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How Health and Fitness Trackers Are About to Get a Lot More Granular

Many people have become accustomed to devices quantifying their steps or heart rate. That's just the beginning.

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The Future of Everything covers the innovation and technology transforming the way we live, work and play, with monthly issues on transportation, health, education and more. This month is Well-Being, online starting Jan. 6 and in print Jan. 13.

From counting 10,000 steps to reminding when to stand or take a few deep breaths, many Americans have become accustomed to devices quantifying their progress toward health goals. Is this just the beginning?

Businesses and researchers are dreaming up the next generation of methods to create and quantify personal data, with the aim of using the information to boost health and happiness. Some technologies are in their infancy, including machines that sit in the home, passively scanning for early signs of illness. Others are in limited use. Still others, such as smart thermometers and blood-glucose monitors, are widespread, but their proponents see untapped potential in the data they collect.

These advances bring concerns about security, as sensitive information is beamed up to the cloud, and privacy, especially in cases where manufacturers own data about their customers' health that the customers themselves can't access. It's still too early to know exactly which metrics correspond to improved health, or whether zealously tracking them itself has negative impacts.

Natural Medicine

Research has shown that time outdoors can benefit well-being—but do certain natural settings have an outsize effect? NatureQuant, based in Bend, Ore., is aiming to quantify time in nature. This week, the company released NatureDose, an app that tracks people's time indoors and outdoors as they go about their daily routines. The app can map the types of nature a person passes, whether a lake or tree-lined city street, through phone sensors including GPS and accelerometers. That data is paired with NatureQuant's mapping systems to determine a person's proximity to natural elements. The app is being tested in clinical trials in universities, with the aim of determining how time in nature impacts anxiety and depression. Eventually, the company hopes, health professionals could use the data to prescribe time in nature, even tailoring recommendations by lifestyle, season and locale. For example, the app could alert users with vitamin D deficiencies to the best time to catch UV rays.

ILLUSTRATION: SOL COTTI

Watch Your Mouth

Dentists have long advised brushing teeth for two minutes twice a day. In the future, quantifying dental data, such as tracking acidity in the mouth, may help forecast cavities before they happen and draw connections between oral health and other health issues. For example, night guards or other devices that measure specific biomarkers in saliva could uncover disease, such as inflammation of the gums that is linked to diabetes, says Dr. Corneliu Sima, an assistant professor of oral medicine, infection and immunity at the Harvard School of Dental Medicine. Camera-enabled toothbrushes could serve as oral scanners, beaming real-time information to dentists, who could use machine learning to sift through the data to determine whether patients need to come in

for a visit, he says.

Body of Water

The well-known admonition to drink eight glasses of water a day has persuaded many Americans to lug around water bottles in the hopes of satisfying their hydration needs. Hydration, after all, has been shown to benefit brain function, heart health, digestion and other bodily functions. Is eight glasses really the right number for everybody? In the future, connected devices could help assess how much water is the optimum amount for each individual. The PÜL SmartCap, a mobile-connected water-bottle cap, recently hit the market promising to help consumers set goals and track their hydration levels with an accompanying app.

ILLUSTRATION: SOL COTTI

In the Blood

Some people are wearing blood-glucose monitoring devices, which continuously measure blood sugar via a small device worn on the arm, even if they don't have diabetes. Elevated or spiking blood sugar is linked to heart disease, stroke and diabetes, so proponents of blood-glucose monitors say that tracking blood sugar could help wearers personalize their diets and live healthier lives. The Levels software, for example, allows users to watch their glucose levels on an app as they eat different foods, exercise and sleep. Ultimately, the company envisions people having several biosensor streams to help them optimize cell function and predict disease, says Dr. Casey Means, the chief medical officer of Levels.

The Wearable You Don't Need to Wear

Researchers at the Massachusetts Institute of Technology have created a wall-mounted, laptop-size box that sits in the home, analyzing electromagnetic waves around residents as a noninvasive way of gauging health metrics. Using machine learning, the device can track breathing, heart rate, movement, gait, time in bed and the length and quality of sleep—even through walls. Health organizations, hospitals and medical schools are using the device. It is being used in clinical studies for Parkinson's disease, Alzheimer's and immune diseases and was used to monitor Covid-19 patients in isolation during the first wave of the pandemic. Dr. Dina Katabi, a professor at MIT's computer science and artificial intelligence lab who led the project, says the boxes could be used in the homes of seniors and others to help detect early signs of serious medical conditions, and as an alternative to wearables.

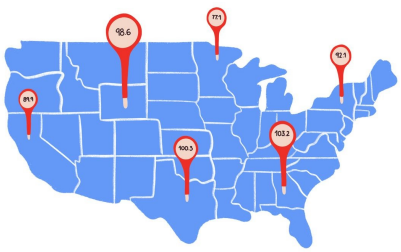

ILLUSTRATION: SOL COTTI

Taking the Temperature

Thermometers are ubiquitous in households across the country. They are often the first medical tool that people consult once they start feeling sick. Aggregating those temperature readings and associated symptoms could someday quantify and diagnose illness at a population level. In the coming years, smart thermometers may be able to help determine whether patients have particular strains of flu or Covid-19, based on symptoms, temperature and other data collected in the area. Inder Singh, the founder of Kinsa, a San Francisco-based smart-thermometer company, says this kind of diagnosis could allow patients to bypass doctor visits and get medication quickly. Kinsa is working to turn its smart thermometers, introduced in 2013, into a system that detects outbreaks and tells people how and when they should seek treatment. The network has about 2.5 million thermometers in the U.S. so far.

Old Dog, New Tricks

Pet owners, including the many who adopted animals during the pandemic, are seeking to quantify the health of their furry friends as well. Whistle Fit, for example, offers a glimpse into a possible future for connected pet care. The 1.5-inch device affixes to a dog's or cat's collar and monitors its health, fitness and behavior. Sensors collect data about a pet's daily routine. Algorithms analyze the data to detect behavior tied to well-being, including playing, running, sleeping, exercising and drinking. After establishing a baseline, Whistle can determine whether a pet's behavior is changing. The owner can set exercise goals based on breed, age and weight. The company provides summaries to share with vets and alerts around behavioral problems like excessive licking or scratching.

ILLUSTRATION: SOL COTTI

The Right Amount of ZZZs

A plethora of products is already on the market to help people sleep. More futuristic offerings include robots that help lull patients to sleep with breathing exercises and "digital sleeping pills," beamed through headbands that play music or soothing sounds when they sense users are about to wake up, says Dr. Seema Khosla, the medical director at the North Dakota Center for Sleep. Going forward, it would be helpful to have a bespoke assessment of how much sleep each individual needs, as opposed to the one-size-fits-all recommendation of eight hours, she says. Devices will likely be less clunky in the coming years, she says, sitting by the bedside with less need for physical contact with the sleeper.

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