

Wearable devices may be able to capture well-being through effortless data collection using AI

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To determine if machine learning models applied to wearable device outputs could be trained to distinguish an individual's degree of resilience and psychological well-being, the Icahn Mount Sinai researchers analyzed data from the Warrior Watch Study. The metrics collected were found to be predictive in identifying resilience or well-being states. Credit: The BioMedical Engineering and Imaging Institute at Icahn Mount Sinai.

Applying machine learning models, a type of artificial intelligence (AI), to data collected passively from wearable devices can identify a patient's degree of resilience and well-being, according to investigators at the Icahn School of Medicine at Mount Sinai in New York.

The findings, reported in the May 2 issue of *JAMIA Open*, support [wearable devices](#), such as the Apple Watch, as a way to monitor and assess psychological states remotely without requiring the completion of mental health questionnaires.

The paper, titled "A machine learning approach to determine [resilience](#) utilizing wearable device data: analysis of an observational cohort," points out that resilience, or an individual's ability to overcome difficulty, is an important stress mitigator, reduces morbidity, and improves chronic disease management.

"Wearables provide a means to continually collect information about an individual's physical state. Our results provide insight into the feasibility of assessing psychological characteristics from this passively collected data," said first author Robert P. Hirten, MD, Clinical Director, Hasso Plattner Institute for Digital Health at Mount Sinai. "To our knowledge, this is the first study to evaluate whether resilience, a key mental health feature, can be evaluated from devices such as the Apple Watch."

Mental health disorders are common, [accounting for 13% of the burden of global disease](#), with a quarter of the population at some point experiencing psychological illness. Yet we have limited resources for their evaluation, say the researchers.

"There are wide disparities in access across geography and [socioeconomic status](#), and the need for in-person assessment or the completion of validated mental health surveys is further limiting," said senior author Zahi Fayad, Ph.D., Director of the BioMedical

Engineering and Imaging Institute at Icahn Mount Sinai. "A better understanding of who is at psychological risk and an improved means of tracking the impact of psychological interventions is needed. The growth of digital technology presents an opportunity to improve access to mental health services for all people."

To determine if machine learning models could be trained to distinguish an individual's degree of resilience and psychological well-being using the data from wearable devices, the Icahn Mount Sinai researchers analyzed data from the [Warrior Watch Study](#). Leveraged for the current digital observational study, the data set comprised 329 [health care workers](#) enrolled at seven hospitals in New York City.

Subjects wore an Apple Watch Series 4 or 5 for the duration of their participation, measuring [heart rate variability](#) and resting heart rate throughout the follow-up period. Surveys were collected measuring resilience, optimism, and [emotional support](#) at baseline. The metrics collected were found to be predictive in identifying resilience or well-being states. Despite the Warrior Watch Study not being designed to evaluate this endpoint, the findings support the further assessment of [psychological characteristics](#) from passively collected wearable data.

"We hope that this approach will enable us to bring psychological assessment and care to a larger population, who may not have access at this time," said Micol Zweig, MPH, co-author of the paper and Associate Director of Clinical Research, Hasso Plattner Institute for Digital Health at Mount Sinai. "We also intend to evaluate this technique in other patient populations to further refine the algorithm and improve its applicability."

To that end, the research team plans to continue using wearable data to observe a range of physical and psychological disorders and diseases. The simultaneous development of sophisticated analytical tools,

including artificial intelligence, say the investigators, can facilitate the analysis of data collected from these devices and apps to identify patterns associated with a given mental or physical disease condition.

More information: A machine learning approach to determine resilience utilizing wearable device data: analysis of an observational cohort, *JAMIA Open* (2023). [DOI: 10.1093/jamiaopen/ooad029](https://doi.org/10.1093/jamiaopen/ooad029)

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