**Your health speaks : vocal biomarkers the future of diagnostic medicine**

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**Voices to diagnose illnesses is that possible?**

If a person’s state of health changes, this immediately affects the voice” as Dr. Guy Fagherazzi, director of the Department of Population Health and head of the Deep Digital Phenotyping Research Unit said. Words may literally have the power to heal now, These vocal biomarkers can serve as a diagnostic tool for your physician to indicate signs of illnesses ranging from stress and depression to cardiovascular diseases. An earlier diagnosis could essentially be the difference between life and death. The human voice is a way which medium which serves as a primary source for communication between individuals With the purpose of reaching a human-like level, the development of artificial intelligence (AI), technologies, and computer sciences has led the way to new opportunities for the field of digital health, the ultimate purpose of which is to ease the lives of people and healthcare professionals through the leverage of technologies. is it possible to diagnose illnesses from the sound of your voice? Vocal biomarkers give us new opportunities in prevention also?

**How can it be used?**

The evolution of voice technology, audio signal analysis, and natural language processing/understanding methods have opened the way to numerous potential applications of voice, such as the identification of vocal biomarkers for diagnosis, classification, or patient remote monitoring, or to enhance clinical practice . The changes in the voice may be barely perceptible to the human ear. But digital technologies and artificial intelligence can measurably detect them as useful markers for diagnostic and medical purposes. A biomarker is a factor objectively measured and evaluated which represents a biological or pathogenic process, or a pharmacological response to a therapeutic intervention , which can be used as a replacement marker of a clinical endpoint. In the context of voice, a vocal biomarker is a signature, a feature, or a combination of features from the audio signal of the voice that is associated with a clinical outcome and can be used to monitor patients, diagnose a condition, or grade the severity or the stages of a disease or for drug development . It must have all the properties of a traditional biomarker, which are validated analytically, qualified using an evidentiary assessment, and utilized

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**Cardiometabolic and Cardiovascular Diseases**

A team from the Mayo Clinic has identified several vocal features associated with a history of coronary artery disease . Regarding diabetes, only one study has studied vocal characteristics in people with and without type 2 diabetes showing differences between the 2 groups for many features .It has been demonstrated that people with type 2 diabetes with poor glycemic control or with neuropathy had more straining, voice weakness, and a different voice grade , and that the most common type 2 diabetes phonatory symptoms were vocal tiring or fatigue and hoarseness

**COVID-19 and Other Conditions with Respiratory Symptoms**

More recently, considerable research activity has emerged to use respiratory sounds (e.g., coughs, breathing, and voice) as primary sources of information in the context of the COVID-19 pandemic .COVID-19 is a respiratory condition, affecting breathing and voice, and causing, among other symptoms, dry cough, sore throat, excessively breathy voice, and typical breathing patterns. These are all symptoms that can make patients' voices distinctive, creating recognizable voice signatures and enabling the training of algorithms to predict the presence of a SARS-COV-2 infection or as a tool to grade the severity of the disease. Results on vocal biomarkers to aid the diagnosis of COVID-19 by Cambridge University, or more recently by MIT scientists are promising. Other projects based on cough sounds are ongoing with the objective of developing a robot-based COVID-19 infection risk evaluation system. Future work should focus on the impact of the age category or the cultural background on the performances of cough-based algorithms, before launching such pre-screening tools on a large scale.

### **Mental Health and Monitoring Emotions**

Stress is an established risk factor of vocal symptoms. It was shown that smartphone-based self-assessed stress was connected with voice features .A positive correlation between stress levels and duration of verbal interaction has also been reported. Voice symptoms seem more frequent in people with high levels of cortisol , which is common in patients with depression; therefore, voice characteristics are used to discover depression symptoms or estimate depression severity. An automated telephone system has been successfully tested to assess biologically based vocal acoustic measures of depression severity and treatment response or to compute a post-traumatic stress disorder mental health score .Beside acoustic measures, the linguistic aspects of voice are likely to be affected in mental diseases. Discourse tends to be incoherent in schizophrenia, manifested by disjointed flow of ideas, nonsensical associations between words, or digressions from the topic. Circumstantial speech is prominent in patients with bipolar and histrionic personality disorders. Recent methodological developments have also allowed for improved emotion recognition accuracy ,which enables sufficient maturity to be reached for medical research to monitor patients in between visits or to gather real-life information in clinical or epidemiological studies.

**Technical challenges**

Building and sharing large databanks of highly qualified audio recordings with clinical data and identifying key vocal biomarker candidates ,Increase audio data harmonization and standardization across studies, Move from language-, accent-, age-, and culture-specific vocal biomarkers to more universal ones Improve algorithm accuracy, Embed algorithms into medical devices (apps, vocal assistants, smart mirrors …) and prototyping

**Summary**

Today, voice technology is even considered as one of the most promising sectors, with healthcare being predicted to be a dominant vertical in voice applications , this platform will be able to provide a better alternative to the invasive diagnostic techniques by using just the human voice. Your “I’m not feeling well” may just be enough to figure out what’s wrong without having to go through a series of cumbersome diagnostic tests. It will definitely be a major win for the diagnostic medicine

**Sources:**

* [Digit Biomark.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8138221/) 2021 Jan-Apr; 5(1): 78–88.

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* [Vocal biomarkers could be the future of diagnostic medicine (thenextweb.com)](https://thenextweb.com/news/vocal-biomarkers-future-diagnostic-medicine)
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