

# Heat exhaustion more likely to strike athletes who use nicotine, study finds

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Olympic athletes with a nicotine habit, beware. New Brock-led research has found nicotine consumption—whether smoking, chewing, vaping or even wearing a patch—raises the risk of developing heat exhaustion

while undergoing intense physical activity, especially when doing so in a hot environment.

The [latest study](#), published in the *Journal of Applied Physiology*, by Brock University Kinesiology Professor Toby Mündel, conducted alongside an international research team, comes just days before the opening ceremonies of the Paris 2024 Summer Olympics.

The findings are particularly relevant, as Mündel's previous research has shown a high rate of [nicotine](#) use among [elite athletes](#). "Also, [climate change](#) has exacerbated temperatures in northern hemisphere summers," says Mündel, Canada Research Chair in Extreme Human Environments.

He says the last Summer Olympics in Tokyo, Japan, "was the hottest, most humid Olympics on record," with the upcoming Games in Paris forecasted to potentially break those records once again.

Holding an Olympics in an urban setting with limited greenspace and lots of pavement and concrete—which absorbs heat—adds to the risk of [heat exhaustion](#) for athletes and the audiences watching them, he says.

Mündel and his team wanted to find out whether nicotine raises body temperature—as measured by the temperature of the gastrointestinal system—primarily by increasing metabolism or decreasing blood flow to the skin.

Drawing from studies showing that former smokers tend to gain weight when they stop smoking, Mündel says they determined that "nicotine appears to accelerate a person's metabolic rate, basically increasing how many calories you burn."

Other studies also found that nicotine constricts blood vessels so that less blood flows to the skin. Blood flow to the skin enables the body to

release heat and supplies the fluid for sweat. If this is restricted, the body can overheat, he says.

Ten male research participants who had never used nicotine wore a nicotine patch overnight, and then repeated this wearing a placebo patch. Neither the participants nor the researchers knew when they received active and inactive patches.

The next day, participants cycled for one hour in environments of 20°C and again in 30°C. After each trial, researchers measured participants' gastrointestinal and skin temperatures. The experiment was repeated four times.

Two participants had to leave the 30°C nicotine trials, as one had reached the maximum ethical limit for gastrointestinal temperature and the other stopped due to "nausea and chills."

Through their various measurements of skin blood flow and the gastrointestinal system, the team concluded nicotine use increases [heat stress](#), leading to heat exhaustion, by reducing the flow of blood to the skin.

Mündel says the study's results are not only relevant for athletes but for others who work in high-temperature environments, including military, firefighters and some industries.

Mündel says he is sometimes asked whether nicotine use among athletes should be partially or fully banned. He notes nicotine stays in the body for a while, so a ban in the hours or days leading up to a competition may not be effective.

It's crucial athletes and audiences drink plenty of water and keep their hydration levels high, he says.

**More information:** Nicole E. Moyen et al, Nicotine exacerbates exertional heat strain in trained men: A randomized, placebo-controlled, double-blind study, *Journal of Applied Physiology* (2024). [DOI: 10.1152/jappphysiol.00403.2024](https://doi.org/10.1152/jappphysiol.00403.2024)

Provided by Brock University

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