

Pedaling like a Tour de France winner is a losing strategy for most of us

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Credit: Peter Griffin/Public Domain

Peddaling like Chris Froome or Alberto Contador might seem appealing, but Oxford University researchers have found that for most of us it's likely to reduce rather than improve our performance.

A team from Oxford's Nuffield Department of Clinical Neurosciences looked at a common measure of aerobic fitness called VO₂ max. While

it can be measured accurately in a laboratory, it is often more practical to use techniques that estimate VO₂ max for individuals by getting them to exercise to their maximal level. These include the 'bleep test' of shuttle runs used by police forces and the Royal Air Force among others, or tests using a cycle ergometer, also known as an 'exercise bike'.

The current calculation for a cycle ergometer is based on body mass in kilograms and work rate in Watts, but the Oxford team wanted to see if including the rate of pedalling, called 'cadence', would give a more accurate result, not only for VO₂ max but especially for people who, often for health reasons like heart failure, cannot exercise to their maximal level. For these people, measurements have to be based on exercise carried out below the maximum level, making their result more of an estimate. Ensuring that estimate is as accurate as possible can be vital in developing appropriate health and fitness programmes for them.

Dr Federico Formenti led the research. He explained: 'We used ten healthy men aged between 19 and 48. We measured the participants' energy consumption at different cadences and exercise intensities, and used video-based motion analysis to study the mechanical determinants of changes in the energy cost.'

Professional cyclists pedal at a very high cadence, often above 100 revolutions per minute, for improved efficiency, and they can sustain very high exercise intensity for a long period of time. But Dr Formenti and his colleagues found that this was less effective for recreational cyclists.

Dr Formenti said: 'We used mathematical models to show the degree to which energy required to spin the legs increases with cadence. At a low exercise intensity of 50 Watts, a recreational cyclist trying to pedal like a professional at 110 revolutions per minute will use more than 60% of their power just to spin their legs. Only 40% is going into overcoming

the cycling resistance. To translate that to cycling on the road - only 40% of the energy you burn would be going into moving the bike forward.

'Recreational cyclists want to pedal efficiently, just like the professionals do, but achieving that means pedalling differently from the professionals. Pedalling faster might work for Tour de France winners but it probably won't work for the rest of us. At low [exercise intensity](#), increasing cadence mostly results in a less effective stroke, reducing efficiency.'

Using the results of this study and other published results, Dr Formenti and colleagues have proposed a new and more accurate equation for estimating energy consumption on stationary cycle ergometers, using cadence as well as weight and exercise power.

More information: Federico Formenti, Alberto E. Minetti, Fabio Borrani (2015). Pedalling rate is an important determinant of human oxygen uptake during exercise on the cycle ergometer is published in *Physiological Reports* on 14 September 2015.

physreports.physiology.org/content/3/9/e12500

Provided by Oxford University

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