



Statistical Validation of a Smartphone-Based Lyfas Anger Screening Optical Biomarker

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INTRODUCTION

Mental health has been perceived as the most important healthcare facet to take care of, especially during the corona pandemic. In general, mental illness screening tools are largely questionnaire-based, which are either self-rated or to be filled up by the mental health workers. A hybrid approach of clinical examination, laboratory tests, and response to therapeutic management are essential to arrive at an appropriate diagnosis by curbing down the chance of human bias. During the corona pandemic, meeting a psychiatrist or going to the laboratory for tests are restricted to prevent catching the virus. Hence, on 25/3/2020, Govt. of India legalized the telemedicine model of healthcare delivery with guidelines, where patients and medical doctors can communicate with each other online.

Phenotyping is a method of determining the characteristics based on observational or exhibiting traits. Anger is a protective emotional trait and is quite prevalent in modern days and its management is even a larger challenge during this pandemic phase due to a lack of social interactions, socioeconomic turmoil, uncertain future, high incidence of morbidity-mortality, and administrative decisions made, which some section of the population thinks unjustified, as found in the work.

DESCRIPTION

Anger is more prevalent in males in society as mentioned in the research of However, during this pandemic period, a good number of perimenopausal females complain of intractable but suppressed anger episodes, in their study due to various reasons and they have reported to the authors. Anger trait has

genetic trait through the expression of the MAO-A gene, evident in the study endocrine irregularities e.g., estrogen and progesterone depletion, substance abuse described, several environmental factors and mental illnesses that show high grades of anger issues. The neurophysiology of anger shows that emotion, the orbital, medial, and ventrolateral frontal cortex are the key brain regions implicated in anger response and hence emotion tagged to anger is expressed more in these regions. Reactive anger is also due to an aberration in the amygdala-hypothalamus-periaqueductal gray matter.

Applications of smartphones in healthcare are gaining popularity across the world due to the increased number of smartphone users, cheaper mobile data, patient-centric delivery, higher version of data privacy, and its pervasive nature. Using the optical sensor of the smartphone's rear main camera and the in-built LED light, these can measure the capillary blood flow and volume of the index fingers, when these are gently pressed on the camera.

Lyfas is a novel smartphone-based, and non-invasive optical biomarker capturing tool. The tool has been developed using the principle of digital signal processing. It can capture a total of 101 different digital biomarkers and is commercially available. These functional biomarkers are indicative of the psychophysiological state of an individual. Lyfas works on two principles, Photoplethysmography (PPG) and Photochromatography (PCG). PPG measures blood volume changes in the microvasculature, while PCG measures the reflected light from various blood components such as cells and solutes. The process is carried out using an optical sensor on the camera and its flashlight acting as an information capturing layer. The next

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layer is a signal processing layer, which consists of the proprietary mathematical modeling and algorithms (a combination of heuristics-ML-AI), which converts the input signal into actionable metrics, which in turn captures the functional biomarker parameters system-wise. These parameters were then validated in clinical settings (history, physical examination, and laboratory investigations) to detect several electromechanical and physiological activities, such as cardiovascular mechanics, hemodynamics, hemorheology, indicative hematology, and biochemistry in the test takers. Lyfas has also been found reliable in predicting the cardiac risks in. Lyfas has also been found reliable in phenotyping the triad of hypertension-anger-anxiety in a vulnerable adult sample.

CONCLUSION

Lyfas can be used as an optical biomarker tool along with other physical parameters in the clinical setup for anger screening and monitoring. Appropriate mental health support can be provided to the sufferers to reduce it to the socially acceptable level towards improving the quality of life, which is often hampered by anger issues. Bodyweight control by regular exercise and dieting, regular hormonal studies, controlling hypertension and diabetes, taking appropriate measures in reducing anxiety, and Lyfas tests that provide the psychophysiological snapshots through high LF/HF and SD1/SD2, and low SDNN estimations as a tale-tell instrument, are some important correlates found in the study that influences anger to occur.