

Athletes: Fit But Unhealthy

Is death part of the game?

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In the U.S. Olympic marathon trials this past November, Ryan Shay collapsed and died about five miles into the race. It was sad, of course, any way we look at it. Ryan died of a heart attack. But why were so many people confused about the death of one of America's best runners at age 28? Part of the misunderstanding is how the event was reported. New York City's Chief Medical Examiner said the cause of Shay's death was, "Cardiac arrhythmia due to cardiac hypertrophy with patchy fibrosis of undetermined etiology. Natural causes." Natural causes? There's nothing natural about a 28-year old, very fit athlete whose heart stops in the middle of competition.

News reports of athletes dying in the course of competition are not uncommon. While we take physical injury in sports as part of the game, we're bewildered when a seemingly healthy and young athlete drops dead. Our sports culture, spectators and participants alike, see knee, back and other injuries as the normal "wear and tear" of supposedly giving 110%. But when the "injury" occurs in a different part of the body – such as the heart – many people are perplexed.

Are heart attacks, which can occur at virtually any age, considered *natural* because they are one of the most common causes of death in the population overall? Is it *natural* to die at age 28 at the peak of a successful athletic career? How rare can this be? The sad fact is it's not natural or rare. Many athletes in great condition have died in the course of training, competition or just while hanging out. This past June, a 46-year old athlete died in one of the US Olympic trials in the triathlon. A month later, another triathlete, a 32 year-old man, died during another race, also in New York City. (Eight triathletes have died during races this year, as of August.) In the latter case, the New York Times headline read, "Triathlete Autopsy Reveals No Cause." The fact is, only about 2% of young athletes who die suddenly are reported to show normal cardiac structure on standard autopsy examination. In the rest, there's a clear cause; typically, some form of heart disease.

There are several issues to address here. First, our definition of health is wrong if we include fitness. One cannot be healthy while diseased. And, neither youth nor athleticism automatically confers health. Death comes when something goes wrong – some problem causes the heart to stop, a blood vessel clogs or some other pathology causes death. Second, most of these problems are preventable. But because as a society we worship athletes, and a lot of money is often involved, prevention is no longer the priority. Third, we must differentiate between those young athletes who die in their twenties, teens and younger, and those in the 35 and older age-group who

make up the majority of competitive athletes. Fourth, when this issue surfaces, which it does regularly, the lifestyle habits of the person are almost never mentioned as a possible cause – especially those factors that can contribute to heart disease, including diet, stress and even overtraining. And finally, a fifth consideration is an ethical one. Who is responsible when we allow and even encourage our children, or ourselves, to be in a very high-risk position, one where there is a significant chance of death? Let's look at each of these issues in more detail.

Health vs. Fitness

Our society views highly trained athletes as the healthiest of all people. This is one reason for the confusion when a young, seemingly healthy athlete dies during competition. These athletes, and those of all ages, who break down with a heart attack are clearly more fit than 99% of the people, but obviously they are not healthy. So let's separate the definitions of fitness and health for a better perspective.

Fitness can be defined by athletic ability, with the level of fitness associated with the levels of training and competition. *Health* is very different; it's the optimal function of all the body's systems: those made up of muscles and bones, organs and glands, heart and lungs, nerves and brain, etc. It is very common for athletes to be fit but unhealthy – whether world champions or “back-of-the-pack” joggers; many are even injured and sick more than the average out-of-shape person. And sometimes they die in the course of their chosen passion, often due to an injury of the heart.

Many athletes, including weekend warriors, spend much of their time getting fit but don't pursue health with the same vigor. Many others can actually become *less* healthy as a result of pushing and sacrificing their bodies beyond some imaginary limit. In doing so, they induce significant stress from training, or overtraining, poor diet or other factors, rendering them less healthy. The result is an injured knee, recurrent respiratory infections, chronic fatigue and other health problems considered part of the game. But it's not part of *healthy* training. These problems are indicative of an imbalance between health and fitness. One can have both good health and achieve very high levels of athletic performance.

Of course, most people don't exercise at all, nor do they focus on their health. When a person in this group dies at a younger age, we say it was due to neglect. The fact is being an athlete doesn't convey health benefits any more than being healthy makes you a great athlete if you don't train.

Prevention

It is obvious that preventing death in sports should be of prime concern. Sudden death in young competitive athletes, those in their twenties and younger, is most often due to some existing heart disease usually not difficult to detect, and, therefore preventable.

About 30% of these deaths are due to a heart condition called *hypertrophic cardiomyopathy* (HCM). In the US each year, a couple of dozen young athletes die during training or competition from this problem (with another 6,000 non-athlete deaths from the more than 600,000 people with HCM). Prevalence of HCM is significantly higher in dark-skinned individuals, and in men, although African American female athletes have a relative high incidence. These conditions are considered *congenital*, being acquired before birth during heart development.

About half of the young athletes who die have some other type of unhealthy heart condition, which is also preventable. They include coronary artery abnormalities, abnormally enlarged ventricles, myocarditis (inflammation of the heart) and coronary artery disease. A smaller number, probably less than 2%, die from asthma, with prescription and recreational drugs representing about 1% of the deaths.

Accidental death of young athletes not associated with disease occurs in about 20% of cases. These are mostly due to blunt force trauma to the chest, which can immediately stop the heart. This occurs when the chest is hit by a ball or other object, or by another person, at a very precise point in the cardiac cycle. The incidence of death by blunt force trauma can be reduced by adhering to specific rules in each sport.

Electrocardiograms (ECGs) are simple and inexpensive tests that can help diagnose many potentially fatal heart problems. Abnormal ECGs are present in 40% of trained athletes, including those without disease, are twice as common in men, and more prevalent in endurance athletes such as runners, swimmers and cyclists (*Circulation*. 2000;102:278). Most cardiologists would consider these heart abnormalities related to so-called normal physiological changes from training. However, in some highly trained athletes, the abnormal ECGs are identical to non-athlete patients with heart conditions such as HCM and other abnormalities. Whether these changes are due to overtraining, poor lifestyle, or are actually normal may be differentiated with further evaluations.

The changes observed in the hearts of most athletes are considered to be training-induced and not unique to some genetic factor. While genetics always plays a role in our development, the hearts of these athletes are primarily associated with non-genetic factors; in addition to training these include body size and surface area, type of sport, gender and age (*Circulation*. 2006;114:1633-1644).

Most deaths in those with heart problems can be prevented. A discussion of this issue becomes an ethical one as well. Both the International Olympic Committee and the European Society of Cardiology have advocated that all young competitive athletes be screened routinely and completely (including an extensive history, physical exam and 12-lead ECG). But the latest guidelines of the American Heart Association do not make this recommendation, saying there is no law in the US defining legal requirements of

sports governing bodies and educational institutions with regard to the screening of competitive athletes. However, in other countries, such as Italy, local law requires cardiovascular screening and physicians are criminally negligent for improperly clearing an athlete with an undetected cardiovascular abnormality that ultimately leads to death. And their strategies have been successful, with about a 90% reduction in death from heart disease by competitive athletes.

Many athletes fear cardiovascular screening because if a problem is found they can be banned from competition. In addition to saving their life, it can also give some the option of getting healthy with the potential of returning to training and competition. Twenty-three year old college basketball superstar Hank Gathers died during a game in March of 1990; the cause appeared to be myocarditis. Writing in the *New England Journal of Medicine* (1993;329:55-57), Dr. Barry Morano of the *Minneapolis Heart Institute Foundation*, and an expert in this field, stated: "It is possible that had Gathers been withdrawn from competitive sports, his heart disease might have resolved within 6 to 12 months, permitting him to return safely to competition."

Age

Athletes in their mid-30s, at every level of sport, can also die; but the *cause* of death is dramatically different. Sudden death at this age and older is primarily due to *atherosclerotic coronary artery disease* – so-called clogged arteries. What's also remarkably different is that this condition can develop through a less-than-healthy lifestyle that begins during youth. These health problems include poor diet, excess stress and overtraining. Moreover, the number of fatalities is significantly higher than in young athletes who die.

One reason the cause of death changes in those mid-thirty athletes and older is time; these individuals have been alive longer, and therefore have more time to develop disease. The vast majority of these conditions are also preventable. But in this age group, prevention is best defined differently. While in young athletes, *screening* is the measure that can rule out diseases that kill, in older athletes, prevention refers to slowing the aging process that typically causes a buildup of plaque in the blood vessels – this can be accomplished with a healthy lifestyle. We can still teach young athletes the value of healthy eating and training, and cardiovascular exams for those in their 30's can also play an important role in health care.

Lifestyle

A healthy lifestyle can contribute significantly to good health and fitness. Heart disease is a leading cause of death in the Western world, and like most other chronic illness, is a preventable condition. Both improved health and prevention of disease can be accomplished with the help of a healthy diet, and the moderation of stress, including not overtraining. (Even in those with so-called genetic predispositions, lifestyle factors can "turn-on" or "turn-off" the gene for heart disease.)

Preventing disease and premature death are only two benefits of a healthy lifestyle; another is improved quality of life. For most athletes, in addition to being healthy through age 70, 80, 90 and beyond, it also means participating in running, biking, swimming, golf, tennis or other sports during these years.

There's not doubt that diet plays a vital role in the development of heart disease. Just in the past decade, this idea has gained significant acceptance in virtually all areas of health care. In addition, stress in its broadest definition can be a significant contributing factor in the development of heart disease. Stress can come from an imbalanced diet, from trying to squeeze too much training into a day also filled with work and family obligations, and from mental pressures, including competition.

Overtraining is a significant and common stress in athletes. In addition to causing an imbalance in the brain, nervous and hormonal systems (through increase sympathetic activity), it can increase chronic inflammation as well. Any of these problems can contribute to heart disease and increased risk of death. Stress and abnormal cardiac changes can be measured in overtrained athletes, even in the early stages. These include peripheral vascular resistance, high blood pressure, high cortisol levels and abnormal heart rate variability.

Overtraining in its early stage, sometimes called *overreaching*, can produce abnormalities; ironically, this can result in short term *improvements* in athletic performance. Many athletes who experience this phenomenon continue pushing themselves, mistakenly thinking their training is successful. Continuing on this path brings further ill health, including more clear indications of overtraining. For example, abnormal blood markers (such as plasma cardiac troponin T and I) have been found in triathletes and marathon runners following long races. These tests are indicative of a transient myocardial problem – a heart injury. Experts say they are still unsure about the seriousness of this problem. Immune markers are also distorted in many athletes following competition, and during periods of hard training, even following a single, long training session. This is associated with an increased frequency of upper respiratory illness common in many athletes. Some have severely compromised immune function making them vulnerable for more serious health problems. Overtraining ultimately results in poor performance.

The acceptance, by both athletes and society as a whole, of ill health is well documented in all sports as seen in the epidemic of physical injuries. In addition, mental and emotional problems are very common. It's an unhealthy, "no pain no gain" approach. There is even a name for cardiac changes that are observed, such as the "athlete's heart." Other overtraining outcomes have special names too, and are often glorified: runner's knee, swimmer's shoulder, and runner's anemia.

Ethics

Can countries with higher death rates of young athletes, such as the US, mandate more effective screening as the International Olympic Committee and European countries do to reduce, possibly significantly, the number of deaths during competition? Many oppose such a requirement, saying it's impractical. In the American Heart Association's "Recommendations and Considerations Related to Preparticipation Screening for Cardiovascular Abnormalities in Competitive Athletes" (*Circulation*. 2007;115:1643-1655) it states that, despite being able to detect heart disease in young athletes, "A large population preparticipation screening initiative for US athletes that mandates a 12-lead ECG, such as that proposed by the ESC and IOC, is probably impractical and would require considerable resources that do not currently exist."

While there are clear ethical considerations, the responsibility also rests with the athlete, or, in the case of minors, their parents. Consider that many athletes, even weekend warriors, are more than willing to place themselves at high risk for the thrill of victory. And society in general shares this double standard. A case in point: Every summer hundreds of people climb the challenging 3,800-meter (12,500-foot) Mont Dolent in Italy. Dozens of them also die there each year from accidental falls.

Should the government impose restrictions on sports because of potential health problems? Can we prevent a young talented athlete from fulfilling his or her dreams because an ECG shows abnormal readings? How many of those tests are false-positive (meaning the test shows a problem but none really exists), leading to unnecessary testing, anxiety and removal from a potentially rewarding career? There are obviously more questions than adequate answers. We do, however, treat athletes differently because we put them on a pedestal, and from an early age. This includes the media who write about them, colleges, universities and professional teams who recruit them, companies who sponsor them, and the public who glorify them. But does this special treatment include making a different medical decision regarding their health? Most health care professionals would say no, but the problem continues.

Until many of these ethical and legal issues are sorted out, there is one important factor that's clear: each person is responsible for his or her own health. Should we choose to put a marathon ahead of our health, we must also be responsible for the outcome, win or lose. Most importantly, we must teach our youth the importance of health and that it's an important part of building fitness.