

THE WALL STREET JOURNAL.

This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers visit <https://www.djreprints.com>.

<https://www.wsj.com/articles/does-your-smartphone-know-if-youre-at-risk-of-suicide-11554131013>

YOUR HEALTH

Does Your Smartphone Know if You're Depressed?

Researchers seek out 'behavioral biomarkers' for mental illness; facial expressions, voice and language may offer clues



PHOTO: RYAN OLBRYSK



By

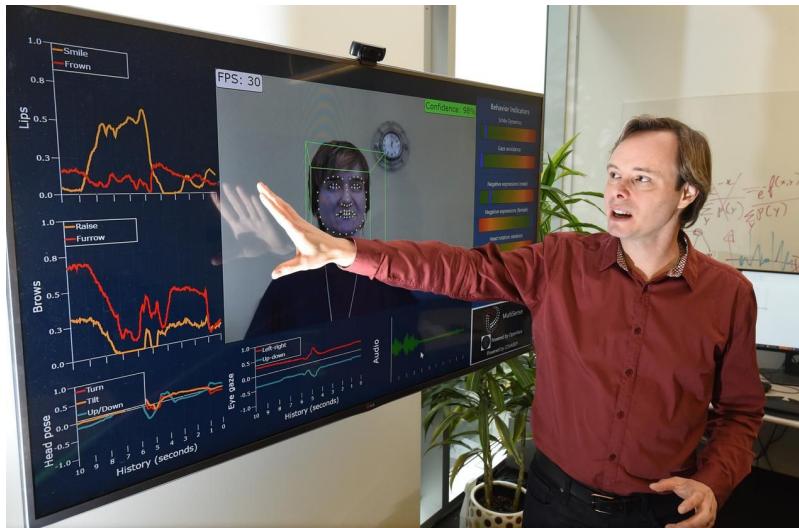
Sumathi Reddy

April 1, 2019 11:03 a.m. ET

Depressed patients don't enunciate vowels as much as people who aren't depressed. Their smiles are smaller. Suicidal individuals who speak in a breathy voice rather than a tense tone are more likely to re-attempt suicide. And patients with psychotic disorders, such as one form of schizophrenia, raise their eyebrows often when averting their gaze.

These are among the behavioral biomarkers researchers have established using facial and acoustic analysis. With technology, they measure shifts not always discernible to the eye or ear, such as slight movements of facial muscles as well as subtle changes in tone and language.

Artificial intelligence “can sense people’s facial expression and behaviors to help doctors do a more objective assessment of mental health,” said Louis-Philippe Morency, an associate professor of computer science at Carnegie Mellon University in Pittsburgh.



Louis-Philippe Morency of Carnegie Mellon University is studying how technology can help monitor mental health. PHOTO: CARNEGIE MELLON UNIVERSITY

Experts say AI has great potential in mental-health care, where evaluations are subjective and often based on patients’ reports about themselves. But questions about privacy, cost and implementation arise when AI moves from the lab to the marketplace.

Dr. Morency was on research teams at the University of Southern California and now Carnegie Mellon that published studies establishing more than a dozen behavioral biomarkers for conditions including depression, PTSD, schizophrenia and suicide. Now he is collaborating with researchers testing how to use technology in monitoring mental health.

“We built a dictionary of these behavior markers for different mental-health disorders,” Dr. Morency said. “The technology gives you a summary of these behavior markers and we can use it as part of a treatment to see how that person is behaving today compared to a month ago.”

This isn’t meant to replace clinicians, he said, and if a patient exhibits a behavior marker, it doesn’t mean that he or she has the condition. It just means that mental symptoms may be more likely.

“This doesn’t mean if you suddenly have a breathy voice, you are suicidal,” Dr. Morency said. “This is one sign that the doctor should be able to use as they are doing their assessment.”

|

Researchers at Columbia University and the University of Pittsburgh are conducting a clinical trial in which they are monitoring adolescents at risk of suicide through their smartphones. “Part of the problem that we’re faced within the field is that we really need to become better at identifying the factors that lead to the escalation of suicide risk,” says Randy Auerbach, an associate professor of psychiatry at Columbia University Medical School. “Can we access them in real time to establish interventions?”

The researchers are recruiting high-risk adolescents who have been in psychiatric emergency rooms due to a suicide attempt or because they have expressed a desire to end their life. They have federal funding to enroll 200 to 300 teenagers to monitor over six months.

All participants and their parents consented to being part of the trial and having the teenagers’ phone use monitored by researchers for the study.

Privacy is paramount, Dr. Morency said, so a large part of the study is about discovering non-identifiable behavior markers from phone data. The Columbia trial will gather information from the smartphones, including selfies and voice recordings. Researchers will collect words the teenagers use on social-media sites and in texts or emails as well as information tracking their whereabouts. From the data, researchers can analyze facial features and the tone, pitch and cadence of speech using the behavioral biomarkers Dr. Morency and his colleagues established. They can use AI to detect if suicidal individuals enter a state when they are at risk of taking their lives.

If participants express suicidal thoughts or behaviors during weekly assessments of their phones, the researchers and clinical staff are notified and will take steps to get the teenager in touch with a doctor or emergency services, Dr. Auerbach said.

Although AI looks promising for the field of mental health, it faces a long road from the research lab to real-life application. Joshua Magee, an assistant psychology professor at Miami University, published a study last year examining mental-health apps, which aren't regulated. He concluded that consumers should be cautious and use such apps only in conjunction with a mental-health professional.

The technology being tested is exciting, Dr. Magee said, but could pose problems. One challenge he cited is generalizing studies based on a relatively small number of individuals to a much larger clinical population. There are also cultural differences to take into account.

"It's a great challenge of all psychological measurement," Dr. Magee said. But if those differences are factored in, incorporating such technology into practice could remove "the systematic biases that we might accidentally introduce into our own assessments."

Ensuring privacy and security if and when such technology is incorporated into phones or other monitoring devices is another challenge, Dr. Magee said.

Dr. Morency says individual differences and cultural differences can be taken into account as the technology initially would be used to monitor an individual over time.

In a separate study, researchers at the University of Pittsburgh are recording therapy sessions between about 70 depressed patients and therapists using high-resolution cameras and microphones, said Holly Swartz, a psychiatry professor there. Data from the sessions, such as how often patients smile or mirror body language of the therapist, will be captured to generate an algorithm on patient-therapist interactions. Researchers will use the algorithm to compare different types of therapy and predict their effectiveness.

"We want to develop something that can be delivered in real time to therapists so they can modify what they're doing," Dr. Swartz said.

Justin Baker, scientific director of the institute for technology and psychiatry at McLean Hospital, a Harvard-affiliated psychiatric hospital in Boston, is working with Dr. Morency to use cues from video and audio recordings of patients hospitalized for psychotic illnesses to monitor their health after release.

Dr. Baker says his research focuses on severe mental illness such as bipolar disorder and schizophrenia. Such patients often have trouble reporting their symptoms accurately. "If we did have an objective way of corroborating someone's self-reports, that would be something that would have a lot of immediate clinical utility," he said.

For one study Dr. Baker is recruiting 100 patients with bipolar disorder or schizophrenia to follow for a year through monthly recorded sessions and data collected from wearable sensors and smartphones.

The goal is to come up with markers that can be objectively measured like a vital sign. "Things like speaking rate, pitch of speaking, length of sentence—these are things that can be measured," he said. "Psychiatrists may pay close attention, yet human ears and eyes may not be able to capture the actual value. Detecting that there's been a subtle change may be even beyond what an experienced clinician is able to pick up on."

BEHAVIORAL BIOMARKERS

Among possible red flags for various mental conditions:

- Depressed patients have shorter smiles, move their heads less often, look down more and don't enunciate vowels as much as non-depressed people. But they don't necessarily smile less often.
- Suicidal patients use first-person pronouns more than non-suicidal people. Those with a breathy voice, rather than a tense tone, are more likely to re-attempt suicide.
- Men with PTSD furrow their eyebrows more and show disgust in their facial expressions more than men without the condition. But women with PTSD are the opposite: They exhibit fewer negative expressions than women without PTSD.
- Patients with one form of schizophrenia avert their gaze more often and for longer than those with another type of schizophrenia. They also use fewer words specifying time or space, such as yesterday, lately or nearby.

Copyright © 2019 Dow Jones & Company, Inc. All Rights Reserved

This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers visit <https://www.djreprints.com>.