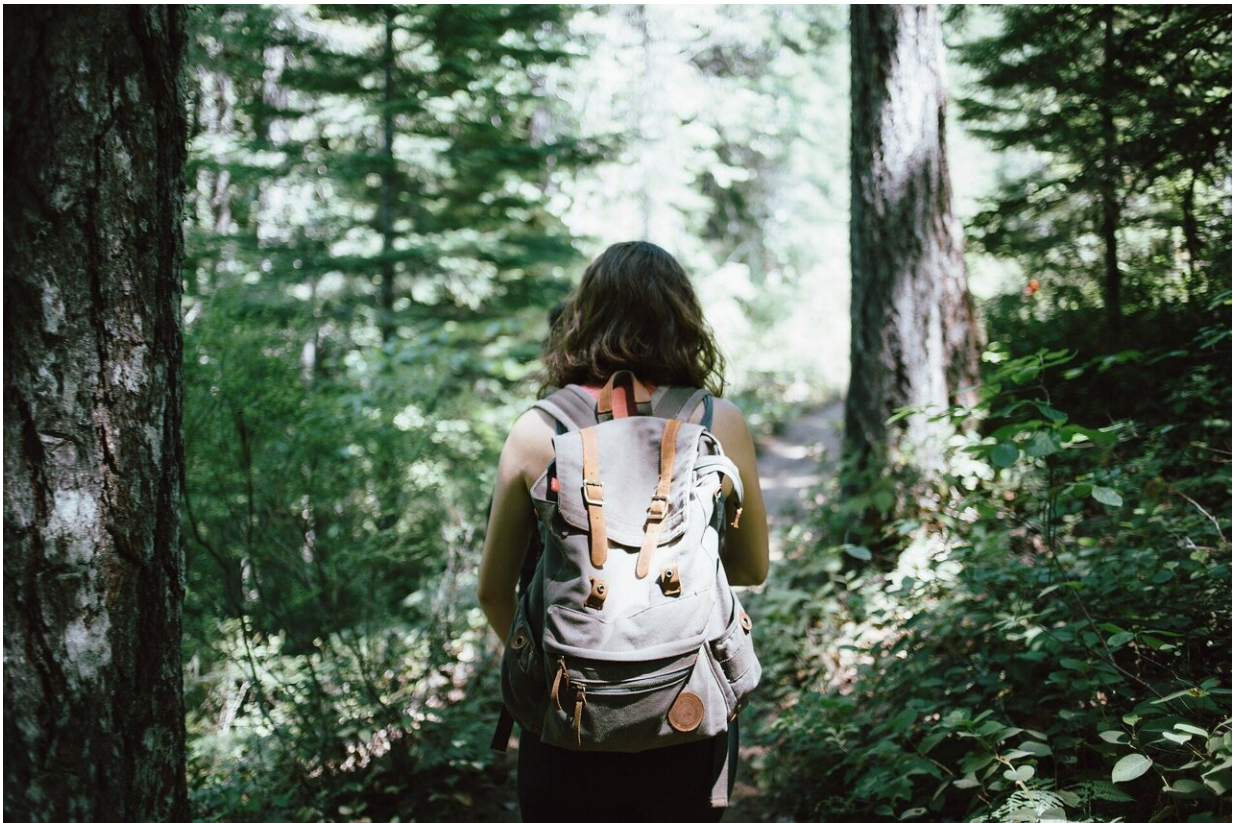


Why hydration is so important when hiking in the heat of summer

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You don't have to be an experienced trailblazer to know that if you choose to hike in the heat, you better be hydrated. Yet scientific literature on the subject reports that roughly 25% of heat-related illness

cases are a result of a fluid imbalance, rather than heat exposure alone.

New research out of Arizona State University seeks to understand exactly what is going on in the body as it responds to heat stress, looking in particular at hydration levels, core temperature and sweat loss, in the hopes of developing interventions and best practices for those whose mountainous wanderlust just can't be quenched.

The findings of one such related study, recently published in the *International Journal of Environmental Research and Public Health*, show that compared to moderate [weather conditions](#), hikers' performance during hot weather conditions was indeed impaired, resulting in slower hiking speeds and prolonged exposure to the elements, thus increasing their risk of heat-related illness.

Perhaps most telling, though, the research team found that most hikers did not bring enough [fluid](#) with them on their hike to compensate for their sweat loss. They also found that less aerobically fit participants were most negatively affected by heat stress and performed worse overall compared to their more aerobically fit counterparts.

"The current guidelines for hikers in general are very broad and geared more toward safety than quantifying the adequate amount of fluid they need," said ASU College of Health Solutions Assistant Professor Floris Wardenaar, corresponding author on the paper. "The guidelines also do not take into account fitness levels or the importance of incremental exposure to the heat, which can be affected by acclimatization to specific environments and weather conditions."

Former College of Health Solutions master's degree students Joshua Linsell and Emily Pelham are the first and second authors of the paper, followed by School of Geographical Sciences and Urban Planning Assistant Professor David Hondula and Wardenaar.

In their study, 12 participants—seven women and five men in their 20s—were asked to hike "A" Mountain on a moderate day (68 degrees Fahrenheit) and then again on a hot day (105 degrees Fahrenheit). They were told to prepare as they normally would, bringing however much fluid they thought they would need, and were asked to hike as quickly as possible without becoming uncomfortable. Each time, they hiked up and down the mountain four times, which adds up to roughly the same distance and incline as Camelback Mountain, one of the most popular hiking destinations in the Phoenix area that sees its fair share of heat-related illness cases.

Before their trek, participants' resting metabolism was recorded to estimate their energy production during the hike. Their weight, [heart rate](#), core temperature and hydration status were measured before and after the hike, and their drinking behavior—how much or how little fluid they consumed—was monitored throughout.

Using that data, researchers were able to calculate participants' rate of sweat loss through their bodyweight reduction, which averaged out to about 1%, whether conditions were hot or moderate.

"The 1% bodyweight reduction had different reasons," Wardenaar said. "During hot conditions, participants' sweat rates were higher while drinking more, often resulting in consuming all of the fluid brought, whereas during moderate conditions, sweat rates were lower, but participants drank less. A 1% bodyweight loss is considered manageable and not likely to result in detrimental performance decline. My concern is that when people hike longer than 80 to 90 minutes in hot conditions that they will not bring enough fluid, resulting in larger bodyweight losses."

Overall, compared to moderate conditions, hot conditions significantly impaired hiking performance by 11%, reduced aerobic capacity by 7%,

increased rate of perceived exertion by 19% and elevated core temperature. On average, participants took about 20 minutes longer to complete the hike during hot conditions than during moderate conditions, which theoretically could exponentially increase the chance of developing heat-related illness.

"Heat slows you down," Wardenaar explained. "This means that what you normally can hike in 75 minutes under moderate conditions may take up to 95 minutes in the heat. That is something that people should take into account, especially when their hike will substantially exceed the 90 minute cut-off."

Based on their findings, Wardenaar suggests preparing for a hike by familiarizing yourself with your personal hydration needs. You can do so by multiplying your weight before the hike by .01, then subtracting your weight after your hike from your starting weight. If the difference between your starting weight and your ending weight is greater than the product of your starting weight multiplied by .01, you need to be drinking more fluid during your hike.

It's also important to be well-hydrated before you even get out on the trail, Wardenaar said. And avoid alcohol, as it can contribute to dehydration.

More information: Joshua D. Linsell et al, Hiking Time Trial Performance in the Heat with Real-Time Observation of Heat Strain, Hydration Status and Fluid Intake Behavior, *International Journal of Environmental Research and Public Health* (2020). [DOI: 10.3390/ijerph17114086](https://doi.org/10.3390/ijerph17114086)

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