

Wearable tech can provide better data for Parkinson's

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Immunohistochemistry for alpha-synuclein showing positive staining (brown) of an intraneural Lewy-body in the Substantia nigra in Parkinson's disease. Credit: Wikipedia

Wearable technology and other mobile data-gathering devices should

replace self-reporting diaries to track symptoms in people with Parkinson's disease, a new study from a large industry and academic collaboration argues. The study was published January 17 in *npj Digital Medicine*.

"For clinicians to effectively manage the [disease](#) and for researchers to develop new therapies, [high quality data](#) are critical," said Paolo Bonato, a senior author on the paper and one of the principal investigators of the initiative.

"By using technology to help us get [accurate data](#) and more of it, we feel this approach can be used to help us improve the care and research options for the population with Parkinson's disease," said Bonato, who is associate professor of physical medicine and rehabilitation at Harvard Medical School, director of the Spaulding Motion Analysis Lab and an associate faculty member at the Wyss Institute for Biologically Inspired Engineering.

The collaborative project, aimed at improving methods of data collection for studies of Parkinson's disease, includes researchers from HMS, Spaulding Rehabilitation Hospital, Boston University School of Medicine, Pfizer Inc., Tufts Medical Center and the Wyss.

Sixty healthy volunteers and 95 people with Parkinson's disease were asked to record their activities and symptoms in electronic diaries. The participants were monitored at home, in simulated apartment settings and in laboratory environments.

Wearable devices are capable of continuously gathering high-resolution motion data in real time, but 38 percent of study participants manually recording their activities missed 25 percent of possible entries. Entries are often made many hours after the events they are describing. Expert analysis of video recordings of the trial subjects found that self-reports

were marked by 35 percent false negatives and 15 percent false positives.

These results highlight the significant opportunity for objective, high-resolution continuous monitoring afforded by [wearable technology](#) to improve upon the monitoring of Parkinson's disease symptoms, the researchers said.

Currently, questionnaires and motor diaries remain the primary tools for identifying and monitoring fluctuations in motor and nonmotor symptoms. Concerns about the accuracy and reliability of motor diaries are driven by a number of factors, including the risk of fatigue that may lead to poor adherence by participants, the effects of recall bias, the limited time resolution the diaries afford and the nature of data that measure only the duration of time spent in an identified state and not the severity of impairment or magnitude of improvement experienced by individuals with Parkinson's disease in response to treatment.

Digital measurement tools including mobile and wearable technologies are widely recognized for their potential to improve the resolution and efficacy of remote monitoring of people with Parkinson's disease. Accurately monitoring motor and nonmotor symptoms, as well as complications resulting from symptoms and treatment, in people with Parkinson's disease is a major challenge both during clinical management and in clinical trials investigating new treatments.

"Digital technologies have the potential to enhance existing standard methods of assessing and monitoring Parkinson's disease, not only [the patient's] motor and nonmotor symptoms in response to treatment, but also their functional ability to live an independent and fulfilling life," said Kip Thomas, the principal investigator of the Boston University arm of the collaboration. "Integrating digital measures into clinical trials will improve the consistency and resolution of the data to the benefit of the

scientist, the clinician, and, most importantly, the patient."

In this first of a planned series of articles, the group focused on the utility and reliability of self-reports for describing motor fluctuations, the agreement between participants and clinical raters on the presence of motor complications, the ability of video raters to accurately assess motor symptoms, and the dynamics of tremor, dyskinesia and bradykinesia in response to medication. The researchers plan to explore additional methods for estimating [symptom](#) severity based on multimodal sensor data collected in this effort in future publications.

"We certainly feel that this work shows the potential for further study with an expanded group that will hopefully provide new tools to treat Parkinson's and support this population," Bonato said.

More information: M. Kelley Erb et al. mHealth and wearable technology should replace motor diaries to track motor fluctuations in Parkinson's disease, *npj Digital Medicine* (2020). [DOI: 10.1038/s41746-019-0214-x](#)

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