Research reveals heat stress risks for construction workers

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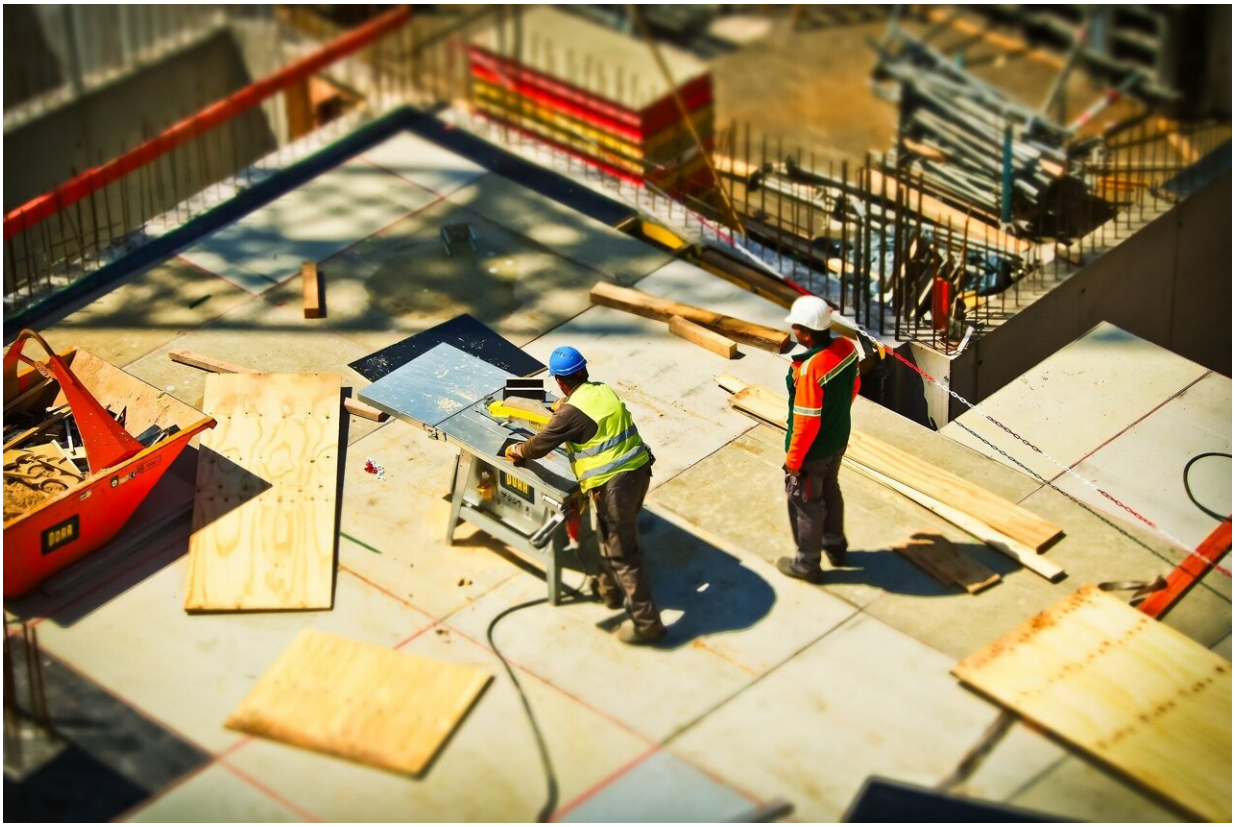

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One of the first steps towards improving anything is awareness. Risks, dangers, and problems can often be resolved, as long as someone is waving the red flag.

That's exactly the reason why College of Education & Human Sciences (COEHS) Exercise Science Professor Fabiano Amorim conducted a study last summer with construction workers. Although the study has not yet been published, it has been submitted for presentation at a conference, and the team is actively working on the manuscript for publication. The study is titled " Environmental Heat Stress and Physiological Heat Strain in Construction Workers During Work in the Summer."

As the title indicates, Amorim led and advised the research team (made up of Indiana University and La Isla Network) in its goal to uncover the impact of summer temperatures on construction workers. What he found indicates a need for more than water breaks to keep workers safe under heat stress.

"My experience with heat stress in an occupational setting started in Brazil, studying heat stress in sugarcane workers or cutters. When I came to the U.S., I wanted to identify occupations particularly susceptible to the challenges of working in hotter environments. While there was already substantial data available for agriculture settings, we were not able to find much information with construction," Amorim said.

Amorim and his team traveled to Kansas City, MO, to be on-site across multiple workdays. "The goal was to investigate the physiological response of construction workers during a typical summer workday. Our main goal was to measure the internal temperature of workers using an ingestible capsule in parallel with the measurement of environmental temperature. We also measured heart rate and dehydration responses when working in hot conditions," Amorim said.

Amorim had to set his alarms for 2 a.m., alongside workers at the site. Like those who work in agriculture, one of the ways construction companies try to get workers to beat the heat is by setting an early start

time.

"Roofers usually start working at 3:30 in the morning. They are already avoiding the hottest parts of the day. The site we went to was for a Meta data center with 1,500 workers; it was a very large worksite involved in data collection," he said.

Participants took a pill that monitored internal body temperature as they went to work like usual. While temperatures skyrocketed the week before and after the study to more than 100°F, Amorim recorded close to 90°F during the three-day study period. Kansas City does not have a dry heat like Albuquerque does, either.

"Humidity plays a major role in heat stress. Our physiology allows us to dissipate heat from our body mainly through sweat evaporation, but when you're sweating in a humid environment, it doesn't work that way," he said. "You're not cooling down your body, and then basically you're dehydrating due to dripping sweat. In Kansas City, we faced a little bit of that, with the humidity around 50 to 70%."

While it may not be as extreme as in locations like Phoenix-degree temperatures in 2023, the combination of humidity, sun radiation, surroundings made of asphalt and concrete, and limited shade and water, 90°F can become challenging quickly.

"The safety of workers depends on the environmental temperature, the intensity of the work, and the clothing and equipment worn. If you are engaged in the hardest job, you produce more heat, and then your body temperature will increase while still getting heat from the environment. If you have this combination, your body temperature is going to increase to very, very high values. This is a problem," Amorim said.

In fact, despite the relatively moderate average temperature of 88°F at

the construction site, Amorim found that 43% of the workers still experienced an internal body temperature of 100.4°F. The National Institute for Occupational Safety & Health does not recommend that non-acclimatized workers surpass 100.4°F, which is considered a benchmark for elevated risk of heat stress.

"It's research. You plan, you plan, you plan, but when you get to the field, you just get exposed to things you cannot control. With the rain the week before, we got mild heat stress. Even collecting the data in this mild heat stress, we got very interesting data," he said.

The typical shift for construction workers runs five to six days per week, with many hours worked in the hottest part of the day. Experiencing that kind of elevated core temperatures every shift, Amorim said, could be a risk to a person's health.

"Roofers usually are exposed to the sun's radiation, and that makes their jobs much harder. The sun sends the radiation that gets trapped by this roof's black insulation material. This black material is basically like an oven that they are on top of," he said. "Then sometimes they want to have a break, and they don't have a shade and then don't want to get down. These people are at a higher risk, among workers already at a high risk."

Something Amorim points out is that the internal body temperature varied based on the job type at the site, influenced by the physical labor, the location on the site, and overall job stress. They also recorded heart rate and thermal comfort and showed lower internal temperatures from workers who weren't in open areas with direct sunlight all day.

"It is known that roofers and cement masons have the highest heat-related deaths. They are the ones that suffer more and die more from heat stress. This construction site had roofers and concrete work, and

also carpenters, blazers, cleaners, and managers," he said.

This study also revealed that despite a strong company push for water breaks, most workers arrived at the site dehydrated. That also showed higher ups that there needed to be a focus on hydration before and after work.

"Over 60% of the workers were dehydrated getting to work. Although the company provided water everywhere to these workers, they started the work shift dehydrated. That's a problem because if you are dehydrated, you increase the chance that you have heat-related issues," Amorim said.

So, what's the solution? Are construction workers just supposed to either grin and bear it or stop working completely in hot weather?

"One way is setting work and recovery times and looking for effective options to cool down the workers. You're going to have to work for a certain time and recover or rest for a certain period. In certain conditions, it's even possible that you cannot do any work. We need to use our brains to find solutions," Amorim said. "The site we were at had a wellness coach talking to the workers as well as water everywhere and an adjusted starting time."

Amorim says researchers work directly with the Occupational Safety and Health Administration (OSHA) to solidify those regulations. Right now, OSHA does not have an official heat standard, they have recommended standards for occupational heat stress. That means despite its mission to protect workers' rights, it will depend on the states to adopt the standards. Some states, such as California, Colorado, Oregon, and Washington, have standards to protect the workers.

"We hope this information is going to help OSHA to propose new

regulations. OSHA can use us as a backup. As a researcher, I think we are helping both sides. They can provide guidelines based on scientific information, not data that's not very applied," he said.

Amorim says something needs to get onto paper fast with these regulations. As 2023 marked the hottest year on record and summers are only expected to get hotter, precautions need to exist to keep workers safe.

"This research is doing things that are important for you, the workers, and the future. For future research, we are planning to see how you can make the cooling more effective on sites with mist fans and things that can help the workers suffer less from heat stress," Amorim said.

This research is also expected to continue soon in New Mexico. Amorim is working with interested companies now who want to check on their workers in the sunny summer. He took a small sample of road construction workers in Pecos to start and already found important signs to continue.

"It was also very interesting data, even though it was smaller with only seven workers and just a day. Many of the things we observed in Kansas, such as dehydration pre-work shift, have been here," he said. "It felt very bad because these people were just in the middle of the road in the middle of summer, but it seemed they knew how to deal with the heat."

More information: Environmental Heat Stress and Physiological Heat Strain in Construction Workers During Work in the Summer. digitalcommons.wku.edu/cgi/vie … =6942&context=ijesab

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