

VO₂ Priming: How Skiers Can Boost Race Performance

What Is VO₂ Priming?

VO₂ priming is a special type of warm-up that helps skiers perform better in races. It gets the body ready to use oxygen faster and more efficiently during high-intensity efforts.

Alpine ski racing demands short, powerful runs that last about 60 to 90 seconds. During that time, racers use both the **aerobic system** (which uses oxygen for energy) and the **anaerobic system** (which works without oxygen). VO₂ priming helps both systems perform at their best.

Leading sport scientists — **Bob Poehling, Sue Robson, and Andy Walshe** — have studied VO₂ priming and used it with elite skiers. Their research shows that a short, intense warm-up before racing can increase blood flow, improve oxygen delivery, and delay fatigue. The goal is to feel ready from **the push out of the gate to the finish**.

Why Oxygen Matters

VO₂ stands for “volume of oxygen.” It’s the amount of oxygen your body can use during exercise.

Your **VO₂ max** is your maximum capacity — how much oxygen you can use when working as hard as possible. Skiers with higher VO₂ max values can perform at a high level longer because their muscles get more oxygen and recover faster.

How VO₂ Priming Works

VO₂ priming means doing a short, hard exercise before a race or hard workout.

It wakes up your heart, lungs, and muscles so your body can reach full oxygen use faster once the race begins. Without priming, oxygen delivery takes longer to catch up when you start working hard, which can make your legs feel heavy at the beginning of a run.

When done correctly, priming speeds up how fast your body brings oxygen to your muscles. This helps you stay powerful longer and delay the feeling of fatigue.

Expert-Recommended Warm-Up

Poehling, Robson, and Walshe recommend that athletes spend **two to three minutes at or above lactate-threshold heart rate** within **20 minutes before** the start of their race. That means working hard enough to breathe heavily, but not so hard that you feel exhausted.

Here are examples of effective VO₂ priming activities:

- **Short bike efforts:** 2–3 minutes of high-resistance cycling followed by easy pedaling.
- **Fast ski movements:** short bursts of skating steps, hops, or tucks on flat terrain.
- **Short intervals:** 20–30 seconds of strong effort, then light movement to recover.
- **Dynamic activation:** arm and **leg swings**, lunges, and squats to loosen up.
- **In the start area:** light jogging, small jumps, or short pole pushes to stay alert without building fatigue.

The goal is to raise heart rate and breathing, not to tire yourself out. Afterward, keep moving easily and stay warm while waiting for your start.

What Science Shows

Researchers use **near-infrared spectroscopy (NIRS)** to measure oxygen in the muscles during warm-ups and exercise. NIRS data show that after a short, high-intensity effort, muscle oxygen levels not only recover — they actually rise above the starting level.

This “oxygen overshoot” helps muscles deliver oxygen faster and more efficiently during the next effort, such as a race run.

That means the primed athlete starts stronger, maintains power longer, and recovers more effectively after the run.

How to Apply It in Ski Racing

For skiers, VO₂ priming fits naturally into pre-race warm-ups. After a general warm-up (like jogging or cycling), racers can do short, controlled bursts of high effort followed by easy recovery.

This can be done at the base area or closer to the start, depending on the race setup. Just before the start, athletes often repeat **leg swings**, a few strong **pole pushes**, or short **tuck drives** to re-activate the muscles and focus their energy.

These actions keep the body “ready” without adding fatigue.

Takeaway

VO₂ priming is a proven way to improve race performance.

By adding a short, high-effort warm-up and keeping the body active until the start, skiers can increase oxygen use, delay fatigue, and stay powerful all the way down the course.

When used properly, it helps athletes feel more confident, focused, and strong — from the **first gate to the finish line**.