

# IBM Research shows how health insights may come from fingernail wearable

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Fingernail sensor that can monitor your activities/health. IBM Lab, Yorktown Heights, NY. Credit: IBM

A tiny fingernail sensor has been worked up that monitors diseases and movement disorders. IBM Research tells their prototype story in a December video.

The IBM team designed the tiny fingernail sensors to help clinicians detect and monitor the progression of disease via AI analysis and grip strength. Why choose fingernails as the window to what is happening in our bodies? Two of the researchers, Stephen Heisig and Katsuyuki Sakuma, discussed this on an IBM site.

They said, "Since nails are so tough, we decided to glue a [sensor system](#)

to a fingernail without worrying about any of the issues associated with attaching to skin. Our dynamometer [experiments](#) demonstrated we could extract a consistent enough signal from the nail to give good grip force prediction in a variety of grip types."

Why focus on grip? This device, attached to a fingernail, performs a continuous measurement of how the person's fingernail bends and moves, in every-day activities such as opening a jar or chopping, which in turn is an indicator of grip strength. How can that reveal so much?

Actually, said IBM, grip strength is a useful [metric](#) in various health issues. Examples include (1) effectiveness of medication for Parkinson's disease (2) the degree of cognitive function in schizophrenics and (3) mortality in geriatrics.

Sensors are involved in this setup along, with data delivered to an app. The information deals with such factors as pressure and motion.

"Our system consists of strain gauges attached to the fingernail and a small computer that samples strain values, collects accelerometer data and communicates with a smart watch."

[SiliconANGLE](#) described their components, as two parts: "The first is a compact computer that sits atop a user's finger, while the other is an array of strain gauges meant to be attached to the fingernail. The strain gauges record the subtle ways the fingernail moves and changes its shape as the wearer uses their hands."

Interestingly, the smartwatch form factor receives the information. "The smartwatch processes the [data](#) using [artificial intelligence algorithms](#) that IBM has developed specifically for the project," said *SiliconANGLE*.

This is where IBM's smarts come into play: Analytics and machine

learning identify patterns of grip strength, tremors and other symptoms. This essentially is offering a window on how the person's brain and body are working.

*SiliconANGLE* said, "its AI can not only identify abnormal movements but also distinguish between different activities. The software is accurate enough to tell, among other things, if the user is writing and even determine when they're drawing numerical digits."

Two of the researchers, Stephen Heisig and Katsuyuki Sakuma, wrote on the IBM site: "It turns out that our fingernails deform – bend and move—in stereotypic ways when we use them for gripping, grasping, and even flexing and extending our fingers. This deformation is usually on the order of single digit microns and not visible to the naked eye. However, it can easily detected with strain gauge sensors."

The eight-member team's paper has the details of their health monitor prototype, and it is titled, "Wearable Nail Deformation Sensing for Behavioral and Biomechanical Monitoring and Human-Computer Interaction," published in *Scientific Reports*. Katsuyuki Sakuma, Avner Abrami, Gaddi Blumrosen, Stanislav Lukashov, Rajeev Narayanan, Joseph Ligman, Vittorio Caggiano and Stephen Heisig are the authors.

"Here we describe a wearable strain sensor, associated electronics, and software to detect and interpret the [kinematics](#) of deformation in human fingernails," they wrote. "To the best of our knowledge, no system has integrated both nail strain and accelerometer information to explore human hand biomechanics and enabled an unconstrained human-computer interaction."

Some of the tech-watching sites drew on the bigger picture view of what this could mean at a time when technology intersects with healthcare—namely, an interesting interface that could add some

momentum to wearables in healthcare.

**More information:** \* [www.ibm.com/blogs/research/201.../fingernail-sensors/](http://www.ibm.com/blogs/research/201.../fingernail-sensors/)

\* Katsuyuki Sakuma et al. Wearable Nail Deformation Sensing for Behavioral and Biomechanical Monitoring and Human-Computer Interaction, *Scientific Reports* (2018). [DOI: 10.1038/s41598-018-36834-x](https://doi.org/10.1038/s41598-018-36834-x)

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