

Data science: the new force in mental health research

The potential of data science to **REVOLUTIONIZE MENTAL HEALTH RESEARCH** was examined at a recent symposium in Tokyo

Data science is the key to a new era in mental health and neurological research, a symposium in Tokyo has heard. "We're at a crossroads right now, where data science really promises to transform mental health research," said I-han Chou, a *Nature* senior editor. "Data science has the power to bring in data from other systems: data on our behaviours, on our environment, and on our social interactions."

The special symposium on mental health and data science, held in Tokyo on 24 October 2019, was sponsored by Janssen, the pharmaceutical company of Johnson & Johnson, the University of Tokyo Center of Innovation, Tokyo University of Science and the Health and Global Policy Institute. Chou noted the huge strides that modern medicine has made in fields such as cancer in contrast with the limited advances that have been made in mental health.

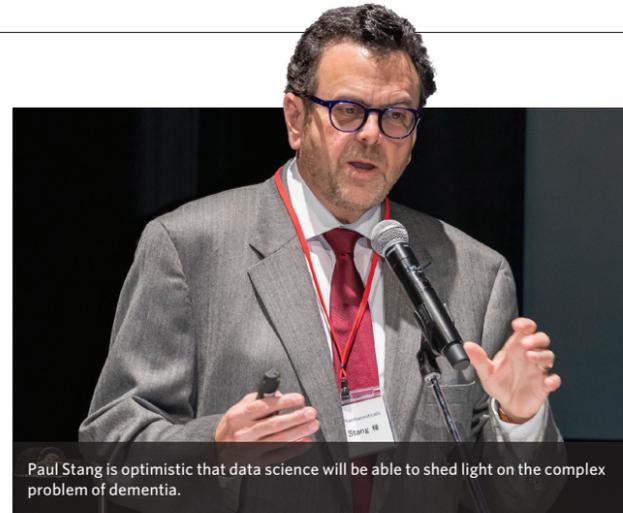
This lack of progress is cause for concern because neurological disorders represent one of the biggest medical challenges of this century. Conditions such as depression, autism, schizophrenia, and Alzheimer's and

Parkinson's diseases devastate the lives of many individuals and those that care for them. They also impose a huge burden on society. And it's only going to get worse as the world's population ages, increasing the prevalence of mental conditions such as dementia, for which age is a significant risk factor.

But the outlook is far from bleak. Data science, which specializes in finding connections and order in complex data sets, provides an opportunity to develop treatments for mental illnesses.

WE'RE AT A CRITICAL TIME FOR DATA SCIENCE AND MENTAL HEALTH

"We're at a critical time for data science and mental health," Chou said. "There's a lot of promise for a big shift. We're going to need very high-quality data; we're going to need a lot of innovation in artificial intelligence and informatics; and we're going to need a lot of people doing basic and clinical research."



Paul Stang is optimistic that data science will be able to shed light on the complex problem of dementia.



I-han Chou believes that collaboration between all players in the dementia space is critical to making progress.

Some promising parameters for assessing depression, a notoriously difficult condition to diagnose clinically, were discussed by Hiroshi Kunugi, director of the Department of Mental Disorder Research at the National Center for Neurology and Psychiatry. He described evidence that chemicals in the body, such as stress hormones and monoamines, could be used to monitor depression. Another promising avenue is measuring inflammation in the brain using inflammatory cytokines. Also, depression could induce changes in the gut microbiome, or perhaps the other way around, with a recent study showing a correlation between depression and fewer 'good bacteria' in the gut.

Mental disorders may even be revealed in speech. Shinichi Tokuno, an associate professor at the University of Tokyo, described a free smartphone app (MIMOSYS) developed by his

team that can analyze emotions such as joy, anger, sorrow and calm in a user's voice. It then employs an algorithm to evaluate the likelihood of depression with high accuracy. There are plans to develop it further, so that it will be able to help to detect the potential for Parkinson's disease and dementia in the future. The app was developed in conjunction with the companies PST Inc and AGI Inc using their Sensibility Technology, and is an excellent example of how public-private collaborations can advance the mental health field.

Data analysis is another area which can help to unravel the complexity of mental illness. Tomohiro Shinozaki, junior associate professor at the Tokyo University of Science, talked about how new informatics and biostatistical methods are evolving to handle the interpretation of highly complex data sets and how it can help inference and



Vice-Minister for Health, Yasuhiro Suzuki (second from left), outlines Japanese government priorities for facilitating research into mental health.

hypothesis testing, thereby greatly improving the analysis of clinical trials.

A CRITICAL TIME FOR COLLABORATION

Summing up, Chou noted the need for collaboration between all players — researchers in academia and in industry, the funders of research, and private citizens. All those groups were represented at the symposium and participated in a panel discussion on how to build strong collaborations with a view to fostering innovation in data science and mental health. It was an example of the kind of discussions

that are needed in order to apply the power of data science to the complexity of mental health.

"We don't really understand how brain function supports how we think, feel, behave and interact," said Chou. "In terms of basic biology, we still have a very long way to go."

Paul Stang, vice president of global R&D epidemiology at Janssen Research and Development, noted the lack of objective tests for diagnosing mental health disorders, the high placebo effects observed in randomized trials, the large number of people who are undiagnosed or misdiagnosed, and the stigma

associated with mental health problems. He also pointed out that there are complex interactions between the mind and the body, so that mental illness is often accompanied by physical illness, and vice versa. Summarizing the situation, Stang said: "We couldn't have conceived a more complex problem to solve." He stressed the need to create a culture that sees medical records as a tool for research and not just as something necessary for patient care. If we can succeed in doing that, Stang is confident that data science will significantly advance mental health research. ■

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