

VO₂ Max Chart

Patient information

Name:

Age:

Gender:

Date of birth:

Height:

Weight:

Test information

Use the calculation section on the next page to get the patient's VO₂ max data. To get the rating, use the reference chart values to compare their results to normative data.

VO₂ max test method:

VO₂ max:

Rating:

- ☐ Superior
- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

Notes

Signature:

Date:

VO₂ Max Chart

Calculation

Utilize one of the following formulas to get your patient's VO₂ max.

Note: This is not an exhaustive list of formulas and methods used to estimate a patient's VO₂ max. Various additional approaches and techniques exist. Each method has its own level of accuracy and applicability depending on the resources, population, and context in which it is used.

Fick equation

The Fick equation defines VO₂ as the product of cardiac output (Q) and the difference between arterial and venous oxygen content at the capillary level (a-vO₂diff):

$$VO_2 \text{ max} = Q \times (CaO_2 - CvO_2)$$

Here, VO₂ max represents oxygen consumption at maximal exertion, Q denotes cardiac output, CaO₂ refers to arterial oxygen content, CvO₂ indicates venous oxygen content, and (CaO₂ - CvO₂) is the arterio-venous oxygen difference.

During incremental exercise to maximal effort, Q increases linearly in a pattern similar to VO₂. Some studies suggest that improvements in VO₂ max are primarily attributed to enhancements in Qmax rather than changes in a-VO₂ diff.

Q:

CaO₂:

CvO₂:

VO₂ max:

Heart-rate method

The heart-rate method formula provides an estimate of VO₂ max based on the relationship between maximum and resting heart rates. This method is simple and non-invasive, making it accessible for estimating aerobic fitness without the need for direct oxygen consumption measurements. The formula is:

$$VO_2 \text{ max} \approx (HR_{\text{max}} / HR_{\text{rest}}) \times 15.3 \text{ mL}/(\text{kg} \cdot \text{minute})$$

Where:

- **HRmax** = Maximum heart rate
- **HRrest** = Resting heart rate
- **15.3 mL/(kg·minute)** is a constant used in the calculation.

This formula provides an approximate value for VO₂ max based on heart rate measurements.

HRmax:

HRrest:

VO₂ max:

Cooper test

The Cooper Test formula estimates $\text{VO}_2 \text{ max}$, which is a measure of aerobic fitness, based on the distance covered during a 12-minute run. Here's an explanation of the two formulas:

For distance in meters:

$$\text{VO}_2 \text{ max} \approx 44.73d_{12} - 504.9$$

- **d12:** The distance you covered in 12 minutes, measured in meters.
- **504.9:** A constant that adjusts for baseline oxygen consumption.
- **44.73:** A scaling factor that converts the difference into units of $\text{mL}/(\text{kg} \cdot \text{min})$.

The formula subtracts 504.9 from the measured distance and divides by 44.73 to estimate the $\text{VO}_2 \text{ max}$.

For distance in miles:

$$\text{VO}_2 \text{ max} \approx (35.97 \times d_{12}') - 11.29$$

- **d12:** The distance you covered in 12 minutes, measured in miles.
- **35.97:** A constant used to scale the distance into $\text{VO}_2 \text{ max}$ units.
- **11.29:** A constant subtracted to adjust for baseline oxygen consumption.

This formula multiplies the distance in miles by 35.97, then subtracts 11.29 to estimate the $\text{VO}_2 \text{ max}$.

d12:

$\text{VO}_2 \text{ max}$:

Rockport fitness walking test

The Rockport formula estimates $\text{VO}_2 \text{ max}$ based on data collected during a one-mile walk performed as fast as possible:

$$\text{VO}_2 \text{ max} \approx 132.853 - 0.0769 \cdot \text{BW} - 0.3877 \cdot \text{age} - 3.2649 \cdot t - 0.1565 \cdot \text{HR} + x$$

- **32.853:** A constant representing a baseline $\text{VO}_2 \text{ max}$ value.
- **BW:** Body weight in pounds
- **0.0769:** This factor adjusts $\text{VO}_2 \text{ max}$ downward for heavier individuals, as body weight impacts oxygen utilization efficiency.
- **Age:** Age in years
- **0.3877:** Reduces $\text{VO}_2 \text{ max}$ to account for the natural decline in aerobic capacity with age.
- **t:** Walk time in decimal
- **3.2649:** Penalizes longer completion times, as faster walkers generally have higher aerobic fitness.
- **HR:** Heart rate in beats per minute
- **0.1565:** Accounts for the relationship between recovery heart rate and fitness; a lower post-exercise heart rate indicates better aerobic fitness.
- **x:** sex-specific constant (6.3150 for males and 0 for females.) Adjusts $\text{VO}_2 \text{ max}$ upward for males due to higher average aerobic capacity compared to females.

BW:

HR:

Age:

X:

t:

$\text{VO}_2 \text{ max}$:

VO₂ Max Chart

Reference values

Typical VO ₂ max for males measured in mL/kg/min						
Age	20–29	30–39	40–49	50–59	60–69	70–79
Superior	55.4	54	52.5	48.9	45.7	42.1
Excellent	51.1	48.3	46.4	43.4	39.5	36.7
Good	45.4	44	42.4	39.2	35.5	32.3
Fair	41.7	40.5	38.5	35.6	32.3	29.4
Poor	<41.7	<40.5	<38.5	<35.6	<32.3	<29.4

Typical VO ₂ max for females measured in mL/kg/min						
Age	20–29	30–39	40–49	50–59	60–69	70–79
Superior	49.6	47.4	45.3	41.1	37.8	36.7
Excellent	43.9	42.4	39.7	36.7	33	30.9
Good	39.5	37.8	36.3	33	30	28.1
Fair	36.1	34.4	33	30.1	27.5	25.9
Poor	<36.1	<34.4	<33	<30.1	<27.5	<25.9

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