

A Novel Voice-Based Method for Estimating the Symptom Class of Depression

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DESCRIPTION

Depression is a common mental disorder that affects millions of people worldwide. It is characterized by persistent low mood, loss of interest, and reduced functioning. Depression can have a negative impact on various aspects of life, such as physical health, social relationships, and work performance. Therefore, it is important to diagnose and treat depression effectively. One of the challenges in diagnosing depression is that it is often underreported or unrecognized by patients and clinicians. Many people with depression may not seek help due to stigma, lack of awareness, or other barriers. Moreover, some of the symptoms of depression may be subjective or difficult to measure objectively. For example, how can we quantify the degree of sadness, hopelessness, or guilt that a person feels?

One possible way to overcome this challenge is to use voice as a biomarker for depression. Voice is a natural and non-invasive modality that can reflect the emotional and mental state of a person. Voice can be easily recorded and analysed using various acoustic features, such as pitch, intensity, duration, and spectral properties. Previous studies have shown that voice can be used to detect the presence or severity of depression with reasonable accuracy. However, detecting depression is not enough. Depression is not a homogeneous condition, but rather a complex syndrome with different subtypes and symptoms. Different people with depression may experience different combinations and intensities of symptoms, such as insomnia, fatigue, anxiety, weight loss, or suicidal thoughts. These symptoms may have different implications for the treatment and prognosis of depression. Therefore, it is also important to estimate the symptom class of depression from voice.

Recent studies proposed a novel method for estimating depressive symptom class from voice. The study used the Hamilton Rating Scale for Depression (HAM-D), which is a widely used clinical tool for assessing the severity and type of depressive symptoms. The HAM-D consists of 17 items that cover various aspects of depression, such as mood, insomnia, agitation, guilt, and somatic symptoms. Each item is rated on a

scale from 0 to 4 or 0 to 2 depending on the item. The study first clustered the HAM-D scores of 100 depressed patients into four groups using a hierarchical clustering algorithm. The four groups represented different symptom classes of depression: mild (group 1), moderate (group 2), severe with anxiety (group 3), and severe with somatic symptoms (group 4). The study then extracted acoustic features from the speech samples of the patients, who were asked to read aloud a short text and answer some questions. The acoustic features included pitch-related features (such as mean pitch and pitch range), intensity-related features (such as mean intensity and intensity range), durationrelated features (such as speech rate and pause rate), and spectralrelated features (such as formant frequencies and spectral tilt).

The study then trained a decision tree classifier to estimate the symptom class of depression from the acoustic features. The decision tree classifier is a simple and interpretable machine learning model that splits the data into smaller subsets based on certain criteria until a final decision is reached. The study evaluated the performance of the classifier using a leave-one-out cross-validation method, which means that each patient was left out once as a test case while the rest were used as training cases. The results showed that the classifier could estimate the symptom class of depression from voice with an accuracy of 79%. The most important acoustic features for distinguishing between symptom classes were pitch range, speech rate, pause rate, mean intensity, and spectral tilt. The study also found that some acoustic features were correlated with specific HAM-D items. For example, pitch range was negatively correlated with depressed mood and guilt, while speech rate was positively correlated with agitation and anxiety.

In conclusion that voice from speech can estimate the symptoms associated with depression. Many Findings have several implications for clinical practice and research. It suggests that voice can be used as an objective and easy method to assess depressive symptoms in addition to self-report or clinician ratings and implies that voice can provide information about the subtype and severity of depression, which can help tailor the treatment and monitor the progress of patients. It indicates that

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Received: 03-Apr-2023, Manuscript No. JOP-23-21150; **Editor assigned:** 06-Apr-2023, PreQC No. JOP-23-21150 (PQ); **Reviewed:** 20-Apr-2023, QC No JOP-23-21150; **Revised:** 27-Apr-2023, Manuscript No. JOP-23-21150 (R); **Published:** 04-May-2023. DOI: 10.35248/2378-5756.23.26.584

Citation: Hall KE (2023) A Novel Voice-Based Method for Estimating the Symptom Class of Depression. J Psychiatry. 26:584.

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voice can reveal some of the underlying mechanisms and processes of depression, such as emotional regulation and cognitive functioning.