

MAY 2019

PHYSICAL EXERCISE IN CARDIOVASCULAR HEALTH : FRIENDS OR FOE

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About Cardiovascular Disease (CVD)

Overview

“Cardiovascular disease has the same meaning for health care today as the epidemics of centuries had for medicine in earlier times: 50% of the population in developed countries die of cardiovascular disease” (Pál Kertai)

Someone has a heart attack every two minutes (British Heart Foundation)





Incidence and Prevalence

CAUSES OF MORTALITY IN 2019

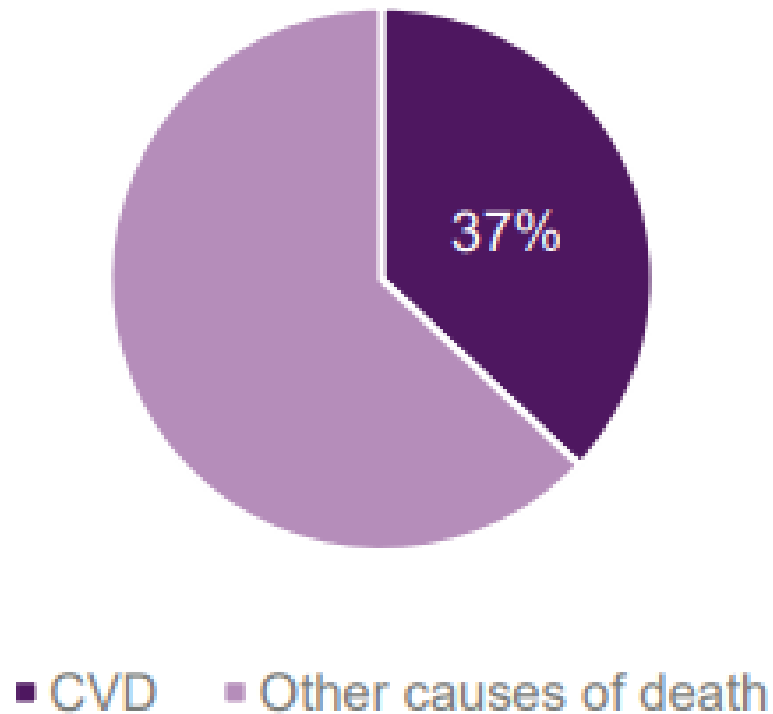
Among the many risk factors that predispose to CVD development and progression, a sedentary lifestyle, characterized by consistently low levels of physical activity, is now recognized as a leading contributor to poor cardiovascular health.

PREVALENCE

In the United States, CVD accounts for ~600,000 deaths (25%) each year, and after a continuous decline over the last 5 decades, its incidence is increasing again

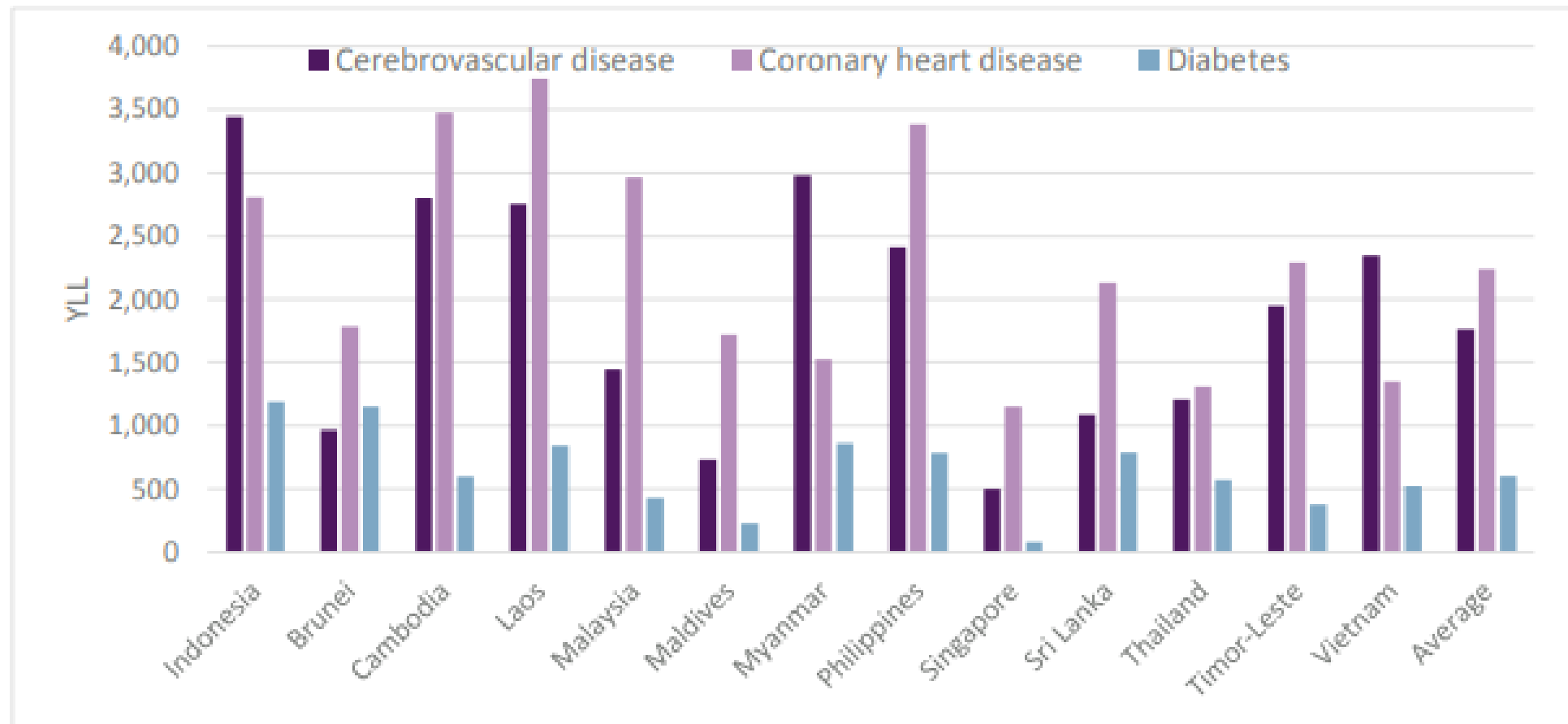
In the **Indonesia**, CVD accounts for **2.650.340** deaths each year

Cardiovascular disease the leading cause of death



Cardiovascular diseases account for 37% of deaths in Indonesia. The burden of disease for 2012 was approximately 18,000 disability-adjusted life years (DALYS), of which 17,500 were years of life lost due to premature mortality (YLL) and the remainder due to years of healthy life lost due to disability (YLD)

Years of life lost due to premature mortality from cerebrovascular disease (stroke), coronary heart disease, and diabetes in Indonesia are considerably greater than those observed in many neighbouring regions





What Are the Benefits of Exercise?

A sedentary lifestyle is one of the 5 major risk factors (along with high blood pressure, abnormal values for blood lipids, smoking, and obesity) for cardiovascular disease, as outlined by the AHA.

Evidence from many scientific studies shows that reducing these risk factors decreases the chance of having a heart attack or experiencing another cardiac event, such as a stroke, and reduces the possibility of needing a coronary revascularization procedure (bypass surgery or coronary angioplasty).

Although the effect of an exercise program on any single risk factor may generally be small, the effect of continued, moderate exercise on overall cardiovascular risk, when combined with other lifestyle modifications (such as proper nutrition, smoking cessation, and medication use), can be dramatic.

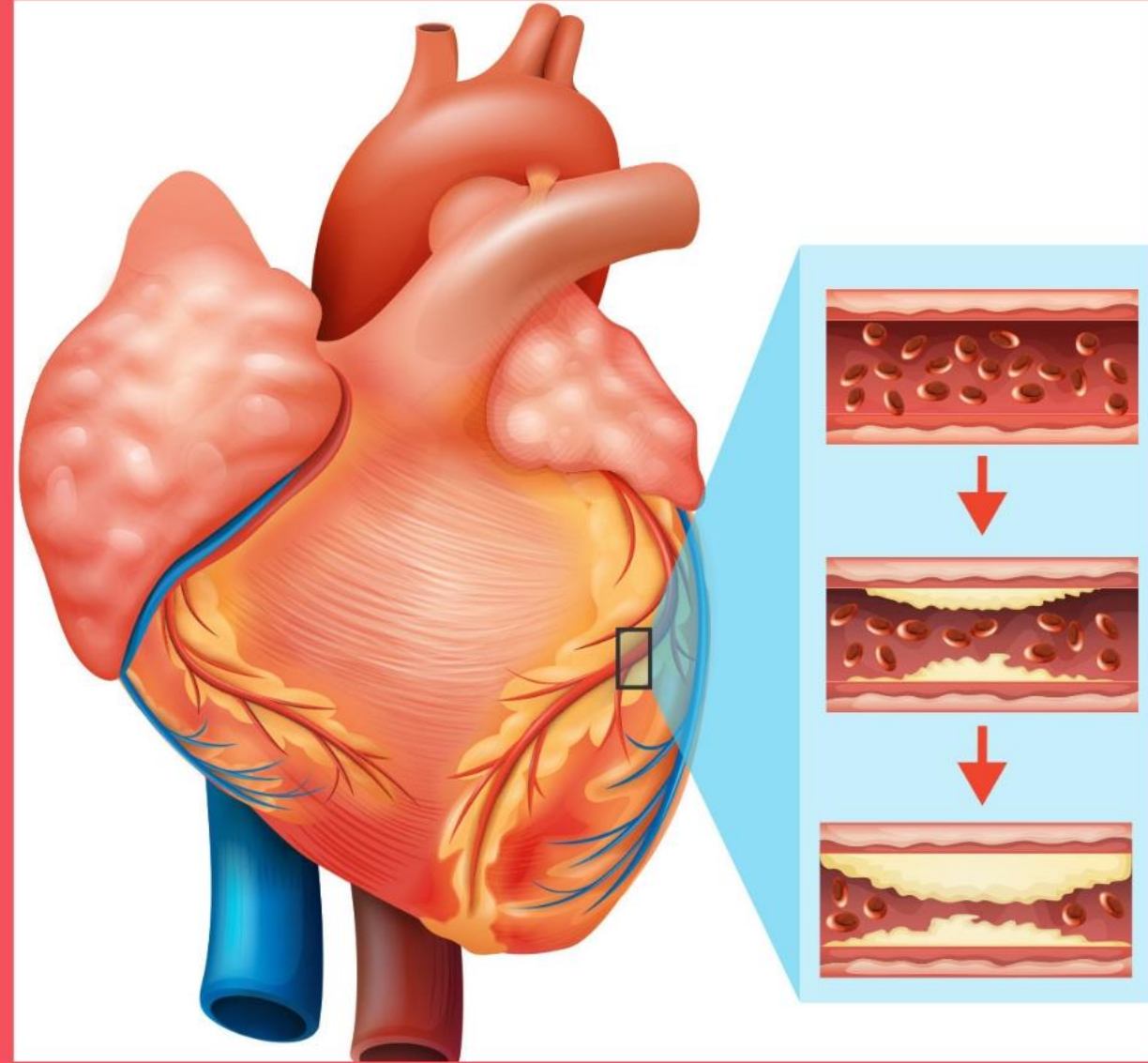


PLASMA LIPIDS AND ATHEROGENESIS

Endurance training associated with elevated levels of circulating HDL and decreased TG

In addition to changes in plasma lipids, exercise could directly impact the homeostasis of the arterial wall to antagonize the progression of atherosclerotic disease. The well-documented reduction in coronary artery disease in people with active lifestyles, when compared with sedentary individuals.

In patients with stable CAD, 4 weeks of rowing or cycling led to enhanced endothelial function, associated with increased total endothelial nitric oxide synthase (eNOS) expression and eNOS, and protein kinase B (Akt) phosphorylation.



INSULIN SENSITIVITY

The association between blood lipids and cardiovascular health is highly influenced by systemic insulin sensitivity, and resistance to insulin signaling is known to promote the development of heart disease, in part by altering the blood lipid profile



Reduction of insulin levels

Resistance of adipocytes to the effects of insulin and resulting reduction in glucose uptake leads to the increased release of free fatty acids, triglycerides, and VLDL by the liver. In addition, reduced HDL in the insulin

Improved insulin sensitivity

resistant state, resulting in part from increased activity of cholesteryl ester transfer protein (CETP), and transfer of cholesteryl esters from HDL to triglyceride-rich lipoproteins, suppresses reverse cholesterol transport from the arterial wall and promotes atherosclerotic plaque formation.

BLOOD PRESSURE

During exercise, increases in cardiac stroke volume and heart rate raise cardiac output, which coupled with a transient increase in systemic vascular resistance, elevate mean arterial blood pressure. However, long-term exercise can promote a net reduction in blood pressure at rest.

A meta-analysis of randomized controlled interventional studies found that regular moderate to intense exercise performed 3–5 times per week lowers blood pressure by an average of 3.4/2.4 mmHg.



Clinical Studies Proving The Effectiveness of Exercise Training in Cardiovascular Disease Prevention

Several studies have demonstrated positive associations between sedentary behaviours/low cardiorespiratory fitness and health outcomes such as type 2 diabetes, CVD mortality, and all-cause mortality.

In a systematic review and meta-analysis of 33 cohort studies consisting of 883 372 participants, physical activity was associated with **35% risk reduction for CVD mortality** and **33% risk reduction for all-cause mortality**. In their analysis, self-reported physical activity was associated with a smaller risk reduction compared with objectively measured physical fitness, probably because participants overestimated their physical activity levels in self-reports

BENEFITS OF REGULAR EXERCISE ON CARDIOVASCULAR RISK FACTORS

- Increase in exercise tolerance
- Reduction in body weight
- Reduction in blood pressure
- Reduction in bad (LDL and total) cholesterol
- Increase in good (HDL) cholesterol
- Increase in insulin sensitivity

Increased arterial stiffness is associated with several pathologies, including systolic hypertension, left-ventricular hypertrophy, and CHF. Clinical investigations documented that arterial stiffness is lower in those who performed aerobic exercise on a regular basis compared with sedentary peers.



The Benefits of Exercise Primary Prevention

- Brisk walking, 30mins/day, 5 times/week
 - 30% ↓vascular events in 3.5 years follow-up¹
- 3 hours of brisk walking/week = 1.5 hours of vigorous exercise per week²
- Resistance exercise and weight training were also beneficial³



The Benefits of Exercise Secondary Prevention



Physical activity with 1000kcal/wk

- 20-30% ↓ all cause mortality¹

For patients without revascularization

- Exercise training improves SBP, angina symptoms and exercise tolerance²

For patients with revascularization

- Improvement in QoL, exercise tolerance
- ↓29% cardiac events
- ↓re-admissions (18.6 vs 46%)³



The American Heart Association Recommendations for Physical Activity in Adults

For Overall Cardiovascular Health:

At least **30** minutes of moderate-intensity aerobic activity **At least 5** days per week for a total of **150** minutes

OR

At least **25** minutes of vigorous aerobic activity **At least 3** days per week for a total of **75** minutes

or a combination of the two

AND

Moderate **HIGH INTENSITY** muscle-strengthening activity **At least 2** days per week for additional health benefits

For Lowering Blood Pressure and Cholesterol:

An average **40** minutes of moderate- to vigorous-intensity aerobic activity **3-4** days per week

© 2015

Learn more at heart.org/ActivityRecommendations.



Pelari Maybank Bali Marathon 2018 Alami Kejang-kejang Lalu Meninggal Dunia Jelang Garis Finish

Minggu, 9 September 2018 20:23



Peserta Electric Jakarta Marathon 2018 Ada yang Meninggal

Minggu, 28 Oktober 2018 15:04 WIB



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Sportarema

Mendekati Garis Finis, Pelari Borobudur Marathon 2018 Pingsan dan Akhirnya Meninggal Dunia

Senin, 19 November 2018 21:05



London Marathon death: Chef, 29, dies after collapsing during hottest race on record

A RUNNER who took part in the London marathon on Sunday, has died after collapsing during the hottest race day on record, according to race organisers.

“

“In historical terms, I believe in 38 editions of the event we have had over one million finishers and sadly there have been 14 deaths,” Brasher said. “It is unusual and always tragic when it happens. There will be an autopsy so we can’t - and we shouldn’t - speculate about what should happen next. All we should say is that our thoughts are with Matt’s family and friends.”

The Risk of Exercise

SUDDEN DEATH AND CARDIAC EVENTS

In the early to mid 1970s, Bassler stated that marathon running may confer total protection against significant CHD.

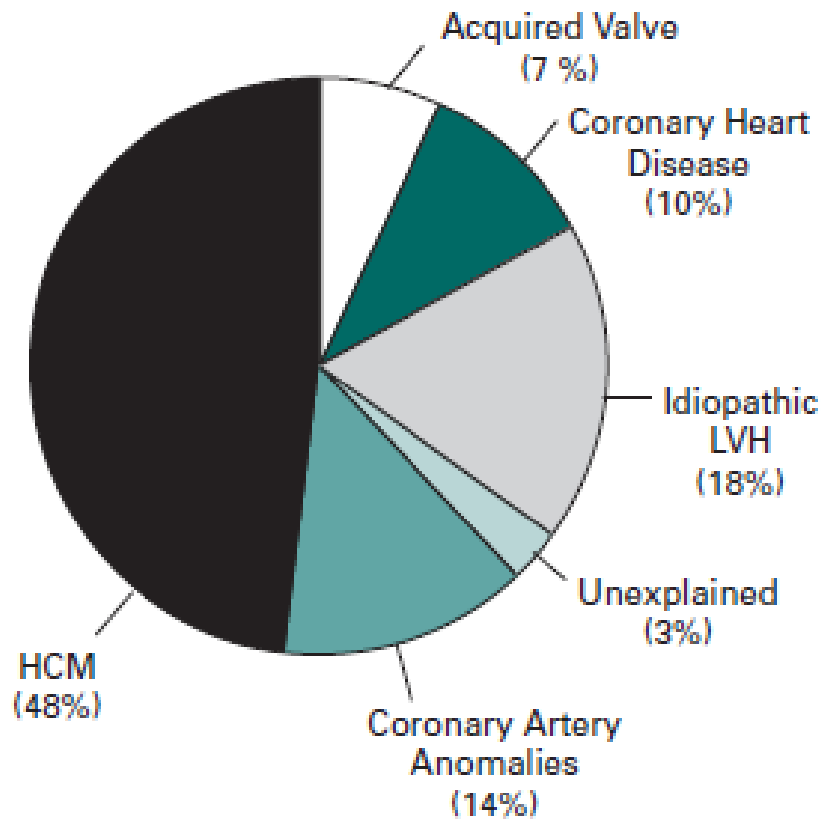
Although some remarkable claims have been made regarding the protective effects of exercise, numerous examples of sudden death in athletes trained for endurance (including marathon runners) continue to cause concern among lay persons and physicians regarding the safety of vigorous exercise.

In fact, the legendary Pheidippides, who collapsed and died after running from Marathon to Athens, probably represents the first known case of sudden death associated with long-distance running. Noakes

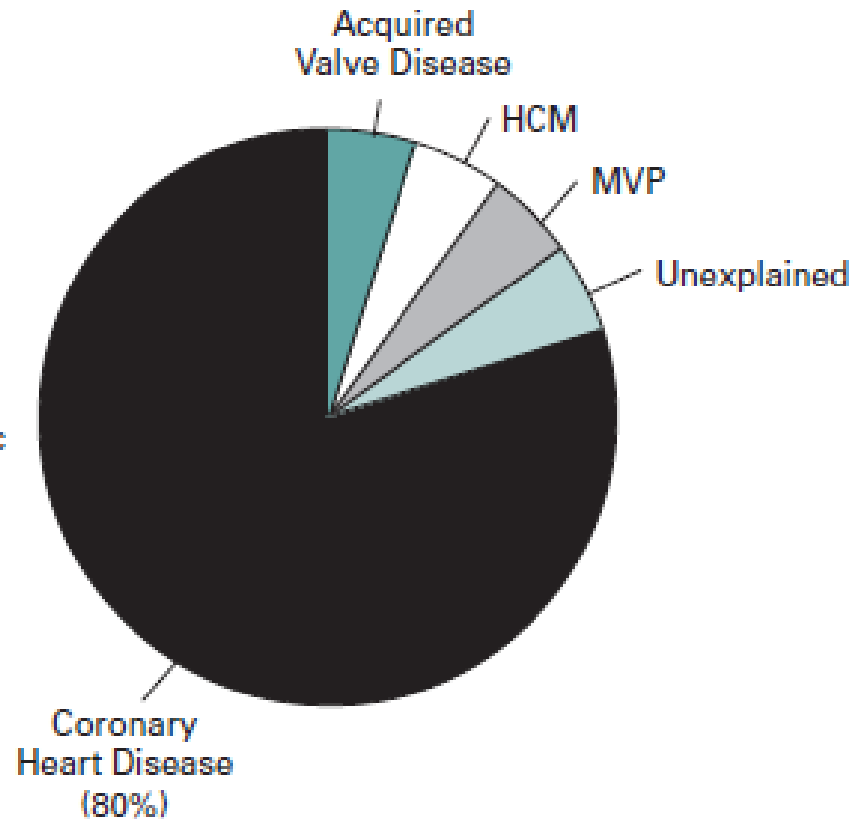
6%-17% of all sudden deaths occur in association with exertion.

Although clearly there is substantial evidence that regular exercise is associated with marked reductions in cardiac events and mortality (discussed below), there is also evidence to suggest that vigorous exertion simultaneously triggers and protects against cardiac events and sudden death. Unfortunately, this triggering of events has received widespread attention and often overrides the marked protective effects of regular exercise.

< 35 years old



≥ 35 years old



Causes of death in competitive athletes. Estimated prevalences of diseases responsible for death are compared in young (<35 years old) and older (> 35 years old) athletes.

Randomized Evaluation of Rect x Death and near death from card x +

https://www.ncbi.nlm.nih.gov/pubmed/22040232

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[Pacing Clin Electrophysiol](#). 2012 Feb;35(2):241-4. doi: 10.1111/j.1540-8159.2011.03248.x. Epub 2011 Oct 31.

Death and near death from cardiac arrest during the Boston Marathon.

[Cohen SI¹](#), [Ellis ER](#).

Author information

Abstract

The Boston Marathon has been run for 115 years during which there were three sudden cardiac arrests. The most recent was a near death avoided by rapid cardiopulmonary resuscitation (CPR) and defibrillation. Awareness of the dangers of participating in a marathon, the risk factors associated with sudden death during competition, and the life-saving importance of rapid CPR and defibrillation are essential for participants and event organizers. Available records and reports of the three known cases of cardiac arrest during the Boston Marathon were examined. These cases were identified by representatives of the Boston Athletic Association, which has organized each marathon since its inception. Pertinent literature was reviewed and new information was obtained during interviews of witnesses and rescuers. The data were analyzed in search of shared risk factors for cardiac arrest, death, and the optimal requirements for survival. In 115 years, there were two cardiac deaths and one near death from cardiac arrest. A history of coronary artery disease, advanced age, and prolonged race time are risk factors for sudden cardiac arrest. Rapid application of CPR and defibrillation are essential for survival. Prevention or reduction of life-threatening cardiac incidents during marathon races might be achieved if participants of advanced age or with a history of coronary artery disease seek medical clearance prior to entering an event. Those with coronary risk factors should have a discussion with their physician. Availability of trained personnel and defibrillators are important considerations in marathon planning.

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PMID: 22040232 DOI: [10.1111/j.1540-8159.2011.03248.x](#)
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[Out-of-hospital cardiac arrest surveillance --- Cardiac Arrest Reg](#) [MMWR Surveill Summ. 2011]

[Review Cardiac arrest care and emergency medical services in Canada.](#) [Can J Cardiol. 2004]

[Review Preparing for sudden cardiac arrest--the essential role of automat](#) [Br J Sports Med. 2009]

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Cited by 2 PubMed Central articles

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- In 115 years, there were two cardiac deaths and one near death from cardiac arrest.

A study by the American College of Cardiology in 2009, found that the risk of death from running a marathon is 0.8 per 100,000 people which is significantly lower than dying from childbirth in the UK which in 2012 was 8.6 in 100,000 births, reports the Telegraph.

Longevity in elite athletes: the first 4-min milers

**Barry J Maron, Paul D Thompson*
barrymaron1@gmail.com

www.thelancet.com Vol 392 September 15, 2018

	Country	Date	Time	Age (years)	Life expectancy (years)*
Roger Bannister	UK	May 6, 1954	3 min 59.4 s	88†	78
John Landy	Australia	June 21, 1954	3 min 57.9 s	88	80
László Tábori	Hungary	May 28, 1955	3 min 59.0 s	87†	71
Chris Chataway	UK	May 28, 1955	3 min 59.8 s	82†	78
Brian Hewson	UK	May 28, 1955	3 min 59.8 s	85	78
Jim Bailey	Australia	May 6, 1956	3 min 58.6 s	88	80
Ron Delany	Ireland	June 1, 1956	3 min 59.0 s	83	78
Gunnar Nielsen	Denmark	June 1, 1956	3 min 59.1 s	57†	78
Derek Ibbotson	UK	Aug 7, 1956	3 min 57.2 s	84†	78
Don Bowden	USA	June 1, 1957	3 min 58.7 s	81	76
Stanislav Jungwirth	Czech Republic	July 19, 1957	3 min 59.1 s	55†	75
Olavi Vuorisalo	Finland	Aug 7, 1957	3 min 59.7 s	85	77
Dan Waern	Sweden	Sept 4, 1957	3 min 59.3 s	85	80
Roger Moens	Belgium	Sept 4, 1957	3 min 58.9 s	88	78
Herb Elliott	Australia	Aug 6, 1958	3 min 54.5 s	80	80
Murray Halberg	New Zealand	Aug 6, 1958	3 min 57.5 s	85	79
Mervyn Lincoln	Australia	Aug 6, 1958	3 min 55.9 s	82†	80
Zbigniew Orywal	Poland	Sept 3, 1958	3 min 59.7 s	87	73
Siegfried Valentin	Germany	May 28, 1959	3 min 56.5 s	82	78
Terry Sullivan	Zimbabwe	Sept 25, 1960	3 min 59.8 s	82	59

*Men; based on country of origin. †Deceased.

Table: First 20 people to run 1 mile in less than 4 min, 1954–60

Longevity in elite athletes: the first 4-min milers

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Brian					
Jim B					
Ron I					
Gunr					
Dere					
Don					
Stani					
Olavi					
Dan					
Roge					
Herb					
Murr					
Merv					
Zbig					
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Table: First 20 people to run 1 mile in less than 4 min, 1954–60

This principle is consistent with reports showing that other endurance athletes (French Olympic rowers, Tour de France competitors, Swedish ski racers, or oarsmen from Harvard University)^{4,5} might live longer than the general population, highlighting the potential benefits of exercise.

Principles of Exercise Prescription

1. Cardiology assessment, management & stabilization of patient
2. Treadmill exercise stress test initial assessment
3. Tips on Exercise prescription
4. Regular clinical follow-up for exercise progress and symptoms reassessment
5. Regular treadmill exercise stress test reassessment

When to check up before initiating exercise?

American College of Sports Medicine recommends person at moderate risk for CVD to undergo medical exam prior starting a vigorous exercise

Moderate risk for CVD:

Asymptomatic

Has two or more CVD risk factors

Vigorous exercise for moderate risk

-Achieving $\geq 60\%$ oxygen uptake reserve or

-heart rate reserve or

- ≥ 6 METS

High risk for CVD:

Symptomatic or

Have known cardiovascular, pulmonary, metabolic or renal disease

Vigorous exercise for high risk

-Achieving 40- 60% oxygen uptake reserve or

-heart rate reserve or

- ≥ 6 METS

EXERCISE ECG



Phase: Belastung HF: 87
Stufendauer: 59 RR: 160/9
Bela.-Dauer 01:59

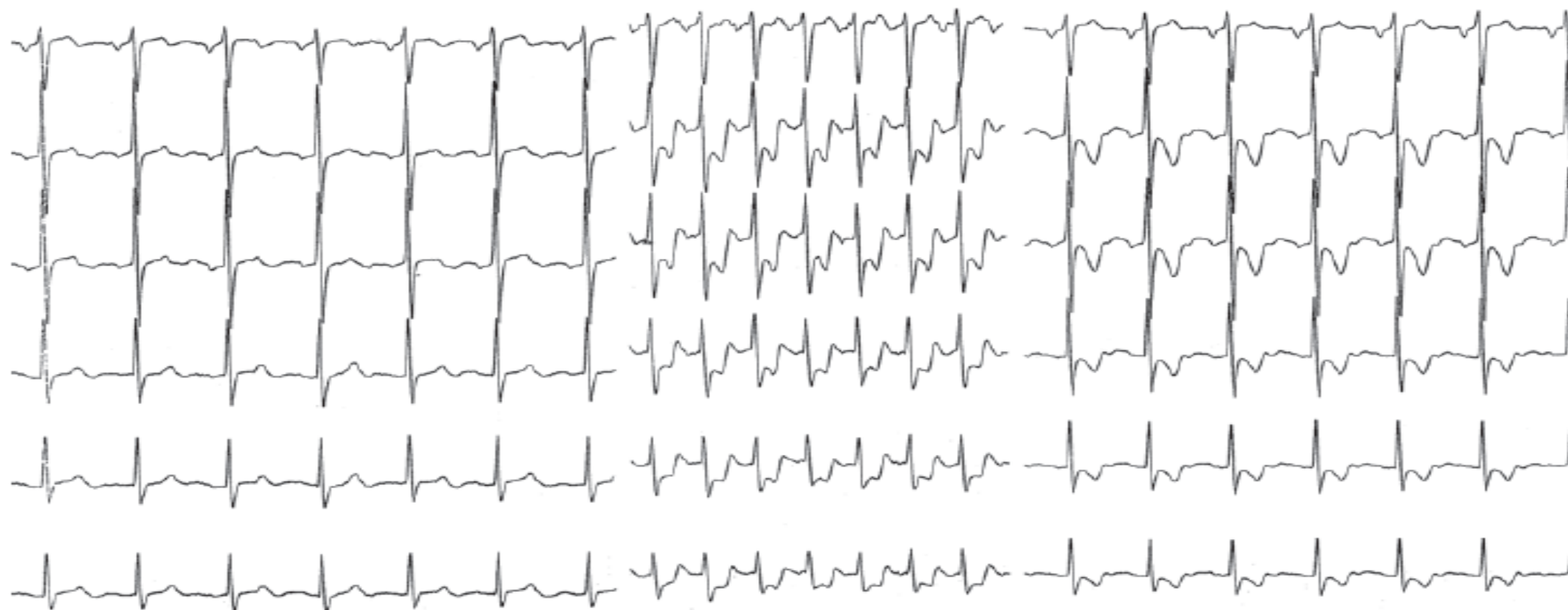
Belastung: 25 W
Protokoll: 25/25/2min

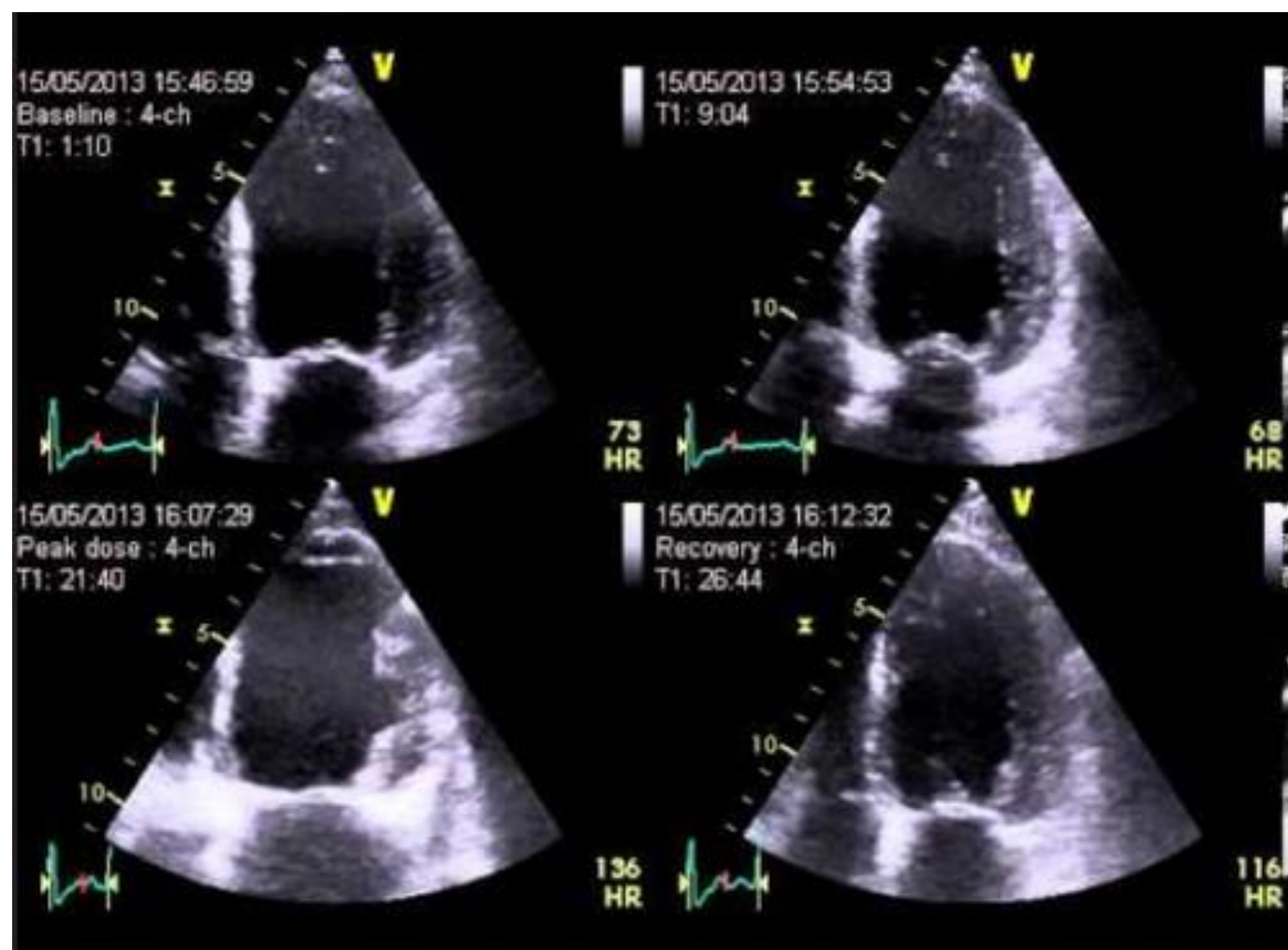
Phase: Belastung
Stufendauer: 53
Bela.-Dauer 00:53

Belastung: 100 W
Protokoll: 25/25/2min

Phase: Erholung HF: 95
Phasendauer 32:59 RR: 171
Bela.-Dauer 06:54

Protokoll: 25/25/2min





How to exercise?

Know your target heart rates for exercise (from AHA)

Principle rules:

- Normal is between 60-100 bpm
- When it comes to heart rate, lower is better
- Know your numbers: maximum and target heart rate

Maximum Heart Rate = $220 - \text{Age}$

Target Heart Rate

→ Moderate intensity = 50-70% of max HR

→ vigorous intensity = 70-85% of max. HR

How to exercise?

Know your target heart rates for exercise (from AHA)

Principle rules:

- If your heart rate is too high, you are STRAINING. Slow your roll!
- If your heart rate is too low, and the intensity feels light to moderate → you may want to push yourself a little harder.

Maximum Heart Rate = $220 - \text{Age}$

Target Heart Rate

→ Moderate intensity = 50-70% of max HR

→ vigorous intensity = 70-85% of max. HR

How to exercise?

Principle rules:

- If you feel something different, any symptoms, any pain, stop your exercise, consult to your physician or call for help in case of emergency
- Do not ignore your body



THANK YOU

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