

Jogging and mortality: U curves is there a relationship?

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Jogging and mortality: U curves is there a relationship?

Conflicts of interest:

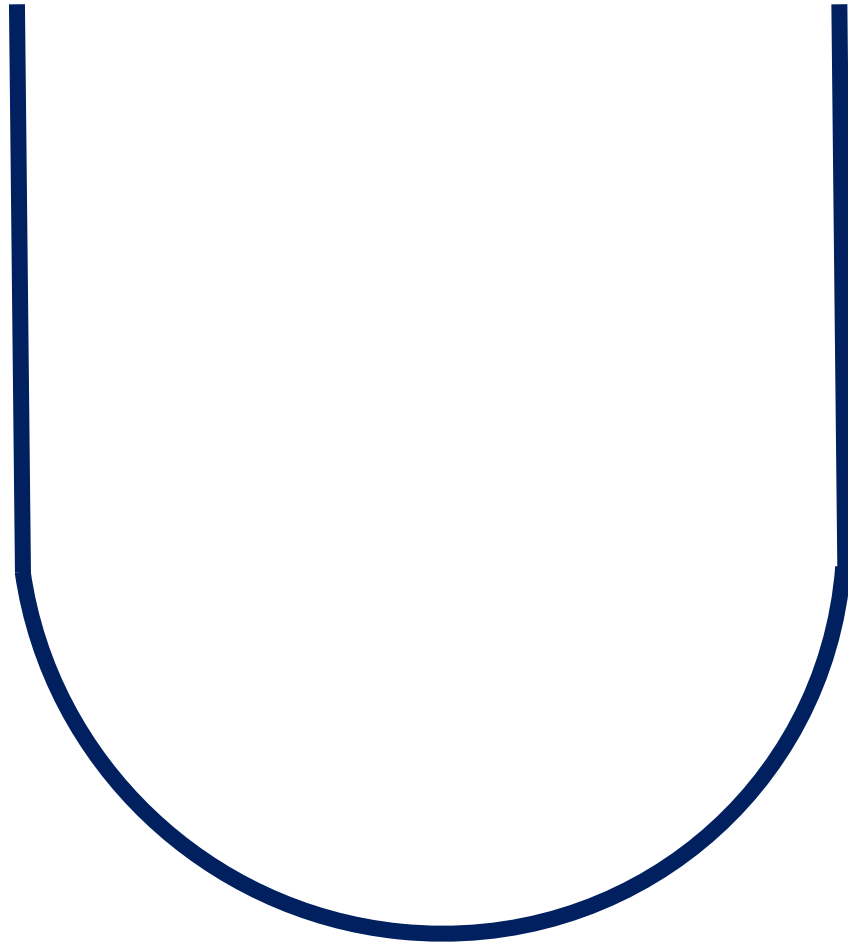
Nothing to declare

Jogging and mortality: U curves is there a relationship?

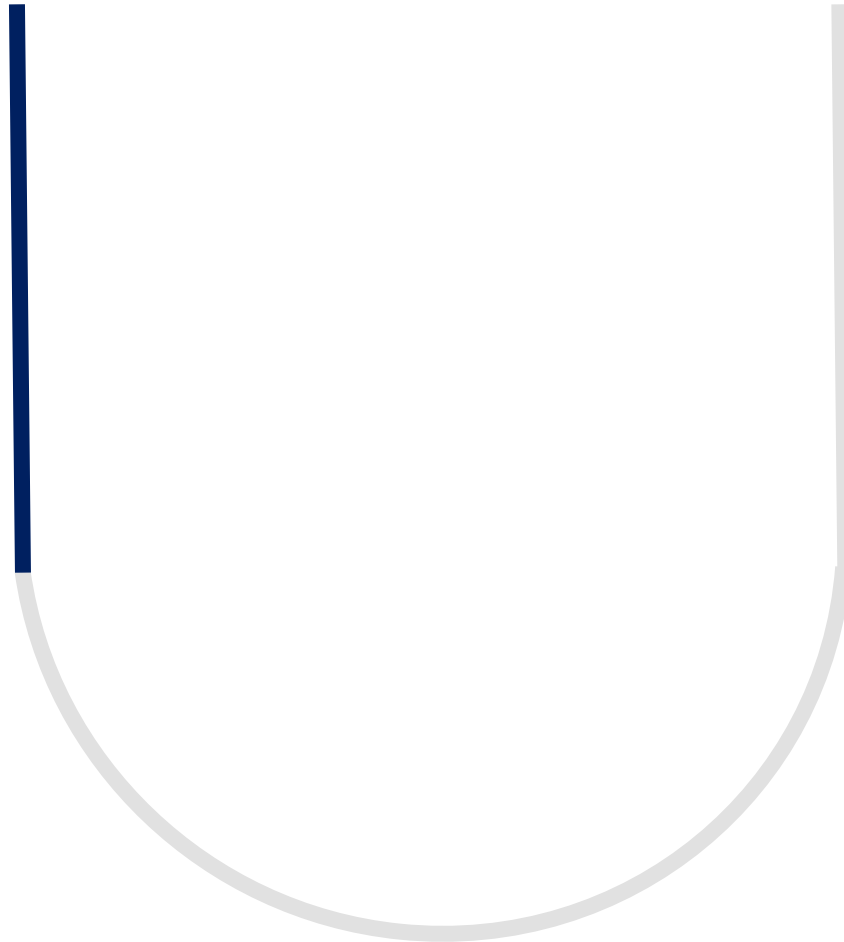
“Everything in excess is opposed to nature”

Hippocrates

Jogging and mortality: U curves is there a relationship?



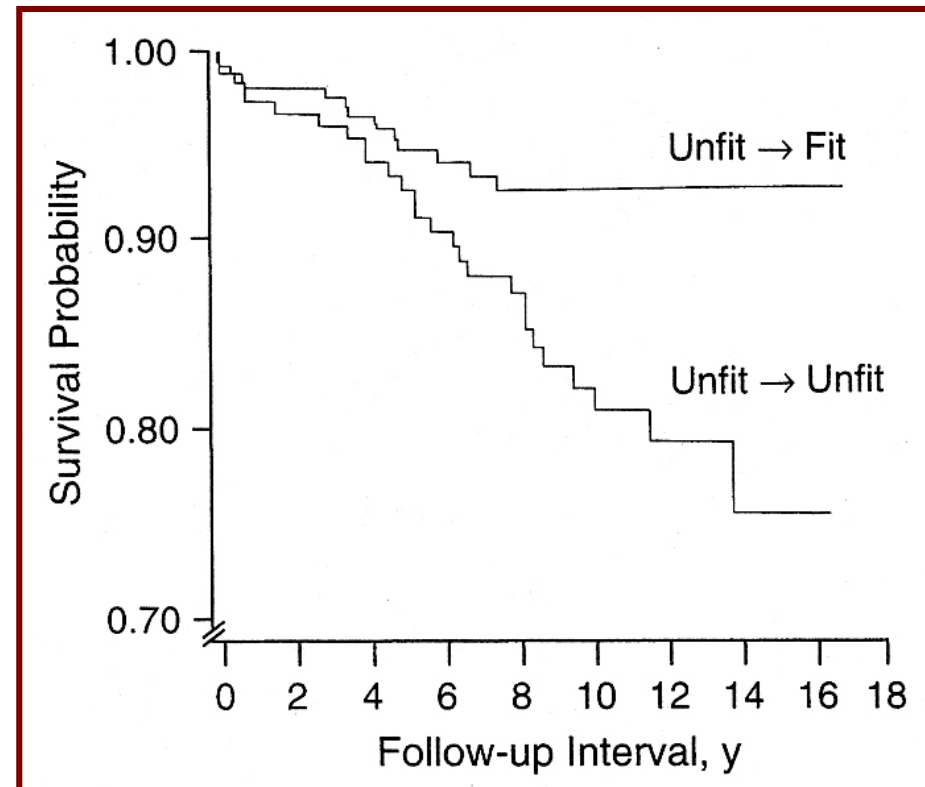
Jogging and mortality: U curves is there a relationship?



Physical activity and public health

Pate RR et al, JAMA 1995;273:402-7

Men who were initially sedentary and have become active had a mortality risk by 44% lower than those who remained sedentary !!



Longevity in Male and Female Joggers: The Copenhagen City Heart Study

American Journal of Epidemiology, February 28, 2013

1129 healthy joggers and 16423 healthy non-joggers

- ✓ The hazard ratio of jogging for all-cause mortality was 0.69 (95% CI: 0.57, 0.83) for men and 0.60 (95% CI: 0.42, 0.85) for women
- ✓ The age-adjusted increase in survival with jogging was 6.2 years for men and 5.6 years for women

The benefits of physical activity

Neurological

- ↓ Anxiety/depression
- ↓ Dementia
- ↑ Cognitive function
- ↓ CVAs

Cardiovascular

- ↓ mortality
- ↓ CAD
- ↓ BP
- Cardiac rehab

Endocrine

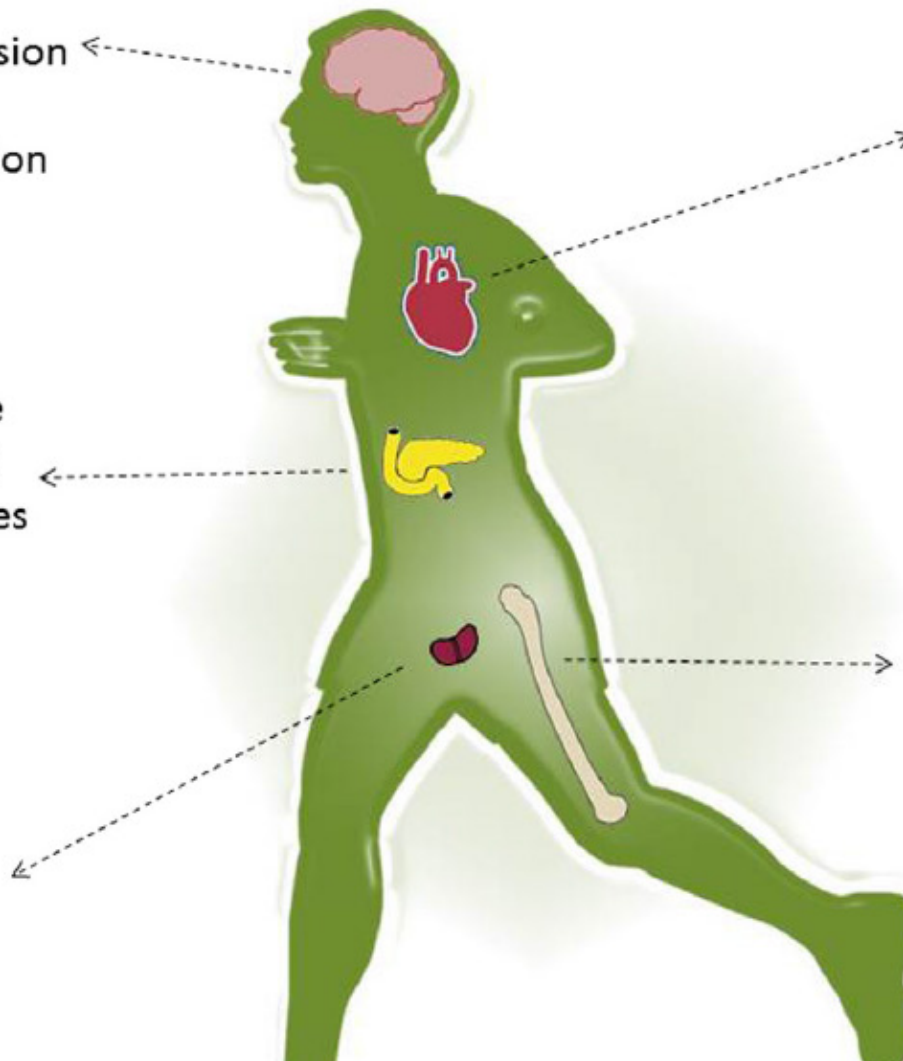
- ↓ Weight
- ↓ Diabetes
- ↓ LDL
- ↑ HDL

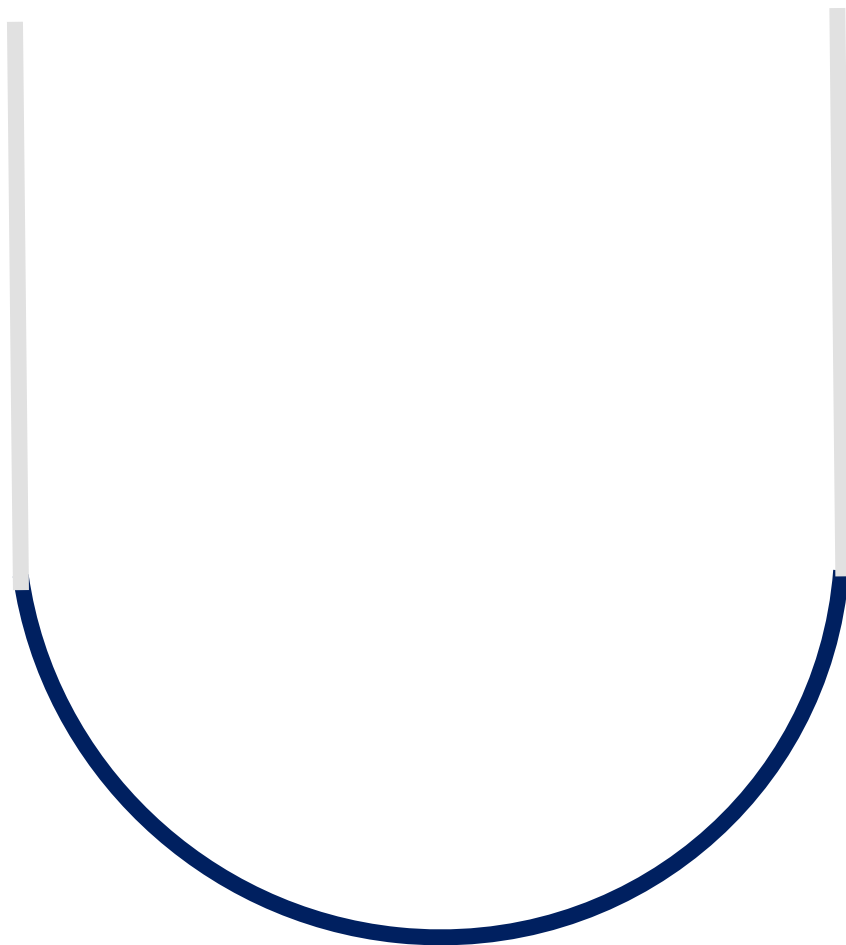
Musculoskeletal

- ↓ Osteoporosis
- ↓ Falls
- ↓ Disability

Oncological

- ↓ Prostate Ca
- ↓ Breast Ca
- ↓ Bowel Ca





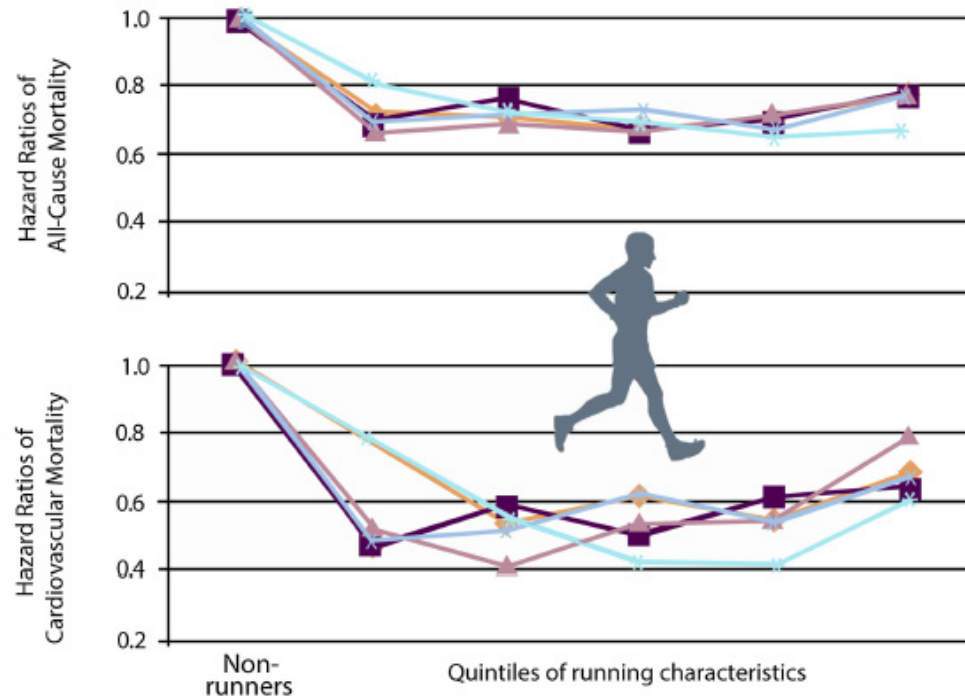
Physical Activity and CV Health

- ✓ Regular moderate physical activity has been shown to be useful in both primary and secondary prevention in men and women
- ✓ All the Guidelines recommend for all citizens 30 minutes of moderate physical activity (such as brisk walking) for 5 days/week, which is equivalent to 150 min/week
- ✓ Similar benefits can be obtained with more intense physical activity (eg jogging) for 15 minutes a day 5 days/week (or 75/min week) for a total of about 10 km/week

The Aerobic Center Longitudinal Study

Lee D-C et al. JACC 2014;64:472-81

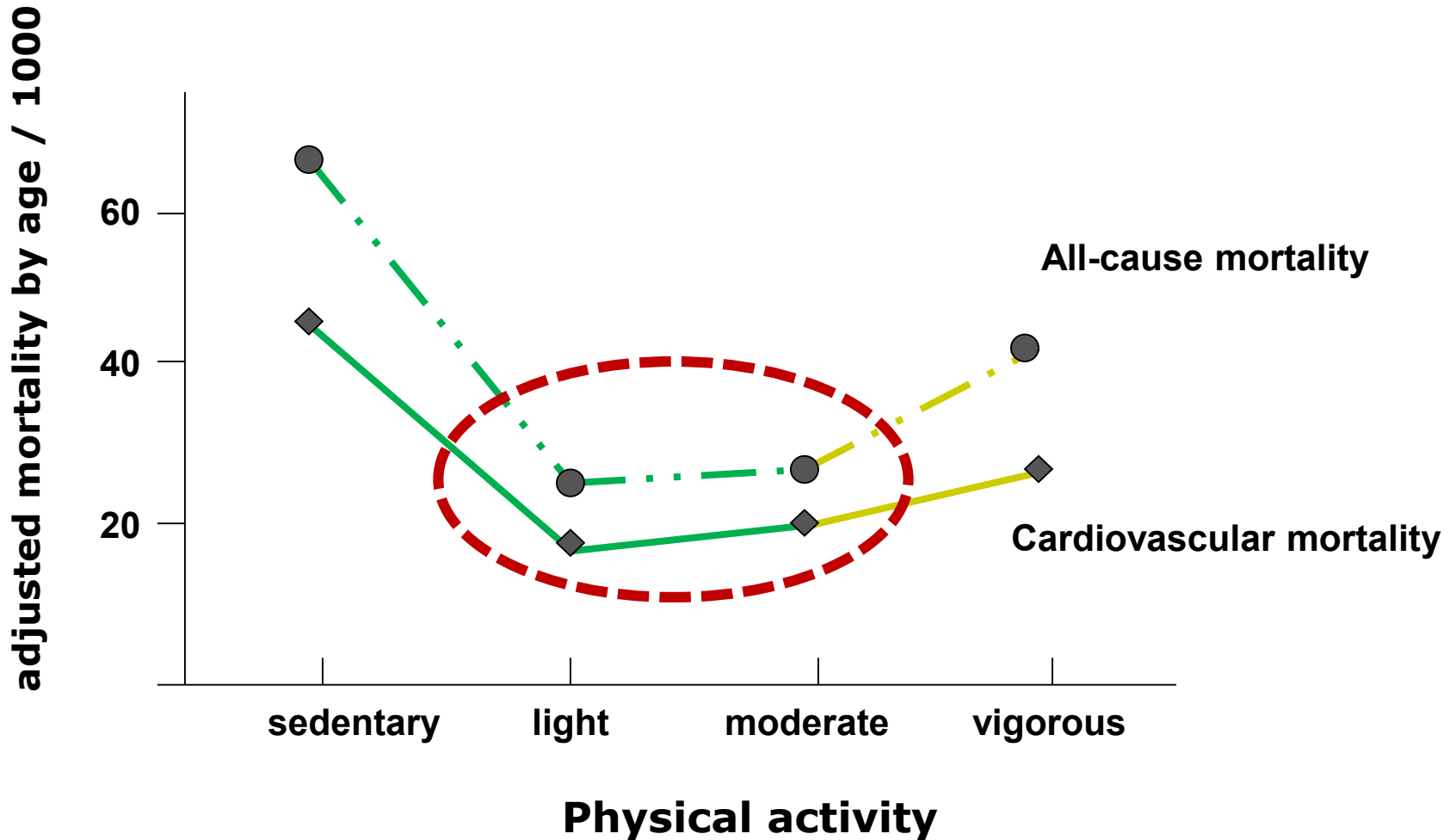
**13.000 runners and 42.000 non-runners
Followed for an average of 15 years**

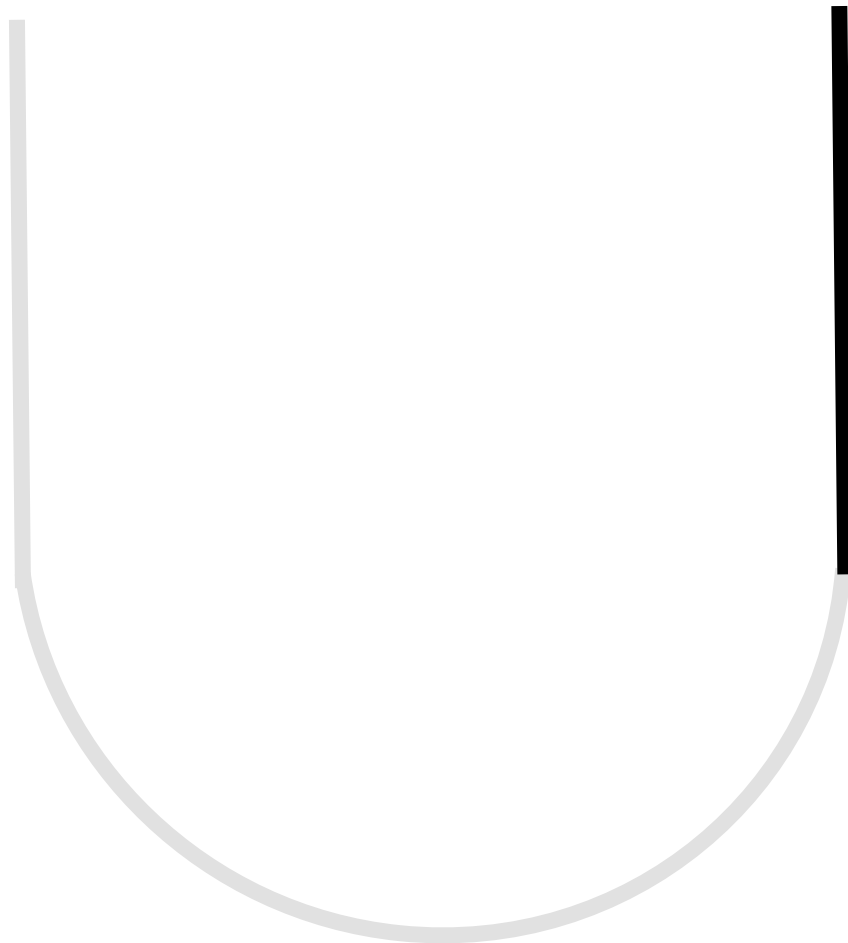


	Time (min/wk)	0	<51	51-80	81-119	120-175	≥176
	Distance (miles/wk)	0	<6	6-8	9-12	13-19	≥20
	Frequency (times/wk)	0	1-2	3	4	5	≥6
	Total amount (MET-min/wk)	0	<506	506-812	813-1199	1200-1839	≥1840
	Speed (mph)	0	<6.0	6.0-6.6	6.7-7.0	7.1-7.5	≥7.6

Mortality in subjects aged over 65 years based on the level of physical activity

Wannamethee S et al. *Circulation* 2000;102:1358-63



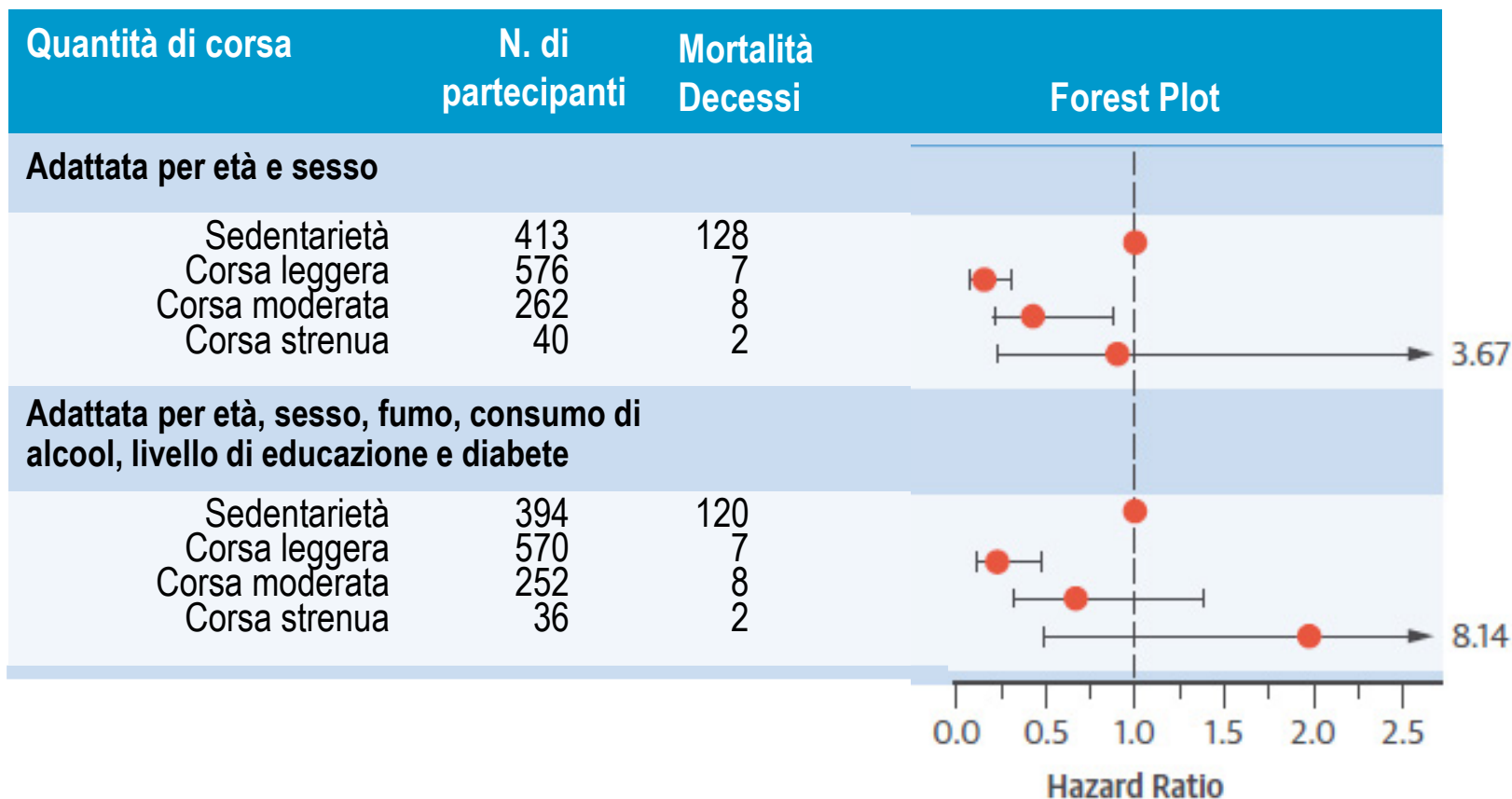


Dose of Jogging and Long-Term Mortality

The Copenhagen City Heart Study

Schnohr P et al. JACC 2015;65:411-9

**1098 healthy joggers and 3950 healthy non-joggers
Followed up since 2001**

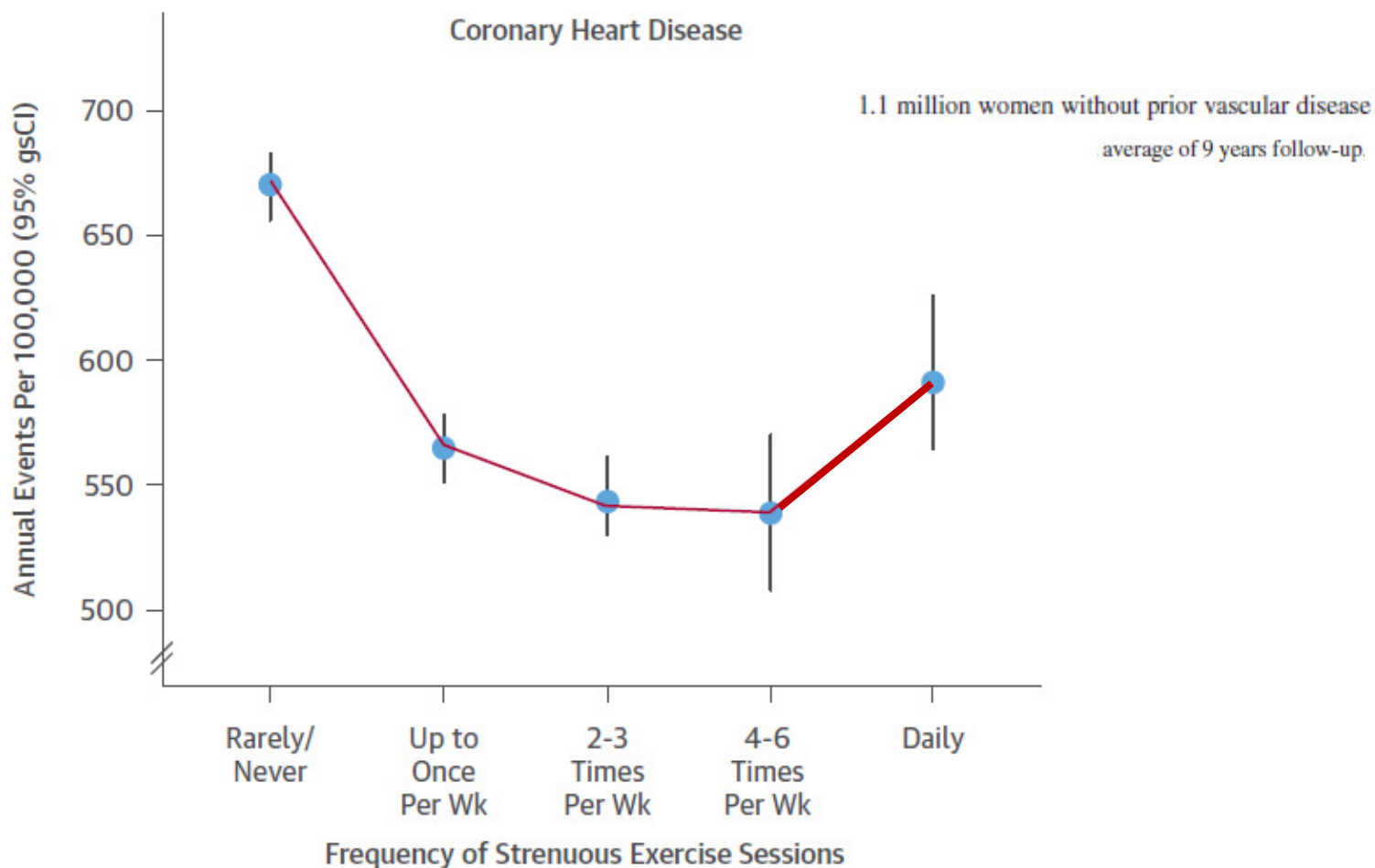


Frequent Physical Activity May Not Reduce Vascular Disease Risk as Much as Moderate Activity

Large Prospective Study of Women in the United Kingdom

Miranda E. G. Armstrong, MPhil(Cantab), PhD; Jane Green, BMBCh, DPhil;
Gillian K. Reeves, MSc, PhD; Valerie Beral, DBE, AC, FRS; Benjamin J. Cairns, PhD;
on behalf of the Million Women Study Collaborators*

Circulation February 24, 2015



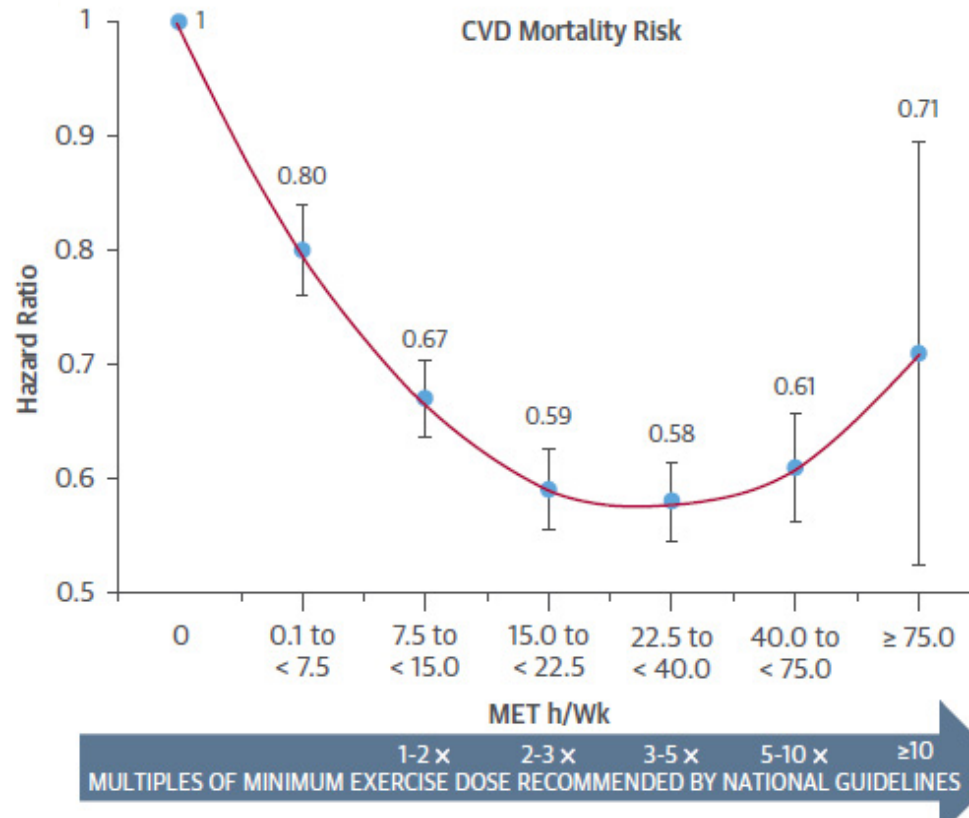
Leisure Time Physical Activity and Mortality

A Detailed Pooled Analysis of the Dose-Response Relationship

Arem H et al. *JAMA Inter Med* 2015; april 6

Pooled data from 6 studies in the National Cancer Institute Cohort Consortium
(baseline 1992-2003 till 2014)

661 137 men and women (median age, 62 years; range, 21-98 years) included

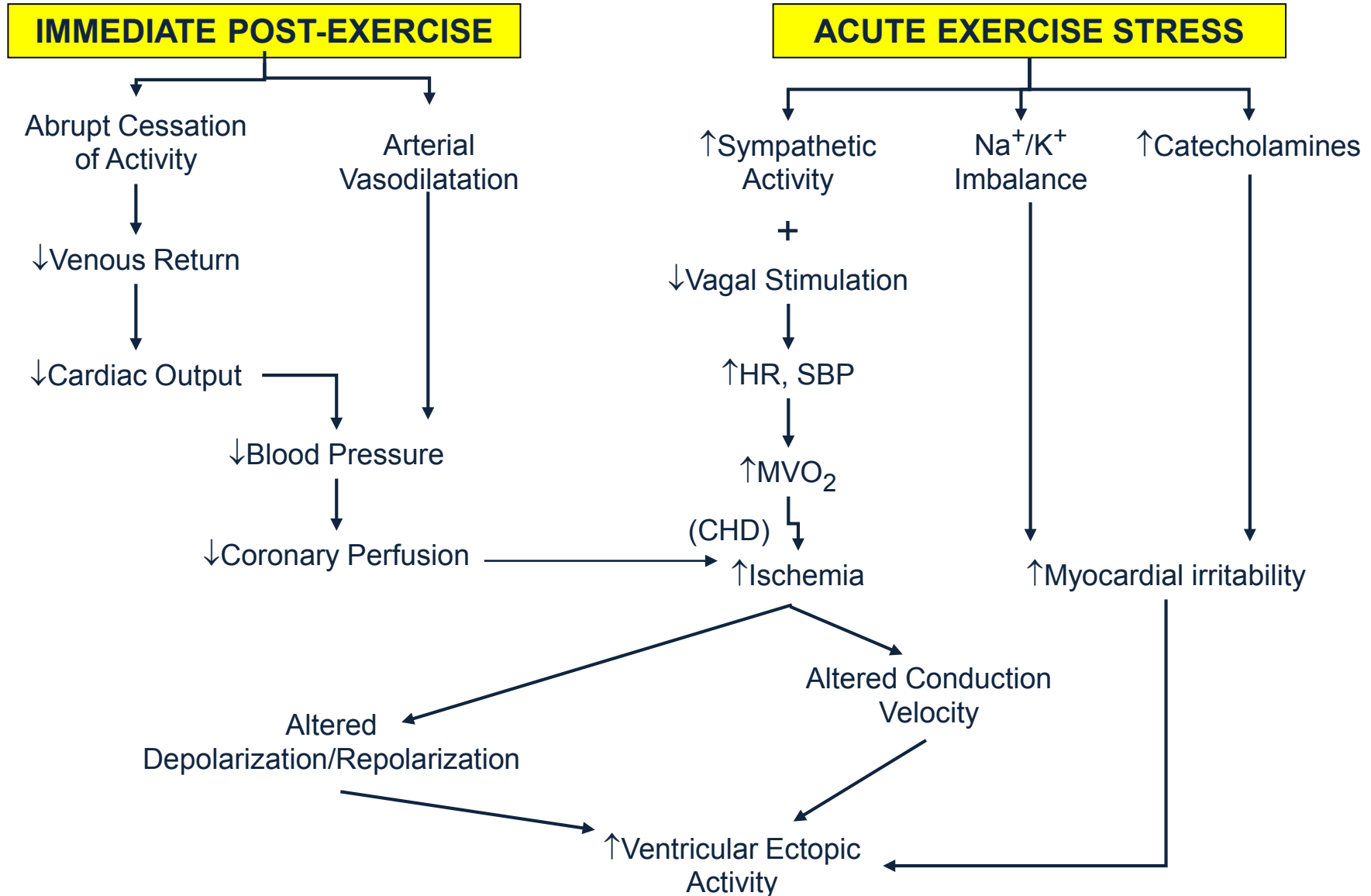


Why?

Excessive endurance exercise and risk of sudden cardiac death

- ✓ During the Greco-Persian war in 490 BC, Pheidippides, a 40-year-old Greek herald, ran almost 150 miles during a 2-d period to deliver urgent military messages. On the third day, he ran the 26 miles from the battlefield near Marathon to Athens to deliver news of a momentous Greek victory. As per the legend, upon arriving, Pheidippides explained to the Athenians, "Victory is ours!", and then he immediately collapsed and died.
- ✓ 2,500 years later Micah True, the mythical long distance runner surnamed Caballo Blanco – who runs as far as 100 miles on some days - while out on a relatively routine 12-mile training run, died suddenly, presumably from a lethal arrhythmia.

Excessive endurance exercise and risk of sudden cardiac death



AHA Scientific Statement

(*Circulation*. 2007;115:2358-2368.)

Exercise and Acute Cardiovascular Events

Placing the Risks Into Perspective

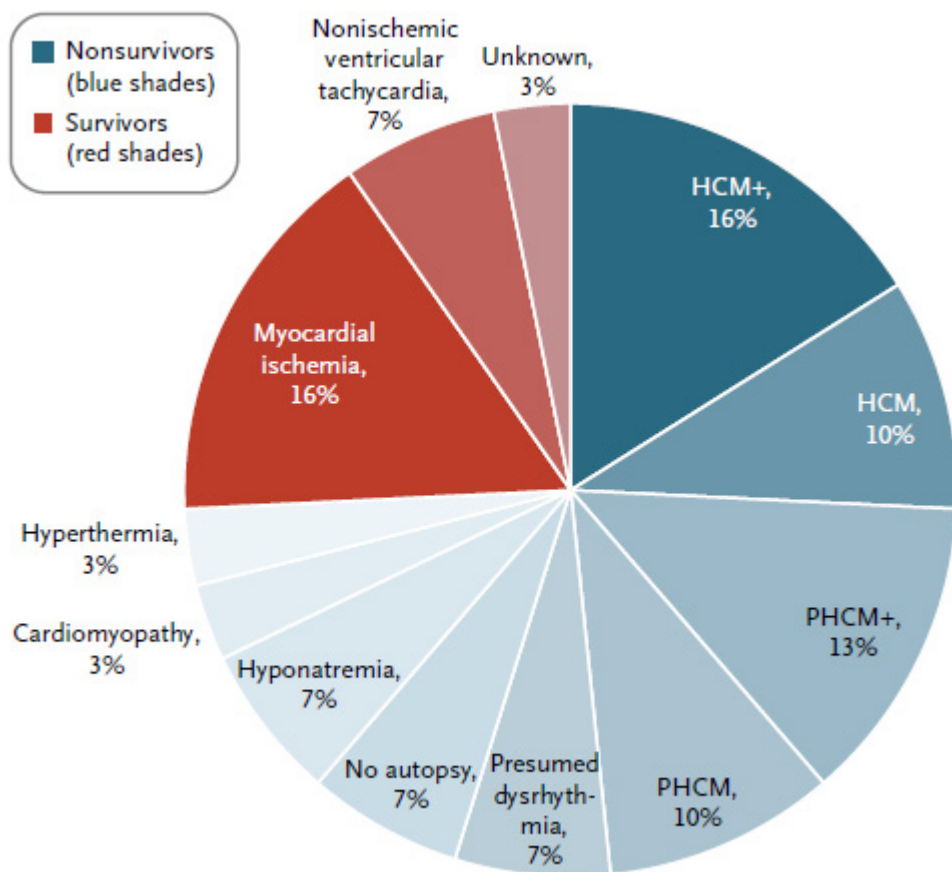
A Scientific Statement From the American Heart Association
Council on Nutrition, Physical Activity, and Metabolism
and the Council on Clinical Cardiology

Summary of Contemporary Exercise-Based Cardiac Rehabilitation Program Complication Rates

Investigator	Year	Patient- Exercise Hours	Cardiac Arrest	MI	Fatal Events
Van Camp and Peterson	1980-1984	2,351,916	1/ 111,996	1/ 293,990	1/ 783,972
Digenio et al	1982-1988	480,000	1/ 120,000	1/ 160,000	1/ 120,000
Vongvanich et al	1986-1995	268,503	1/ 89,501	1/ 268,503	0/ 268,503
Franklin et al	1982-1998	292,254	1/ 146,127	1/ 97,418	0/ 292,254
Average		1/ 116,906	1/ 219,970	1/ 752,365	1 / 81,670

Cardiac Arrest during Long-Distance Running Races

Jonathan H. Kim, M.D., Rajeev Malhotra, M.D., George Chiampas, D.O.,
for the Race Associated Cardiac Arrest Event Registry (RACER) Study Group



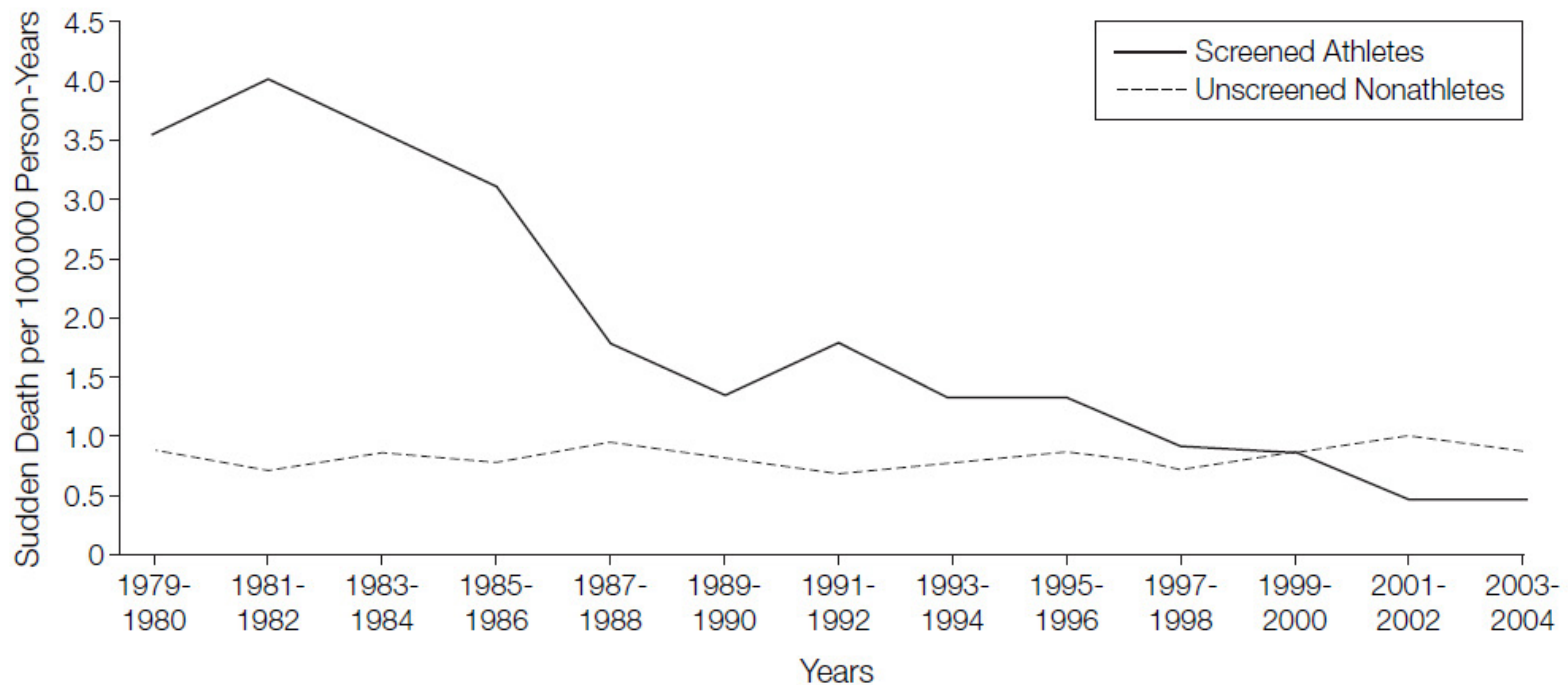
✓ **Results.** Of 10.9 million runners, 59 (mean [\pm SD] age, 42 \pm 13 years; 51 men) had cardiac arrest (incidence rate, 0.54 per 100,000 participants; 95% confidence interval [CI], 0.41 to 0.70).

✓ **Conclusions.** Marathons and half-marathons are associated with a low overall risk of cardiac arrest and sudden death. Cardiac arrest is most commonly attributable to hypertrophic cardiomyopathy and less frequently to atherosclerotic coronary disease.

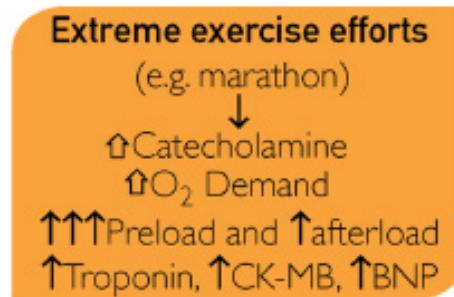
Trends in Sudden Cardiovascular Death in Young Competitive Athletes After Implementation of a Preparticipation Screening Program

Domenico Corrado, MD, PhD JAMA, October 4, 2006—Vol 296, No. 13

Mortality was predominantly due to sudden death from cardiomyopathies

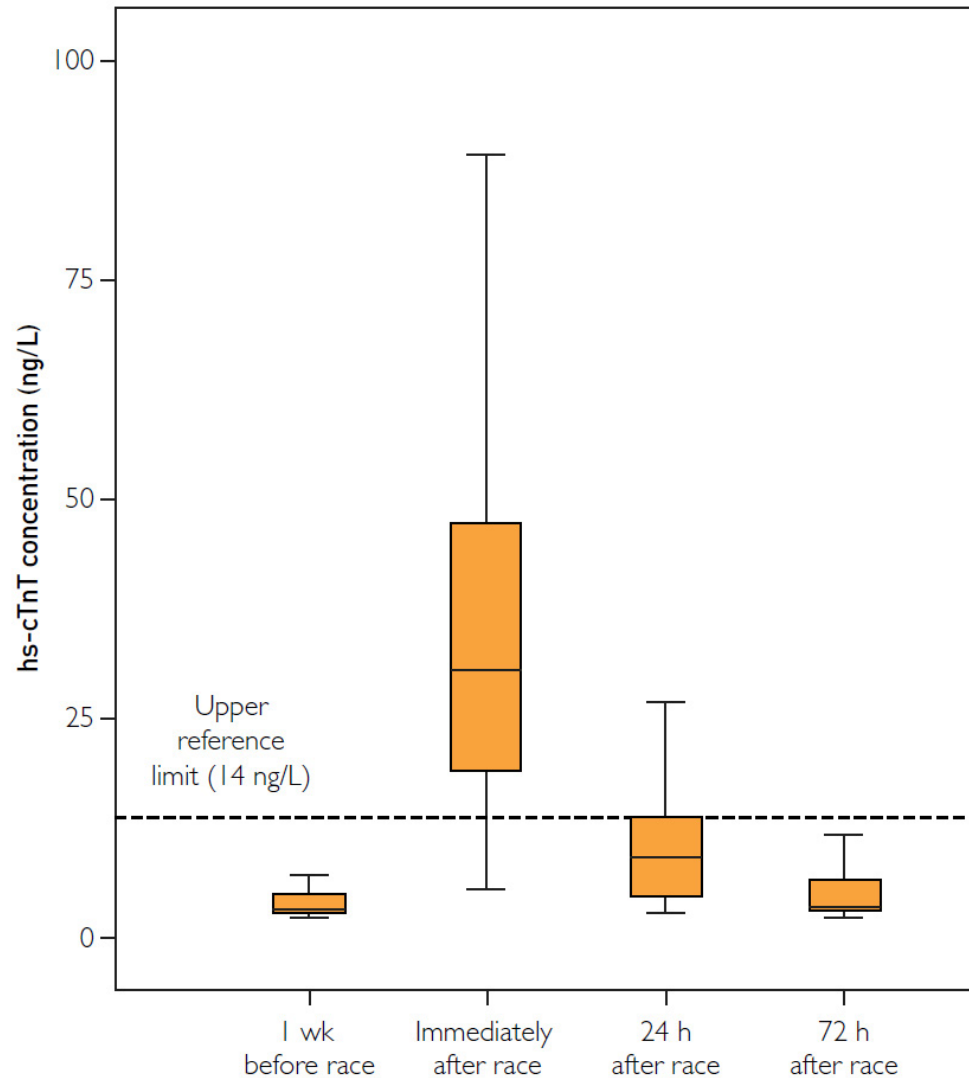


Excessive endurance exercise and effects on cardiac function

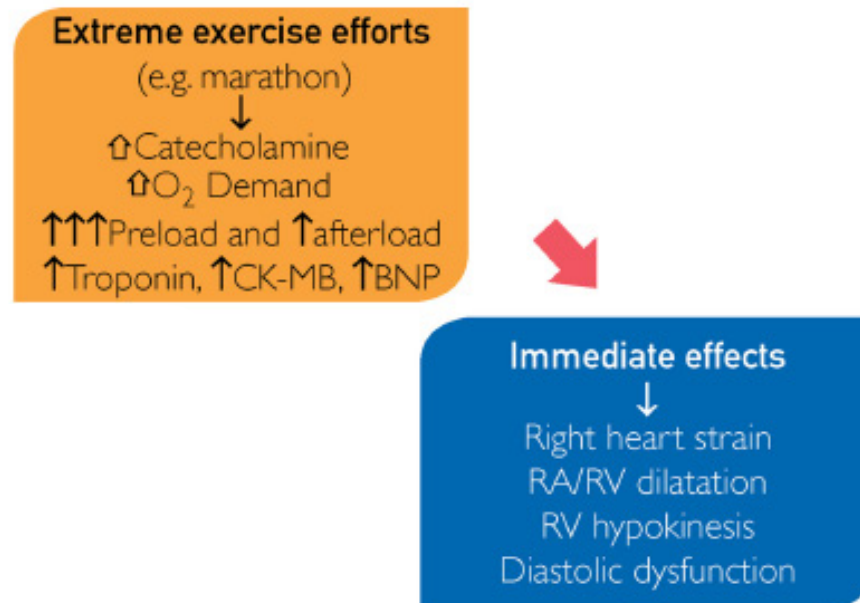


High-sensitivity cardiac troponin T concentrations before and after marathon race

Scherr J, et al. Med Sci Sports Exerc. 2011;43



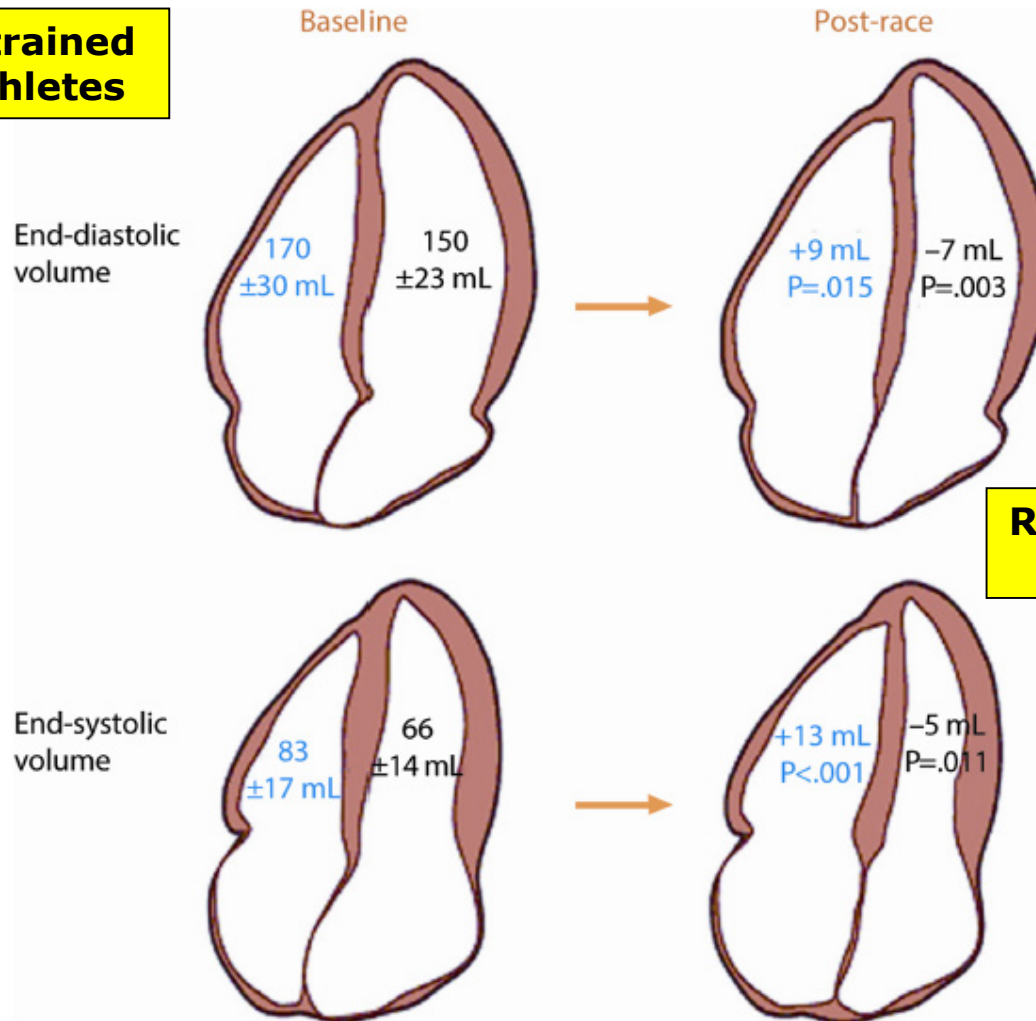
Excessive endurance exercise and effects on cardiac function



Differential effect of prolonged intense exercise on RV and LV volume

La Gerche et al. Eur Heart J 2012;33:998-1006

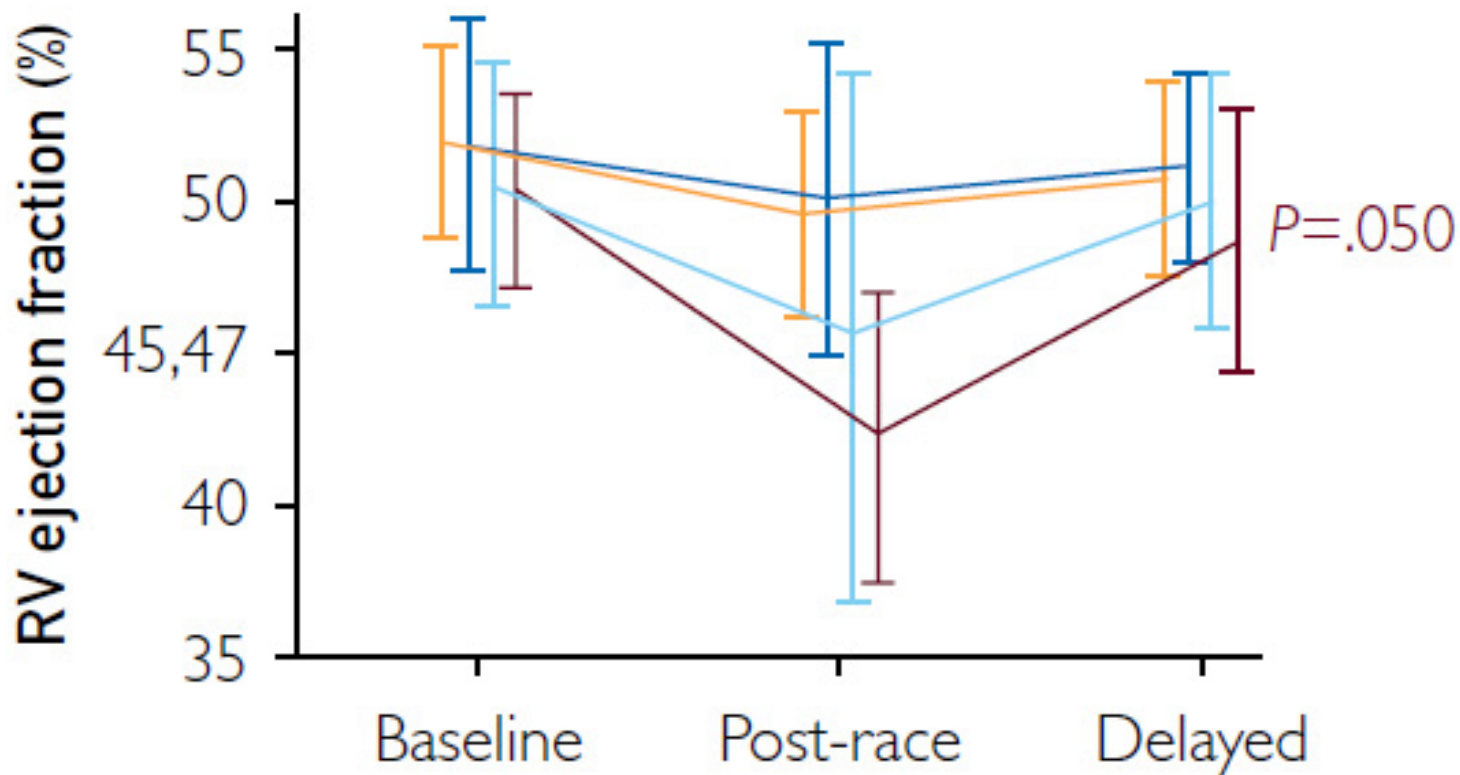
40 highly trained aerobic athletes



Return to baseline within the first few weeks

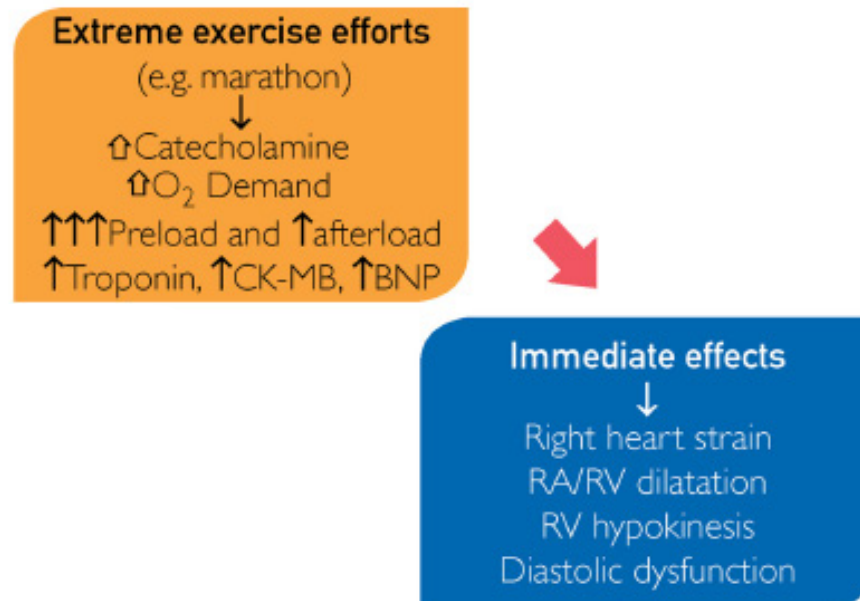
Duration-dependent effect of endurance events on right ventricular ejection fraction

La Gerche et al. Eur Heart J 2012;33:998-1006

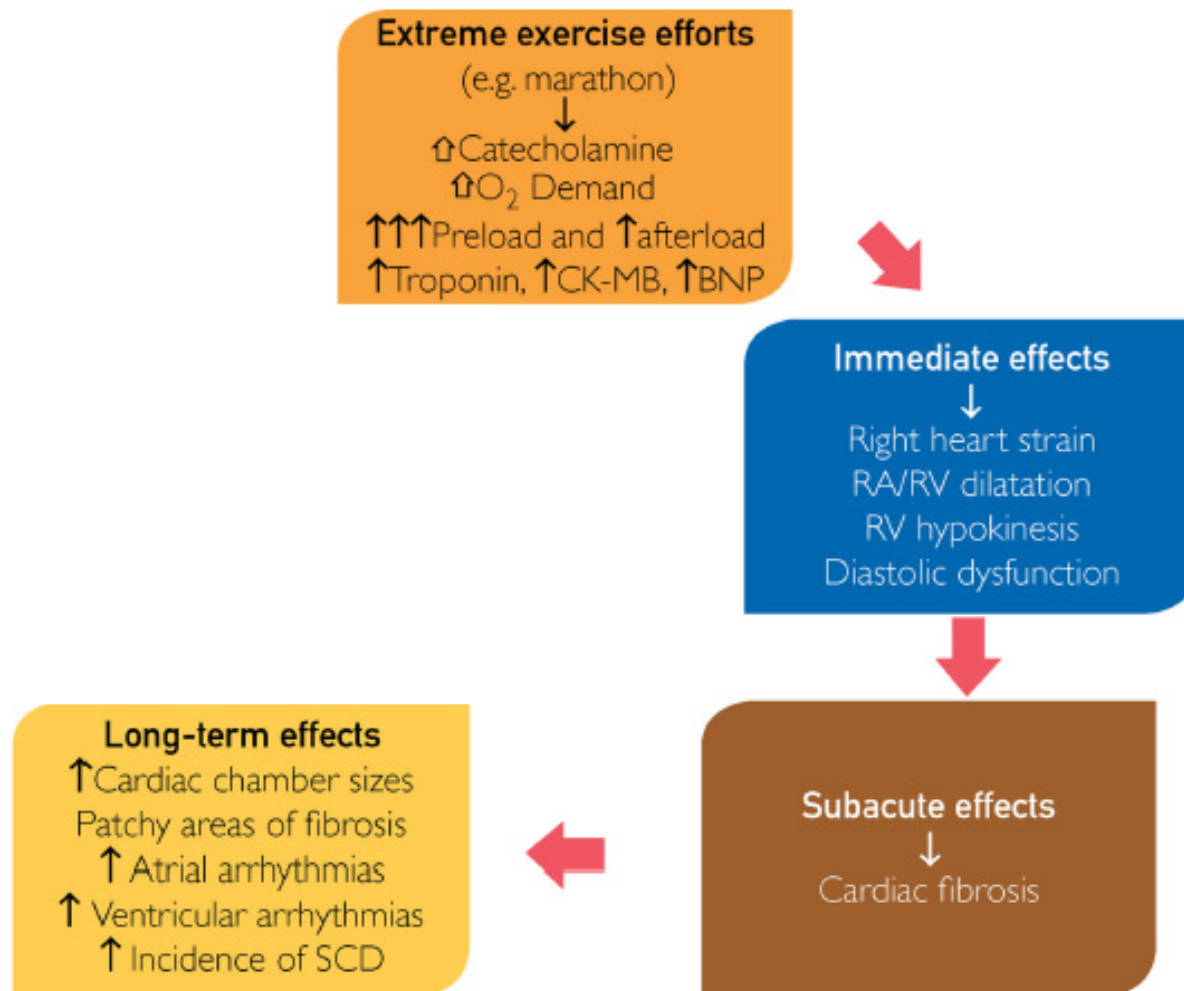


- Marathon (3 h)
- Endurance triathlon (5.5 h)
- Alpine cycling (8 h)
- Ultratriathlon (11 h)

Excessive endurance exercise and effects on cardiac function



Excessive endurance exercise and effects on cardiac function



Excessive endurance exercise and risk of cardiac fibrosis

**102 runners
(at least 5 marathons
over last 3 years)
vs 102 sedentary**

Age 50-72 yrs

**The prevalence of late
gadolinium enhancement
(LGE) was
12% vs 4% (p=0.077)**

***Breuckmann F et al.
Radiology 2009;251:50-7***

**93 runners for more than
20 years
(including 21 athletes elite
Masters)**

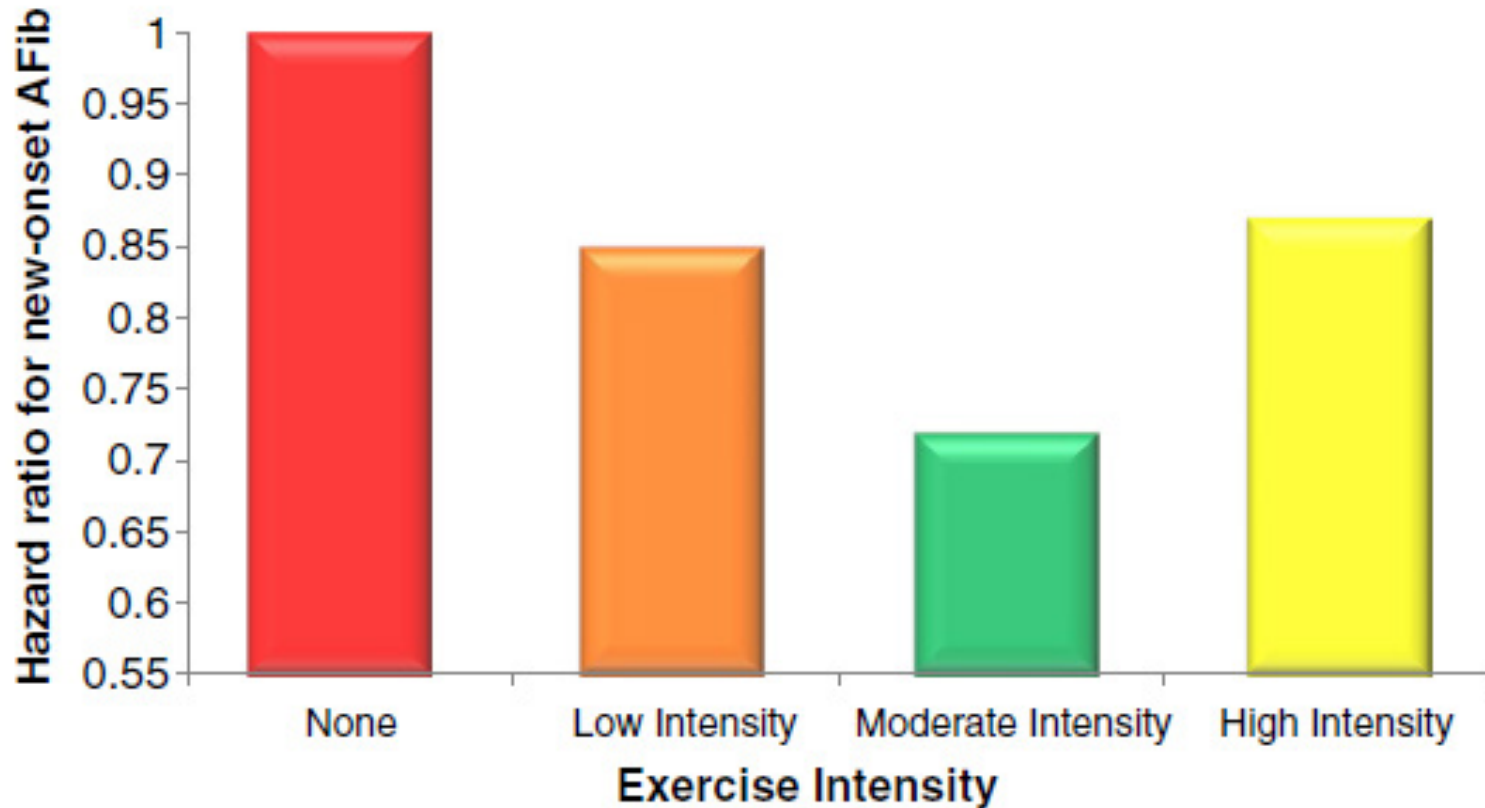
**Mean age 69 yrs
27% women**

No person with LGE

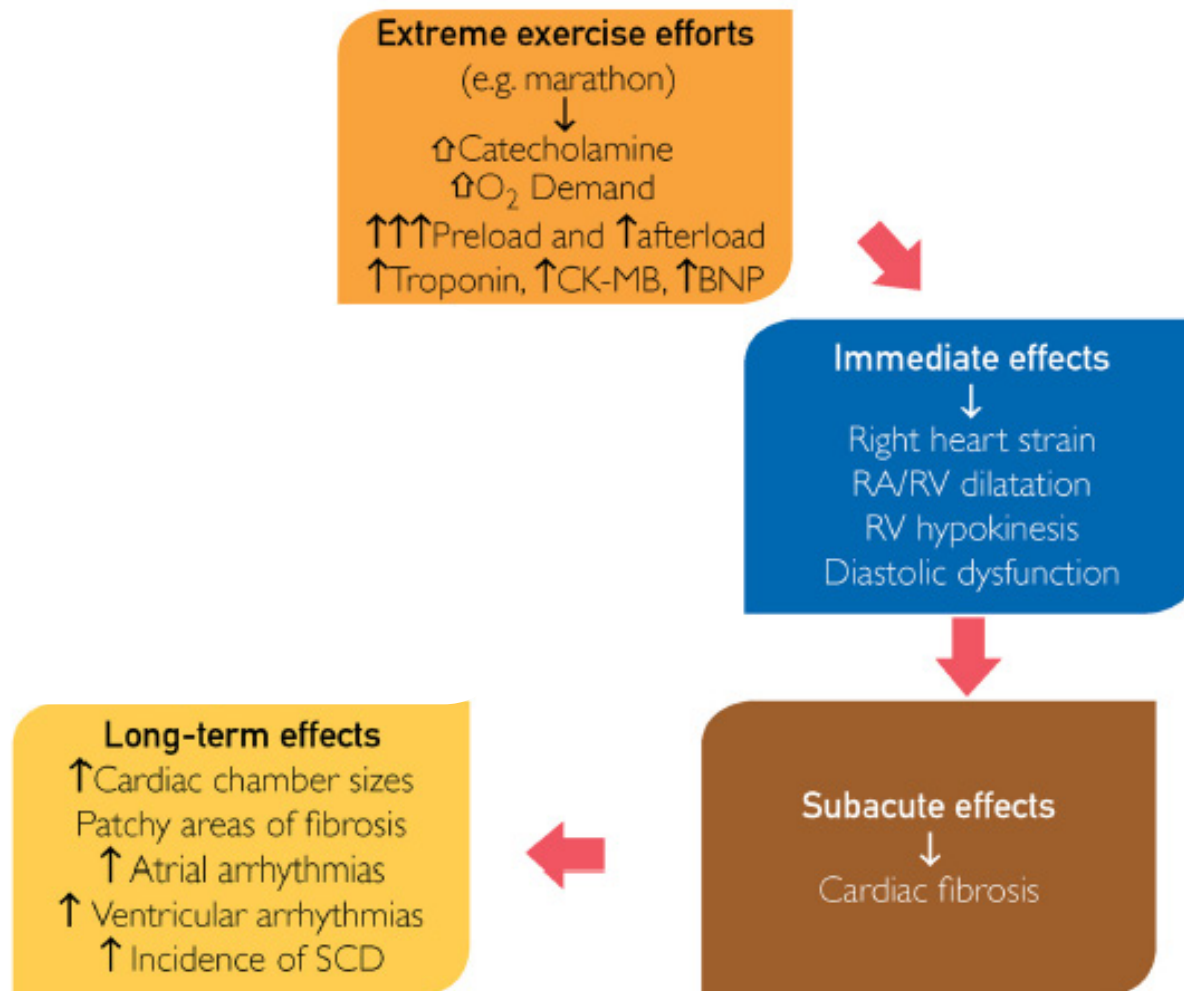
***Barkley R et al.
J Am Coll Cardiol. 2013;61***

Excessive endurance exercise and risk of atrial fibrillation

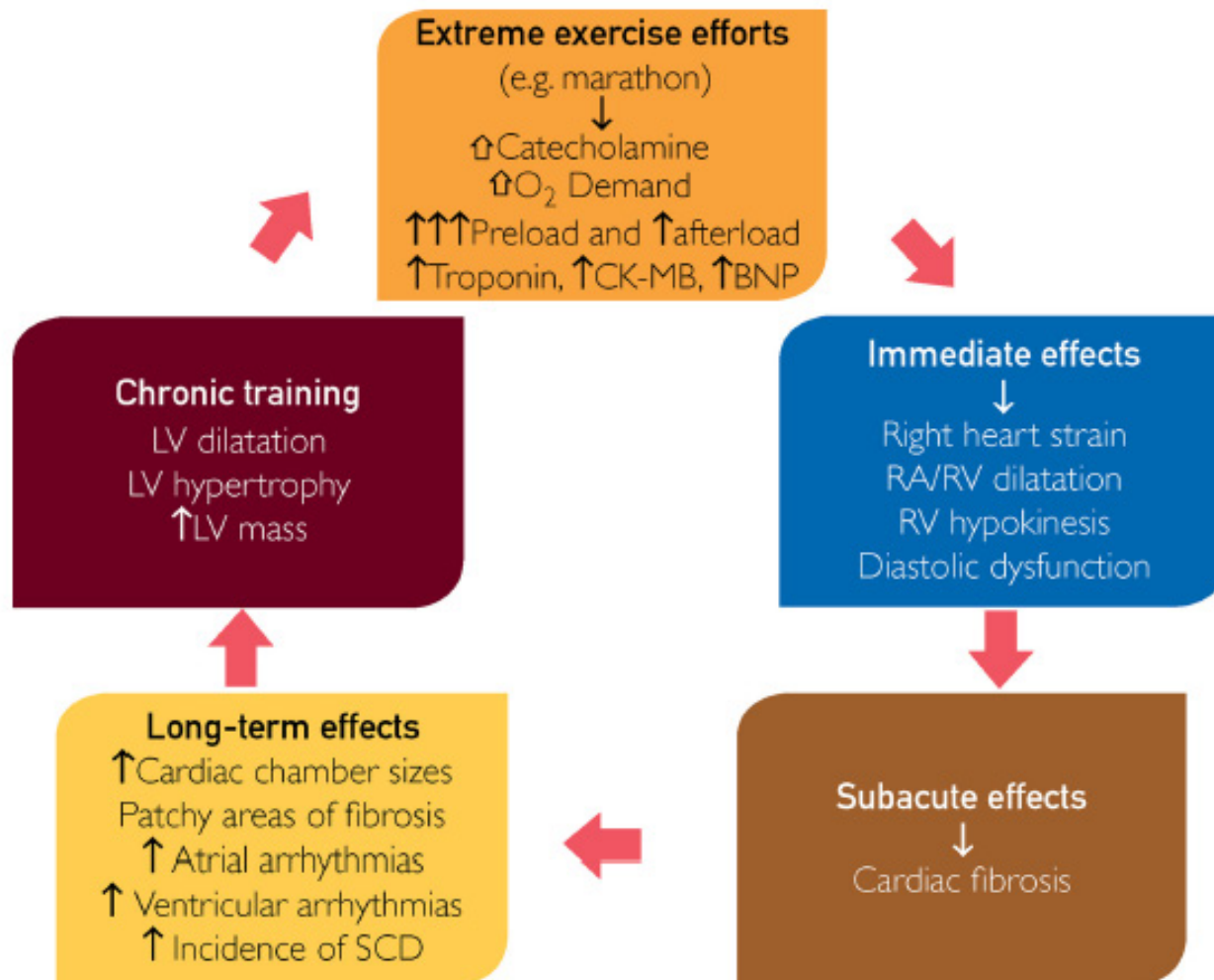
O'Keefe JH et al. Mayo Clin Proc 2012;87:1171-5



Excessive endurance exercise and effects on cardiac function

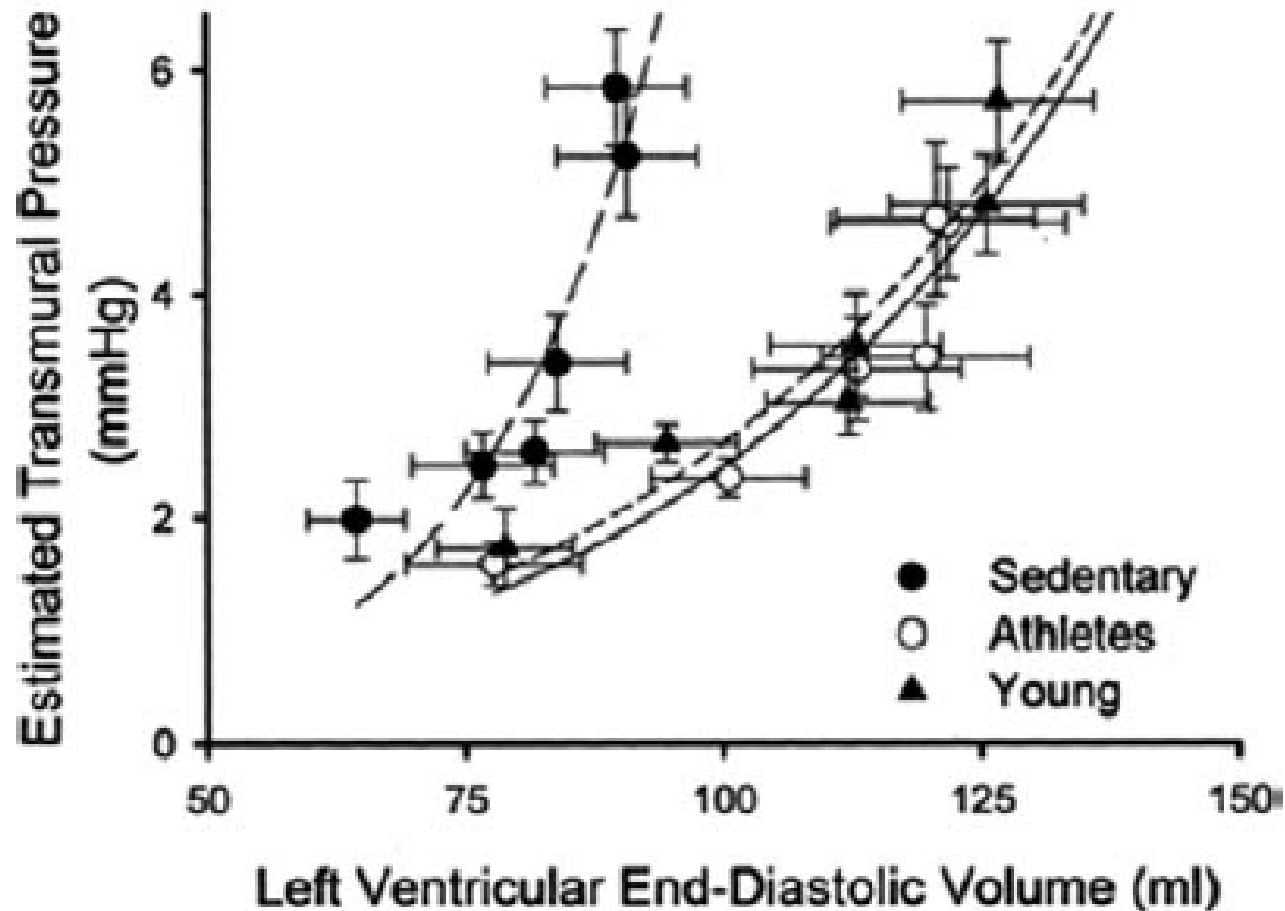


Excessive endurance exercise and effects on cardiac function



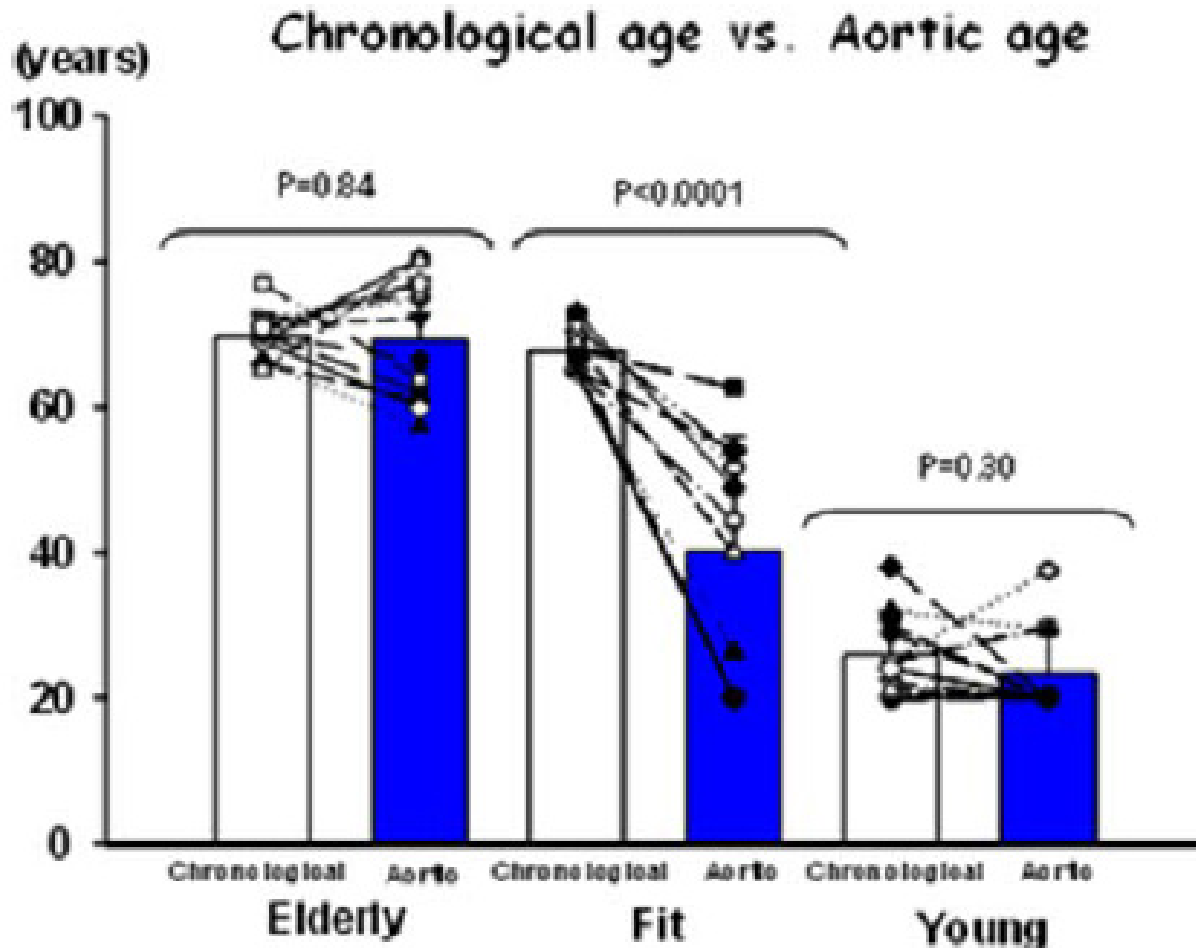
Effect of aging and physical activity on LV compliance

Arbab-Zadeh A et al. *Circulation* 2004;110:1799-805



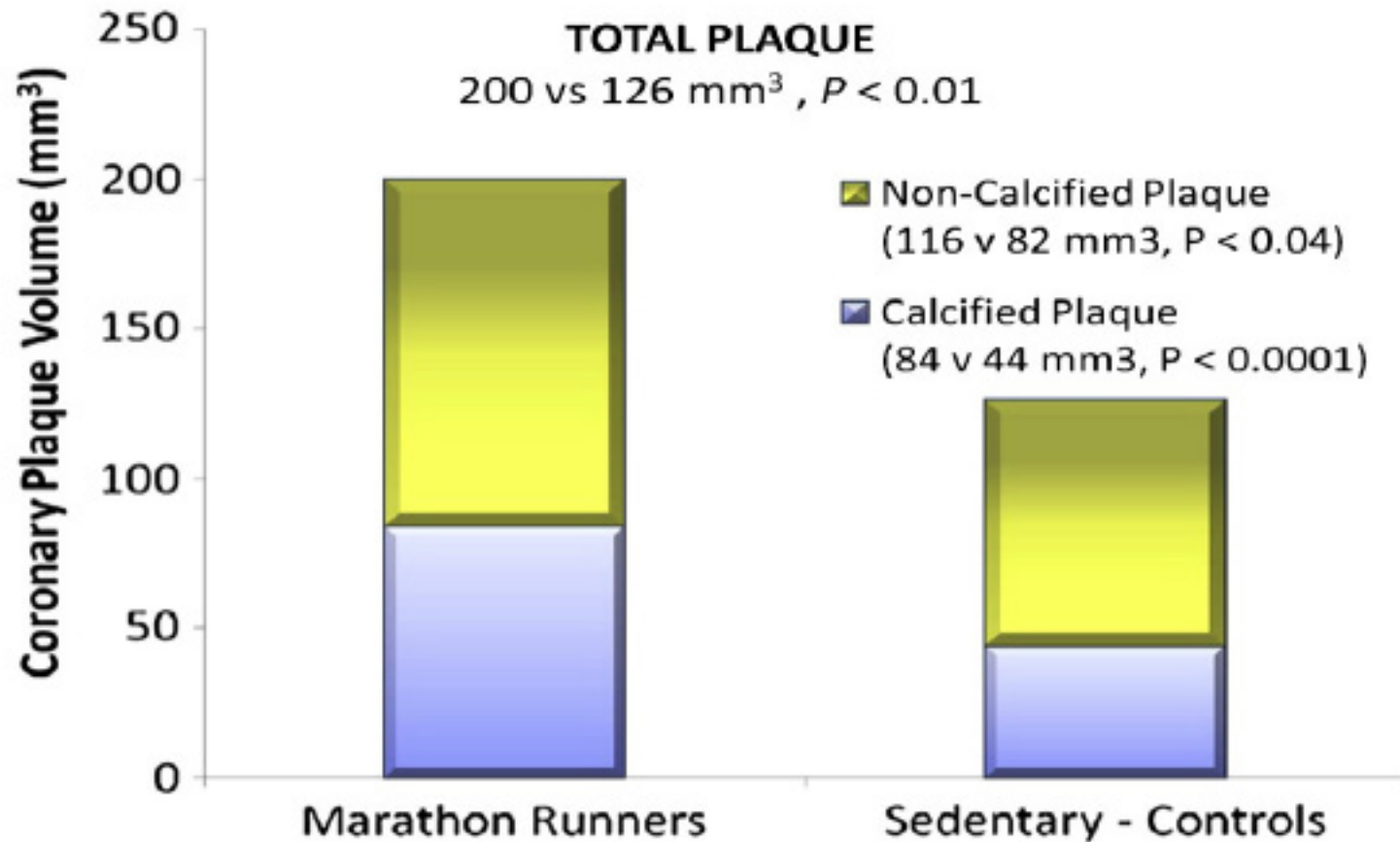
Biological aortic age in sedentary healthy subjects and Masters athletes

Shibata S et al. J Appl Physiol 2011;110:981-7



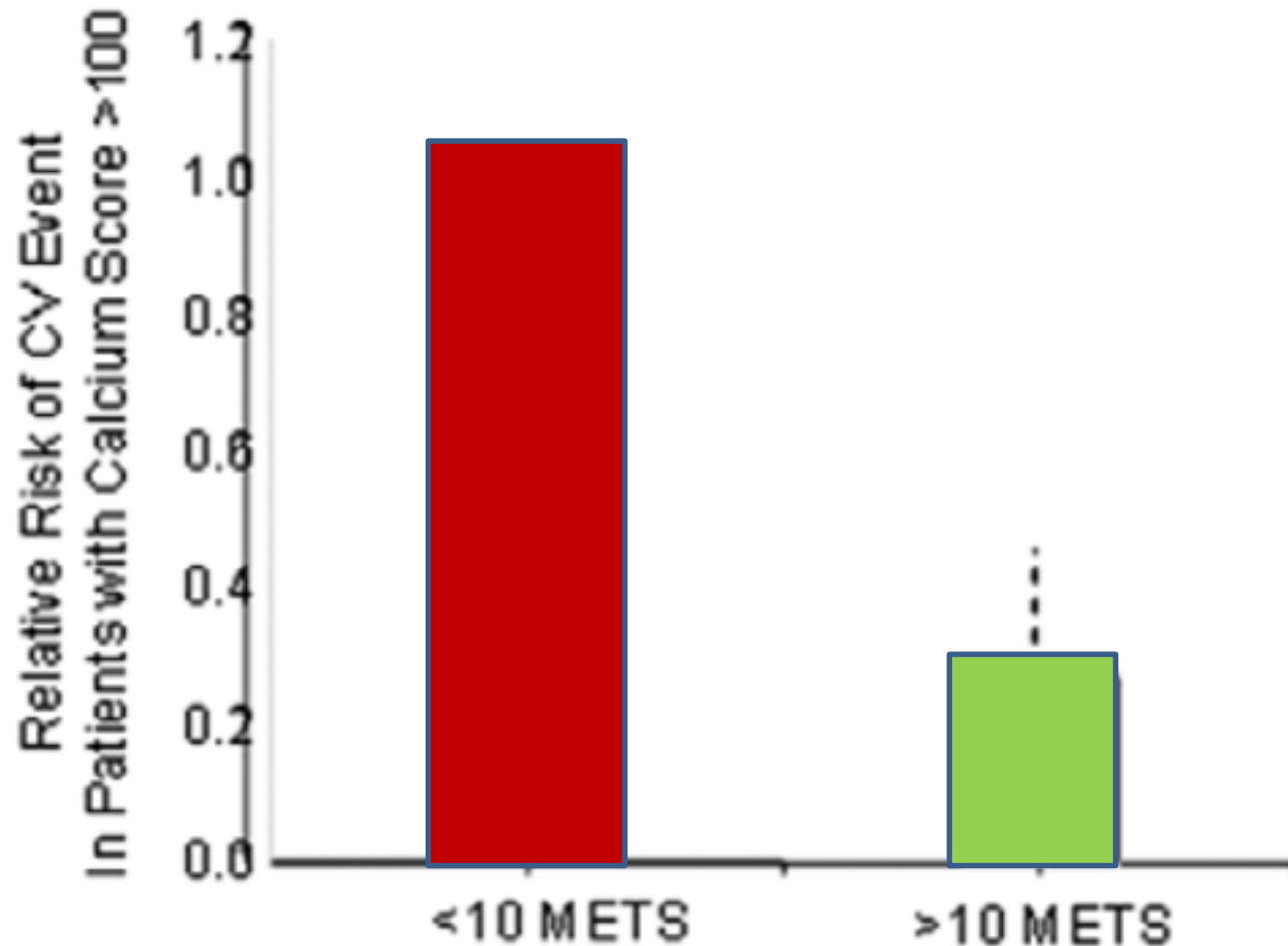
Excessive endurance exercise and risk of CHD

Schwartz RS et al. Mo. Med 2014;111:85-90



Coronary artery calcium, exercise tolerance, and CHD events in asymptomatic men

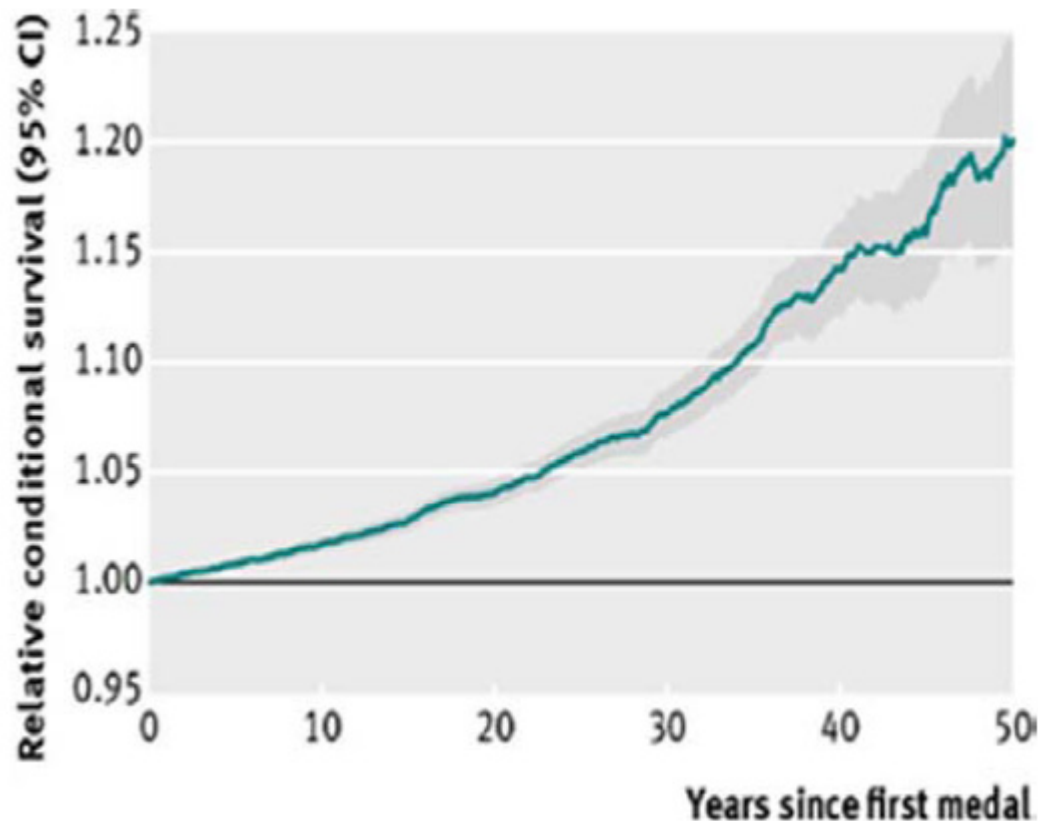
LaMonte MJ et al. *Atherosclerosis* 2006;189:157-62



Survival of the fittest: retrospective cohort study of the longevity of Olympic medalist

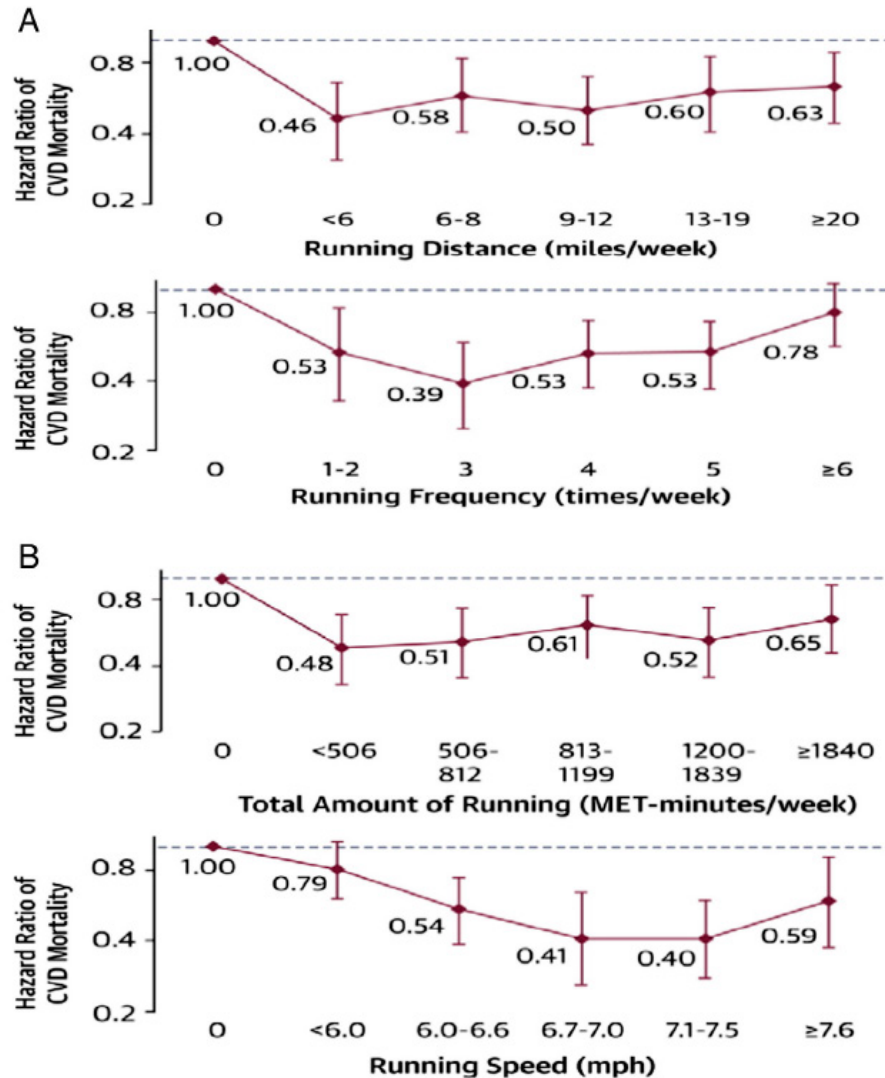
Clarke PM et al. *BMJ* 2012;345:e8308

When **>15 000 Olympic medalists** from 9 different country groups were **examined over decades after their first medal**, there was a **progressive increase in conditional survival** (compared with age- and sex-matched controls from the general population in those countries)



CV mortality by running distance, frequency, total amount, and speed

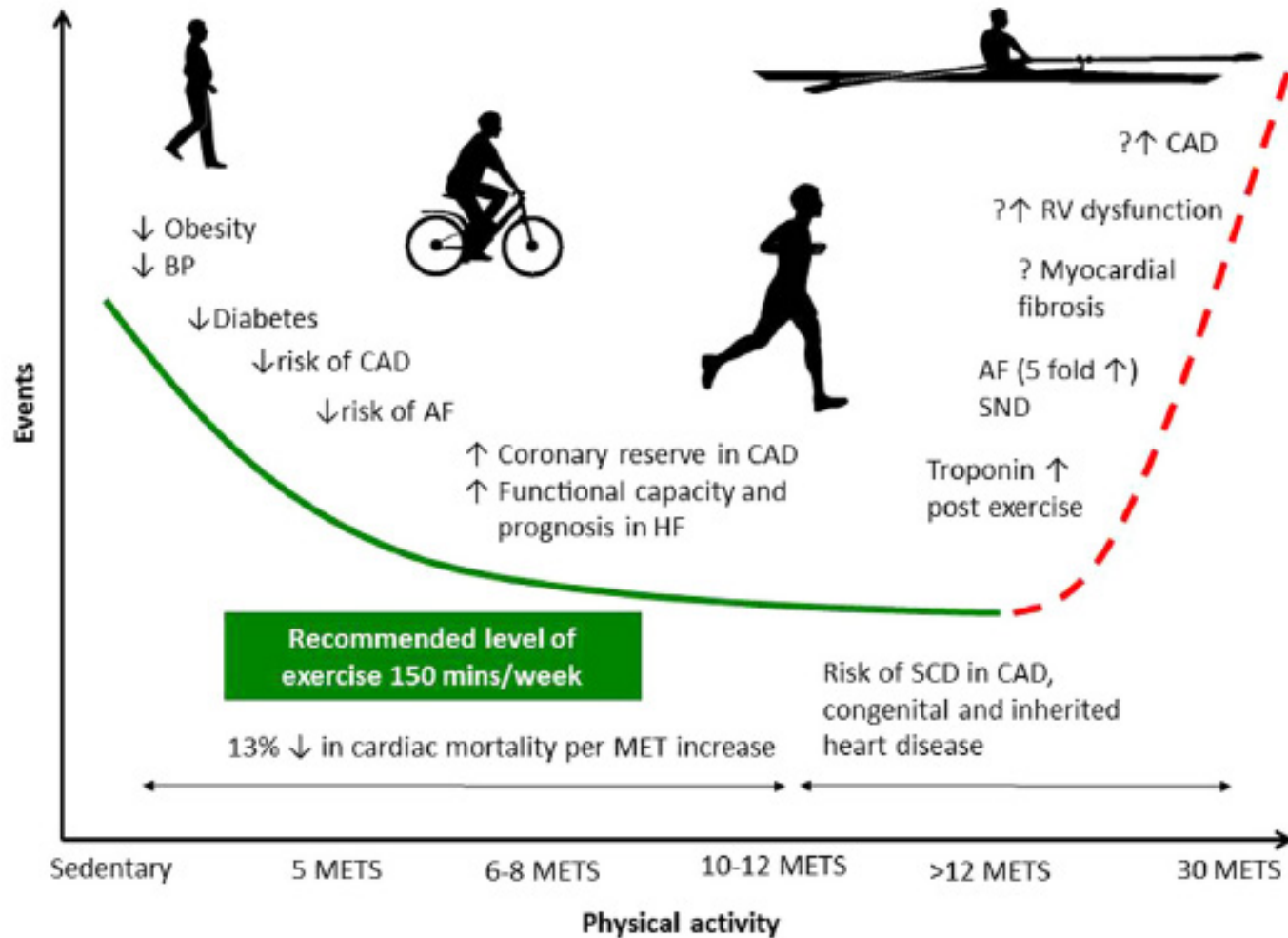
Lee D-C et al. JACC 2014;64:472-81



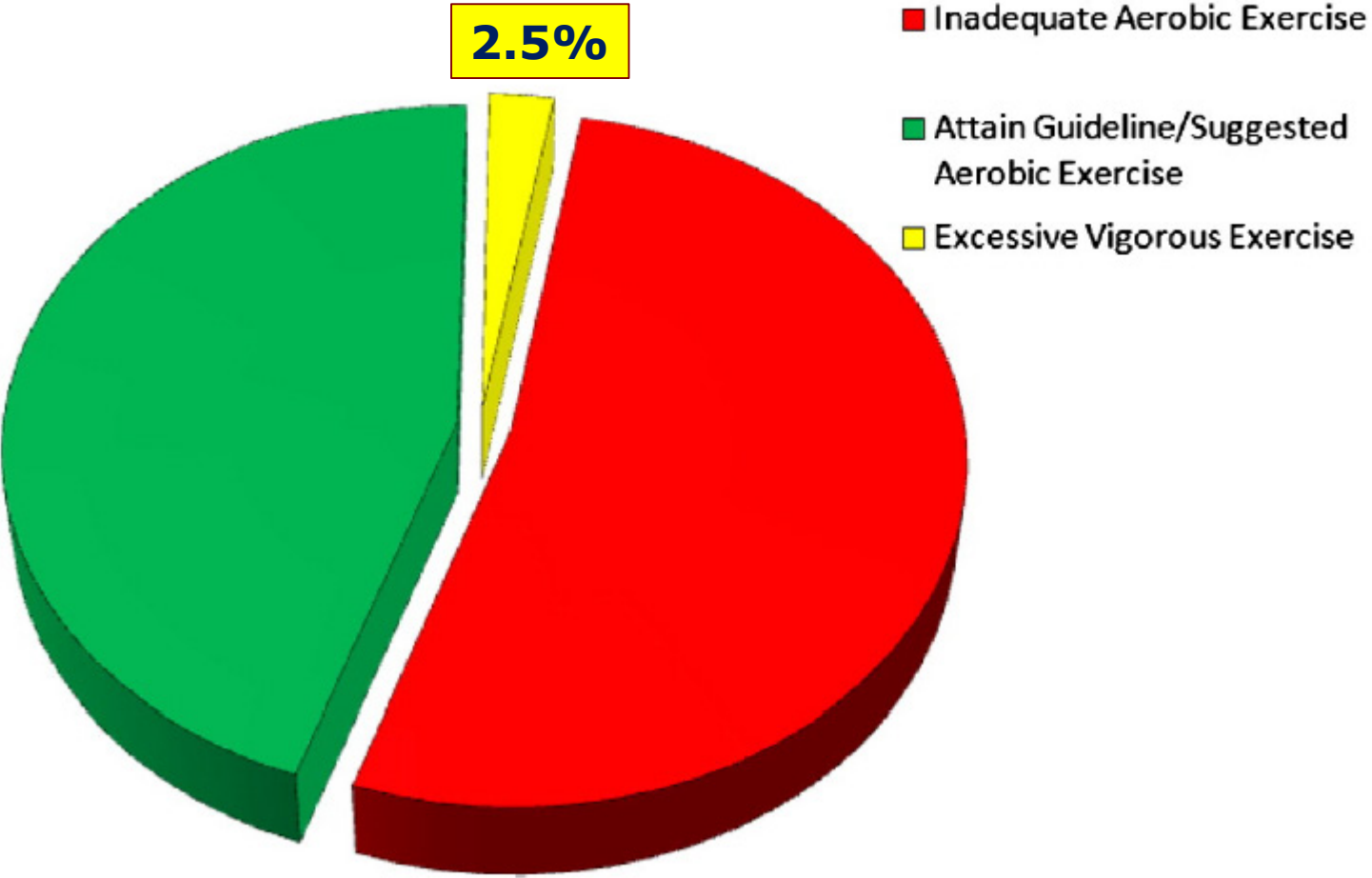
**55.000 adults
ages 18 to 100 years
followed for 15 years**

Jogging and mortality: Curved U 'revisited'

Merghani A et al. Trends in Cardiovascular Medicine 2015



About half of the population does not meet the minimum recommended amount of physical activity



Take Home Message (i)

- ✓ An intense and prolonged physical activity can cause fatigue of the heart muscle, more pronounced for the right ventricle. But it recovers quickly even after long events, and does not seem to induce pathological changes;
- ✓ The evidence that years of intense training accelerates atherosclerosis, or cause cardiac fibrosis is weak, and given the well-known benefits of intense training on cardiac and vascular structure and function, is likely to be clinically unimportant;
- ✓ The high-intensity physical training in the presence of advanced atherosclerosis, however, probably does increase the risk, especially if there is ischemia, and in these subjects the exercise does not prevent atherosclerosis;

Take Home Message (ii)

- ✓ The older athlete is probably at an increased risk of atrial fibrillation for high-intensity activity even if lower doses of physical activity do not seem to increase this risk;
- ✓ The adults who, not for health reasons (challenges, competitions, entertainment, ego satisfaction, psychological benefits) want to do high-intensity runners must know that there is a certain risk, though relatively mild;
- ✓ Ideally, a weekly dose of intense jogging not exceeding 5 hours could be an ideal model, including 1-2 days of rest.

Jogging and mortality: U curves is there a relationship?

“In medio stat virtus”

Aristotele

Jogging and mortality: U curves is there a relationship?

