

# Listen to your heart

Following a bout of erratic beats during training, *CW*'s David Bradford decided to investigate the growing evidence linking endurance exercise and irregular heart rhythms



David Bradford

**Y**ou are at heart a cyclist. Literally. You carry in your heart the imprint of your dedication; the product of your labours on the bike is the adapted physiology at the centre of your being. Put a hand on your chest and feel that slow, metronomic thudding: your high-capacity engine in standby mode, ready to rev. This is not normal, of course — you are every beat a cyclist — and the specialisation of your heart may matter more than you realise.

Cyclists' hearts become highly attuned to hard work. It's little wonder. Consider the extra workload involved in an intense interval session or race.

Every desperate urge to slow down is overcome through sheer force of will; you gasp, grimace and mentally refuse admission to everything except the course ahead and the counting-down of time and distance.

Your heart is pounding so hard it feels as though it's about to ricochet into your throat. You either ignore it completely or scowl

**“Athletes are five times more likely to develop atrial fibrillation. Five to 10 per cent are affected”**

resolutely at the rising beats per minute (bpm) readout on your computer. *Must. Keep. Pushing.*

During this intense effort, your heart's blood output increases from around five litres per minute to as much as 35 litres per minute. Over an hour-long race, it has to beat as many as 10,000 times — nearly four times faster than its resting rate. Perhaps we shouldn't be surprised, then, that just occasionally an athlete's heart loses track of its own cadence.

#### Hair-raising heart rate

Last year I experienced just such a misfire during an interval session. I'd started my second five-minute effort and felt a slight flutter in

my chest; a glance down at my Garmin revealed an eye-popping 194bpm — my outright maximum is 186bpm, or so I'd

thought — which swiftly soared to over 220bpm. I wasn't feeling ill or breathless but, spooked by the high numbers, stopped, sat down and thankfully within a couple of minutes my bpm tumbled back down to normal levels. What the hell had just happened?

I visited my GP who carried out an electrocardiogram (ECG) and referred me to a cardiologist for further tests, advising me “don't push too hard” in the meantime (whatever that meant). Over the next few weeks, my heart launched into its crazy bebop rhythm several more times in similar circumstances; each time, a short rest seemed to bring it back under control.

The follow-up tests — an echocardiogram scan and ECG while exercising — were completed six weeks later, and I was finally given the all-clear to resume full training.

The problem was not precisely diagnosed, since my heart was never measured during a bout of berserk beating, but doctors assured me that no serious problems or risks had been detected. I was relieved but

also intrigued. As I shared my experience with fellow runners and cyclists, I began to realise I was not alone; several others had been through similar episodes. Could it be that we sporty folk unwittingly provoke our hearts into rebellious misbehaviour?

#### A higher risk

I put this question to Dr Ahmed Merghani, research fellow in sports cardiology at St George's, University of London Hospital — are athletes more at risk of heart-rate glitches?

“Yes, studies have shown that athletes are five times more likely to develop atrial fibrillation. The incidence varies between different groups, but it's around five to 10 per cent of the athletic population, in contrast to one per cent in the general population.”

It's a striking difference: five to 10 athletes diagnosed for every single non-athlete. Bear in mind, though, that this is 10 from every 100 athletes, with 90 remaining glitch-free — the kind of odds against which, I'd guess, most of us would be willing to ride our luck.

Atrial fibrillation (AF) is the most common form of heart-rate irregularity. As the name suggests, it affects the atria, the upper chambers of the heart, causing them to contract randomly as confused electrical signals override the heart's natural rhythm. While some sufferers experience palpitations, elevated heart rate and dizziness, the effects are rarely serious and can usually be effectively treated. Of more serious concern for cyclists with AF is that it is associated with an increased likelihood of stroke, and blood-thinning medications to control this risk are not conducive to hard training.

The cause of my galloping heart rate was not AF but most likely a different form of atrial arrhythmia, called supraventricular tachycardia, which is less common than AF but similarly more prevalent in athletes. What is it about our training-adapted hearts that make them more inclined to fall out of rhythm?

#### ‘Cycling saved my life’



Kurt Sowa, 51, narrowly escaped death after suffering cardiac arrest while riding his bike — yet he is convinced it is thanks to cycling he survived.

“I was going 26mph when my heart went into ventricular fibrillation and failed to restart. I fell unconscious and, according to a witness, wobbled and then went over the handlebars.

“I lay in the road not breathing and with no pulse — not to mention the fractured ribs, shattered collarbone and punctured lung. My friend started CPR. It took around 20 minutes for the ambulance to arrive, and after several attempts the paramedics managed to shock my heart back into rhythm. I was in intensive care for eight days. After four weeks a quadruple bypass was carried out.

“The surgeon told me I'd developed collateral arteries (or ‘natural bypasses’), and I'm convinced that my cycling fitness saved my life. I got back on my bike for the first time on Boxing Day.”

**Training dilemma**

“[In athletes] something happens that makes the left atrium and the right chamber bigger and more irritable,” says sports cardiologist Dr Graham Stuart (sportscardiology.co.uk). “Training strengthens the heart muscle and makes it thicker, just like with a leg or arm muscle, but the right ventricle is a much thinner-walled chamber than the left. Although it does get thicker, it mostly just gets physically larger.”

The right ventricle’s job is to pump blood to the lungs, where it is re-oxygenated and then returned to the heart to be pumped around the body. An increase in capacity is a crucial training adaptation, as Dr Stuart explains:

**“A huge amount of exercise, within limits, is usually better for you than none”**

“In order for the heart’s output to increase, you either raise your heart rate or increase the amount of blood your heart can pump out. It can beat only so fast, so it enlarges its capacity.”

Because the athletic heart is bigger and stronger, it doesn’t need to beat as fast as a non-athletic heart while at rest. Most fit cyclists

have a resting heart rate of 40-60bpm, compared to 60-80bpm in the general population. Put simply, a trained person’s heart becomes more highly attuned to the nervous system (called increased vagal tone). It is thought the combination of adaptive changes in an athlete’s heart — slower resting rate, increased size and higher levels of adrenalin — is what lies behind the increased incidence of problems.

“As you get older, the adaptation doesn’t work quite as well,” adds Dr Stuart. “What’s liable to happen is that, as a heart runs along slowly

in its normal pattern, suddenly another rhythm breaks through.”

**A step too far**  
Aside from atrial arrhythmias, there is of course a scarier category of heart

abnormality affecting athletes: problems that can trigger cardiac arrest. Thankfully these defects are very rare; sudden death in young athletes strikes down only about one in 150,000 per year. In the majority of these cases, the victim is found to have had a pre-existing, undetected heart condition, such as hypertrophic

**Heart in numbers**

**35**  
litres of blood per minute – max output of an athlete’s heart during hard effort

**42**  
beats per minute – typical resting heart rate in a well-trained cyclist

**100,000**  
the average number of times your heart beats in a day

**5.6 litres**  
amount of blood in your body

**19,000km**  
the distance travelled in one day by your blood. It circulates your body around three times a minute

cardiomyopathy (irregular thickening of the heart muscle) or coronary disease (clogged arteries). Nonetheless, some cardiologists believe that some of us do push our hearts too hard.

Dr John Mandrola (drjohnm.org) is a cardiac electrophysiologist and also a competitive amateur bike racer. He has been outspoken in his belief that extreme events, such as Ironman triathlon, are a step too far in terms of heart health. “The combination of high-intensity and ultra-long duration of Ironman puts the heart at a higher risk of inflammation, scarring and other associated problems. The dilemma is that experts cannot know which athletes will be lucky enough to avoid the damage.”

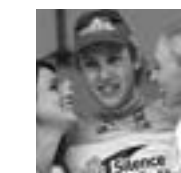
Studies on marathon finishers have recorded elevated levels of enzymes usually only seen in patients who have suffered a heart attack, as well as calcium deposits (‘plaque’) in the coronary arteries, another key risk factor. In an Australian study on athletes who had completed extreme endurance events, 12.5 per cent were shown to have scarring in the right ventricle of the heart. Scarring occurs when the heart develops a tear and muscle is replaced with fibrous tissue, forming a structural change.

“The human heart does not regenerate itself,” warns Dr Mandrola. “Scar remains scar — and you only have one heart.”

**Know your limit**

This does not necessarily mean that doing vast amounts of cycling is unhealthy or unacceptably dangerous. A 2011 study on the longevity of 834 former Tour de France cyclists found that they lived on average 17 per cent longer compared with the general population of their home nation, 81.5 years to 73.5. The benefits of exercise far outweigh the risks in all but a tiny minority who push beyond their limit.

Universal guidelines are impossible to establish because each cyclist has a different limit — lowest in those who are under-prepared or genetically



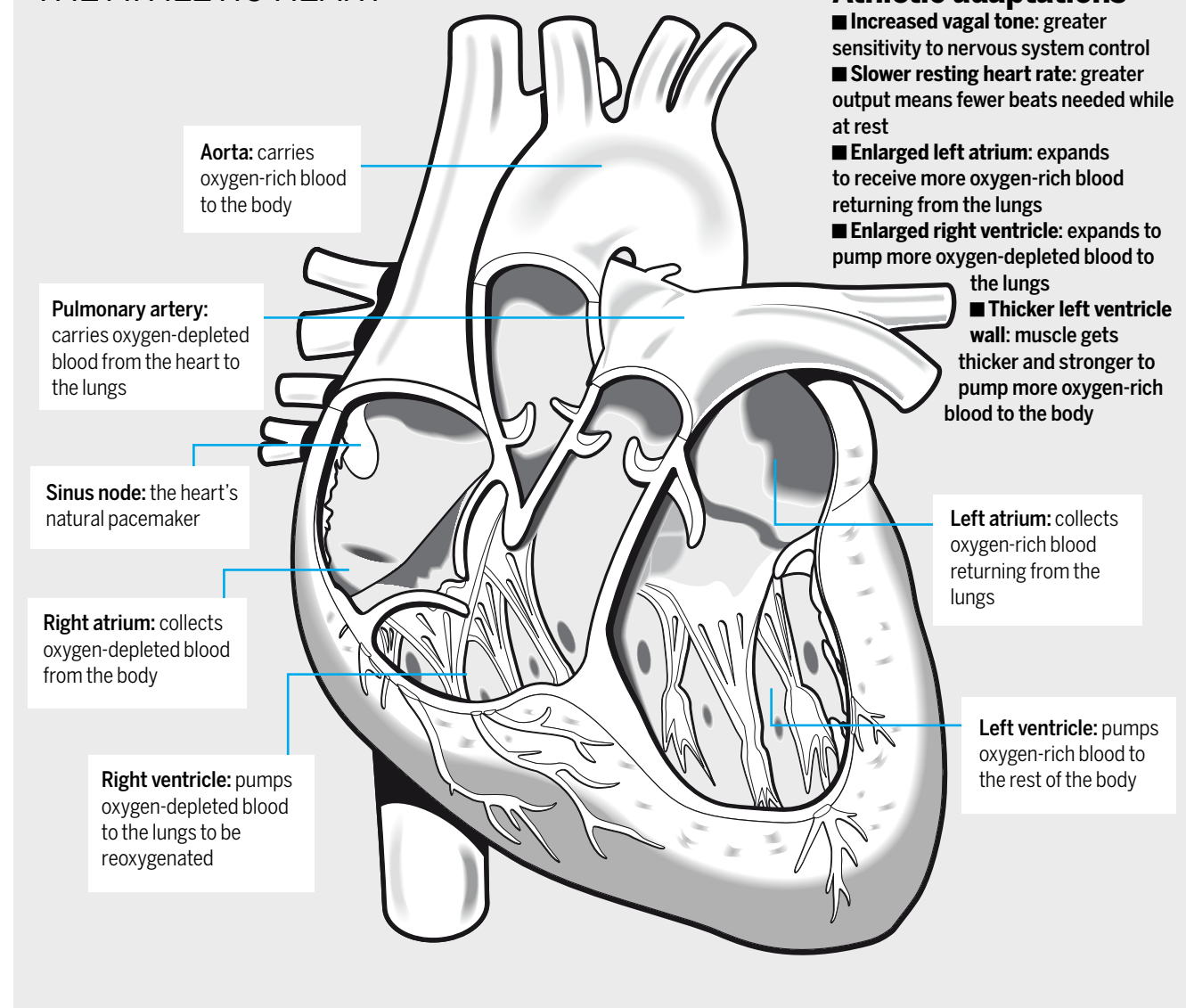
Former Lotto pro Olivier Kaisen, 31, was forced to retire from cycling last year after he was diagnosed with a serious heart abnormality.

“I have a heart fibrosis [structural change] that causes ventricular arrhythmia, not only during exercise but also at rest. I didn’t have any symptoms, and it wasn’t picked up until I had a routine heart screening last winter. After a stage of the Tour Down Under [in January 2014], I had a severe heart arrhythmia and I had to withdraw. According to the doctors, the fibrosis was most likely caused by a virus.

“Because mine is a potentially dangerous type of arrhythmia, I had no choice but to end my career. I’d expected to race for at least five more

Illustration: Ian Moores

**THE ATHLETIC HEART**



**Athletic adaptations**

- **Increased vagal tone:** greater sensitivity to nervous system control
- **Slower resting heart rate:** greater output means fewer beats needed while at rest
- **Enlarged left atrium:** expands to receive more oxygen-rich blood returning from the lungs
- **Enlarged right ventricle:** expands to pump more oxygen-depleted blood to the lungs
- **Thicker left ventricle wall:** muscle gets thicker and stronger to pump more oxygen-rich blood to the body

predisposed to problems. So the key question is: where does one’s own limit lie? How much is too much *for me*?

“For most people, you’ve got to be doing quite a lot,” says Dr Stuart. “Probably more than 10 hours per week, before your mortality [risk of death] reaches the same level as someone who is sedentary. Doing a huge amount is still usually better than doing nothing, but the risks do begin to increase above a certain level of exercise.”

Your heart thrives on hard work — but it has a limit. Your legs may be the only part of you complaining after a hard race but that doesn’t

mean they were the only ones beaten up and in need of plentiful recovery, sleep and nutrients. Your heart too, though wondrously adaptable and finely-tuned to your demands, is fallible biology, not an unbreakable machine.

**Useful links**

Sports Cardiology — expert advice: sportscardiology.co.uk  
Joe Humphries Memorial Trust — information on serious heart issues in young people: jhmt.org.uk  
Arrhythmia Alliance Heart Rhythm Charity — provides information and training: hearhythmcharity.org.uk

**Should you go for screening?**

Although screening can detect most serious heart problems, it is not fail-safe. As in the case of footballer Fabrice Muamba, who had been repeatedly screened, potentially lethal defects can go undetected and around 10 per cent of those tested register a false positive result.

Nonetheless, the sports cardiologists we spoke to agreed that everyone from ‘at risk’ groups definitely should be screened before participating in sport. This applies to you if:

- a) a member of your immediate family has suffered from a serious heart problem; and/or
  - b) you have experienced one or more of the following symptoms during exercise: chest pain, racing heart beats, dizziness or fainting.
- Subsidised screening is available via the charity Cardiac Risk in the Young c-r-y.org.uk