Inquiro, the UAB undergraduate science research journal

Volume 2015 | Number 9 Article 3

2015

Predicting Schizophrenia with Computers

Hriday Bhambhvani

Predicting Schizophrenia with Computers

Hriday Bhambhvani

The lack of objective clinical tests in psychiatry, relative to other areas of medicine, has been a persistent challenge for the field. Despite considerable progress in characterizing the pathophysiology of many neuropsychiatric illnesses, markers that reliably differentiate psychiatric health from illness in individual patients remain elusive. Recently, however, the seemingly disparate field of computer science has begun to be recognized as a potential source of answers. Its increasingly sophisticated approaches to characterizing and predicting human behavior are already widely used in industry—as in computerized job screens and essay scoring, for example—but their applications to diagnosis and prognosis in psychiatry are only now beginning to be explored.

In a study published on August 26, 2015, in the journal *Schizophrenia* by researchers at Columbia University, the New York State Psychiatric Institute, and the IBM T.J. Watson Research Center, an automated speech-analysis program administered at the start of the 2.5-year study period predicted with 100% accuracy which of the 34 young participants would experience a psychotic episode during the remaining time. This program managed to outperform more traditional advanced screening technologies, such as EEG recordings and neuroimaging biomarkers (e.g. ^{1}H magnetic resonance spectroscopy to gauge glutathione).

The study began with the participants undergoing open-ended, narrative interviews in which they were encouraged to describe significant life events or lifestyle changes they had experienced and the impact of these events. Interviews were transcribed and analyzed for semantics (meaning) and syntax (structure); tone and inflection were also important variables. While a psychiatrist may intuitively pick up on signs of disorganized thought, a machine can have the advantage of quantifying these parameters in a rigorously consistent way. Following baseline interviews, participants were observed for two and a half years.

Of the initial thirty-four participants, five went on to experience a psychotic episode and twenty-nine did not. Remarkably, the computer analysis had predicted the correct outcome for each participant. The speech-analysis program, at the core of which is a complex algorithm, honed in on a few key features in the speech of the five participants who eventually developed psychosis: breaks in the flow of meaning from one sentence to the next, use of unusually short phrases, and a lack of elaboration. For example, consider the following passage spoken by a participant who later developed psychosis: "I was always into video games. I mean, I don't feel the urge to do that with this, but it would be fun. You know, so the one block thing is okay. I kind of lied though and I'm nervous about going back." These breaks in and of themselves are not highly specific to the development of psychosis, though the combination of brief syntax with semantic incoherence is a strong predictor of psychosis.

To determine whether this automated speech-analysis software is consistent and applicable to a wide variety of potential patients, further studies with a larger group of individuals are required. However, the present study does open the possibility of using these new technologies to aid clinicians in prognosis and track treatment response. Speech analyses have the significant advantages of being non-invasive, inexpensive, portable, and fast. With further development, they have the potential to become powerful tools that can complement clinical interviews and ratings. Beyond diagnosis, if speech analyses are able to identify individuals at risk for developing psychosis before symptoms start, targeted preventive measures may become possible. Ultimately, this would mean a chance to delay the onset of symptoms or reduce their severity.