

Respiratory muscle warm-ups. Do they help running?

A coach's point of view.

(results of a BSc research project based partly at Denmead Striders)

Some of you may remember that I completed a project in 2009 for my BSc in Sports Science, with the help of two other students and a supervisor, looking at warming up the respiratory muscles prior to running a time trial. Previous studies had shown that this could help rowers and people doing shuttle runs, but noone had looked at distance running.

Fifteen people (11 men and 5 women) completed the project. It was set up to recreate what might happen at a race, with a warm-up followed by an unavoidable wait of a few minutes before the race start. In a race, it would not be possible to use the warm-up and run straight away, as was done in previous studies, because you have to either gather at the start line or in the warm-up area (if on the track) before the race. 3000 m was chosen as a practical distance that, although short, indicated distance running ability, and also a standard race distance. I also obtained my level 3 qualification, specialising in 3000 m, so that helped my understanding of what runners were experiencing.

Apart from a jog warm-up, the participants used a "Powerlung" respiratory trainer, which is available to buy and similar to a "Powerbreath" trainer. The Powerbreath was used by runners a few years ago before races, when it became known it might help sportsman, but without direct evidence for distance running. It is also likely that guesswork was involved, it didn't seem effective and the idea fell out of fashion somewhat.

However, the evidence still remained that it seemed to help runners go further in shuttle running (eg. a bleep test). This was partly because they felt less out of breath. My project revealed that in 3000 m running, the situation is far from clear. The numbers showed no average change in running using the respiratory warm-up.

However, this conceals many varied experiences by the runners and is a warning not to take "averages" too literally, but to think about the individual. Some felt their respiratory muscles were fatigued by the Powerlung and it slowed them down during the run, others felt it distracted them and they couldn't get their minds away from their breathing when running. Others felt nothing different and others felt it definitely helped them get into a strong, regular, breathing pattern and ran better.

Two different respiratory warm-ups were used, on different days. One was just inspiratory (breathing in), and the other inspiratory and expiratory (breathing both in and out) against the Powerlung resistance. The second warm-up had never been reported before in science, before sporting activity, so was unknown. The inspiratory warm-up made participants produce 5.7% more force breathing in, on average, but the new warm-up had no significant effect. However, this didn't transfer to better running, on average. But for individuals this may not be the case. Some could have been fatigued by the warm-up and it slowed them down, cancelling out those that improved.

There was another interesting finding. In general, studies have shown that sportsman tend to have stronger inspiratory muscles than people who don't exercise. However, my project showed that, in distance runners, there may be two competing forces. The one force is the benefit of having stronger respiratory muscles, to breathing, and the other is the need to be as light as possible. In my project, the better the runner, the weaker the respiratory muscles, which is against previous research for trained sportsman. However, it is not unreasonable to think a good distance runner would benefit more from being really light but sacrificing some respiratory muscular strength, in contrast to people from other sports like team sports. Unfortunately, it might mean that good distance runners are more likely to suffer fatigue trying to use a respiratory warm-up, since studies have shown that the weaker the muscles the easier they can be fatigued.

So the end result is a conundrum for the coach and runner. What does it tell us? Mine still remains the only published research examining respiratory warm-ups before distance running time trials. One reason for this might be that much of the earlier research in running showed that respiratory muscles don't get tired during running, so

scientists focussed on rowing, cycling or swimming, where they often do. Studies have also shown that distance running training improves the fatigue-resistance of respiratory muscles. In fact, one study showed that the ability to breath in and out powerfully, over a period of minutes, explained 27% of the variation between runners in 10 k running time. I have witnessed runners, after doing a few months marathon training, seeming to have slower, clearer and longer breaths in general. So it is tempting to think a warm-up is unnecessary. But what about the participants who were sure it helped them and the improved shuttle running?

In order to start to unravel this conundrum, I reviewed all the studies of inspiratory muscle fatigue in running and hoped to see how much influence both endurance running training and inspiratory muscle strength had on how fatigued the inspiratory muscles get in running. This might help pinpoint which individual runners might benefit from a warm-up. However, a supervisor wasn't available for me to pursue this in my MSc in Sports Performance, and it didn't happen.

Coach's advice:

The obvious advice is not to try the Powerbreath or Powerlung as a warm-up before a race. It is unpredictable and might slow you down. This doesn't mean that it couldn't help an individual. However, I suspect this might require very careful setting of the loading on the device (not overdoing it) and practice over a period of months so that it becomes part of a normal routine and doesn't pre-occupy you with your breathing, and allows a slight adjustment to breathing rate if necessary. It is also very important to distinguish between respiratory warm-ups before running and respiratory training away from the running, as the latter shows more promise and some good results.

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The detailed results of this study were presented to an audience of peers and academics at the BASES Student Conference on 30th March 2010. The published abstract is available on request from kevin.reeves@myport.ac.uk.