



BREATHING & EXERCISE

ARTICLE 8: Sport-specific POWERbreathe® training: cycling

Introduction

In the previous article, we explored how to undertake specific POWERbreathe® training in order to optimise your swim phase in triathlon. Although the highest levels of inspiratory muscle fatigue reported in the scientific literature are induced by swimming – a whopping 29%⁽¹⁾ - research on triathlon shows that its the cycle phase that appears to generate the highest levels of inspiratory muscle fatigue. There are probably three reasons for this:

- 1) Athletes pace themselves during the swim in order to avoid inspiratory muscle fatigue early in the event (they are effectively 'saving' themselves);
- 2) During the cycle phase, the inspiratory muscles suffer from the accumulated fatigue of both the swim and the cycle phases;
- 3) The cycle phase presents its own challenges to breathing, and these shouldn't be underestimated.

The breathing challenges of the cycling phase were described in detail in the first article in the series, but in short, crouching forward forces the contents of the abdomen (stomach, liver and intestines) upward against the diaphragm. This impedes the downward movement of the diaphragm during inhalation because the abdominal contents are pushed up against the diaphragm causing it to 'work harder' for each breath.

Studies have shown that elite cyclists appear to adapt to this challenge and are not disadvantaged by it in the same way as cyclists who are not accustomed to cycling in this

position. This strongly suggests that training adaptation occurs within the inspiratory muscles of the elite cyclists. However, rather than spending weeks on a bike battling to get used to using your 'aerobars', a convenient shortcut to more comfortable and efficient breathing is to use POWERbreathe®. What's more, even if you are accustomed to using 'aerobars', I've got some tips that will enable you to get your inspiratory muscles in the best possible shape for the cycle phase. As with the swim phase, cycling specific POWERbreathe® training needs to take into account posture and also the constraints of maintaining an aerodynamic position.

Why is your posture during training important?

During cycling, the mechanics of breathing are altered by your posture for two reasons; firstly, compression of the thoracic cavity influences the mechanical operating strength of the inspiratory muscles and increases the force that they must work against in order to inflate your lungs, and secondly because your breathing muscles are also a vital component of the muscles that make up your 'core' stabilisers.

During cycling, you're crouched forward with your arms tucked tightly into your body, which produces compression from all sides. In addition, the effective and safe 'force transmission' during each pedal stroke demands activation of your core stabilising muscles. These deep core muscles of the trunk are not only vital for maintaining upright posture, but they also protect the spine and pelvis from injury. Without them, your lower spine and pelvis would be unstable, putting you at grave risk of injury.

A little known fact is that one of the most important core stabiliser muscles is the diaphragm. This means your diaphragm must meet the dual challenges of breathing *and* providing a stable and safe platform for force production; two conflicting requirements. The only way to resolve this conflict is to ensure that your inspiratory muscles are trained to meet the dual demands, and this means you need to complete your POWERbreathe® training under conditions that simulate the breathing challenges that cycling presents.

Principles of posture specific POWERbreathe® training

As in the previous article on POWERbreathe® training for the swim phase, my aim here is to give you the knowledge to set you on your way to devising your own exercises.

Everyone is different, and for some people, certain postural challenges will be harder than others, so you need to know how to devise challenges that address ***your*** weaknesses. These 'advanced' principles should only be attempted once you have completed your 'Foundation' training (article #6).

Here's a reminder of the three main principles of posture-specific POWERbreathe® training, and how to determine the right number of 'reps' to achieve your training goals:

Principle 1:

POWERbreathe® training is resistance training; there are good reasons why POWERbreathe® should not and need not be used during any aerobic training (see article 7 for an explanation of these reasons).

Principle 2:

POWERbreathe® is a resistance training tool, so think in terms of 'reps and sets' (see table below). Decide whether you are training for, say, strength (low reps / high load), or power (moderate reps / moderate load), and then devise an exercise/movement that challenges the muscle of your torso in a similar way to the challenge that they face during aerodynamic cycling. Then perform the exercise/movement using the rep/load combination that is most appropriate.

Principle 3:

Simulate as closely as possible the postural conditions associated with the sporting activity. In the case of cycling, you have to contend with restricted movement of your rib cage and diaphragm due to the crouched cycling position and tightly tucked arms. This can be simulated by undertaking your POWERbreathe® training in postures that mimic these restrictions.

Playing with 'reps and sets'

If you want to introduce intensity specificity into your POWERbreathe®, then here's a reminder of a few principles to apply:

Suggested POWERbreathe® training regimens.

All regimens should be carried out 5-7 days per week. Training loads can be identified by 'trial and error' (see Top-tips for optimal training in article 6). As your ability to complete the sets improves, increase the training load by 1/4 turn of the load adjuster.

| Four week block | POWERbreathe® training regimen | | | | |
|-----------------------------|---------------------------------------|--------------------|-------------|--------------------------|----------------------|
| | Load | Repetitions | Sets | Rest between sets | Times per day |
| Strength | 10RM | 10 | 3 | 60 sec* | 2 |
| Strength/Power | 30RM | 30 | 1 | - | 2 |
| Speed/Endurance | 20RM | 20 | 4 to 6 | 60 sec* | 1 |
| Endurance (up to 30 min) | 40RM | 40 | 6 | 240 sec* | 1 |
| Endurance (over 30 min) | 60RM | 60 | 4 | 180 sec* | 1 |

NB. Repetition maximum (RM) = the load that you can only just complete the prescribed number of repetitions, e.g., a 10 rep max is a load that you can only complete 10 reps of before 'failure' (see above for definition of failure).

**If you become dizzy due to hyperventilation, hold your breath between sets, and/or use the re-breathing advanced Top-tip from article 6.*

Here are two exercises to get you on your way...

'Aerobars'

Complete the desired number of POWERbreathe 'reps' whilst seated, stationary on your cycle in the crouch position, with your arms tucked in tight to your ribs. If you don't have access to your bike, you can simulate the position whilst seated on a stool or balance ball. You can also make the exercise more challenging by *not* taking your weight on your arms as you crouch forward; the resistance that was provided by your arms tucked



against your ribs can be substituted with a resistance band around the ribs (as for the swimming-specific exercises).

An even more advanced version is holding your arms out in front of you whilst in the crouch. Your outstretched arms create a weight that you must counterbalance using your 'core' muscles, making it that much tougher, especially when you add the POWERbreathe®. You should concentrate on engaging your diaphragm to ensure that you get maximum benefit (see tips on 'Getting in touch with your diaphragm' in article 4).

'Ab' crush

A second, more advanced exercise that challenges the diaphragm can be achieved in the standing position. To do this, you need to compress your abdomen by bending

forward from a standing position and grasping your ankles. Your knees should be bent slightly so that your thighs press against your torso. In this position, your diaphragm is compressed by your thighs, and its movement during inspiration is impeded by your abdominal contents (now above it) that rest on it due to gravity. This exercise is very tough and you may need to step down the load setting on your POWERbreathe® when you first start. You should concentrate on maintaining the volume of each breath, inhaling your breath as quickly as possible, and focussing on the diaphragm to get maximum benefit.



Definitions

'Core': a muscular corset forming an abdominal 'box' that is bounded by the muscles of the abdominal wall (front), paraspinals and gluteals (back), pelvic floor and hip girdle (bottom), and diaphragm (top). The 'core' stabilises the upper body, pelvis and spine.

Summary

In this article we learned about the principles of devising sport specific POWERbreathe® training for the cycle phase. As was the case with training for the swim phase, you should experiment with different postures that simulate aspects of the competing demands of breathing and maintaining posture/'core' stability. In article 9, we'll place the final piece in our jigsaw by considering sport-specific training for the run phase.

References

1. Lomax ME, McConnell AK. Inspiratory muscle fatigue in swimmers after a single 200 m swim. J Sports Sci. 2003 Aug; 21(8):659-64.

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