BREATHING & EXERCISE

ARTICLE 6: Building the foundations of your POWERbreathe® training

Introduction

In the first two articles of this series, we considered the structure and function of the breathing pump, the individual demands of swimming, cycling and running, as well as the challenges posed by combining these activities into a single competitive event – the triathlon. Within the information provided by these articles we saw that fatigue of the breathing pump, specifically the inspiratory muscles, is a 'normal' part of triathlon.

In the third article we got a bit more technical and considered the unexpected and wide-reaching physiological implications of 'breathing fatigue', while in the fourth article in the series, we considered the best strategies and tactics for maximising breathing comfort, and minimising the chances of 'breathing fatigue'. In the final introductory article in this series, we considered the evidence that POWERbreathe® training is a proven ergogenic aid that is quite simply the quickest fix around.

In the next four articles, we will consider the practicalities of POWERbreathe® training – from laying down the foundations, to devising sport-specific exercises to help you to maximise breathing efficiency in each discipline of the triathlon. This specificity is important, because, as we learned in earlier articles in this series, some activities are tougher than others when it comes to breathing. I also want to introduce you to the idea that your diaphragm is actually an important 'core' muscle; during exercise it has to meet the dual demands of breathing and maintaining postural stability. If not adequately prepared for this, you may suffer from postural instability and an increased risk of injury. We will also consider how to use POWERbreathe® as part of your warm-up, because this also adds another 1% to your performance if you use it just before you race[(1).]

Strength, endurance and power: can you have it all?

POWERbreathe® should be thought of in the same way as any other muscle resistance training, and should be used in the same way too, i.e., as an addition to whole body training. In other words, by training with POWERbreathe® you are covering all of the bases in terms of weak links in the performance chain. POWERbreathe® training can ensure that your breathing is not the weak link that it might otherwise be.

Your inspiratory muscles will respond to a training stimulus in the same way as your other muscles[2]; low repetitions combined with heavy loads stimulate strength-related adaptations, whilst high repetitions with low loads stimulate endurance adaptations.

However, there are other adaptations that take place in muscles, which also have a bearing on their ability to function optimally. These include their ability to contract quickly (sprinters train to optimise this), or to maximise their power output (all athletes strive to achieve this).

There is a common misconception that you can only increase muscle endurance by doing endurance training, but this is not the case. Increasing a muscle's strength also increases its endurance because for any given activity, a strong muscle is operating at a lower percentage of its maximal capacity than a weaker muscle. This means strong muscles can keep going for longer before they become fatigued.

Training to increase muscle strength is much more time efficient than training for endurance, because fewer repetitions are required. In addition, strength training provides the 'cross-over' benefit of increasing endurance, but endurance training does not convey the same dual benefits.

Table 1 illustrates the adaptations stimulated by different training stimuli (strength, speed, power or endurance). Heavy loading represents an extreme form of strength training, whilst prolonged light loading represents a form of endurance training:

	Strength	Speed	Power	Endurance
Heavy loading	✓			✓
Moderate loading	✓	✓	✓	✓
Light loading		✓		
Prolonged light loading		✓		✓

Table 1. Muscle adaptations stimulated by different types of training.

Its clear from table 1 that the most versatile form of training is moderate loading, which stimulates the widest range of functional improvements. This means that you get a more comprehensive training result.

Figure 1 illustrates the internal workings of the POWERbreathe®, which can be thought of as a 'dumbbell for your diaphragm'. The valve can only be opened if sufficient pressure is generated by the inspiratory muscles to overcome the compressive tension on of the spring. Your inspiratory muscles therefore lift the spring in the same way that your arm muscles might lift a dumbbell. As with a dumbbell, the 'weight' of the valve can be adjusted, and in this way, a training regimen can be undertaken that has a heavy or light load. But what is the best load, how do you set it, and how do you know when to change it?

FIGURE 1

POWERbreathe® Foundation Training

All of the studies demonstrating performance benefits after POWERbreathe® training that were described in earlier articles in the series used an identical moderate loading programme. This is our 'tried and trusted' POWERbreathe® Foundation training regimen, which consists of a load setting equivalent to the 30 ***repetition maximum*** (30RM). The 30RM corresponds to a load of around 50-60% of the inspiratory muscles' maximal strength (a moderate load).

The Foundation programme is designed to give users the most comprehensive range of training improvements. I call it the 'Foundation' programme, because it lays the foundations of your inspiratory muscle training onto which you can lay more specific training regimens (see articles 7 to 9).

As described above, strength training has the advantage of providing dual 'cross-over' training benefits, because improved strength also provides improved endurance. This is another reason why the Foundation training programme consists of 30 breaths, which provides a strength bias, but with the additional benefit of stimulating speed, power and endurance improvements (see table 1).

I also want to take this opportunity to dispel a myth that could impair the benefits you can achieve using POWERbreathe®. There's a common misconception that subjecting a muscle to both strength and endurance training stimuli concurrently will provide the best of both worlds. In fact, it does precisely the opposite because the muscles become 'confused' about how to adapt[3]. For this reason, POWERbreathe® training should be performed in discrete blocks (***mesocycles***, e.g., four weeks) that emphasise a specific training outcome, e.g., improving strength. After progressing through the Foundation stage, the blocks of POWERbreathe training should ideally mirror the objectives of the blocks of your whole body training mesocycles. For example, if you are entering a mesocycle where the emphasis of your whole body training is upon developing speed endurance, your POWERbreathe training regimen should also be oriented towards speed endurance. In the following article I will provide examples of POWERbreathe training programmes with differing training objectives.

Definitions

Repetition maximum: the maximum number of repetitions that can be completed at any given load or weight. This is normally measured by commencing at a moderate load/weight and progressively increasing the weight until only one repetition can be executed

Mesocycle: blocks of training during which a specific training outcome is targeted - e.g., the development of speed endurance. Mesocycle length may be short (4-6 weeks), or long (12-16 weeks)

Don't just do it, do it well

Below is some general guidance and 'top-tips' for getting the most out of your POWERbreathe® training.

General guidance for POWERbreathe® training

- POWERbreathe® is supplied with a noseclip to prevent air bypassing the POWERbreathe via the nose. Some people find noseclips uncomfortable and prefer not to use them. This is OK, but you need to ensure that air does not enter your lungs via your nose, because this is a form of 'cheating'. Air entering via your nose will cause a 'snorting' sound during inhalation. If you don't like the noseclip, the nose can be occluded during training simply by pinching it with your fingers, but some people are able to block off their nose internally and don't need to do this. Whichever technique works for you is fine, as long as air doesn't bypass the POWERbreathe® via your nose.

- Setting the training load by 'trial and error' is the best way to optimise the load, and to ensure that the load 'keeps pace' with the improvements induced by the training. For example, in the case of the 30RM Foundation training, the load adjustment should be increased over the course of 3 or 4 sessions until a load is identified that you can only just allows you to complete 30 repetitions before reaching 'failure' (30 repetition maximum (30RM)). Judging the point of repetition

'failure' is dealt with in the next tip. Over the next 2 or 3 training sessions you will find that achieving the 30 reps becomes easier, and you will shortly be able to complete more than 30 reps (you should train to 'failure' every time you train). At this point (consistently achieving 33-34 reps), increase the training load by turning the load adjuster 1/4 turn clockwise. This will bring the number of repetitions to 'failure' down to below 30 (most likely 25-30), but keep training at this load until you can achieve 33-34 repetitions again. Then increase the load as described, and keep doing so.

- The inspiratory muscles are strongest when the lungs are empty, and weakest when they are full. You can experience this for yourself by cupping your palm over you nose and mouth and sucking in as hard as you can with your lungs full or empty. When your lungs are empty you will be able to suck very hard against your palm, but when they are full, you will hardly be able to produce any 'suck'. We recommend that you breathe out as far as possible with each breath through the POWERbreathe® (see below). This means that every repetition (breath) against the load on the POWERbreathe® starts from a point of strength, but as the inhalation progresses, the inspiratory muscles' ability to overcome the load diminishes. The consequence of this is that, as fatigue sets in, a repetition can be started, but not completed. This is different from other muscles; for example, in the case of the biceps, a curl is initiated from a point where the bicep is weakest, so when the muscle fatigues, the repetition cannot even be started. This makes defining 'failure' during a set of repetitions less clearly defined for the inspiratory muscles than it is for some other muscles. However, 'failure' during POWERbreathe® training can be defined by the point at which a 'satisfying' breath cannot be achieved. In other words, once you sense that you are no longer able to fill your lungs adequately, this defines 'failure'.

- All POWERbreathe® training should be conducted with maximum effort; i.e. each repetition (inspiration through the POWERbreathe®) should be executed as fast as possible; try to fill your lungs as fast as you can. This ensures the recruitment (use) of the greatest number of muscle fibres, which means that more fibres receive a training stimulus. The inspiratory effort should take around 1 to 1.5 seconds, with 3 to 4 seconds for expiration.

- POWERbreathe® training should be conducted over the full range of lung volume, i.e., from being as empty as possible, to being as full as possible – squeeze out at the end of every breath, and pull in as far as you can. Once again, we take our lead from established training theory; muscles show specificity in their adaptation to a training stimulus. The greatest increases in function are seen over the range of movement undertaken during the training. In other words, muscles show little improvement over ranges of movement that were not used during training. The take home message is to breathe as deeply as possible.

- The expiratory phase of the POWERbreathe® manoeuvre is a 'rest' phase taking 3 to 4 sec. There is no need to force the air out of your lungs with great speed. This will make you breathe too quickly, and result in dizziness due to hyperventilation. If you feel dizzy, just pause a little longer at the end of the expiration until you feel the urge to breathe in again. Also see another tip below for combating hyperventilation.

- Your inspiratory muscles are involved in subtle postural activity that maintains an upright body position. If you want to really focus the activity of your inspiratory muscles on working against the POWERbreathe®, lean forward and 'take the weight off' your upper body postural muscles (as you would if you were resting your hands on your knees, catching your breath after a sprint). Leaning against a windowsill provides an ideal support, enables you to watch the world go by, as well as providing entertainment for your neighbours! As you inhale against the POWERbreathe® you can either continue to lean forward, or lift your upper body into the upright position to really 'open-up' your chest – do whatever makes you feel most comfortable, and/or enables you to put the greatest amount of effort into your training. Also see the sport-specific tips that follow in articles 7-9, relating to posture.

- With practice, you should be able to partition the inspiratory effort against the load on the POWERbreathe® between your diaphragm and chest wall muscles. Ideally, you want to train all of your inspiratory muscles, because they all have a role to play. Tips on diaphragmatic breathing were provided in article 4. Once you have mastered this, use it in your POWERbreathe® training by dividing the repetitions

between the diaphragm and chest muscles; a few repetitions with each, then a few with all of the muscles together. In doing so, you ensure that your inspiratory muscles progress at the same rate, and bad breathing habits are not reinforced during your POWERbreathe® training.

Top-Tips for *advanced* POWERbreathe® training

- If you rest for too long between repetitions, your inspiratory muscles will recover, and the training stimulus will not be sufficiently challenging. This means that rate of improvement will be slower and the magnitude of strength grain smaller. The objective of any physical training is to overload the muscles so that they fatigue during the set. With POWERbreathe® training you need to strike a balance between overloading and not hyperventilating, which will make you feel light-headed. A little dizziness is harmless, and you will find that you become less sensitive to it as your training progresses. As you become more accustomed to the training, try to reduce the expiratory phases to 2 to 3 sec in order to maximise inspiratory muscle overload. Also see the next tip if you want to really 'go for it' and reduce the expiratory phase to 1 to 2 sec.

- When training with sets of more than 30 repetitions, or with short expiratory phases (less than 3-4 sec) there is a greater likelihood of becoming light-headed due to hyperventilation. You can avoid this by placing your POWERbreathe® inside an air-tight bag (an average-sized carrier bag is adequate and sealing it loosely around the mouthpiece with your hand. Breathe in and out of the bag for 15 repetitions, and then breathe fresh air for 15 repetitions, etc. Remember to start by exhaling into the bag, and not to re-breathe for more than 15 repetitions at a time!

Monitoring improvement

You can monitor your improvement without the use of expensive laboratory equipment. Monitoring should be done no more frequently that once per week. Remember that monitoring should ideally be performed before you do your POWERbreathe®, or any other training. Monitoring is an excellent way to build motivation, because it reinforces how much improvement you have made.

You can monitor improvement using the POWERbreathe® itself. Starting from the load that you normally train on, execute one repetition, then increase the load by one whole turn of the load adjuster and wait 30 sec; execute another repetition, increase the load by one whole turn wait 30 sec, etc. Continue until you cannot inhale through the POWERbreathe®. This setting corresponds to your maximal inspiratory muscle strength, and is akin the 'one repetition maximum' (1RM) that is used to monitor improvement in other weight training exercises such as bench press. You can keep a record of your progress by marking the setting it on the POWERbreathe® with a dot using a felt tip.

The ability to sustain breathing against a resistance improves after training with the POWERbreathe®; in other words, endurance increases. As with strength improvement, you can assess your endurance improvement using your POWERbreathe®. The first time you do this, simply set the POWERbreathe® slightly below your current training load. Then see how long you can sustain breathing against this load, remembering to maintain good technique (see above). Record your performance as the number of breaths achieved. If the test load was about right, this test should last around 8 minutes. On subsequent re-tests, set the POWERbreathe® at the same load as previously, and see how long you can sustain this load for. This test should not be conducted more than once per week, and can be undertaken instead of one of your normal daily sessions. Periodically, you should re-set your test load, otherwise you'll find yourself doing the test for half an hour!

Finally, if you start using POWERbreathe whilst you're in a fairly constant period of whole body training, you could undertake some time trials to test the improvements that POWERbreathe® training has made to your actual swim, cycle or run performance. I would recommend that the trials be conducted twice before using POWERbreathe® in order to establish a reliable baseline.

So there you have it, within 4 to 6 weeks, your Foundation training will be complete; your inspiratory muscles will be stronger, more powerful and have greater endurance. In addition, you should also be able to detect some improvements in your swim, cycle or run times. But then what; how can you get even more? In subsequent articles we'll consider how to build on the Foundation, and introduce sport-specific challenges to your POWERbreathe® training to take you to the next level.

References

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