Oxygen Uptake (VO_{2max} and submaximal) Testing

Maximal oxygen uptake (VO_2 max) is widely accepted as the single best measure of cardiovascular fitness and maximal aerobic power. Absolute values of VO_2 max are typically 40-60% higher in men than in women.

The average untrained healthy male will have a VO_2 max of approximately 35–40 mL/(kg·min). The average untrained healthy female will score a VO_2 max of approximately 27–31 mL/(kg·min). These scores can improve with training and decrease with age.

In one study, 90% of participants showed substantial benefit after completing a 20-week conditioning program,.

Accurately measuring VO_2 max involves a physical effort sufficient in duration and intensity to fully tax the aerobic energy system. In general clinical and athletic testing, this usually involves a graded exercise test (either on a treadmill or on a cycle ergometer) in which exercise intensity is progressively increased while measuring ventilation and oxygen and carbon dioxide concentration of the inhaled and exhaled air. VO_2 max is reached when oxygen consumption remains at steady state despite an increase in workload.

Tests measuring VO_2 max can be dangerous in individuals who are not considered normal healthy subjects, as any problems with the respiratory and cardiovascular systems will be greatly exacerbated in clinically ill patients. Thus, many protocols for estimating VO_2 max have been developed for those for whom a traditional VO_2 max test would be too risky. These generally are similar to a VO_2 max test, but do not reach the maximum of the respiratory and cardiovascular systems and are called sub-maximal tests.

VO_2Max Norms Chart

Age	Women	Low	Fair	Avg.	Good	High	Athletic	Olympic
	20-29	<28	29-34	35-43	44-48	49-53	54-59	60+
	30-39	<27	28-33	34-41	42-47	48-52	53-58	59+
	40-49	<25	26-31	32-40	41-45	46-50	51-56	57+
	50-65	<21	22-28	29-36	37-41	42-45	46-49	50+
	Men							
	20-29	<38	39-43	44-51	52-56	57-62	63-69	70+
	30-39	<34	35-39	40-47	48-51	52-57	58-64	65+
	40-49	<30	31-35	36-43	44-47	48-53	54-60	61+
	50-59	<25	26-31	32-39	40-43	44-48	49-55	56+
	60-65	<21	22-26	27-35	36-39	40-44	45-49	50+