

# Smartwatches alert wearers to bodily stress, including COVID-19

December 1 2021, by Hanae Armitage

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Michael Snyder is one of the senior authors of a study showing a smartwatch can warn wearers they may be infected with a virus. Credit: Paul Sakuma

Using data from smartwatches, a new algorithm reads heart rate as a proxy for physiological or mental stress, potentially alerting wearers they're falling ill before they have symptoms.

Researchers led by Michael Snyder, Ph.D., professor and chair of genetics, have enrolled thousands of participants in a study that employs the [algorithm](#) to look for extended periods during which heart rate is

higher than normal—a telltale sign that something may be amiss.

But figuring out what may be wrong takes a little sleuthing. During the study, many stressors triggered an alert. Some folks received them while traveling; some while running a marathon; others after over-indulging at the bar.

The most exciting finding, Snyder said, was that the algorithm was able to detect 80% of confirmed COVID-19 cases before or when participants were symptomatic.

"The idea is for people to eventually use this information to decide whether they need to get a COVID-19 test or self-isolate," Snyder said. "We're not there yet—we still need to test this in [clinical trials](#)—but that's the ultimate goal."

The algorithm can't differentiate between someone who's knocked back a few too many, someone's who's stressed because of work and someone who's ill with a virus. Although it pinged users who had COVID-19, more refining is needed before people can depend on their smartwatches to warn them of an impending infection with SARS-CoV-2 or other viruses.

A paper detailing the study was published online in *Nature Medicine* Nov. 29. Snyder, the Stanford W. Ascherman, MD, FACS, Professor of Genetics, and Amir Bahmani, Ph.D., lecturer and director of Stanford's Deep Data Research Computing Center, are co-senior authors. Arash Alavi, Ph.D., research and development lead in Stanford's Deep Data Research Computing Center; research scientist Meng Wang, Ph.D.; and postdoctoral scholars Gireesh Bogu, Ph.D., Ekanath Srihari Rangan, MBBS, and Andrew Brooks, Ph.D., share lead authorship. The alert system was built using MyPHD, a scalable, secure platform for health data.

## Stress detection

During the study, which ran for about eight months in 2020 and 2021, 2,155 participants donned a smartwatch, which tracked mental and physical "stress events" via heart rate. When notified of a stress event, through an alert paired with an app on their phone, participants recorded what they were doing. To trigger an alert, their [heart rate](#) needed to be elevated for more than a few hours, so a quick jog around the block or a sudden loud noise didn't set it off.

"What's great about this is people can contextualize their alerts," Snyder said. "If you're traveling via airline and you receive an alert, you know that [air travel](#) is likely the culprit."

If, however, you're sitting on the couch with a cup of chamomile tea and you receive an alert, that may be a sign that something else—an infection, perhaps—is brewing. Snyder hopes wearers will be able to discern when an alert means they should consider getting tested.

Of 84 people who were diagnosed with COVID-19 during the study, the algorithm flagged 67. Most alerts fell into other categories, such as travel, eating a large meal, menstruation, [mental stress](#), intoxication or non-COVID-19 infections. The algorithm also flagged a period of stress after many participants received a COVID-19 vaccine, reflecting the uptick in immune response prompted by the shot.

## Refining the algorithm

As Snyder and the team recruit more participants into the study, they're planning to hone the specificity of the alerts by adding data—including step count, sleep patterns and body temperature—in the hope that data patterns can correspond to and flag distinct [stress](#) events. In addition, the

researchers plan to run a clinical trial to determine if the alerts can reliably detect a COVID-19 infection and be used to guide medical choices.

**More information:** Arash Alavi et al, Real-time alerting system for COVID-19 and other stress events using wearable data, *Nature Medicine* (2021). [DOI: 10.1038/s41591-021-01593-2](https://doi.org/10.1038/s41591-021-01593-2)

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