‘It’s like having a personal health coach in your pocket’

Developments in health technology allow us to take more personal responsibility for our wellbeing, which may have significant consequences for the future

Sheila Wayman

The first thing Brian Colivet does when he wakes at 6.30am each day is to check the health wearable device on his wrist to see how well it reckons he slept.

A 38-year-old tech entrepreneur and long-distance runner living in Dublin, Colivet started using the sophisticated, always-on fitness tracker Whoop three years ago, on the enthusiastic recommendation of a friend. It has become an integral part of his life. Countless others would say the same about whatever health wearable they use.

In the 1980s, a Finnish company, Polar, developed the world’s first wireless heart rate monitor, which was to revolutionise elite sports coaching. Four decades later, personal use of wearable technology to track physical activity at some level is mainstream. It ranges from basic counting of steps to gathering of data on heart rate, blood oxygen levels, respiratory rate, aerobic capacity and sleep phases, with varying degrees of accuracy depending on the device. Exciting new frontiers are where personal health tech could integrate with professional healthcare and data gathered from wearables could potentially inform public health policy in unprecedented detail and scale.

In 2021, a Sport Ireland survey found more than half the population was using wearable technology, including phones, to track their physical activities. That had nearly doubled over the previous four years and it is likely there has been another sizeable leap in use over the four years since that 2021 survey.

If you have ever cut short a walk or run after realising your means of measuring distance covered has run out of battery, you will know you are in the “if it isn’t logged, it doesn’t count” camp. But on the up side, being invested in a wearable can

get people off the sofa and out in all weathers, to reach, say, the popular daily target of 10,000 steps.

Once Colivet has seen how rested he should feel on awakening, he also takes a few minutes to fill in details of activities over the previous 24 hours. This helps to build a picture of what affects his overnight recovery score. It knows if you ran, he says, but not if you drank alcohol unless you tell it.

"This is how I knew Whoop worked; without me telling it anything, if I had a few beers the night before, my recovery score, which would normally be anywhere between 70 and 100 would be down sub 30. For me that was the litmus test." Seeing the impact of just two or three drinks on his overnight recovery rate has made him more mindful of alcohol consumption. He insists he is not obsessive about the sleep indicators and other features but finds the device useful for observing trends over time.

Helpful sidekick

However, when it comes to his running, he is obsessive about data. He always wears a Garmin running watch, and at times a heart rate monitor around his chest as well, rather than relying on a "jack of all trades" wearable for heart rate zone training. But otherwise,Whoop, which does not measure distance or speed, is a helpful sidekick that can make recommendations based on his data and answer questions through the app's chatbot. "It's like having a personal health coach in your pocket," he adds. "I live a healthier, better life because I have this."

A decade ago wearable devices were basically glorified step counters, says Dr Cailbhe Doherty, assistant professor in the School of Public Health, Physiotherapy and Sports Science at UCD and a funded investigator in the InSight Research Ireland Centre for Data Analytics. Now, they're like miniature health labs on your wrist – or your finger in the case of the Oura ring.

"Where we're headed is even more interesting. I see wearables becoming absolutely central to healthcare, shifting it from a reactive system, where we wait until someone is sick before we act, to a proactive one where we can predict and prevent illness before it happens."

Wearables could transform healthcare in a number of ways, says Doherty. Firstly through gathering data for prevention and early detection of illness; secondly through remote patient monitoring, as, for example, being piloted in the HSE's virtual wards; thirdly through personalised health and lifestyle insights. The integration of AI and big data is what would make this all possible.

However, the challenges around such a vision include whether wearables can actually measure what they claim they are measuring. For instance, says Doherty, while they are great at measuring heart rate at a moderate intensity of physical activity, they are not so good for assessing sleep and calculating calories burned. There is also a huge, separate issue around privacy, ownership of the data and who gets to use it.

All those statistics that individuals track and log about themselves are owned by the company that supplies the device. Some academic researchers say reaching ethical data-sharing agreements with companies can be complex and significantly delay their work.

"There is that potential for a utopian future where wearables empower us to take control of our health," says Doherty. But there's a dystopian version too, "where insurers penalise you for having bad biometrics, or employers use wearables to track your productivity, or your health data gets exploited for profit". All three of those examples are already happening, he asserts, in other parts of the world, including China and the United States.

Privacy policies

Doherty has been involved in research, currently under peer review, which analysed the privacy policies and practices of companies selling consumer health wearables. Those documents run to

thousands of words of opaque language, which most users don't bother to read.

"We tested the devices to see where the data was going and what was happening to it," he says. In some cases the results were "frightening", other companies were "quite good". He is not in a position to say more until the findings are released.

Meanwhile, let's dwell on the positives. Just as some of the wearable platforms are starting to offer users personalised health and lifestyle insights, this could be developed to extend to medical recommendations. "We can't do this now but imagine if we could predict cancer onset, or more feasibly heart disease onset, 20 years in advance."

Already some of these wearables can have a role in medical consultations, as Gerald, a 45-year-old father of one in Dublin, discovered after experiencing a sudden, frightening episode of his heart beat racing. His GP referred him straight to a hospital emergency department.

"I got treated very quickly, obviously because it was a heart thing." But after being quizzed about his lifestyle, the attending doctor suggested the palpitations were due to drinking too much coffee and, as the heart rate had calmed down, sent him home.

Not happy with that, he went back to his GP and requested a referral to a cardiologist. While nothing showed up on testing by the cardiologist, he advised Gerard to get an Apple smartwatch. If the palpitations were to happen again, which the cardiologist thought likely as he too was sceptical of the excess coffee theory, Gerard was to use the watch to record his heartbeat pattern.

Over the following weeks, Gerard made multiple recordings through an app whenever he felt a speeding of his heart beat and downloaded them as a pdf – giving a tracing of his heartbeat pattern "like you would see in any kind of medical drama". After sending those recordings to the cardiologist, he was quickly called back. Using the captured data, the consultant was able to determine that Gerard had two problems.

"I had tachycardia, which is the incredibly high heart rate. So my heart rate would have been hitting kind of an upper level of about 160 beats per minute. And I also had what they thought was AFib [atrial fibrillation], which is an irregular heartbeat."

Gerard was referred on to a cardiovascular surgeon, who asked him to do more recordings with the smartwatch and send them in for review. From these the specialist told him he believed it would be possible to do a fix and Gerard was tested with clinical diagnostic equipment before treatment. He had cardiac ablation to treat both the tachycardia and the suspected atrial fibrillation, which turned out to be atrial flutter. There has been no repeat of heartbeat issues since.

"I used the watch to monitor it again for probably another six months. I didn't really have to ... it was more for peace of mind," says Gerard. All was clear at follow-up appointments after six and 18 months.

"I no longer wear said watch because I don't have to, and equally because I didn't want to get paranoid." However, he adds, it was important to him to be able to use the tech to take as much control as he could of his cardiac problems and be more responsible for his own health.

Clinical cardiologist Prof Osama Soliman of Mater Private in Dublin says he asks patients if they have an Apple watch and to send him data from it if they do. The device's heart monitoring tool has approval from the US Food and Drug Administration (FDA) for use in clinical trials.

A smartwatch does not detect heart attacks, Soliman stresses, but it can show heart rhythm disturbances, which would indicate a need for prompt action, as atrial fibrillation can lead to strokes. The data would still need to be medically verified.

As the scope and accuracy of health wearables increase, Soliman is part of a research team seeking funding for the development of digital twins. This would be the virtual replica of a person, built on data gathered at an initial appointment, including scans, and further informed by continuous input from wearables deemed reliable and appropriate for that individu-

al. By applying a sophisticated modelling system to all this anatomical and physiological information, a picture would be formed not only of the person's current health status but also its likely trajectory.

He envisages people being able to use a screen to log in regularly to their digital twin's dashboard to see if their health meter is moving in a green, yellow or red zone. The avatar would spell out likely consequences of persisting with unhealthy behaviours, the effects of which are being tracked.

Soliman refers to European research which found that even after experiencing a heart attack, only 43 per cent of patients continue to follow doctor's health guidelines. He believes making such advice personal and interactive with digital technology would increase adherence and potentially save many lives.

The idea is to empower people, he adds, because while health professionals are there to help and to guide, "it shouldn't ever be the doctor who is the one taking care of the patient. The patient should take care of themselves."

The principle of pretty much everything with digital health is empowering the person to take more self-responsibility, says Dr Rob Argent, a lecturer in digital and connected health at RCSI. Despite the wide availability of wearable health technology, it is generally not yet connecting with clinicians' work

"That is why I lecture in 'connective health' rather than digital health. To me digital health is about the technology, 'connective health' is about how we create an ecosystem and a model of care that facilitates that."

He encourages students to be cynical about the accuracy of consumer wearables, to question everything and trust nothing. Even the basics. "I know that if I go for a walk today and I'm pushing the buggy with the kids, my watch doesn't track the steps the same."

Their value is as a first level of screening, he suggests. They can indicate something that is abnormal for a user, which might be worth exploring in a more robust way. If you consider about 60 per cent of the population have a smartwatch on their wrist, "you can suddenly screen a lot more people in a very rudimentary way".

The flip side of that, he points out, is that people who have money to buy a smartwatch are probably more engaged with the management of their own health. There is a danger that consumer wearables will deepen health inequity for society's economically and socially disadvantaged – unless, perhaps, a compelling economic case can be made for providing them through the health service.

Meanwhile, the evolution of consumer wearables helps to drive the application of similar technology to medical devices. Embrace2, a wrist-worn monitor for people living with epilepsy, is one example. It detects possible convulsive seizures and alerts caregivers. This is achieved through the same sort of data obtained from sensors in a normal smartwatch, but with a specialised algorithm to classify movements as a seizure, Argent explains. He is supervising a PhD student's research into the use of this medical wearable. Working in conjunction with Epilepsy Ireland, the study will look at the device's accuracy, ie rate of false alarms, and what difference it makes to the user. Does it give them more confidence and do they get help sooner if they have a seizure?

Effectiveness of wearables in keeping people with long-term conditions motivated to persist with exercise after completing a supervised programme is something Prof Suzanne McDonough, head of the RSCI's School of Physiotherapy, is exploring. There is a lot of investment in, say cardiac rehab, or pulmonary rehab classes, but "we know once people stop coming to classes, they often stop doing a lot of what they've been doing".

An initial review of 23 relevant studies showed that adding a digital device to an intervention helps to reduce the amount of direct input needed from healthcare professionals. McDonough is leading funded research with Arthritis Ireland to look at the potential of using wearables for extending the benefits of the organisation's physio-led programmes.

Having a device seems to help because it enables you to see your physical activity in real time, she says, and continuous feedback helps to drive behaviour change. Wearables can be used to build a set of healthy habits, which become automatic and easier to sustain. One challenge, she notes, is that as digital tools become more sophisticated, they also become more difficult to use and harder for professionals to support patients in their use.

Meanwhile, among the general population, blind trust in digital health trackers might appear to fly in the face of "listen to your body" advice. Doherty sees two sides to that. Emerging research suggests use of wearables increases physical activity. "We know that you have a greater sense of being able to listen to your body if you're participating in physical activity. Ergo wearables can increase your ability to be in touch with your body."

Over-reliance

However, traditionally we have always relied on internal cues to understand how we feel. "Maybe there's a risk of over-reliance on metrics. Some people stop listening to their own hunger cues and instead eat or don't eat based on their calorie burn for the day.

"Then there's exercise addiction that is fuelled by data. Some people get so fixated on hitting targets," he says, "that they stop training intuitively. They push harder than they should. They ignore pain or fatigue because their wearable is telling them that they haven't done enough."

That's where common sense has to come in. "I just think that it's better to have the option to quantify rather than not. But you have to understand the limitations of these devices and develop the skill of listening to your own body."

People can be so caught up in feedback that it has a detrimental effect. For example, orthosomnia is where preoccupation with information from a wearable exacerbates a person's sleep problems.

"I'm the sort of person, for example," adds Doherty, "that I don't like to look at my sleep score because it makes me feel worse. There is a lot of people like that; you just need a bit of self-awareness."

Sleep physiologist Motty Varghese says while the accuracy of wearables has improved, caution needs to be exercised when interpreting the data.

"There are lots of dysfunctional beliefs about sleep, like 'I need eight hours of sleep' or 'I am not getting enough deep sleep' etc. I believe it is important to be informed first, and then using the data as an adjunct.

"Individuals with insomnia almost always have anxiety that perpetuates poor sleep," he adds. "Focusing on the data can aggravate the anxiety." Far better in that case to put the device away. ●

Exciting new frontiers are where personal health tech could integrate with professional healthcare

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Predicting the future

Wearable medical devices are already improving the way people with diabetes live and keeping them alive, says Dr Kate Gajewska, clinical manager for advocacy and research with Diabetes Ireland.

Living with type 1 diabetes herself, she describes continuous glucose monitors (CGMs) as a "game changer" in management of the condition.

A CGM shows the user not only their blood glucose level at any given moment but also whether it is rising, dropping or stable. The device works through a sensor under the skin that transmits data to a reading device such as a mobile phone, and sounds an alarm if levels drop or rise excessively, which can be a lifesaver during sleep.

A CGM makes a huge difference to diabetes self-management because it also shows how food and exercise affects blood glucose levels, leading to better informed decisions about insulin dosing.

The free supply of CGMs under the long-term illness scheme to the estimated 32,000 people living here with type 1 diabetes was approved at the end of 2023. Ideally, says Gajewska, this would be extended at least to those with type 2 diabetes who use insulin, if not to all approximately 300,000 people living with diabetes.

While insulin pumps started to become available here more than 20 years ago, replacing delivery through needles, the latest technological development is incorporation of a CGM with a pump. A hybrid closed-loop system can automate delivery of insulin in response to the tracking of blood glucose levels.

It's like a combination of the two best available devices for a person with diabetes, says Gajewska, and minimises the burden of dozens of medical decisions a day.