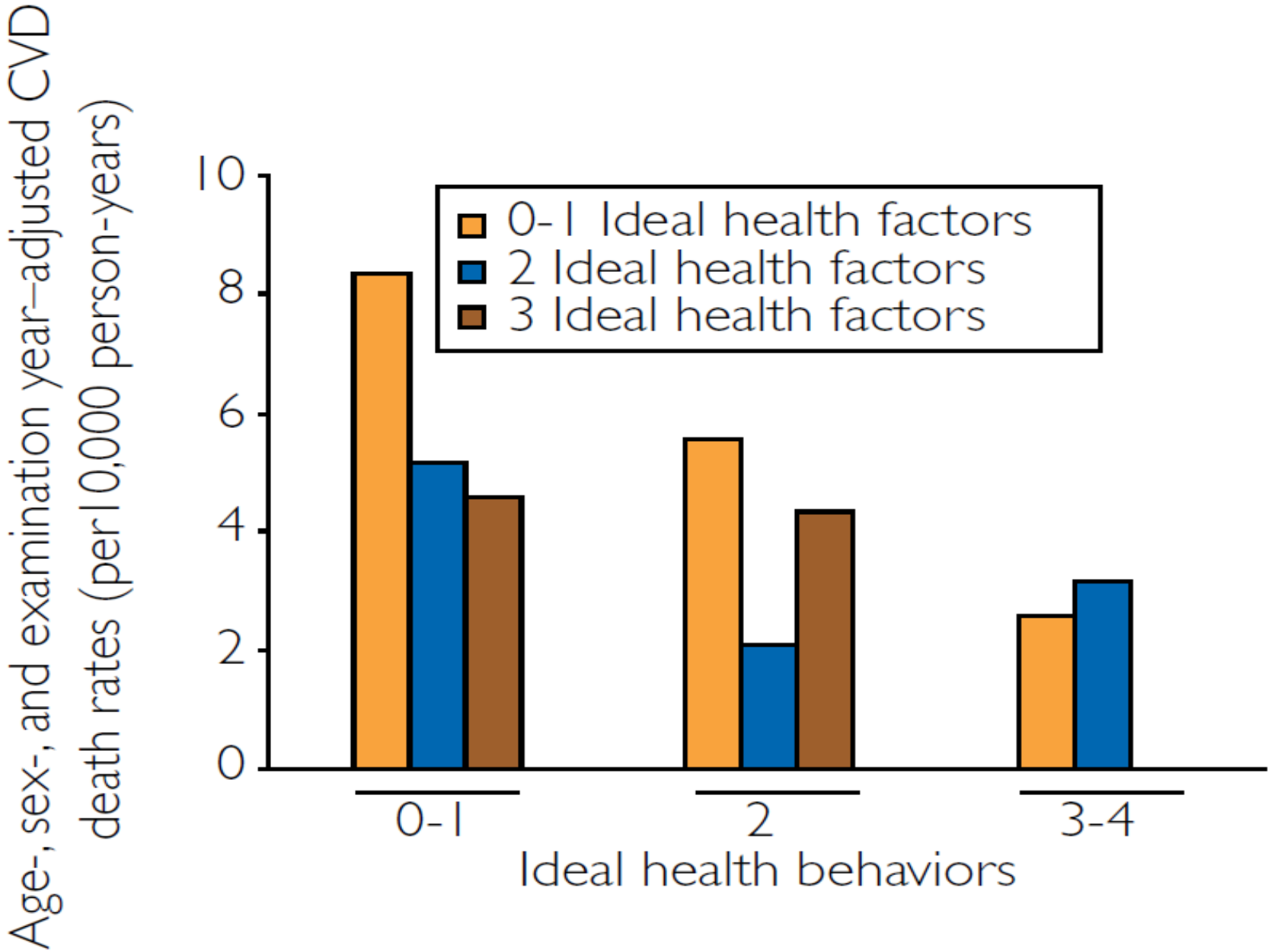


FIGURE 1. Prevalence of poor, intermediate, and ideal levels for each of the 7 metrics of cardiovascular health at baseline.

Mayo Clin Proc. 2012 October; 87(10): 944–952.



Mayo Clin Proc. 2012 October; 87(10): 944–952.

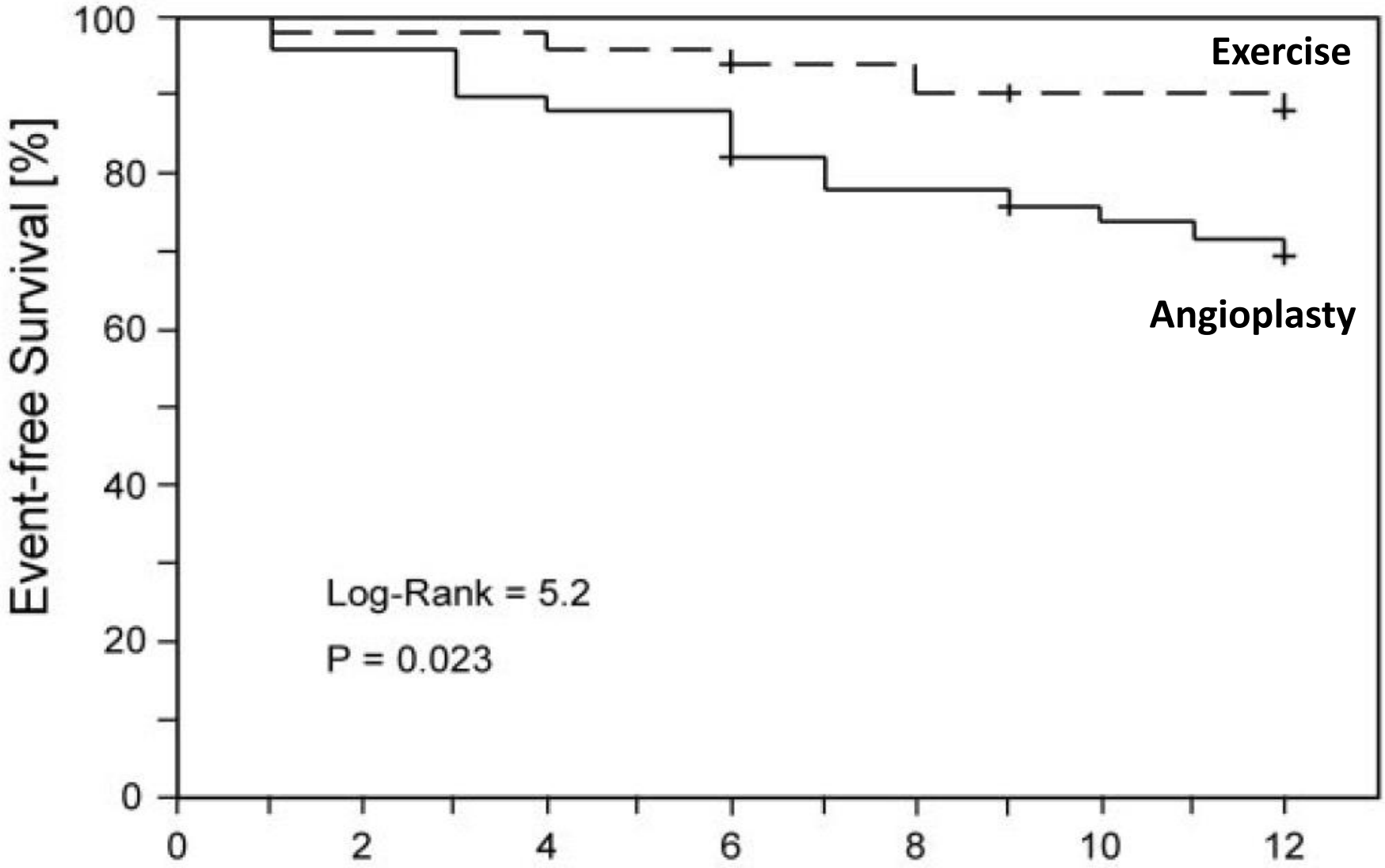
Percutaneous Coronary Angioplasty Compared With Exercise Training in Patients With Stable Coronary Artery Disease

TABLE 1. Clinical Characteristics

	Training Group (n=51)	PCI Group (n=50)	*P*
Age, y	62±1	60±1	0.66
Body mass index, kg/m^2	27.2±0.4	28.0±0.5	0.35
LVEF (ventriculography), %	64±1	62±2	0.32
LVEDD, mm	52±2	52±2	0.89
Mean No. of risk factors	1.9±0.2	1.8±0.1	0.71
Cardiovascular risk factors, No. of patients (%)			
Current smoking	9 (18)	8 (16)	0.69
Hyperlipidemia*	39 (77)	43 (86)	0.22
Hypertension†	42 (82)	35(70%)	0.15
Diabetes mellitus	12 (23)	11 (22)	0.86
LDL, mmol/L	3.2±0.2	3.2±0.2	0.91
HDL, mmol/L	1.3±0.1	1.3±0.1	0.88
Concurrent medication, No. of patients (%)			
ACE inhibitors/ AT1-receptor antagonists	38 (74)	44 (88)	0.13
β-HMG-CoA reductase inhibitors	36 (72)	40 (80)	0.27
β-Receptor antagonists	45 (88)	43 (86)	0.74
Acetylsalicylic acid	50 (98)	49 (98)	0.98

(*Circulation*. 2004;109:1371-1378.)

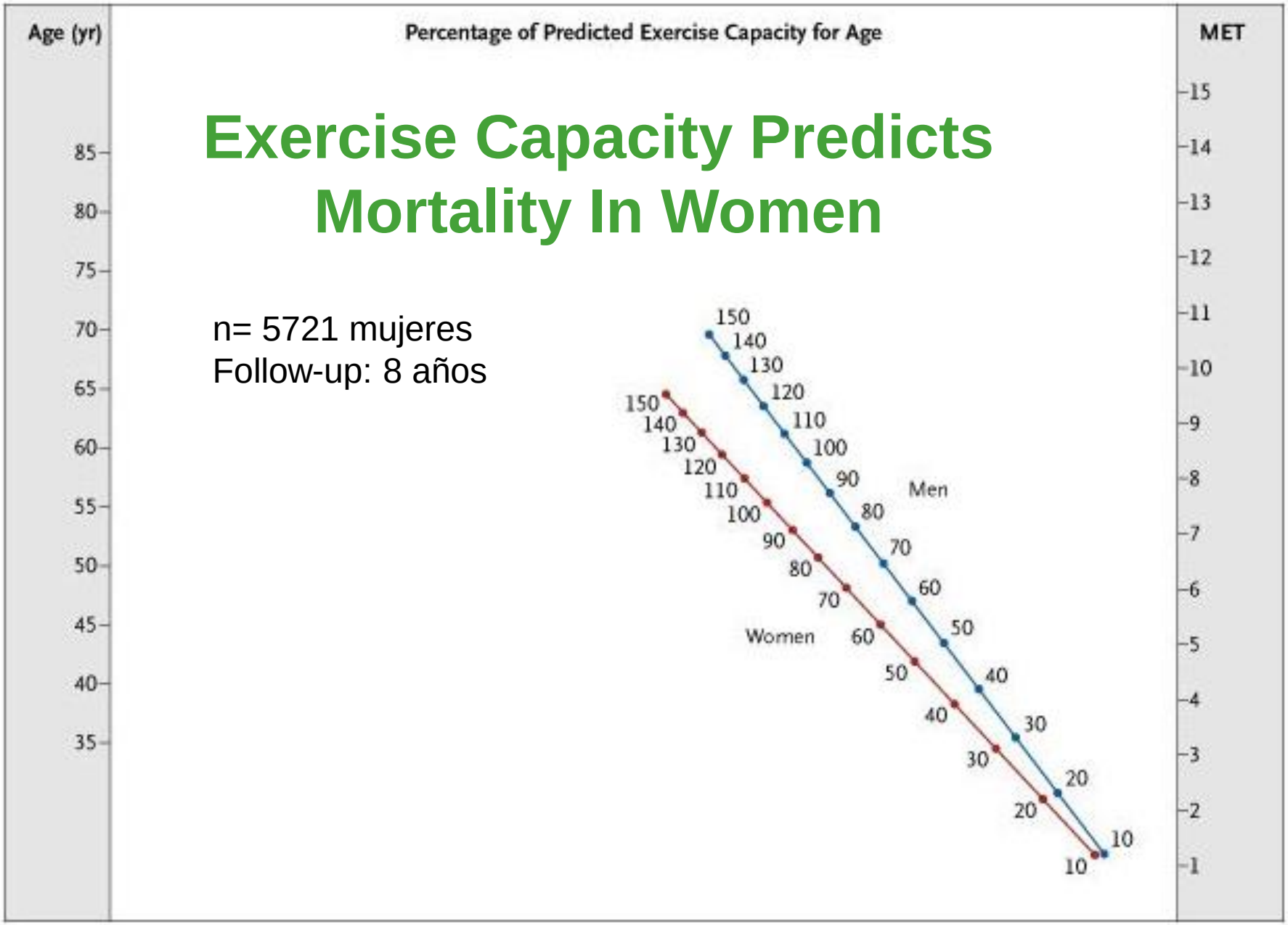
Percutaneous Coronary Angioplasty Compared With Exercise Training in Patients With Stable Coronary Artery Disease: A Randomized Trial



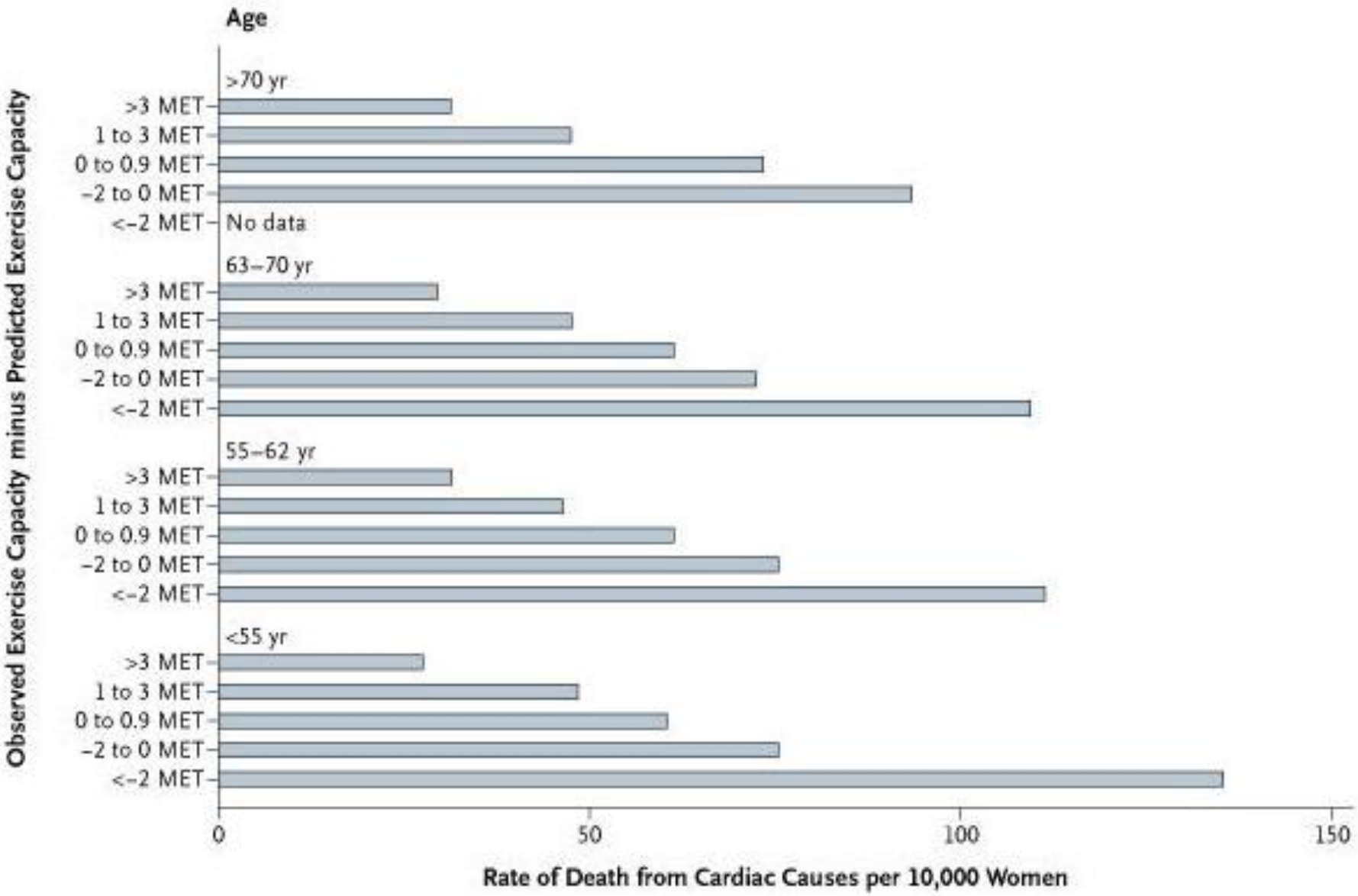
(*Circulation*. 2004;109:1371-1378.)

Exercise Capacity Predicts Mortality In Women

n= 5721 mujeres
Follow-up: 8 años

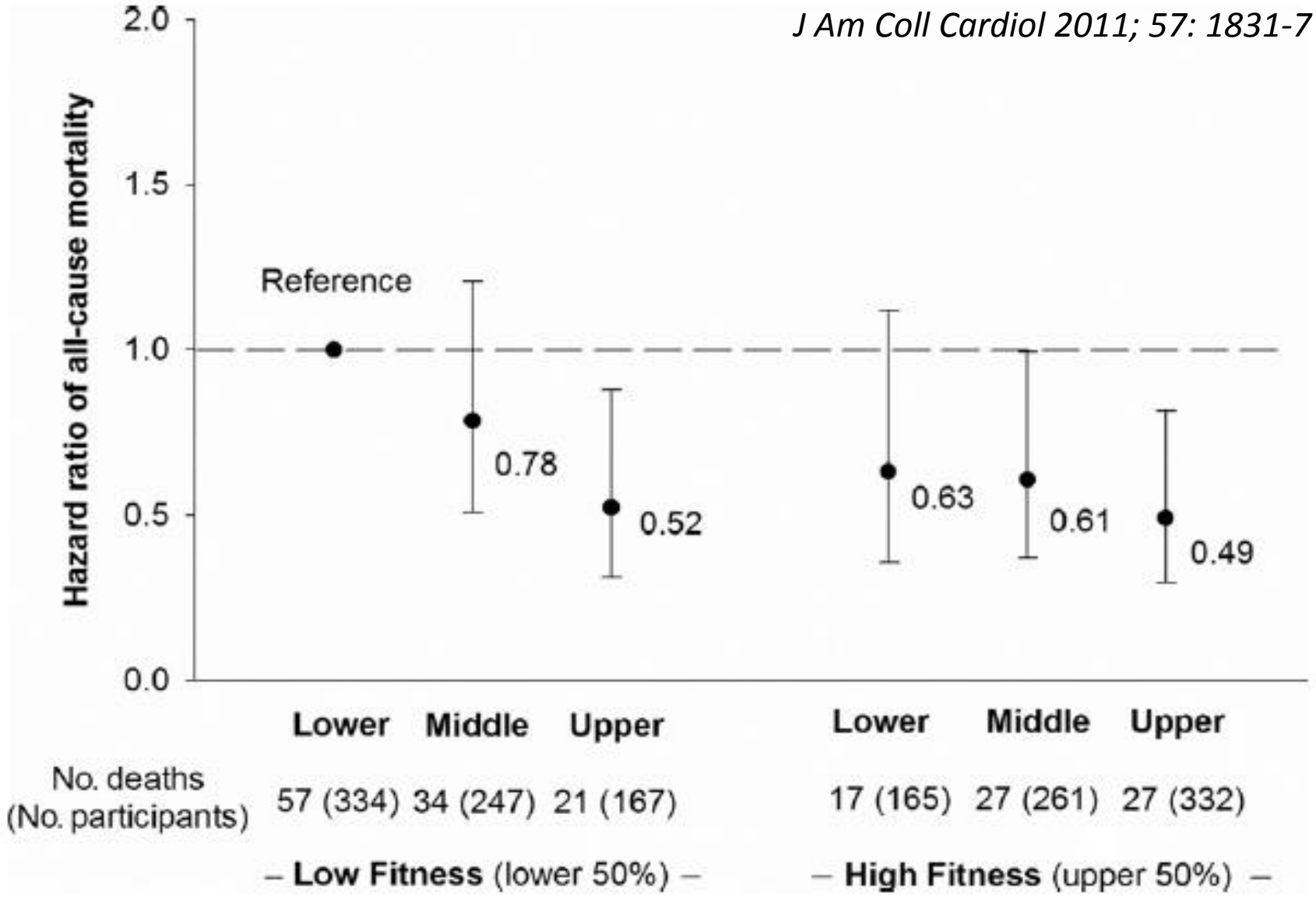


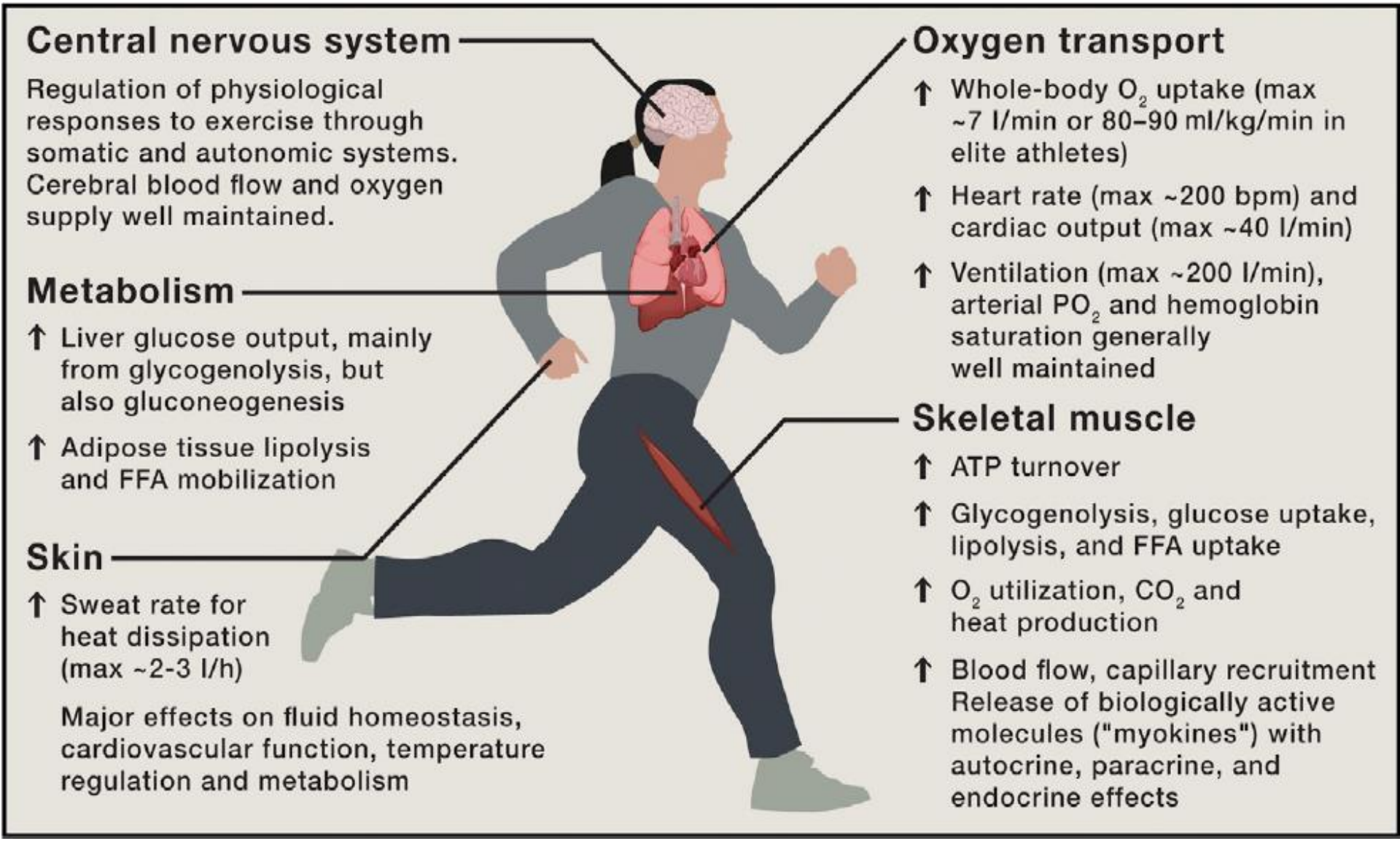
Martha Gulati, et al N Engl J Med 2005;353: 468-75


Age
>70 yr
>3 MET
1 to 3 MET
0 to 0.9 MET
−2 to 0 MET
<−2 MET
No data
63–70 yr
>3 MET
1 to 3 MET
0 to 0.9 MET
−2 to 0 MET
<−2 MET
55–62 yr
>3 MET
1 to 3 MET
0 to 0.9 MET
−2 to 0 MET
<−2 MET
<55 yr
>3 MET
1 to 3 MET
0 to 0.9 MET
−2 to 0 MET
<−2 MET
Observed Exercise Capacity minus Predicted Exercise Capacity
0
50
100
150
Rate of Death from Cardiac Causes per 10,000 Women

Fuerza Muscular y Mortalidad:
Un estudio prospectivo en hombres hipertensos

J Am Coll Cardiol 2011; 57: 1831-7




Central nervous system
Regulation of physiological responses to exercise through somatic and autonomic systems. Cerebral blood flow and oxygen supply well maintained.
Metabolism
↑ Liver glucose output, mainly from glycogenolysis, but also gluconeogenesis
↑ Adipose tissue lipolysis and FFA mobilization
Skin
↑ Sweat rate for heat dissipation (max ~2-3 l/h)
Major effects on fluid homeostasis, cardiovascular function, temperature regulation and metabolism
Oxygen transport
↑ Whole-body O_2 uptake (max ~7 l/min or 80–90 ml/kg/min in elite athletes)
↑ Heart rate (max ~200 bpm) and cardiac output (max ~40 l/min)
↑ Ventilation (max ~200 l/min), arterial PO_2 and hemoglobin saturation generally well maintained
Skeletal muscle
↑ ATP turnover
↑ Glycogenolysis, glucose uptake, lipolysis, and FFA uptake
↑ O_2 utilization, CO_2 and heat production
↑ Blood flow, capillary recruitment
Release of biologically active molecules ("myokines") with autocrine, paracrine, and endocrine effects

BJP British Journal of Pharmacology

British Journal of Pharmacology (2012) **167** 1–12

REVIEW

Exercise acts as a drug; the pharmacological benefits of exercise

J Vina, F Sanchis-Gomar, V Martinez-Bello and MC Gomez-Cabrera

Department of Physiology, University of Valencia, Fundacion Investigacion Hospital Clinico Universitario/INCLIVA, Valencia, Spain

REVIEWS

PHYSIOLOGY 28: 330–358, 2013; doi:10.1152/physiol.00019.2013

Exercise is the Real Polypill

The concept of a "polypill" is receiving growing attention to prevent cardiovascular disease. Yet similar if not overall higher benefits are achievable with regular exercise, a drug-free intervention for which our genome has been haped over evolution. Compared with drugs, exercise is available at low cost and relatively free of adverse effects. We summarize epidemiological evidence on the preventive/therapeutic benefits of exercise and on the main biological mediators involved.

Carmen Fiuza-Luces,[1,2] Nuria Garatachea,[3] Nathan A. Berger,[4] and Alejandro Lucia[1,2]

[1]Universidad Europea Madrid, Madrid, Spain; [2]Instituto de Investigación, Hospital 12 de Octubre, Madrid, Spain; [3]Facultad de Ciencias de la Salud y del Deporte, Universidad de Zaragoza, Huesca, Spain; and [4]Center for Science, Health and Society, Case Western Reserve University, School of Medicine, Cleveland, Ohio
alejandro.lucia@uem.es

Respuesta Fisiológica al Ejercicio
Principios Básicos

- ESPECIFICIDAD
- SOBRECARGA
- REVERSIBILIDAD
- VALORES INICIALES / BASALES
- RESPUESTA BIOLOGICA INDIVIDUAL

Med Sci Sports Exerc 1995; 27: i-vii

Ejercicio & Ateroesclerosis

- Regulación Endotelial
- Resistencia a la Insulina
- Regulaciòn autonòmica (TA y FC)
- SIMPATICO (TA y FC—
- LDL pequeñas, HDL 2, TG
- Inflamación crónica
- Hemostasis favorable (?)

Circulation 2001,103: 327-334

Hipertension & Ejercicio

Endothelial Regulation

Arterial Compliance

Autonomic Balance

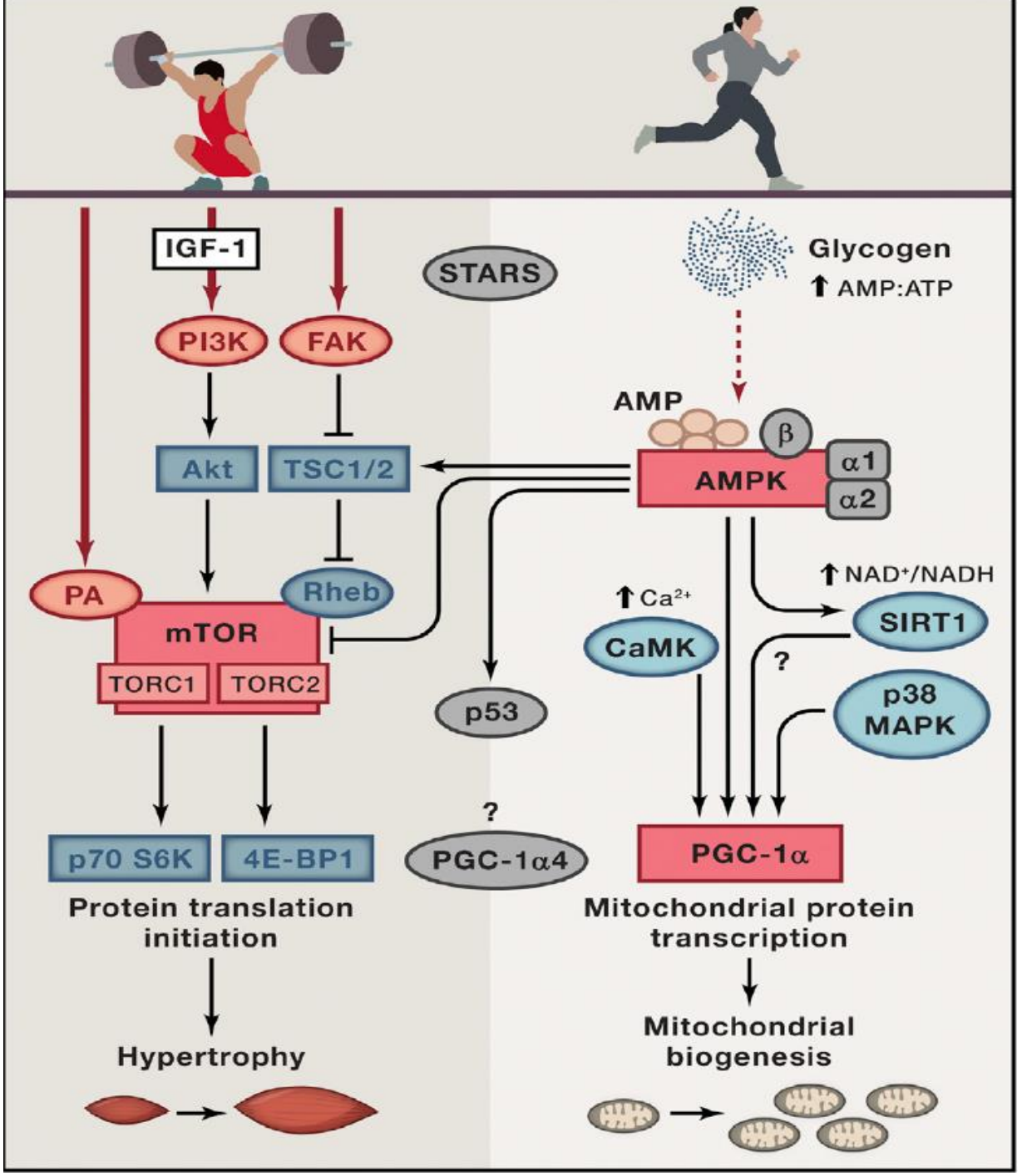
Salt Excretion

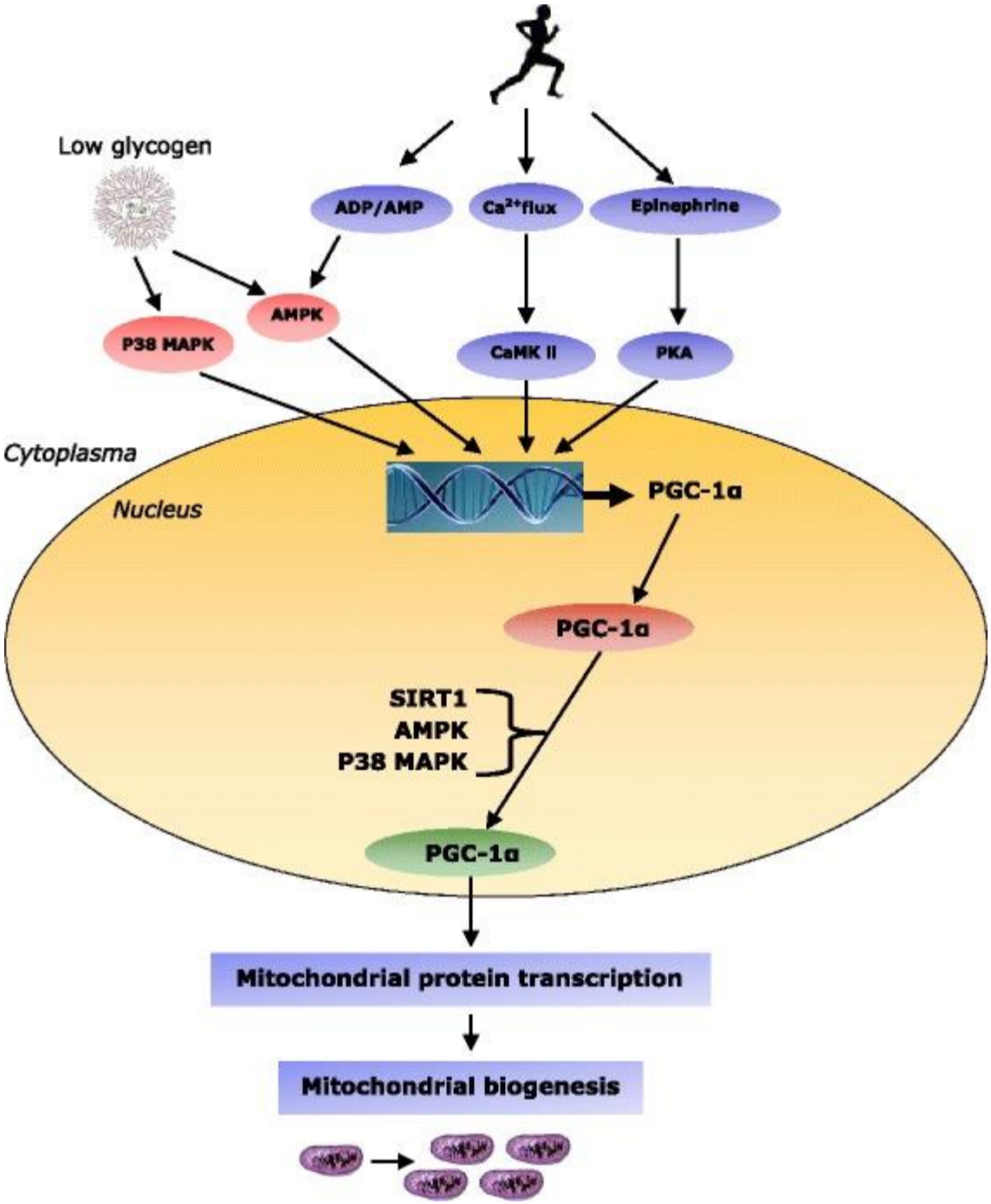
Insulin Resistance

Muscle Mass / Body Fat

Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION


IGF-1
PI3K
FAK
Akt
TSC1/2
PA
Rheb
mTOR
TORC1
TORC2
p70 S6K
4E-BP1
Protein translation initiation
Hypertrophy
STARS
p53
?
PGC-1α4
Glycogen
↑ AMP:ATP
AMP
β
AMPK
α1
α2
↑ Ca2+
CaMK
↑ NAD+/NADH
SIRT1
?
p38 MAPK
PGC-1α
Mitochondrial protein transcription
Mitochondrial biogenesis



Knuiman *et al. Nutrition & Metabolism* (2015) 12:59

Brain
Derived
Neurotrophic
Factor

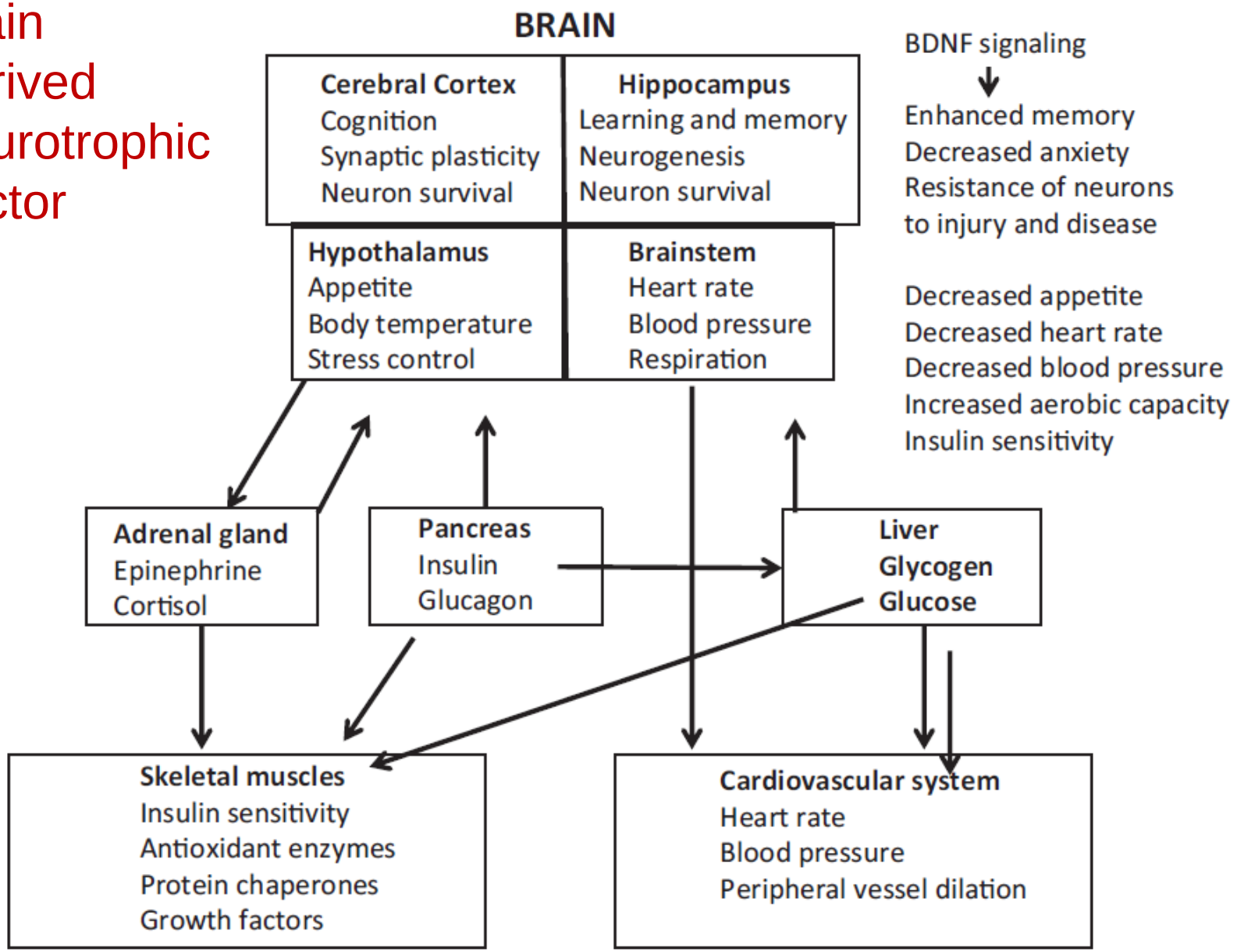


Fig. 2. Brain-derived neurotrophic factor (BDNF) is an integrator of adaptive responses of the brain and body to endurance running.

BMC Public Health

BioMed Central

Research article

Open Access

The association between Colombian medical students' healthy personal habits and a positive attitude toward preventive counseling: cross-sectional analyses

John Duperly[1,2], Felipe Lobelo*[1,3], Carolina Segura[1], Francisco Sarmiento[1], Deisy Herrera[1], Olga L Sarmiento[1] and Erica Frank[4,5]

Review

Physical activity habits of doctors and medical students influence their counselling practices

F Lobelo,[1] J Duperly,[2] E Frank[3]

CLINICAL SCIENCES

Physical Activity Levels and Counseling Practices of U.S. Medical Students

ERICA FRANK[1,2], ELIZABETH TONG[2], FELIPE LOBELO[3], JENNIFER CARRERA[2], and JOHN DUPERLY[4]

[1]Department of Health Care and Epidemiology and Occupational Health and Safety Agency for Healthcare of British Columbia, University of British Columbia, Vancouver, CANADA; [2]Department of Family and Preventive Medicine, Emory University School of Medicine, Atlanta, GA; [3]Department of Exercise Science, Arnold School of Public Health, University of South Carolina, Columbia, SC; and [4]Universidad de los Andes, School of Medicine, Bogota, COLOMBIA

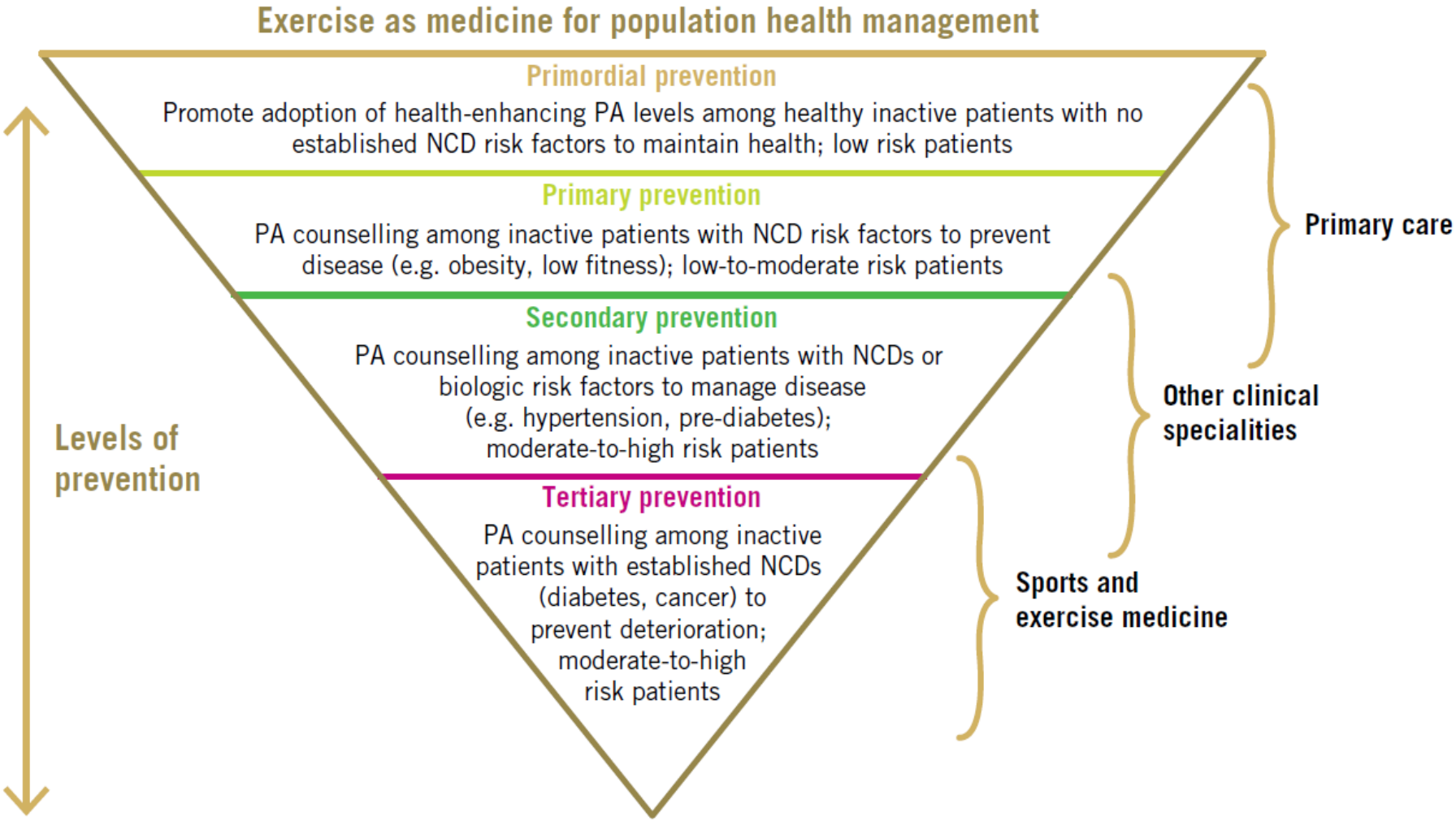


Figure 1: Suggested physician roles for implementation of physical activity counseling in health systems. PA=physical activity, NCDs=non-communicable chronic diseases.

Felipe Lobelo M.D., Ph.D., F.A.H.A.
Associate Professor, Hubert Department of Global Health

Rollins School of Public Health, Emory University
Atlanta, USA

COVERAGE
2011 - 2015

Number of courses & participants

COUNTRY	COURSES	PARTICIPANTS
Argentina	2	64
Bolivia	1	50
Brasil	1	150
Chile	5	66
Colombia	46	1691
Costa Rica	3	101
Ecuador	10	450
México	29	810
Nicaragua	1	33
Uruguay	6	126
Paraguay	2	67
República Dominicana	3	135
Venezuela	9	358
TOTAL	**118**	**4101**

British Journal of
Sports Medicine

Br J Sports Med bjsports-2013-093080Published Online First: 23 April 2014

The Exercise is Medicine Global Health Initiative: a 2014 update

Felipe Lobelo,[1] Mark Stoutenberg,[2,3] Adrian Hutber[2]

Review

Physical Activity Promotion in Health Care Settings: the "Exercise is Medicine" Global Health Initiative Perspective

Felipe Lobelo[1], Jürgen M. Steinacker[2], John Duperly[3], Adrian Hutber[4]

[1] Exercise is Medicine Global Research Center, American College of Sports Medicine, Indianapolis, USA
[2] European
[3] Latin Ame
[4] Exercise is

"Exercise is Medicine" in Latin America: training health care professionals in physical activity prescription

John Duperly[1, 2], Vanessa Collazos[2], Carolina Paez[2], Carolina Donado[1], Michael Pratt[3], Felipe Lobelo[4]

[1] Universidad de los Andes, Medical School, Fundación Santa Fé de Bogotá, Colombia
[2] "Exercise is Medicine" Latin American Regional Center, Bogota, Colombia
[3] National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia, USA
[4] "Exercise is Medicine" Global Center, Indianapolis, Indiana, USA

JOHN DUPERLY

MEDICINA INTERNA - PHD MEDICINA DEL DEPORTE

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ExeRcise is Medicine® Latin America

Prescripción del ejercicio

Una guía para recomendar actividad física a cada paciente

John Duperly, MD, PhD
Felipe Lobelo, MD, PhD

de la ediciones U
LEO

John Duperly es director del Centro Regional de Exercise is Medicine® (EIM®) América Latina. Es especialista en Medicina Interna y PhD en Medicina del Deporte, miembro institucional de la Fundación Santa Fe de Bogotá y profesor asociado de la Facultad de Medicina de la Universidad de Los Andes. Es representante del Presidente de la República de Colombia ante el Consejo Nacional del Deporte, la Recreación, la Actividad Física y el Aprovechamiento del Tiempo Libre.

Felipe Lobelo es profesor asociado del Departamento de Salud Global de la Escuela de Salud Pública de la Universidad de Emory y vicepresidente del Comité de Actividad Física de la Asociación Americana del Corazón (AHA). Es autor de más de 60 publicaciones científicas y miembro de la junta asesora de la iniciativa global EIM® del Colegio Americano de Medicina del Deporte (ACSM), del cual es director de su Centro Global de Investigación y Colaboración.