

## SPORT-SPECIFIC CONDITIONING CONSULTANTS

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### **VO2max Training for Cross Country Skiing**

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VO2max is a measure of an athlete's maximal oxygen consumption (measured in volume / ml of Oxygen consumed per kilogram of body weight per minute - ml of Oxygen / kg /min), and is directly correlated to successful cross-country skiing performance. Simply put, as an athlete improves their oxygen consumption, the more energy they can produce, and the longer they can work / exercise / ski before they reach a point of fatigue. To avoid a lengthy discussion on energy system pathway physiology, the recreational and competitive skier must be aware that while they are skiing they are transitioning between aerobic and anaerobic energy pathways.

Aerobic energy metabolism generates Adenosine Triphosphate (ATP), the body's energy molecule when oxygen is present. This is considered to be your endurance energy pathway, as, as long as there is oxygen present, you can keep producing energy to keep you going. Anaerobic energy metabolism generates ATP when not enough oxygen is present to satisfy all of your energy demands, such as when you do something very quickly like sprinting, ski climbing, or when at altitude. A skier's energy production is facilitated by a continuous transition between aerobic and anaerobic energy pathways, their required substrates (nutrition), and the recovery from their associated by-products. The better conditioned the skier, the more efficient the transition between energy systems, the faster the recovery, and the greater the energy production. Long story short, the better the conditioning of the skier, the stronger, faster and more efficient the skier.

The best way to optimize energy system development is through Interval or Fartlek style training. This style of training consists of segmenting a training session into different blocks, or intervals. Intervals are set at varying intensities, completed for various lengths of time. An effective interval program will consist of sequential training blocks followed by periods of rest. The aerobic and anaerobic adaptive training response will be specific to the intensity of the work to rest ratios within the training session. According to the SAID principle (Specific Adaptations to Imposed Demands) the body will adapt to the demands that are placed upon it. If you are a cross country skier who likes ski climbing or who likes to do hill based tours, an appropriate interval program would include training on hills, or mimicking them through high intensity sprint ski sessions. By working at these high intensity levels in training, your body will be better prepared for them while on the trail. During the summer months cross-training on an elliptical trainer, modified skis with wheels, or other aerobic training can improve a skier's cardiovascular performance and VO2max profile.

VO2max, as mentioned, is the max amount of Oxygen that can be utilized per kilogram of tissue per minute. As your training intensities increase, you force your more Oxygen into the lungs, which re-oxygenate the blood, which get pumped through the heart to the working muscles. The more this happens, the more the body adapts, and the more Oxygen you can pump through the system, increasing your VO2max. In addition to improvements in Oxygen utilization, high exercise intensities also increase caloric expenditure, fat loss and muscle development. The accumulated effects of this style of training produces a skier who is lighter, stronger and more efficient. While VO2max will not determine your skiing mechanics or technique, a low VO2max will hold a good skier back from reaching their performance capabilities.

If you are looking to have your VO2max tested, contact Performance Training Systems Director Eric MacLean at [eric@performancetrainingsystems.net](mailto:eric@performancetrainingsystems.net).