

Excessive endurance training can be too much of a good thing, research suggests

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Micah True, legendary ultra-marathoner, died suddenly while on a routine 12-mile training run March 27, 2012. The mythic Caballo Blanco in the best-selling book, *Born to Run*, True would run as far as 100 miles in a day. On autopsy his heart was enlarged and scarred; he died of a lethal arrhythmia (irregularity of the heart rhythm). Although speculative, the pathologic changes in the heart of this 58 year-old veteran extreme endurance athlete may have been manifestations of "Phidippides cardiomyopathy," a condition caused by chronic excessive endurance exercise.

Regular [exercise](#) is highly effective for the prevention and treatment of many common [chronic diseases](#), and improves cardiovascular health and longevity. However, recent research suggests that chronic training for, and competing in, extreme [endurance exercise](#) such as marathons, iron man distance triathlons, and very long distance bicycle races may cause structural changes to the heart and large arteries, leading to myocardial injury. A study in the June issue of [Mayo Clinic Proceedings](#) reviews the literature and outlines in detail for the first time the mechanisms, pathophysiology, and clinical manifestations of cardiovascular injury from excessive endurance exercise.

"Physical exercise, though not a drug, possesses many traits of a powerful pharmacologic agent. A routine of daily physical activity can be highly effective for prevention and treatment of many diseases, including coronary heart disease, hypertension, heart failure, and obesity," says lead author James H. O'Keefe, MD, of Saint Luke's

Hospital of Kansas City, MO. "However, as with any pharmacologic agent, a safe upper dose limit potentially exists, beyond which the adverse effects of physical exercise, such as musculoskeletal trauma and cardiovascular stress, may outweigh its benefits."

Dr. O'Keefe and his colleagues present emerging data suggesting that extreme [endurance training](#) can cause transient structural cardiovascular changes and elevations of cardiac biomarkers, all of which return to normal within one week. For some individuals, over months and years of repetitive injury, this process can lead to the development of patchy myocardial fibrosis, particularly in the atria, interventricular septum, and right ventricle, and an increased susceptibility to atrial and ventricular arrhythmias. In one study, approximately 12% of apparently healthy marathon runners showed evidence for patchy myocardial scarring, and the [coronary heart disease](#) event rate during a two-year follow up was significantly higher in marathon runners than in controls.

Although it has been recognized that elite-level athletes commonly develop abnormal electrocardiograms and atrial and ventricular entropy, these adaptations traditionally have not been thought to predispose to serious arrhythmias or sudden cardiac death. However, it now appears that the cardiac remodeling induced by excessive exercise can lead to rhythm abnormalities. Endurance sports such as ultramarathon running or professional cycling have been associated with as much as a 5-fold increase in the prevalence of atrial fibrillation.

Chronic excessive sustained exercise may also be associated with coronary artery calcification, diastolic dysfunction, and large-artery wall stiffening.

Lifelong vigorous exercisers generally have low mortality and disability rates and excellent functional capacity, Dr. O'Keefe notes. He suggests that further investigation is needed to identify who is at risk for adverse

cardiovascular remodeling, and to formulate physical fitness regimens for conferring optimal cardiovascular health and longevity.

In a video interview accompanying the article, Dr. O'Keefe stresses that the report does not detract from the importance of [physical exercise](#).

"Physically active people are much healthier than their sedentary counterparts. Exercise is one of the most important things you need to do on a daily basis," he explains. "But what this paper points out is that a lot of people do not understand that the lion's share of health benefits accrue at a relatively modest level. Extreme exercise is not really conducive to great cardiovascular health. Beyond 30-60 minutes per day, you reach a point of diminishing returns."

More information: "Potential Adverse Cardiovascular Effects From Excessive Endurance Exercise," by James H. O'Keefe, MD, Harshal R. Patil, MD, Carl J. Lavie, MD, Anthony Magalski, MD, Robert A. Vogel, MD, and Peter A. McCullough, MD, MPH. *Mayo Clinic Proceedings*, Volume 87, Issue 6 (June 2012), [DOI: 10.1016/j.mayocp.2012.04.005](https://doi.org/10.1016/j.mayocp.2012.04.005)

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