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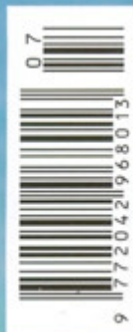
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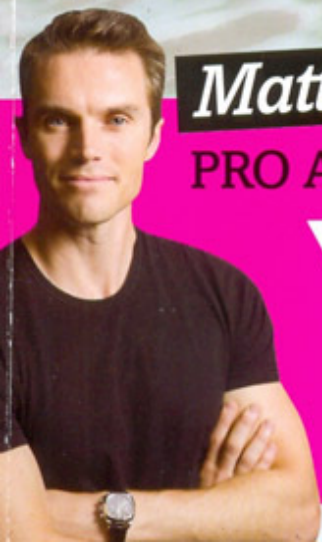
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"IT'S ONLY
OVER THE PAST
DECADE THAT
SCIENTISTS HAVE
OBSERVED HOW
'COSTLY' BREATHING
CAN BE"

Breathe

easy

Breathing more efficiently could help improve your performance, says **Sam Murphy**

"Oxygen is energy," my boxercise instructor used to shout as we sweated, kicked and punched our way through his class – and he was right. To exercise efficiently, we need to have enough oxygen coming into the body to meet demand. At rest, the lungs pump 8-12 litres of air per minute, but during exercise this can increase to as much as 150! So can we train ourselves to breathe better? Professor Alison McConnell, a respiratory physiologist at Brunel University and author of a new book, *Breathe Strong, Perform Better* (Human Kinetics), believes we can. "It isn't an issue of getting more oxygen into the body – the lungs are very efficient at doing that – it's about breathing more efficiently," she says.

For most of us, that means improving the depth of each breath (so, the amount of air we inhale), rather than increasing the frequency of breathing. "It also means focusing the work of breathing on our largest inspiratory muscle – the diaphragm," explains Alison. "As we fatigue, we tend to take more frequent, shallower breaths, which can have a detrimental effect on performance, particularly in activities where breathing and movement need to be coordinated."

Swimming is the perfect example. If you feel breathless when you swim, the typical response is to speed up the rate of your stroke so that you can breathe more often and get more air in, but this disrupts your fluidity, ultimately slowing you down. "By training your breathing, it's possible to maintain a deeper, slower breathing pattern, so that your need to breathe does not drive your movement," says Alison.

the cost of breathing

It's only over the past decade that scientists have observed how 'costly' breathing can be. One study found that during all-out exercise, the breathing muscles might use as much as 14-18

percent of the oxygenated blood being pumped out by the heart per minute. "We've discovered that the respiratory muscles trigger a reflex, called the metaboreflex, that diverts blood away from the working muscles during hard exercise," says Alison. That leaves those muscles in short supply and you in need of a breather.

But, help is at hand, quite literally. Handheld training devices are now available that enable you to 'train' the inspiratory muscles just like you would any other muscle. Isn't breathing itself enough 'exercise' for these muscles? Well, it's enough to cope with everyday life, but if you want to push yourself in sport, you need to overload the muscles with a stress greater than they are accustomed to.

Alison is the creator of POWERbreathe, which she's dubbed 'dumbbells for your diaphragm'. "Inspiratory muscle training can help in two ways," she explains. "Firstly, it

Good vibrations

One new inspiratory muscle training device, Youbreathe is utilising vibration technology – Powerplate for your lungs, perhaps? "Instead of using resistance to restrict air flow, Youbreathe uses vibration, which is a high-flow/low force type of training – ideal for building endurance," explains Dr Paul Summers, a research fellow at the Sport and Exercise Research Centre at South Bank University, where Youbreathe was developed. "Whatever type of exercise you are doing, breathing is always about endurance rather than strength – so this makes training more specific."



reduces your perception of breathing effort, so you don't get so uncomfortable and breathless during exercise. Secondly, it can raise the threshold at which the metaboreflex diverts blood away from your working muscles." That means you can work harder, for longer.

In one of Alison's studies, published in the *Journal of Sport Sciences*, cyclists who used an inspiratory muscle trainer for six weeks improved 40km time trial performance by 4.6 percent, and also reduced their perception of

effort. The scientific evidence on respiratory muscle training is convincing – but are there other strategies that could make your workout a less breathless affair?

go with the flow

Synchronising your breathing with your movements can be beneficial, both in terms of 'flow' and posture – in some activities, like rowing and swimming, it's essential. "Many runners synchronise their breathing with their foot strike pattern," says running coach Malcolm Balk, author of *The Art of Running* (Carroll & Brown). For example, inhaling for two footstrikes and exhaling for two footstrikes. "This can help your stride feel smooth and also ensures you are maintaining an awareness of your breathing rate."

And should you breathe through your nose or your mouth during aerobic exercise, like running? "The objective is to get as much air in as possible with the least amount of mechanical work – and that means breathing through the mouth," says Alison. Research from Liverpool John Moores University backs her up. Scientists found that once exercise gets 'moderately hard,' the most efficient way of breathing in and out is through the mouth, not the nose.

That said, if you're a new runner, nasal breathing can be a good way of keeping your intensity level under control – you can only go as fast and as far as your breathing will allow, reducing the likelihood of you overdoing things. And in a gentle activity, like yoga, where the onus isn't on getting as much oxygen in as possible, nose breathing is usually recommended. It is believed that it stimulates a branch of the nervous system called the 'parasympathetic' nervous system, which helps to calm us down.

"In yoga, we use the breath to act as a focus for the mind, which has a tendency to wander," explains East Sussex-based yoga teacher Elaine Fletcher. "If the breath is calm and steady, hopefully the mind can settle, too. Lengthening the exhalation is designed to enhance and encourage a sense of calmness, while lengthening the inhalation can be energising – so we can change the emphasis according to our needs." In one study, published in the *Indian Journal of Medical Research*, athletes who practised yogic breathing (pranayama) for a year were able to exercise at a higher intensity without increased energy demand or lactic acid production.

"The focus is on maximising the capacity for the respiratory system to be able to respond efficiently to the demands we make on it," Elaine goes on to explain. "So it's not necessarily 'how deep is my breath,' but 'how free is my breath?'"

tummy trouble

If you watch a baby breathe, the tummy will rise and fall – so-called 'belly breathing'. But, as adults, we often hold tension in the diaphragm, due to stress and anxiety, or simply out of habit



TRIED & TESTED

Transformational Breathing

Sam Murphy tries an oxygen-boosting – and emotional – breathing technique for size...



I am lying on my back in a small room, drenched in sweat and salty tears. My nerve endings are tingling, my muscles are twitching and I feel as heavy as a lead soldier. What has put me in such a spent state? Half an hour of

breathing. But it's not just any old breathing, it's a technique called transformational breathing (TB) and if my experience is anything to go by, it certainly lives up to its name.

"Transformational breathing enables us to infuse the body with much-needed oxygen and energy, bringing about physical, emotional and spiritual healing," TB coach Alan Dolan tells me before our session. I am somewhat sceptical, I admit. I get dizzy whenever I try to take deeper breaths, and besides, if my body needed more oxygen, wouldn't it simply breathe more in?

"Most of us use just 20-30 percent of our lung capacity," explains Alan. "This equates to 'survival' mode – but when we start to open up the respiratory systems and give the body more oxygen and energy, it's like switching over to 'thrive' mode."

I'm intrigued. Perhaps learning to breathe more deeply will come in handy next time I hit the pool. "It will," says Alan. "As our respiratory system opens, we can breathe more fully, thereby bringing more oxygen into the system, increasing stamina." That's why Alan counts international sportspeople among his clientele.

He starts by explaining the four key characteristics of TB – firstly, you breathe through the mouth, not the nose. "It's simply a matter of volume," he says. "You can get more oxygen in that way." Secondly, you focus on the inhalation, and let the exhalation happen by itself. There is no pause between the in-breath and the out-breath, you go straight from one to the other, and finally, you breathe from the lower abdomen (or at least you visualise breathing from there, given that the bottom of the lungs sits about seven centimetres below the nipple). This is partly to encourage you to be more 'present' in your body (rather than living in your head, like many of us do) but it's also because encouraging the diaphragm to drop allows the lungs to expand to their fullest extent.

I lie on the couch and get comfy and start to breathe. My mouth dries up straight away,

in trying to pull the tummy in. "This tightness in the abdominal muscles will restrict the action of the diaphragm," says Elaine.

To see if you are a 'belly breather' or a chest breather, try the following exercise: Lie on your back with your knees bent and one hand on your abdomen (thumbs on lowest ribs, palm spread), the other on your chest. As you breathe in, which hand moves first? Is it the one on the chest or the one on the abdomen?

Malcolm Balk believes the term 'belly breathing' is open to misinterpretation. When he tried to incorporate it into his running, he ended up with lower back pain. "Eventually I realised that in pushing my abdomen out with every inhalation, I was arching my lower back and creating strain," he explains. "When the diaphragm descends during an in-breath, the whole torso, including the back, should expand – not just the abdomen." Malcolm recommends focusing on releasing the abdomen during inhalation, rather than pushing it out.

Waiting to exhale

If there's one place where the struggle to breathe is most apparent, it's in the water. "A smooth transition between the water and air is the mark of a free swimmer, but most swimmers find breathing the most challenging aspect of swimming – especially in front crawl," says Steven Shaw from the Art of Swimming (artofswimming.com). Shaw has identified a number of key problems. For starters, he says, many swimmers have poor technique and lift the head too high to inhale, which strains the neck and reduces their ability to inhale in a relaxed way. Secondly, many breathe out too actively under the water, so when they reach the point of the in-breath they feel starved of oxygen and as a consequence, gasp – which can lead to hyperventilation and swallowing water.

"Others simply overestimate the amount of air you need to take in, which can cause panic or anxiety," says Steven. His advice? "Focus on the out-breath, and allow the in-breath to happen by itself."

making me feel tense and panicky – and I think there's little hope of me turning my attention inwards. But, little by little, with Alan's guidance and encouragement, I start to harness the power of my breath. I can feel oxygen flooding into every capillary. I am sizzling with energy. And then, as I make to inhale, I am suddenly racked with sobs. I try to hold it back, but Alan tells me to breathe it out. "Whatever comes up, it's OK – just keep breathing through it," he says. When my stiff upper lip persists, he gets me to make sounds as I exhale, accompanying me in a robust, tuneful voice. I feel foolish, but it enables me to rid myself of the unexpected anguish. It's hard work, transformational breathing. I don't know what my heart rate would have been, had I measured it, but this is concentrated effort – the rhythm feels similar to when I'm running at pace. It's only when it's over that I notice how much I've sweated. I allow my breathing to return to normal and relish the absence of tension in my muscles and bones. And as for that sceptical mind of mine? It's as if a tight strap around my forehead has been released – I feel lightheaded – but not in the least bit dizzy...