# Smartwatches as tools for advancing psychiatric disorder diagnosis



Smartwatches, equipped to gather comprehensive physical and physiological data, are emerging as significant tools in biomedicine, particularly for understanding brain diseases and behavioural disorders, along with their associated genetic drivers. A recent study utilised data from over 5,000 adolescents to train artificial intelligence models aimed at predicting various psychiatric illnesses, revealing genetic associations linked to these conditions.

The research, which draws upon information collected from smartwatches worn by adolescents aged between 9 and 14, suggests that such wearable sensors can enhance the understanding and treatment of psychiatric disorders. “In traditional psychiatry, a doctor will assess your symptoms and you’ll either be diagnosed with an illness or won’t,” stated Professor Mark Gerstein, an expert in biochemistry, computer science, statistics, and data science. He continued, “But in this study, we focused on processing the wearable data in a way that could both be leveraged to predict illnesses more comprehensively, and to better connect them to underlying genetic factors.”

The study's foundation rested on data from the Adolescent Brain Cognitive Development Study, recognised as the largest long-term assessment of brain development and child health in the United States. The smartwatch data incorporated measurements such as heart rate, calorie expenditure, physical activity intensity, step count, sleep level, and sleep intensity.

“There are continuous data collection capabilities with wearable sensors that may present a solution to the challenges of detecting psychiatric illnesses quantitatively,” remarked Jason Liu, a member of Gerstein’s lab and co-lead author of the study. Liu proposed the term "digital phenotype" to describe measurable traits tracked via digital tools like smartwatches. He elaborated that “one advantage of doing this is that we can use the digital phenotype almost as a diagnostic tool or a biomarker, and also bridge the gap between disease and genetics.”

The research team crafted a methodology to manage the vast amount of smartwatch data and transform the raw information into a format suitable for AI model training. Gerstein noted that this feature represents “a new problem to solve in the research world which is technically challenging.” The findings indicated that heart rate was particularly significant for predicting ADHD, while sleep quality and various sleep stages played an essential role in identifying anxiety.

Further insights revealed that smartwatch data could assist in distinguishing among different disease subtypes. “For example, within ADHD, there are different forms,” explained Beatrice Borsari, a postdoctoral associate at Gerstein’s lab and co-lead author. She mentioned the potential of extending their research to differentiate between types of inattention and hyperactivity, which typically respond to diverse pharmacological treatments.

The team also pursued an investigation into the potential of digital phenotypes to reveal underlying genetic factors. By applying a series of multivariate statistical tools developed through collaboration with the University of Barcelona, the researchers made strides in linking watch data with genetics. “Our methodology has made it possible, for the first time, to simultaneously analyse the relationship between genetics and the different measures provided by smartwatches,” said Diego Garrido Martín, a professor at the University of Barcelona and co-author of the study.

The researchers identified 37 genes linked to ADHD when assessing how genetic mutations influenced smartwatch data among healthy individuals compared to those diagnosed with ADHD. Notably, no specific genes were found directly associated with an ADHD diagnosis, underscoring the enhanced insights provided by continuous smartwatch data.

“This method holds great promise for addressing long-standing challenges in psychiatry and may ultimately reshape the way we understand the genetics and symptom structure of psychiatric disorders,” commented Walter Roberts, assistant professor of psychiatry at Yale School of Medicine and co-senior author of the study.

While this investigation centred on ADHD and anxiety, the researchers anticipate broader applicability for their approach, particularly regarding neurological diseases or neurodegeneration. They aspire that these findings may encourage a shift away from traditional clinical diagnostics towards quantitative behavioural measurements, which could prove more beneficial in revealing genetic biomarkers.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://www.jmir.org/2024/1/e58936/> - This article discusses the role of smartwatches in health care, including their use in monitoring and predicting health outcomes, which aligns with the study's focus on using smartwatch data for psychiatric illness prediction.
* <https://www.jmir.org/2024/1/e58936/PDF> - This PDF provides further details on the integration of smartwatch data into health care, highlighting its potential for enhancing patient monitoring and personalized care.
* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7321114/> - This article explores the use of wearable devices in monitoring health metrics, which is relevant to the study's use of smartwatches for collecting physiological data.
* <https://www.nature.com/articles/s41598-021-94444-4> - This study discusses the application of wearable sensors in detecting psychiatric illnesses, aligning with the research's focus on using smartwatch data for psychiatric disorder prediction.
* <https://www.sciencedirect.com/science/article/pii/S2213177921001068> - This article examines the potential of wearable devices in monitoring neurological conditions, which is pertinent to the study's broader implications for neurological diseases.
* <https://www.abcstudy.org/> - This is the website for the Adolescent Brain Cognitive Development Study, which provided the data used in the research mentioned in the article.
* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8414556/> - This article discusses the role of digital phenotypes in health research, which aligns with Jason Liu's concept of using digital phenotypes as diagnostic tools.
* <https://www.frontiersin.org/articles/10.3389/fpsyt.2020.00555/full> - This study explores the use of wearable devices in psychiatric care, highlighting their potential for improving diagnosis and treatment.
* <https://www.sciencedirect.com/science/article/pii/B9780128217145000115> - This chapter discusses the integration of wearable technology into psychiatric research, which is relevant to the study's methodology and findings.