Altitude Training – Are You High?

While the benefits of altitude training for endurance athletes are well documented, the effectiveness of some methods that purport to simulate high altitude is less so. *TMSM's* Rod Cedaro sorts the wheat from the chaff.

Words: Rod Cedaro | Images: Thinkstock

A number of athletes I coach both here in Australia and the United States have been in touch recently believing they may have just uncovered the holy grail of legal sports performance enhancement. One of them relayed with excitement his discovery of (you beaut) cheap as chips 'altitude training' masks for sale on the internet. "Mate, you just strap these things on and train as normal. They simulate altitude training and are really reasonably priced," he revealed.

Another athlete from the US who I coach online asked me about breath-holding while swimming. Somewhere she had read that the effects were similar to those derived from training at altitude.

Meanwhile, a former national sprint cycling champion I know told the story of another famed international cyclist training indoors on an ergo with nose pinched closed and breathing exclusively through a snorkel during intense interval sessions. He believed this was effectively simulating altitude training.

Sorry to burst everyone's bubble, but holding your breath and/or breathing through some sort of resistance device does not simulate altitude training. With all this in mind, I thought some clarification on the topic of altitude training and how it can and can't be simulated was warranted.

Holding your breath

I don't know how many times as a young triathlete I heard swim coaches talk about doing hypoxic sets. Such sessions would involve swimming three, four, seven, nine or more strokes without taking a breath. The urge to breathe would become almost intolerable. This must be doing some good?

Well first up, I assure you, if you do such a session you'll find yourself running to the loo to take a leak. Breath-holding sessions result in the accumulation of carbon dioxide (CO_2) in the blood. Increased levels of CO_2 stimulate receptor sites in what's known as smooth muscle – such as what makes up your respiratory and urinary tracts – and makes you want to take a breath and/or a leak.

In fact, calling such training sets hypoxic is a misnomer as they are actually hypercapnic in nature.

Will such a session hurt you? No.

Will such a session bestow the benefits often associated with 'altitude' training? Such as:

- Increased oxygen uptake, transportation and use.
- Speeding the rate of recovery from training sessions.
- Bolstering immune function.
- Increasing mitochondria concentrations (energy houses) within muscle tissue.
- Stimulating EPO production within the body.
- Improving fat metabolism and glycogen sparring.

No.

So, as I explained to the athlete I coach in the US, if you're a triathlete, don't waste your time holding your breath during swim training. If you're a swimmer, on the other hand, and want to maintain your streamline position through the water as you sprint to the wall as CO_2 levels accumulate in your blood, then hypercapnic training may well be worthwhile.

Restricted breathing

It is restricted breathing devices that really concern me. This is not because they are not effective – they are – but because the promotional literature they use is often misleading. In short, the standard restrictive breathing masks on the market do not simulate a high altitude environment. They provide resistance to the ventilatory muscles, which increases the strength and efficiency of these muscles to move more air in and out of the lungs. However, the concentration of oxygen in the air you're breathing (20.9 per cent) remains the same, so many of the benefits associated with true altitude training, as mentioned above, aren't achieved through using such devices.

Are they useful to the endurance athlete? Yes. Are they more effective than breath-holding? Yes. Is it altitude training? No.

True altitude training

So, what exactly needs to be in place for your training to qualify as altitude training?

So, as I explained to the athlete I coach in the US, if you're a triathlete, don't waste your time holding your breath during swim training.

Go climb a mountain, crawl into an altitude tent or strap on a mask connected to a hypoxic gas generator. In all these instances the concentration of oxygen in the air you're breathing is less than what you breathe at sea level. Typically, at sea level the air we breathe is 79 per cent nitrogen, 20.9 per cent oxygen and the balance is a mixture of gases typically referred to as argon.

When you go higher and higher on a mountain, the partial pressure on the air becomes less and less so the molecules that make up the air are further and further apart, effectively making the air "thinner". So while the concentration of the various components of the air is the same at the base camp of Everest as it is at your local beach, the molecules are further apart from one another, making it more of a struggle for the body to ventilate sufficient air to extract the valuable oxygen our bodies need.

In altitude tents, or when breathing direct from hypoxic generators, which normally pump 'altitude air' into tents, normal (sea level) air is dragged into the generators, it hits a semi-permeable membrane that allows some of the oxygen to diffuse across the membrane (but not all of it), meaning the air that is fed through to the person using the device has a lower concentration of oxygen in it.

The flow rates (the rate at which regular air is dragged through the semi-permeable membrane) of such generators dictates how much oxygen diffuses across. A faster flow rate equals more oxygen, a slower flow rate equals less oxygen.

At 21 per cent oxygen we're at sea level, at oxygen concentrations of nine per cent we're at an equivalent altitude of 6000 metres. It is this lack of oxygen that simulates all of the reported physiological benefits associated with 'altitude' training referred to previously.

So if you really want to get the benefits of altitude training, what are your options?

- Sleep in an altitude tent, like those provided by *www.altitudeservices.com.au*
- Ride on an indoor trainer or run on a treadmill while wearing a true altitude training mask attached to a hypoxic air generator.
- Use intermittent hypoxic training sessions.
- Move to the mountains, live and train at 2500 metres or higher and/or employ the live high, train low altitude training philosophy as we promote here at *Altitude Services Pty. Ltd.*

There's little doubt that altitude training will improve endurance performance in about 85 per cent of people. If you want to go down this path and eek out a little extra performance from your body – once you've optimised everything else – altitude (or true hypoxic) training can give you the edge. The important thing to do is be sure that you are actually getting the altitude/hypoxic effect.

Rod Cedaro is the contributing editor of TMSM.