

REVIEW

BY DANIEL BARRON

As a physician, I need to figure out three things when a new patient walks into my office: what their life is typically like, what has changed that made them seek treatment and what I can do to help them. It's a complex problem, and most fields of medicine approach it by taking measurements. If I were a cardiologist evaluating a patient's chest pain, for instance, I would speak with the patient, but then I would listen to their heart and measure their pulse and blood pressure. I might order an electrocardiogram or a cardiac stress test, tools that weren't available a century ago.

Because I'm a psychiatrist, however, I evaluate patients in precisely the same way that my predecessors did in 1920: I ask them to tell me what's wrong, and while they're talking I carefully observe their speech and behavior. But psychiatry has remained largely immune to measurement. At no point in the examination do I gather numerical data about the patient's life or behavior, even though tools for taking such measurements already exist. In fact, you likely are carrying one around in your pocket right now.

In the last decade, an entire industry has been built to predict a person's behavior based on their smartphone use and online activity. Because our search and social media history is digitized and time stamped, it represents a permanent breadcrumb trail of our thoughts and emotions. Tech companies and governments already use these data to monitor and commodify our likes and dislikes; soon psychiatrists might be able to use them to measure and evaluate our mental state.

Our smartphones measure our movements with accelerometers, our location with GPS and our social engagement with the number of calls and texts we send. These data have extraordinary potential for psychiatric diagnosis and treatment. Studies have shown that the words we use to express ourselves on Facebook and Twitter can predict the emergence of conditions like postpartum depression and psychosis. A person's recent Google search history, it turns out, is a better predictor of suicide than their clinician's most recent notes.

Digital tools could also help psychiatrists measure a patient's behavior during a session. Each visit to a therapist creates a wealth of clinical data that is currently wasted because it's not recorded or analyzed. Speech and facial recognition technologies could be used to precisely measure a patient's expression, the words they use and the intonation of their voice. Such tools could be used to recognize the subtle changes that occur when a patient is about to become floridly manic, or analyze how they respond to treatment. A recent study by Cheryl Corcoran published in the journal *World Psychiatry* showed that elements of speech such as coherence and the frequency of possessive pronouns (words like his, her, my or mine) can predict, with an accuracy of 83%, whether someone at risk for psychosis will actually become psychotic. Such data is created at every clinical en-



The Rise of Big Data Psychiatry

The information captured by our smartphones, as well as new speech- and facial-recognition technologies, can yield invaluable insights for mental health professionals.

counter, but it is far too subtle for a doctor to detect.

The ability to interact digitally with a patient could also smooth the transition from hospital to outpatient care. Studies have shown that

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up to 80% of patients do not remain in mental health treatment after they leave the hospital. This underscores a fundamental problem with the traditional model of care: I only know how a patient is doing if they

show up for their next appointment, or call or email me. App-based therapies and passive behavioral measurement would allow doctors to better connect with patients after they leave, helping to reduce attrition.

Quantifying behavior by collecting large amounts of data could also help psychiatrists discover insights that aren't intuitive. A century ago, it wasn't at all obvious that treating hypertension could prevent heart attacks. Today, data might show that we should treat a symptom such as decreased facial expressivity to prevent suicide. In the same way that molecular sensors revealed genetic abnormalities and treatment targets in oncology, digital sensors might reveal behavioral patterns and lead to new interventions. Patients in traditional talk therapy may benefit from a big data approach to psychiatry, but it will likely prove most helpful in the diagnosis and treatment of severely ill patients.

Companies like Google, Facebook, Instagram and Twitter already use many of these tools to gain an enormous amount of information about our behavior, but the interests of the tech giants aren't always aligned

with those of the individual user or society at large. Using big data for behavioral healthcare offers a way to return ownership and benefit to the individual.

Two models have already begun to emerge. In one, doctors offer carefully calibrated laboratory tests, sitting down with patients to decide which data might be helpful to collect and why. Patients then decide whether and how much of their data to share, for how long and with which treatment providers. Some academic research groups are already piloting a new kind of medical role, a "digital navigator" who specializes in exploring data collection and sharing with patients.

The other potential approach to big data is a consumer-facing product similar to the genetic testing offered by 23andMe, in which people pay for access to their own data and then decide who to share it with. Private tech companies have already developed online dashboards for processing and viewing behavioral data in real time.

These two strategies will probably need to converge in order to succeed. Private tech companies have an

abundance of technology and processing power, but they lack access to the patient data required to train their tools. Academic centers have access to patients but are forced to create in-house dashboards and data collection systems that already exist in the private sector. Bridging the divide between academic and private sectors will require a rethinking of fundamental questions about data ownership, data security and intellectual property.

Before new data technologies are employed and marketed, they must be evaluated as rigorously as other clinical tools, of course. But using

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big data to make psychiatry more precise and effective has the potential to help all patients.

Dr. Barron is a psychiatrist and the incoming medical director of the Interventional Pain Psychiatry Program at Brigham and Women's Hospital. This essay is adapted from his new book "Reading Our Minds: The Rise of Big Data Psychiatry," published this week by Columbia Global Reports.



WORD ON THE STREET
BEN ZIMMER

A Nothing Of a Name For a Perplexing Pitch

THE FIRST MONTH of the Major League Baseball season has had many oddities, as teams struggle with pandemic protocols. But one peculiar development is accompanied by an equally peculiar word: the resurgence of the "eephus" pitch.

While modern-day pitchers routinely serve up fastballs at



Greinke broke out the pitch on April 12, when Renato Núñez of the Detroit Tigers looked on helplessly as a 51-mph eephus floated past him for a called strike. When position players are brought in to pitch—as they have been more often this season by managers looking to rest pitchers' arms—speeds can get even more sluggish. Minnesota Twins utility player Willians Astudillo recorded two 46-mph strikes, and Chicago White Sox shortstop Danny Mendick managed to get his eephus down to 40 mph.

These super-slow looping pitches have gone by many names, including the "blooper ball," the "parachute," the "rainbow pitch," and the "Bugs Bunny change-up"—that last one after

a classic 1946 cartoon in which Bugs strikes out three batters with one perplexing slowball.

But "eephus," sometimes spelled "ephus" or "eefus," is the name most often been applied. Its mysterious origins are quite fitting for a pitch that seems to come out of nowhere.

Pittsburgh Pirates pitcher Rip Sewell is widely credited with introducing the eephus, and the first examples of the term for a slow pitch appear in newspaper articles about Sewell's remarkable 1943 season, when he led the major leagues with 21 wins at the age of 36. On June 21, the Pittsburgh Press reported that Sewell's "lazy tantalizers" were making his opponents look silly, though two batters "stepped

into the 'ephus ball'" for hits.

On July 15, the Pittsburgh Post-Gazette attributed the term to Sewell's catcher Al Lopez: "Lopez, in using the non-word, ephus, justifies his encroachment on Webster, by unassailable logic. He says that while he has never seen or heard the word ephus he also had never seen or heard about the peculiar pitch that Sewell has developed."

Sewell himself later gave another teammate credit. He recalled that outfielder Maurice Von Robays used the word when Sewell introduced the pitch in a spring-training game. After Sewell inquired what an "eephus" was, Von Robays replied, "Eephus ain't nuthin', and that's what that pitch is, nuthin'."

Sewell also told the Sporting News in 1944 that "ephus means nothing in some language (he isn't sure which one), so it's just another way of saying 'nothing ball.'" Some baseball historians have theorized that the language was Hebrew, which has a word "efes" (pronounced "EFF-ess") meaning "nothing," though there's no evidence that Sewell or teammates knew any Hebrew.

There are also earlier origins.

Some have speculated that "eephus" emerged as a bit of lucky nonsense chanted when throwing dice in craps games. Regardless, the term seemed to first take off in the San Francisco Bay area, a hotbed of slang in the early 20th century. In June 1925, it appeared in the San Francisco Examiner meaning "the inside dope" ("here's the eephus"). Then it showed up in the paper a month later in a baseball reference—a slangy take on the Seals, the city's minor-league ball club: "We all wished you was here so you could've joined the customers in giving the athlete the old razz-matazz, which is a way of saying the 'eephus.'"

A few years later, a young pitcher named Lefty Gomez debuted with the Seals. He went on to pitch for the New York Yankees and took the "eephus" slang with him, though not applied to a specific throw. In 1935, he used the term for an ineffable ingredient in a pitching performance: "Eephus is that little extry you have on your good days," Gomez said. For slowball experts from Sewell to Greinke, "eephus" is more about addition by subtraction. It might refer to a "nothing" pitch, but in American slang history, it's truly something.

[Eephus]

around 100 mph, the "eephus" slows things down to about half that velocity. It's an off-speed pitch that's so off, it can fool batters who aren't expecting such a drastic change of pace. Houston Astros pitcher Zack