

# A new wearable system tracks Parkinson's disease symptoms remotely

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iHandUapp. Credit: INESC Brussels HUB

Parkinson's disease affects 10 million people worldwide and its symptoms include tremors in the fingers and hands, small handwriting, loss of smell, walking difficulties, dizziness, and others. As these

symptoms worsen over time, monitoring and treating PD is crucial to preserve the patients' autonomy and enhance their quality of life.

This is the goal of a group of Portuguese researchers. The project iHandUapp extended the iHandU project to the full cycle of the PD. It resorts to mobile and wearable proprietary technologies to monitor PD patients' symptoms, with the possibility of sharing the data with their doctors in real-time, including quantitative automatic evaluation of the symptoms, medication or even disease-related events.

James Parkinson was an English surgeon, geologist and political activist born in 1755. After almost being arrested due to his political career, he directed his attention to Medicine, following the steps of his father. As a strong advocate of the underprivileged, Parkinson focused on improving the general health of the population. The peak of his career in Medicine was the publication of "An Essay on the Shaking Palsy," in which he described six patients with similar symptoms of unintended shaking. The disease that today bears his name was coined by the French neurologist Jean-Martin Charcot about 60 years after.

We have learned a lot about Parkinson's disease (PD) since the 18th century. PD is characterized by uncontrollable movements and rigidity of the arms and legs that are known to worsen over time. In the [basal ganglia](#), a region of the brain that regulates movement, [nerve cells](#) get impaired and/or die, which results in the most noticeable signs and symptoms of PD. These nerve cells, or neurons, normally produce a crucial brain chemical called dopamine. It seems that movement issues linked to the disease are caused by decreased dopamine production, as a result of the neurons' degeneration and death. The reason why neurons degenerate in the first place is still unknown.

Parkinson's disease affects 10 million people worldwide, and family members are usually those who notice the first signs of the disease.

These include tremors in the fingers and hands, small handwriting, loss of smell, walking difficulties, dizziness, and others. As these symptoms worsen over time, monitoring and treating PD is crucial to preserve the patients' autonomy and enhance their quality of life.

The project iHandUapp uses mobile and wearable proprietary technologies to monitor PD patients' symptoms, with the possibility of sharing the data with their doctors in real time, including quantitative automatic evaluation of the symptoms, medication or even disease-related events. This technology displays the information on a web platform, providing doctors access to the evolution of the symptomology of their patients, and allowing them to prescribe new tests and change medication remotely.

"The system includes a hybrid [mobile application](#) for Android and iOS devices, through which patients can manage their medication and perform tests to monitor symptoms associated with the disease, at home or during medical appointments, while keeping the [healthcare professionals](#) informed about relevant events that may occur. Moreover, iHandUapp features a specialized dashboard so that healthcare professionals can monitor the medical history of patients and a cloud-hosted database that displays information in real-time," said Duarte Dias, a researcher and coordinator of the Biomedical Engineering Research Center at the Institute for Systems and Computer Engineering, Technology and Science (INESC TEC).

The system works best with the information provided by external components called accessories. iHandU is a wearable device with embedded electronics integrated into a patented technology that can measure wrist rigidity, one of the PD symptoms. INESC TEC has been developing this technology since 2015 and led to the creation of a spin-off in 2019, dedicated to evolving the technology to the market—InSignals Neurotech.

"The first iHandUapp prototype is a promising proof-of-concept that will add value to the monitorization of Parkinson's disease. The app and its features have been analyzed in collaboration with the Hospital Centro Hospitalar Universitário de São João (CHUSJ), taking into consideration the health professionals' problems and needs. So far, the feedback has been very positive, which reinforces the usability, simplicity and suitability of our solution," said Duarte Dias.

The technology is also being used during deep brain stimulation surgeries, a therapy proposed to suppress motor symptoms when medication is no longer effective. A crucial part of the surgical procedure is choosing where to place electrodes in the patient's brain, and neurosurgeons typically use rigidity as feedback to optimize electrode placement. Currently, this crucial step is carried out based on [human perception](#), but the wearable device developed at INESC TEC provides quantitative data free of human bias with an impressive 80% accuracy.

The iHandUapp was publicly announced in June 2022, during the IEEE MELECON conference that took place in Italy. Duarte Dias and his team presented the work "PDapp: A Companion Mobile Application with Accessories for Continuous Follow-up of Parkinson's Disease Patients," which received the Best Paper Award, demonstrating the solution's scientific, technological and clinical impact.

The paper was authored by researchers Nuno Oliveira, Joana Silva, Duarte Dias and João Paulo Cunha, a professor at the Faculty of Engineering of the University of Porto and senior researcher at INESC TEC—the team responsible for the development of the iHandUapp system. They were supported by Dr. João Massano, a neurologist at CHUSJ, who was essential in designing a system adapted to clinical needs. The system has been evolving and will be used in a clinical study already approved at CHUSJ, now with two other researchers involved:

Eduardo Campos and Adriana Arrais. The goal is to commercialize this promising technology via INESC TEC's spin-off company InSignals Neurotech.

Scientists are exploring ways to identify biomarkers for PD that can lead to earlier diagnosis and more adapted treatments to slow down the disease process and, one might hope, even find how to cure it. In the meantime, this technology is ready to help patients and doctors to better manage the disease, helping to increase the quality of life of those affected by it.

Provided by INESC Brussels HUB

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