

Secret to performing at altitude – train your diaphragm

By Alex Hutchinson, Outdoors

Five years ago, as the members of a British military expedition trekked up the Barun Valley in Nepal toward 27,766-foot Makalu, the world's fifth highest peak, the levels of oxygen in their blood began to drop – a normal but troublesome physiological response to the thin air of altitude. By the time they reached Base Camp, at just over 16,000 feet, their arterial oxygen saturation was 20 percent lower than it had been at sea level.

Not everyone felt the same effect, though. Fourteen of the climbers had volunteered to be part of a study run by Mitch Lomax, an exercise physiologist at the University of Portsmouth. And half of those volunteers were randomly assigned simple exercises to strengthen the muscles involved in breathing – a technique called inspiratory muscle training – for four weeks leading up to the expedition. When the IMT group got to Base Camp, they had desaturated by only 14 percent, a significant six-percent advantage over the control group that persisted as they kept climbing to the advanced base camp at over 18,000 feet.

Lomax's results, which were published in the journal *Aviation, Space, and Environmental Medicine* in 2010, sparked interest from guides, climbers, and other mountain athletes who all wondered: Can you beat the energy-sapping effects of altitude by strengthening your breathing muscles?

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