New predictive computer program could help detect individuals at high risk of depression

Reviewed by <u>Emily Henderson, B.Sc.</u>   Jan 23 2022

A team of scientists from Nanyang Technological University, Singapore (NTU Singapore) has developed a predictive computer program that could be used to detect individuals who are at increased risk of depression.

In trials using data from groups of depressed and healthy participants, the program achieved an accuracy of 80 per cent in detecting those individuals with a high risk of depression and those with no risk.

Powered by machine learning, the program, named the Ycogni model, screens for the risk of depression by analysing an individual's physical activity, sleep patterns, and circadian rhythms derived from data from wearable devices that measure his or her steps, heart rate, energy expenditure, and sleep data.

Depression affects 264 million people globally, and is undiagnosed and untreated in half of all cases, according to the World Health Organisation. In Singapore, the COVID-19 pandemic has led to increased concerns over mental well-being. A new study by Singapore's Institute of Mental Health pointed to a likely increase in mental health issues, including depression related to the pandemic.

Activity trackers are estimated to be worn by nearly a billion people, up from 722 million in 2019.

To develop the Ycogni model, the scientists conducted a study involving 290 working adults in Singapore. Participants wore Fitbit Charge 2 devices for 14 consecutive days and completed two health surveys, which screened for depressive symptoms, at the start and end of the study.

The average age of the participants was 33 years old, with the sample closely mirroring the ethnic population of Singapore. Participants were instructed to wear trackers all the time and to remove them only when taking a shower or when the device needs charging.

Professor Josip Car, Director, Centre for Population Health Sciences at NTU's Lee Kong Chian School of Medicine (LKCMedicine), who co-led the study, said: "Our study successfully showed that we could harness sensor data from wearables to aid in detecting the risk of developing depression in individuals. By tapping on our machine learning program, as well as the increasing popularity of wearable devices, it could one day be used for timely and unobtrusive depression screening."

> " *This is a study that, we hope, can set up the basis for using wearable technology to help individuals, researchers mental health practitioners and policy makers to improve mental well-being. But on a more generic and futuristic application, we believe that such signals could be integrated with Smart Buildings or even Smart Cities initiatives: imagine a hospital or a military unit that could use these signals to identify people-at-risk."*
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> *Georgios Christopoulos, Study Co-Lead and Associate Professor, Nanyang Business School, Nanyang Technological University*

The results of the study were published in the peer-reviewed academic journal *JMIR mHealth and uHealth* in November.

Vital signs linked to depressive symptoms

Besides being able to accurately determine if individuals had a higher risk of contracting depression, the researchers successfully associated certain patterns in the participants behaviours to depressive symptoms, which include feelings of helplessness and hopelessness, loss of interest in daily activities, and changes in appetite or weight.

From analysing their findings, the scientists found that those who had more varied heart rates between 2 am to 4 am, and between 4 am to 6 am, tended to be prone to more severe depressive symptoms. This observation confirms findings from previous studies, which had stated that changes in heart rate during sleep might be a valid physiological marker of depression.

The study also associated less regular sleeping patterns, such as varying

waking times and bedtimes, to a higher tendency to have depressive symptoms.

The scientists explained that although weekday rhythms are mainly determined by work routine, the ability to follow this routine better differentiates between depressed and healthy individuals, where healthy people demonstrated a greater regularity in the timings when they woke up and went to sleep.

Prof Car added: "We look forward to expanding on our research to include other vital signs in the detection of depression risk, such as skin temperature. Fine-tuning our program could help in facilitating early, unobtrusive, continuous, and cost-effective detection of depression in the general population."

Assoc Prof Christopoulos added: "Our team will also be working on expanding to other types of psychological status, such as mental fatigue, which seems to be an alarming problem nowadays. Wearables can also be part of feedback system that could support therapists to better evaluate the psychological status of their patients - for instance improvements in sleep quality."

Source:

Nanyang Technological University

Journal reference:

Rykov, Y., *et al*. (2021) Digital Biomarkers for Depression Screening With Wearable Devices: Cross-sectional Study With Machine Learning Modeling. *JMIR Mhealth Uhealth*. doi.org/10.2196/24872.