What is VO2 Max?

Exercise Physiology Series:

This blog post marks the first in a small series of posts based around exercise physiology (how the body responds to physical activity and also, how the body then adapts to physical activity over time). In this first post, we will dive into VO2 Max.

What is VO2 Max?

For those that don't know what VO2 max is, it's defined as the maximum (max) volume (V) of oxygen (O_2) that your body is able to utilise, per minute. Typically, a VO2 Max 'score' is expressed as millilitres per kilogram of body mass per minute (ml/kg/min), resulting in a score of 10-90 ml/kg/min. The other measure sometimes used for VO2 Max is simply L/min (litres per minute) and is not relative to your body weight.

Oxygen is a critical ingredient in the respiratory process that's involved in breathing. As you breathe in oxygen, your lungs absorb it and turn it into energy called adenosine triphosphate (ATP) . ATP powers your cells and helps release the carbon dioxide (CO_2) that's created when you exhale (as part of the respiratory process). The benefits are simple: The greater your VO_2 max, the more oxygen your body can consume, and the more effectively your body can use that oxygen to generate the maximum amount of ATP energy. This means that your body can better handle aerobic fitness activities that require a lot of oxygen intake like running, swimming, cycling and other types of cardio.

Who should improve their VO_2 max?

As much as VO_2 max can be a good predictor of your athletic performance, it is not just for athletes. It is a way to determine cardiorespiratory fitness in anyone. Medical professionals can use it to determine your heart and lung health. Everyone, no matter their athletic ability, should try to increase their cardiorespiratory endurance. It is widely accepted that a lower VO2 Max score indicates a higher chance of mortality. In a study that Dr. Andy Galpin (PHD, professor of kinesiology at California State) conducted, they found that a VO2 Max score of 20-22 was the threshold of being able to live independently.

How to test your VO2 Max

The gold standard here is to visit a laboratory for your VO2 Max test, usually done on a treadmill or a stationary bike whilst wearing a mask that measures volume and gas concentrations of inspired and expired air. The test usually increases incrementally until exhaustion and is designed to achieve a maximal effort. You will also obtain your maximum heart rate from this test, which, along with resting heart rate, can be used to develop a more precise target heart rate range. This is more accurate than age-predicted equations.

There are testing protocols that can be done at home / in the gym which are fairly accurate. A 12 minute Cooper Test is a commonly used maximal test and the Rockport 1-mile Walk Test as a sub maximal test, which are both fairly accurate. The type of VO_2 max

test that’s best for you depends on your fitness level. You may do a simple walk/run test on a treadmill if you’re newer to exercise or have not exercised for some time.

How to train your VO2 Max

VO2 Max intervals typically last for 2-5 minutes at a time and are at a near maximal intensity, with a decent recovery window (2-4 minutes typically). One of the key factors here, in order to elicit the correct response from your body, is your heart rate. You should see your heart rate climbing up to the higher end of your capacity. Another method of improving your VO2 Max is with some shorter intervals with a partial recovery between (say 30s hard work with a 15s recovery between, repeated for multiple efforts). This style of interval training allows you to potentially work at higher intensities due to the short recovery between efforts, accumulating more time at higher intensities. The gold standard here is to build to 24-30 minutes of accumulated time of work intervals.