Medical Xpress

With digital phenotyping, smartphones may play a role in assessing severe mental illness

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Digital phenotyping approaches that collect and analyze Smartphone-user data on locations, activities, and even feelings—combined with machine learning to recognize patterns and make predictions from the

data—have emerged as promising tools for monitoring patients with psychosis spectrum illnesses, according to a report in the September/October issue of *Harvard Review of Psychiatry*.

John Tourous, MD, MBI, of Harvard Medical School and colleagues reviewed available evidence on digital phenotyping and machine learning to improve care for people living with schizophrenia, bipolar disorder, and related illnesses. "Digital phenotyping provides a much-needed bridge between patients' symptomatology and the behaviors that can be used to assess and monitor psychiatric disorders," the researchers write.

Digital phenotyping in schizophrenia and bipolar disorder—the evidence so far

"Digital phenotyping is the use of data from smartphones and wearables collected in situ for capturing a digital expression of human behaviors," according to the authors. Psychiatry researchers think that collecting and analyzing this kind of behavioral information might be useful in understanding how patients with severe mental illness are functioning in everyday life outside of the clinic or lab—in particular, to assess symptoms and predict clinical relapses.

Dr. Tourous and colleagues identified 51 studies of digital phenotyping in patients with schizophrenia or bipolar disorder. The review focused on studies using "passively" collected data—for example, accelerometer readings (step counters) and GPS signals. Other digital phenotyping approaches use "actively" collected data—for example, surveys to ask patients to report their mood.

The studies varied in terms of the digital phenotyping features used, data handling, analytical techniques, algorithms tested, and outcome measures reported. Nearly all studies included patients with bipolar disorder or

schizophrenia. The studies included an average of 31 participants and monitored them for about four months.

Most studies used passive data collected by accelerometers and GPS; other measures included voice call and text message logs. The studies used a wide range of different apps, as well as different clinical tools/questionnaires for assessing patients' mental health status.

The studies presented higher variability in reporting of basic data such as smartphone model and operating system, patient age and race/ethnicity, and whether patients had received training in use of the technology. The authors make suggestions for a standardized reporting format that would improve the comparability of future studies.

Sixteen of the studies used machine learning-based approaches to analyze the passively collected data. As Dr. Tourous and coauthors note, the studies used various different algorithms, and for different purposes. The most commonly used algorithm type was "random forests," which work by combining many small, weak decisions to make a single strong prediction. For example, one study used passively tracked behavioral data to predict mental health scores in patients with schizophrenia.

Other studies used machine-learning approaches such as support vector machine/support vector regression or neural nets. These algorithms work in different ways to use behavioral data—where patients are going, whether they're returning calls, even their tone of voice—to assess patients' current mental health status, predict their risk of relapse, and so forth.

"Digital phenotyping provides a much-needed bridge between patients' symptomatology and the behaviors that can be used to assess and monitor psychotic disorders," Dr. Tourous and colleagues write. They call for larger studies with higher-quality data—along with "expanded

efforts to apply machine learning to passive digital phenotyping data in early diagnosis and treatment of psychosis, including in clinical high risk and early-course psychosis patients."

More information: Benoit, James PhD et al, MBI Systematic Review of Digital Phenotyping and Machine Learning in Psychosis Spectrum Illnesses, *Harvard Review of Psychiatry* 9/10 2020 - Volume 28 - Issue 5 - p 296-304 DOI: 10.1097/HRP.0000000000000268

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