# Study finds intense training sessions temporarily impair mitochondrial function

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New research finds elite athletes have temporary mitochondrial impairment after intense workouts, suggesting they may need to be mindful about overtraining. The study is published ahead of print in the

*Journal of Applied Physiology*.

Mitochondria, the "powerhouses of the cells," are structures that produce energy in the body. Mitochondrial capacity is a term used to describe the body's ability to generate energy. Greater mitochondrial capacity is one factor associated with increased athletic performance during endurance exercise. Previous research by scientists in Denmark and Sweden found that untrained recreational athletes had a decrease in mitochondrial capacity after sprinting exercises.

In the research team's new study, the researchers worked with a small group of male elite athletes, many of whom held national titles or were internationally recognized for their performance in cycling and triathlon. The athletes participated in a four-week training program in their primary sport that consisted of two to four days of low-to-moderate–intensity endurance workouts, followed by three days of more intense training. The intense workouts included high-intensity interval training in the morning, followed by a seven-hour break and then a moderate-intensity cycling session in the afternoon. The total number of activity hours ranged between 12 and 20 per week for each volunteer. Though the men were used to heavy training, they were not accustomed to this specific workout schedule.

To the research team's surprise, the highly trained participants' mitochondrial capacity was impaired after the month-long training period. "We thought that elite athletes should be more resistant against [these] kind of alterations," said Filip Larsen, Ph.D., of the Swedish School of Sport and Health Sciences and corresponding author of the study.

Elite athletes may be able to prevent temporary mitochondrial impairment by listening to their bodies. Paying attention to changes such as "mood disturbances, reductions in maximal heart rate [during exercise

] and muscles that feel heavy and unresponsive" may help top athletes pull back and avoid overtraining situations that could contribute to reduced mitochondrial content and function, Larsen explained. "Exercise is good for you, but too much unaccustomed training might have mitochondrial consequences."

Other findings of the study included:

- Reduced mitochondrial capacity did not affect exercise performance, which may indicate that oxygen delivery from the heart to the muscles plays a more important role than mitochondrial function in performance.
- Expression of three proteins with strong antioxidant properties increased in the muscles after intense training.

"Short term intensified training temporarily impairs mitochondrial respiratory capacity in elite endurance athletes" is published ahead of print in the *Journal of Applied Physiology*.

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