

Study: Extreme exercise can lead to mitochondrial functional impairment

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A team of researchers from the Swedish School of Sport and Health Sciences and the Karolinska Institutet, has found that people who go to extremes when exercising can go too far, resulting in mitochondrial functional impairment and insulin resistance. In their paper published in the journal *Cell Metabolism*, the group describes exercise experiments they conducted with volunteers and what they learned from them.

One of the things most people hear from their doctors is a suggestion to get more exercise. But in this new effort, the researchers have found that there is a limit to what the body can endure—too much training, they found, can lead to [insulin resistance](#) and mitochondrial functional impairment.

To learn more about the way the body responds to exercise, the researchers developed an extreme regimen to test the boundaries of seriously pushing the body to its limits. They then enlisted the assistance of 11 healthy young volunteers who were already keeping themselves in shape using some form of exercise.

The experiment had three phases. Volunteers rode exercise bikes for certain amounts of time over a four-week period. In the first phase, all the volunteers engaged in high-intensity pedaling for four- to eight-minute intervals over 36 minutes. In the second phase, duration of the workout was bumped up to 90 minutes. And in the third phase, it was bumped to 152 minutes over a week. During the experiments, the researchers collected muscle biopsies from each of the volunteers to measure mitochondrial function. Each [volunteer](#) also underwent glucose measurements to monitor insulin resistance.

The researchers found, as expected, that insulin remained at [normal levels](#) for phases one and two of the experiment. They also found that mitochondrial function improved over the first two phases, which was also expected—prior research has shown that normal exercise is good for mitochondrial function. But for phase three, they found that most of the volunteers experienced insulin resistance similar to a person developing diabetes. They also found that mitochondrial respiration fell by an average of 40% for the volunteers compared with samples collected during phase one of the experiment.

The researchers also found that [oxygen consumption](#) improved overall for the volunteers during the experiment, as did power output levels. But in an interesting twist, mitochondrial respiration did not fully recover after a week of normal [exercise](#).

More information: Mikael Flockhart et al. Excessive exercise training causes mitochondrial functional impairment and decreases glucose tolerance in healthy volunteers, *Cell Metabolism* (2021). [DOI: 10.1016/j.cmet.2021.02.017](https://doi.org/10.1016/j.cmet.2021.02.017)

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