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Study to detect early depression among seniors through voice analysis

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Researchers aim to detect and manage early signs of depression among seniors through voice analysis, as part of a three-year study and pilot programme that uses artificial intelligence (AI).

Changes in the pitch or tone of voice could be a result of physiological changes arising from early depression, say the researchers.

The SoundKeepers programme will recruit more than 600 seniors aged 55 and above in Hougang and Woodlands to collect their voice samples, which will be used to build an AI algorithm to detect subsyndromal depression (SSD).

SSD is characterised by the emergence of depressive symptoms that are not severe enough to be diagnosed as major depression.

The programme involves seven partners – NTU's Lee Kong Chian School of Medicine and College of Computing and Data Science, National Healthcare Group Polyclinics, the Institute of Mental Health (IMH), Fei Yue Community Services, Club Heal and Lien Foundation.

In Singapore, past research has shown that around 13.4 per cent of seniors over 60 experienced SSD, though this figure is likely underestimated due to reliance on self-reported assessments, the agencies said on Oct 16.

This statistic is from a research paper in 2016 based on data from a 2011 Well-being of the Singapore Elderly study, a nationwide survey on the mental health profile of seniors here.

"Currently, SSD is not actively diagnosed or treated," said Dr Mythily Subramaniam, assistant chairwoman of IMH's medical board for research.

"However, with the focus on early detection and treatment... this project becomes extremely relevant as it can facilitate the early detection and diagnosis of SSD with a tool that can be easily used in the community setting."

When at least 630 voice samples have been collected, the AI voice biomarker will have enough data to provide an indication of the state of a patient's mental health relating to SSD.

By examining acoustic properties such as pitch, tone and speech patterns, researchers hope to detect physiological changes that correlate with mental health deterioration.

Such deterioration often leads to physiological changes in the muscles used in voice production, the agencies added.

For example, stress can cause muscle tension in the throat, neck and jaw, affecting the pitch and tone of one's voice. Shallow or irregular breathing, commonly seen in patients with anxiety, can affect vocal projection and clarity.

Insomnia can lead to difficulty in concentrating, affecting speech rate, fluency and articulation.

Assistant Professor Lee Eng Sing, co-principal investigator of SoundKeepers, said: "With the AI voice tool, primary care physicians will be able to identify seniors with SSD faster, without subjecting them to a battery of questions that may be distressing to seniors."

The potential of this new area of research in the field of mental health is immense and represents a paradigm shift in the way medical personnel screen and diagnose depression, Prof Lee added.

In the past decade, American, Canadian and Chinese start-ups have been developing voice biomarker technology for use in the health sector. While creating native technology for Singapore requires more effort, it offers advantages such as easier compliance with national healthcare data protection standards, the agencies' statement noted.

All voice samples will be anonymised and stored in a secure central storage terminal.

After the voice analysis, participants identified with SSD will be referred to a 24-week community intervention programme developed in collaboration with IMH and social service agencies.

It includes psychoeducation, social activities and befriending initiatives aimed at enhancing emotional resilience and social connections.

Currently, mental health is mainly assessed via self-reported data such as questionnaires provided by healthcare and social service professionals. The accuracy of the questionnaires often depends on a person's ability to recall information accurately, as well as subjective assessment.

"Those who prefer to keep their mental condition under wraps can do so easily by providing inaccurate answers. As a result, healthcare providers sometimes struggle with reconciling questionnaire results with their intuition," the statement said.

"This challenge is often accentuated when working with seniors who are reluctant to share their mental health issues."

The goal of SoundKeepers is not to replace existing screenings but to complement the assessments of health professionals.

It is hoped that the AI tool will be part of the set of instruments used routinely in a regular doctor's consultation.

Lien Foundation chief executive Lee Poh Wah said: "We need new ways to listen to our seniors. While they may not express their worries through words, we can now try to hear it through their voices."

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