

## The Physiological Effects of Prior Cycling on Run Performance

By Lee Cook

Many of us have noted that our running times for a given distance are worse in triathlons than when running that distance fresh. However, few of us know the reasons for this decrease in time or how we can minimise these negative consequences.

### Background

Many researchers have noted an increase in cardiorespiratory variables during triathlon running in comparison to control running (running without prior exercise) over a standard distance triathlon. Research is pretty conclusive that triathlon running increases oxygen cost ( $VO_2$ ), pulmonary ventilation ( $V_E$ ), breaths per minute ( $f$ ) and average heart rate (HR) when compared to control running. The decrease in performance during triathlon running has been attributed to two major factors: biomechanical and physiological.

### Biomechanical factors

Prior cycling is thought to decrease running economy particularly during the early stages of the run. It is important to remember that cycling employs a concentric muscle contraction (force is generated as the muscle shortens) whereas running is largely eccentric (force is generated as the muscle lengthens). There are also differences between the two disciplines in the way motor unit recruitment patterns occur (this is what activates the muscle to contract). These two factors can cause a significant decrease in stride length and stride frequency during the initial stages of triathlon running.

It is therefore obvious that the quicker the body is able to adapt from cycling to running, the shorter the period of time at which performance loss can occur. This is why back to back cycle-run training is essential before race season. It is important that the training is under simulated race conditions as you will not experience same perception of discomfort as you would in a race otherwise. Like anything else, the more you practice something the better you get at it. It is possible that you could beat another racer who usually beats you over a straight 10K, just because your legs are able to make the transition from cycling to running faster than theirs. A worthy investment of your time I would expect.

### Physiological factors

The central issues which result in the increase in cardiorespiratory variables noted above are temperature regulation and hydration. Many athletes invest in many hours of training time only to find themselves under perform on race day because they are dehydrated. As triathlon running is preceded by swimming and cycling and ultimately longer in duration, the extent to which we become dehydrated is increased without adequate ingestion of fluids both before and during a race.

The effects of dehydration can have devastating consequences on performance. When we become dehydrated our blood volume is reduced which results in the heart

pumping faster to get the same blood volume to the working muscles. It has been noted that a 3% water deficit can increase heart rates by a range of 8 to 40 beats per minute! If the heart is already working at maximal capacity the mathematics are simple, a reduction in blood volume to the muscles equals a reduction in oxygen to the muscles which means a reduction in performance.

The other obvious effect of dehydration is that sweating rate is reduced which means that the body has no way of being able to cool itself down. This results in an increase in core body temperature which further dehydrates the body. It really is a vicious cycle and it always amazes me how many people neglect adequately hydrating themselves.

My own personal study which I did for my dissertation looked at the physiological effects of prior 20km cycling on 5km run performance (sprint distance). Even over a distance which takes roughly an hour to complete, the water loss incurred was surprisingly big. Average fluid loss sustained by subjects was 0.7 litres and on average a 2.5- 3% loss of total body fluid. When taking into account that the subjects didn't have to swim this loss is pretty substantial. Researchers have noted that a 2% water deficit will reduce sweating rate by 3% and elevate both heart rate by 10 beats per minute and core body temperature by 0.5°C. It therefore alarms me that some coaches believe that hydration isn't important over a sprint distance triathlon. What is the point in training every hour that God sends and then under performing because you have not addressed a relatively simple thing. If you can implement back to back sessions into your training and take on board the hydration issue, then you will leave yourself in a great position to optimise your performance in the triathlon run.

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