



CAYMAN PULSE

A publication of The Heart Health Centre for health care professionals

Cardiovascular Damage from Extreme Endurance Exercise:

Too Much of a Good Thing

James H. O'Keefe MD

During the Greco-Persian War in 490 BC, Pheidippides, a 40-year-old Greek messenger ran ~150 miles during a 48-hour period to deliver urgent military information. On the third day, he ran the 26 miles from a battlefield near Marathon to Athens to deliver news of a Greek victory. According to legend, upon arriving, Pheidippides exclaimed to the Athenians, "Victory is ours!", then immediately collapsed, and died. Now, 2500 years later, with the rise in popularity of endurance sports, concerning evidence is mounting that chronic extreme endurance training may promote adverse cardiac remodeling, and predispose to acute and chronic cardiovascular (CV) problems.

Although exercise is not a pharmacologic agent, in many ways its effects resemble those of a powerful drug. Daily exercise produces countless favorable changes in gene expression, with improvements in physiology, structure, and body composition. Indeed, a regimen of regular exercise is highly effective in the prevention and treatment of many chronic diseases, including coronary artery disease, diabetes, obesity, high blood pressure, heart failure and depression. Individuals who exercise regularly have markedly lower rates of disability, and an average life expectancy ~7 years longer than sedentary people. For this reason, health care providers routinely prescribe regular physical activity.

As can be expected with any drug, a safe upper range for the dose of exercise may exist, above which the adverse effects of sustained intense physical activity may outweigh its benefits. Even a modest dose of regular physical activity (15 minutes daily), can confer substantial benefits to CV health and longevity. Overall survival improves in response to regular exercise in a dose-dependent fashion up to ~60 minutes of daily vigorous activity, beyond which it becomes a point of diminishing returns. (Figure 1) A 15-year study of 52,000 adults reported a U-shaped mortality curve for running distance, speed, and frequency. Running speeds of 6-7 miles/hr and distances of 1-20 miles/week were associated with lower mortality; while higher weekly mileage and faster running paces were not associated with improved survival.

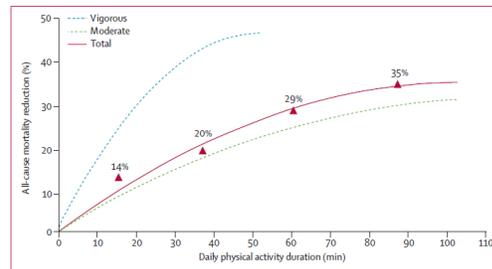
Competitive ultra-endurance athletes often engage in daily vigorous aerobic exercise for 90-300 minutes per day, which is about 5- to 10 times more than what is recommended by guidelines for prevention of CAD. Chronic intense sustained endurance exercise may cause adverse structural and electrical remodeling of the heart and large arteries that appears to attenuate some of the benefits conferred by more moderate intensities and durations of exercise.

An evolving body of data indicates that chronically training for and participating in extreme endurance competitions such as marathons, ultra-marathons, Iron-man distance triathlons, very long distance bicycle racing, etc. can cause transient acute volume overload of the atria and right ventricle, with transient reductions in right ventricular ejection fraction and elevations of cardiac biomarkers (troponin, BNP, etc), all of which return to normal within one week. In veteran extreme endurance athletes this recurrent cycle of myocardial injury and repair may eventually result in patchy myocardial fibrosis, creating a substrate for atrial and ventricular arrhythmias. Furthermore, chronic excessive high-intensity exercise appears to be associated with diastolic dysfunction, large-artery wall stiffening and coronary artery calcification.

Avoiding Exercise-Induced CV Damage:

Suggestions for an exercise routine that will optimize health, fitness and longevity:

- ◆ Avoid a daily routine of exhaustive strenuous exercise for greater than one hour continuously. An ideal target might be not more than 7-10 hours of exercise per week.
- ◆ During aerobic exercise, take intermittent rest periods (even for a few minutes at an easier pace, such as slowing down to walk in the middle of a run).
- ◆ Accumulate a large amount of daily light-to-moderate physical activity, such as walking, gardening, housekeeping, taking the stairs, etc.
- ◆ Once or twice weekly, perform high-intensity interval training to improve or maintain peak aerobic fitness. This is more effective than continuous aerobic exercise.
 - ◆ Incorporate cross training using stretching and strength training into the exercise routine.
 - ◆ Avoid chronically competing in very long distance races.
 - ◆ Individuals over 45-50 years of age should reduce the intensity and durations of endurance exercise and allow more recovery time.



Our Physicians

- Dr. Mikhail Kosiborod, MD, FACC
- Dr. Carlos Rivas-Gotz, MD, FACC
- Dr. A. Iain McGhie, MD, FACC
- Dr. Ibrahim 'Abe' Saeed, MD, FACC
- Dr. Adnan Chhatriwalla, MD, FACC

Our Services

- Consultation Services
- Diagnostic Testing and Imaging
 - Electrocardiogram
 - Treadmill Stress Test
 - Echocardiogram
 - Stress Echocardiogram
 - Nuclear Stress Testing (Pharmacological and Exercise)

This Month

- April 4th-5th Dr. Chhatriwalla
- April 19th-21st Dr. Kosiborod (Stress Echocardiography Available)
- April 26th-28th Dr. Saeed (Stress Echocardiography Available)
- April 30th-May 1st Dr. McGhie (Nuclear Stress Testing Available)

Special thank you to this month's guest contributor Dr. James O'Keefe. Dr. O'Keefe practices with our physicians at Saint Luke's Mid America Heart Institute in Kansas City, MO.

Physical Address:
The Heart Health Centre
West Shore Center
508 West Bay Road
Tel: (345) 943-5800
Fax: (345) 943-5801

Mailing Address:
The Heart Health Centre
P.O. Box 32148
Grand Cayman KY1-1208
CAYMAN ISLANDS

Connect With Us:
www.hearthealthcayman.com
info@hearthealthcayman.com
www.facebook.com/TheHeartHealthCentre
www.twitter.com/HeartHealthGCM