Breathing

I decided on my angle for this talk when I went for my first run in ages the other week and to be perfectly honest, I was out of breath rather quickly. It got me wondering just why it was that not exercising for a while affects the breathing so much and what the differences are between regular breathing in everyday life and breathing during exercise.

The first important point to note is that breathing and respiration are not technically the same thing.

The act of breathing is part of the respiratory system and is a process that allows air to travel into and out of the lungs. Respiration, on the other hand, is a chemical process in which exercise causes energy to be released from food (or more precisely glucose).

Importantly, there are two types of respiration – aerobic and anaerobic.

Aerobic respiration needs oxygen to work and is what we do in normal life.
It follows the simple equation:

Glucose + oxygen **=** carbon dioxide + water + energy

The energy produced is what allows muscles to move and warm-blooded mammals to maintain a constant body temperature. This type of respiration occurs when your body is producing enough oxygen to perform its function. As well as its use in everyday breathing, it is also the type of respiration used in gentle or endurance exercise.

Anaerobic respiration only occurs during hard exercise when the heart cannot get enough oxygen to cope with demand. The process releases glycogen, which is broken down into lactic acid and this is what causes muscle fatigue and pain in the muscles after a vigorous workout. This type of respiration does not need oxygen and therefore does not necessarily need us to be breathing, which causes us to pant after exercise to bring lots of oxygen into the system and break down the lactic acid.

So now we know that, what exactly happens to our breathing and respiration during exercise?

Our respiratory system (including the lungs, diaphragm and nasal cavity) works harder to meet the demands of the muscles and works with the cardiovascular system – heart, blood and blood vessels – to transport oxygen and carbon dioxide around the body.

During exercise, your adrenal gland produces more adrenaline and noradrenaline which improve our ability to transport oxygen and carbon dioxide. The hormones then influence the sympathetic nerves to stimulate the heart to beat stronger and faster.

The larger amount of oxygen and carbon dioxide also makes your rate of breathing increase. At rest, the normal adult respiratory rate is between 15 and 20 breaths per minute but often increases to 30-35 per minute during exercise. Lung volume also increases by up to 15 percent, which would bring the average resting capacity of 6 litres up to 6.9 litres.

Activity in our joints also promotes respiration. As the joints in your body move, nerve endings tell your brain to stimulate additional breathing. And particularly interesting for us, it's been proven that simply the act of anticipating exercise also increases our breathing rate.

Increasing the body's respiratory capacity through exercise improves the efficiency of the system, which explains why it was harder for me to breathe during my run the other week than it used to be when I was running regularly. A professional athlete training at his highest rate can increase his breaths from 15-20 per minute to around 40 to 60 breaths, according to the British Lung Foundation. That equates to 100 to 150 litres of air filling the lungs and emptying again every minute, which is a lot of oxygen.

For people running long distances, learning the difference between aerobic running and anaerobic running is essential. Your body needs to conserve as much fuel as possible so if you run faster than your aerobic threshold and start running anaerobically, you will burn through your fuel stores faster and more than likely hit the wall before you finish.

For sprinters, however, it's a different story. They run entirely anaerobically and require no extra oxygen during a race. In fact, during a 100m race some sprinters do not breathe at all until they have finished, which is why they need to gasp in more air after a race than a marathon runner does.

Another interesting area is mouth vs nasal breathing. We are advised here that breathing through the nose is preferable. But is that the same during exercise? There seems to be a lot of debate on this, with some articles on fitness or running websites advising short, shallow breaths to be taken through the mouth, which doesn't seem a very good idea to me.

So I looked at Malcolm Balk's book for his thoughts. He quotes writer John Douillard who states that mouth breathing is normally shallower, is associated with over-oxygenation of the blood and hyperventilation, and stimulates the sympathetic nervous system, which results in the fight or flight response.

Breathing through the nose, according to Douillard, allows air to be filtered and warmed; is generally deeper so brings more oxygen to our muscles; and tends to stimulate the parasympathetic nervous system, which helps calm us down. And particularly interesting for athletes, nasal breathing also usually helps lower the heart rate. All of this means performing with less stress and more efficiency.

So nasal breathing during moderate exercise seems preferable where possible. However, Malcolm warns against putting unnecessary effort into nasal breathing as it'll reduce many of the benefits you might experience. He advises being particularly mindful of sniffing in air and pulling our heads back and down.

His recommendation when it comes to breathing is to learn to release and lengthen your torso during the in-breath, which will allow your abdomen to respond to the rhythm of your breathing and provide the necessary support without needing to hold your stomach or breathe with the belly, as some people recommend. He also states that it's impossible to improve your breathing without improving your use.

Foods that are particularly good for lung health

Apples: Research has shown that good lung function is linked to higher consumption of foods containing vitamins C, E and beta-carotene. However, the only food that made a significant difference was apples. Eating five or more a week increases lung capacity by 138 millilitres on average, compared to those who didn't eat apples at all – a rise of around 2.5%. A 2008 study also found that eating one or more apples a day may reduce your risk for lung and colon cancer.

Fish: A study from 1994 looked at a diet high in fish consumption and its effects on asthma and other pulmonary diseases. The data showed a high dietary intake of fish is likely associated with higher levels of pulmonary function.

Red peppers: A 2003 study reviewed dietary data from more than 60,000 adults in Shanghai and found those who consumed the most beta-cryptoxanthin foods such as red peppers and pumpkin had a 27 percent decrease in lung cancer risk.
Red peppers also contain high levels of vitamin A ,and researchers at Kansas State University investigated the link between vitamin A and both lung inflammation and the lung disease emphysema. The study found laboratory animals fed a vitamin A-deficient diet developed emphysema, and a diet rich in the vitamin was able to counter the effect and reduce emphysema rates.

Wine: A paper published in 2002 looked at the effect wine has on the lungs. After analyzing the 30-day and lifetime alcohol consumption behaviours of the subjects in the study, the researchers were able to link higher rates of both red and white wine consumption to the best lung function test results. The researchers concluded that although a healthier lifestyle in wine drinkers might affect the results, the tests suggested that moderate wine intake may be good for your lungs.