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## What Is VO2 Max and How Do You Improve Yours?



Unless you're a pro athlete, "VO<sub>2</sub> max" probably sounds like a formula you forgot from high school chemistry. But VO<sub>2</sub> max training is becoming more and more common as average-Jane exercisers are training like, well, athletes.

Below, your VO<sub>2</sub> max cheat sheet.

## What Is VO<sub>2</sub> Max?

As the intensity of your exercise increases, so does the amount of oxygen your body needs. That's because your body uses oxygen to generate energy (also known as ATP), which keeps you powered up while you're active, explains Thanu Jey, D.C., C.S.C.S. chiropractor and clinic director at [Yorkville Sports Medicine Clinic](#) in Toronto. You're familiar with the huff-and-puff that accompanies exercise so you know this—at least to some extent.

What you may not know is that there's a ceiling to just how much oxygen your body is capable of utilizing per minute. And that maximum oxygen intake is called your VO<sub>2</sub> max.

"VO<sub>2</sub> stands for volume (V) of oxygen (O<sub>2</sub>) and it's a numerical value that indicates the maximum amount of oxygen a person can intake per unit of time," explains [Niket Sonpal](#) M.D., gastroenterologist and adjunct professor at Touro College. "It is a good base indicator of a person's cardiorespiratory capacity."

It's expressed in milliliters of oxygen over kilograms of body mass per minute, which looks like this: ml/kg/min. "The higher the number, the more cardiovascularly conditioned you are—and the easier a longer workout will feel," says Allen Conrad, B.S., D.C., C.S.C.S. chiropractor at [Montgomery County Chiropractic Center](#) in North Wales, P.A.

What is a good VO<sub>2</sub> max? For women ages 18 to 45, the average VO<sub>2</sub> max is roughly between 35 and 46. For more elite athletes, it can be upward of 50 or even 60. (For a more detailed breakdown, Conrad suggests consulting [this VO<sub>2</sub> max chart](#).)

## How to Measure VO<sub>2</sub> Max

There are a couple of ways to measure your VO<sub>2</sub> max, each requiring different equipment.

### At-Home VO<sub>2</sub> Max Test

- Start by [finding your resting heart rate \(RHR\)](#)—either by counting how many times your heart beats in 60 seconds or by peaking at your [fitness tracker's](#) built-in heart-rate monitor.
- Then, figure out your max heart rate for your age using Karvonen Formula: 220 minus your age.
- Divide your max heart rate by your resting heart rate.
- Finally, take that number and multiply by 15. That's your VO<sub>2</sub> max score in ml/kg/minute.

### 12 Minute Walk/Run VO<sub>2</sub> Max Test

All you need for this test is a treadmill. This 12-minute walk/run test—created by the [Cooper Institute](#)—is the best way for someone without a coach or personal trainer to find their VO<sub>2</sub>max, says Austin Johnson, a fitness nutrition specialist and [Gold's Gym](#) fitness expert. Here's how:

- Warm up for at least 5 minutes.
- Then, use your best effort to walk/run as far as you can in twelve minutes. Try to maintain a steady pace throughout the test while covering as much distance as possible.
- Cool down for at least 5 minutes.
- Look up the distance you covered (during the 12-minute test only—not the warm-up or cool-down) on this [test results chart](#).

- Once you see what your cardiovascular fitness level is you can then take your distance covered and calculate your  $VO_2$  max with the following formula:  $VO_2 \text{ Max} = (\text{Distance covered in meters} - 504.9) \div 44.73$

## **$VO_2$ Max Mask Test**

The most official (and expensive) test involves a lab that specializes in sports performance exams, a breathing mask, and a [heart rate monitor](#). "The mask monitors and measures the rate and volume of oxygen and carbon dioxide that you breathe in and out as you use a cardio machine (like an elliptical machine, treadmill or stationary bike)," explains Dr. Sonpal. Here's how it works:

- Start off at a warm-up pace on the machine.
- Every few minutes, the intensity will increase (via speed, resistance, etc., depending on the machine).
- It will continue to increase until you've reached a peak and can no longer maintain the effort.

This maximum intensity point—measured by the machine and recorded as a number—is the point that you switched from aerobic respiration to anaerobic respiration, meaning you've transitioned from efficiently using oxygen to create energy to using either glycogen or creatine phosphate for energy, explains Vince Sant, Lead Trainer and Co-Founder of [V Shred](#). This will give you your official  $VO_2$  max.

The machine also measures your heart rate and will record what your heart rate is when your  $VO_2$  max is reached. This HR recording is important because "it's the heart rate that correlates with your max  $VO_2$ ," says Jon de la Torre, a certified personal trainer with [DIAKADI](#) in San Francisco. More on that below. (Related: [You Should Be Doing These 3 Types of Cardio](#))

# Why Your VO<sub>2</sub> Max Matters

Your VO<sub>2</sub> max is a really good indication of cardiovascular fitness and endurance, says Johnson.

"Athletes who participate in endurance sports and activities would benefit the most from knowing and caring about their VO<sub>2</sub> max," says Jey. So if you're looking to shave off a few seconds of your 5K, run a sub-4-hour marathon, or get a faster [Murph](#) time, a high VO<sub>2</sub> max could help you get there.

That said, it's only one factor of fitness alongside other factors like [muscular strength and endurance](#), mental toughness, and [mobility](#). Improving your VO<sub>2</sub> max won't help you with anaerobic (meaning, oxygen-less) feats of fitness like a heavier [one-rep max](#), higher vertical jump, or a 100-meter sprint. (Related: [How to Train Your Anaerobic and Aerobic Energy Systems](#)).

Even if you aren't training like an athlete, having a good VO<sub>2</sub> max is good for your general health, says Conrad. Basically, the higher your VO<sub>2</sub> max, the less work your lungs and heart have to do to keep you alive. (Related: [5 Simple Ways To Prevent Heart Disease](#)).

## Can You Improve Your VO<sub>2</sub> Max?

There are some factors (other than training) that contribute to your VO<sub>2</sub> max—such as age, gender, and genetics—that you have no control over, explains Sant. But there are others—such as your training level, the type of training, the location or altitude levels where you're training, and your overall mass—you can control.

To increase your VO<sub>2</sub> max, "find out what your current VO<sub>2</sub> max is and your correlated heart rate at that point, then spend more time [training at that heart-rate intensity](#)," says de la Torre.

Higher VO<sub>2</sub> max scores are associated with endurance sports like running, cycling, and rowing, because they place a higher demand on your cardiovascular system, so endurance workouts will help increase your max as well, says de la Torre. (Related: [The Track Workout That Increases Endurance and Helps You Run Faster](#)).

[Research](#) has found that HIIT training can also "significantly enhance" your VO<sub>2</sub> max. "HIIT places increased demands on the heart and lungs, which forces the body to adapt and raises the volume of oxygen processed," says Conrad. (Try this [8-minute full-body HIIT workout](#), this [lower body HIIT workout to get started](#), or any of these high-intensity [CrossFit WODs](#).)

Your VO<sub>2</sub> max won't go up immediately. You'll need to train at the limits of your maximum value for weeks and even months. You should wait at least 30 days before retesting your VO<sub>2</sub> max to see any progress, says Johnson. Depending on your fitness goals, it may be well worth the effort.

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