

Factors that affect $\text{VO}_2 \text{ max}$

Structural/physiological factors

The following factors are seen where the body has changed and adapted as a result of training to improve the way oxygen is utilised by the muscles:

- Increased maximum cardiac output.
- Increased stroke volume/ejection fraction/cardiac hypertrophy.
- Greater heart-rate range.
- Less oxygen being used for heart muscle, so more available to muscles.
- Increased levels of haemoglobin and red blood cell count.
- Increased stores of glycogen and triglycerides.
- Increased myoglobin content.
- Increased capillarisation around the muscles.
- Increased number and size of mitochondria.
- Increased surface area of alveoli.
- Increased lactate tolerance.
- Reduced body fat ($\text{VO}_2 \text{ max}$ increases as the percentage of body fat decreases).
- Slow-twitch hypertrophy.

Lifestyle

Smoking, a sedentary lifestyle, and poor diet and fitness can all reduce $\text{VO}_2 \text{ max}$ values.

Training

$\text{VO}_2 \text{ max}$ can be improved by up to 10–20% through aerobic training (e.g. continuous, fartlek or aerobic interval training).

Genetics

Inherited physiological factors may limit possible improvement.

Body composition

A higher percentage of body fat decreases $\text{VO}_2 \text{ max}$.

Gender

Men generally have a $\text{VO}_2 \text{ max}$ that is 10–15 ml/kg/min higher than women.

Differences in age

As we get older, our $\text{VO}_2 \text{ max}$ declines as our body systems become less efficient.

Age

$\text{VO}_2 \text{ max}$ peaks in the early 20s and declines 1% per year thereafter

Training

Contributes 5–20% to a $\text{VO}_2 \text{ max}$ measure

Gender

Males have 10–15 ml/kg/min higher $\text{VO}_2 \text{ max}$

Altitude

Higher altitudes have lower partial pressures of O_2 so reduce $\text{VO}_2 \text{ max}$

Genetics

Genetic factors contribute 20–30% to a $\text{VO}_2 \text{ max}$ measure

Heat

Higher temperatures reduce $\text{VO}_2 \text{ max}$, as the body has to work harder to thermoregulate

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