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The Future of Online Therapy – PsAIch Emotracker

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ABSTRACT

Good mental health is essential to a person's overall health and well-being. Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. As the COVID-19 pandemic upends the lives of young people around the world, a long-simmering mental health crisis threatens to boil over. Demand for mental health care is skyrocketing, and yet support services have been significantly curtailed. Our solution to this problem is the PsAIch Emotracker, which makes use of various existing technologies to help psychiatrists in the efficient therapeutic treatment of mental illnesses virtually. This report showcases a design for a potential remote mental-health treatment system and aims to elicit insights about working of the PsAIch Emotracker and its potential applications.

Keywords: *Mental Health, Online Therapy, Wearable Technology, Emotion Tracker, EEG headband, Psychotherapy, Covid-19, Smartwatch*

1. INTRODUCTION

In recent years, there has been a huge rise in the number of mental health cases being reported every year. In just the last decade, there has been a 13% rise in mental health conditions and disorders [1]. Most mental health conditions can be effectively treated at relatively low cost, yet the gap between people needing care and those with access to care remains substantial. This happens due to a number of reasons:

Figure 1: Mental health disorders (figure from [15])

Mental health issues are still considered a taboo in many parts of the world due to which people are hesitant to seek aid for their mental health concerns. A lack of trained healthcare professionals found in villages and towns, means people either go undiagnosed or take antidepressants they don't need [2]

Mental health issues have increased at an exponential rate during pandemics and other natural disasters[3]. However, treatment of these patients can pose a challenge due to the difficult scenarios.

A popular solution to these problems is online counselling. However, Online therapies often makes it difficult for doctors to get a clear picture of the patient's feelings, thoughts and moods[4]. This problem often makes it difficult to virtually treat people with these illnesses.

The PsAIch Emotracker is a potential solution to all these problems. It can help in improving the efficiency of online therapy.

2. METHODS

Working Of the Design

PsAIch Emotracker is an AI-based Emotion Tracker which is paired with smart wearables, namely smartwatch and an portable EEG headband, to help psychiatrists in the efficient treatment of mental illnesses virtually. The EEG headband monitors brain activity and the smart watch collects vital biomarkers crucial for analysing the state of a person's mind and body. While on the backend, algorithms decode the brain signals and biomarkers the sensors collect and send them to the psychologist. Simultaneously, the emotion tracker performs an analysis and predicts the mental and emotional state of an individual. This allows the therapist to get a comprehensive idea on how the patient progresses during the virtual therapy session in real-time.

There are five main stages to the working of the product while the therapy session takes place.

Initially, the user logs into the application which is downloaded in his desktop, and then establishes a connection with the Therapist. After a formal introduction, the therapist advises the patient to wear his smartwatch along with the EEG headband. During the therapy session the webcam of the desktop system captures the individual's micro facial expressions and data like posture. With this data, the AI emotion tracker then runs its algorithm to analyse the data and predicts the emotional state of the individual, with the help of many factors. On the basis of this, the emotional state of a person is predicted.

Simultaneously, the portable EEG headband detects the electrical activity of the brain and sends relevant data in real time during the session. The EEG headband plays a very pivotal role not only in treating the patient but also understanding the state of the individual's mind [5]. At the same time, the smart watch worn on the patient's wrist collects vital biomarkers like heart rates, temperature ,perspiration rates which helps the therapist in briefly understanding the improvement of the patient from the first therapy session and also the effect of medication on the individual remotely [6].

Finally, Data from the wearables are sent to the desktop by bluetooth from where the data is sent to the therapist system. Both the processed and raw data will be available to the therapist during and also after the session. This will help the therapist in analysing the performance and efficiency of the treatment on the individual. Additionally, it will help the therapist in planning future sessions too.

Brief analysis on the technology used

The PsAIch Emotracker comprises various cutting-edge technologies and interesting applications of science in order to bring about the most efficient system.

The Emotracker works on a pre-trained facial expression recognition algorithm, which incorporates computer vision, multi-modal fusion and automatic learning [7]. It includes two machine learning models: a face detector and emotion classifier model.

The model detects your face and then analyses your emotional state and behaviour characteristics based on several factors such as the location of your eyebrows, posture, eyes, and how your mouth is positioned. It also analyses the detection of engagement, detection of facial actions and continuous prediction of emotion [8].

It collects these biomarkers and then the software does a brief analysis on the collected biomarkers and then predicts the emotional state of the individual and classifies them as: angry, sad, surprised, tensed, happy and scared. This allows the therapist to get immediate response from the individual towards a particular treatment method.

The portable Electroencephalography(EEG) headband monitors the electrical activity of the brain and sends back data. It detects the electrical activity of a large group of neurons that are active at the same time. Studies show that EEGs carry a lot of important signals and can be used for the diagnosis and treatment of mental health illnesses like depression. And so, the EEG headband proves to be very helpful in improving the efficiency of mental health treatments remotely and facilitates various forms of therapies like the Cognitive-Behavioural-Therapy, Biofeedback therapy, Progressive-Muscle-Relaxation and Neurotherapy.

Figure 2: Brain (figure from [16]

Neurotherapy is a therapeutic intervention that provides immediate feedback from the brainwave activity [9]. A common doubt would be: A typical EEG involves a lot of electrodes and wires. How can it be used at homes?

The EEG which we have used in designing this product is a wearable EEG headband developed by professor Arjun Ramakrishnan and his team at Cogwear technologies [10]. This wearable EEG makes it very convenient for the patient for wearing and also for the physician for collecting essential data and biomarkers remotely. Therefore, these EEG headsets can not only be used to monitor mental states of an individual with certain psychiatric conditions such as anxiety or depression during the session but also facilitate various forms of therapy.

Our body responds to stress, anxiety, fear and excitement by activating the nervous system. This causes a rise in blood pressure and heart rate, constricts blood vessels, increases perspiration rate, dilates the pupils and many other changes. This also results in a phenomenon called the skin conductance by which the skin momentarily becomes a better conductor of electricity. This creates electrical changes that we can sense on the surface of the skin [11].

Figure 3: EEG headband by Cogwear Technology (figure from [17])

Measuring and analysing this data, using various sensors in a smartwatch, can help the psychiatrist track the responses received from the patient and also track the progress during a session. The collection of these biomarkers is done by the wearable smartwatch on the patient's wrist. Overall, the collected data helps the therapist in understanding the state of the patient irrespective of the virtual format.

Figure 4: Smartwatch (figure from [18])

3. DISCUSSION

We are living amidst a civilization pioneering evolutionary heights, and evolving to massive changes, but the pandemic has proper efficient method for treating individuals suffering from mental illnesses virtually. Covid-19 has aided in highlighting and voicing the need for one. Online therapy sessions through video calls aren't very effective since the therapist usually does not understand the present mental state of the individual through the video call. Similarly, virtual therapy sessions are the only possible way through which individuals in rural areas have access to psychotherapists. Therefore, this solidifies the need for an efficient remote treatment system for mental health illness.

4. CONCLUSION

According to WHO, India is home to an estimated 56,000,000 people suffering from depression and 38,000,000 from anxiety disorders [12].

In rural India, the challenges of addressing mental illness are particularly significant due to the large concentration of psychiatrists and resources in major cities [13].

Incorporating the PsAIch Emotracker into health centres could help ensure that the people in these areas also have the opportunity to consult top doctors and seek aid for their mental health concerns. It would also help Certain government initiatives like the National Mental Health Programme achieve their objectives effectively [14].

The PsAIch Emotracker is just a design which we are looking forward to developing in the future. It has the potential to revolutionise the way mental health issues are treated today.

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6. REFERENCES

[1] https://www.who.int/health-topics/mental-health#tab=tab_2

highlighted many flaws that exist in our world. Even before the pandemic started, there was no

[2] https://www.thehindu.com/sci-tech/health/addressing-mental-health-in-rural-india/article25352154.ece
[3] https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/
[4] https://www.verywellmind.com/advantages-and-disadvantages-of-online-therapy-2795225
[5] https://www.consultant360.com/podcast/consultant360/amit-etkin-eeg-tool-depression-treatment
[6] https://www.mayoclinic.org/tests-procedures/biofeedback/about/pac-20384664
[7] https://machinelearningmastery.com/how-to-perform-face-detection-with-classical-and-deep-learning-methods-in-python-with-keras/
[8] https://www.sciencedirect.com/science/article/pii/S23529148203020 1X
[9] https://www.mentalhealthcenter.org/treatment-programs/neurohealth-center/neurofeedback/
[10] https://penntoday.upenn.edu/news/innovative-technology-wearable-portable-EEG-moves-brain-monitoring-from-lab-to-real-world
[11] https://www.livescience.com/65446-sympathetic-nervous-system.html#:~:text=The%20sympathetic%20nervous%20system%20directs,extra%20blood%20to%20the%20muscles
[12] https://www.livemint.com/Specials/Ysja8QtaVqjRpKg7eAFJfL/Over-5-crore-people-suffer-from-depression-in-India-WHO.html
[13] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6034434/
[14] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4623656/
[15] Image References:
[16] https://www.leogenic.com/wp-content/uploads/2019/11/Mental-Disorder-768x853.png
[17] https://d.newsweek.com/en/full/1228350/brain-stock.jpg?w=1600&h=1600&q=88&f=8aed7f2d433de8262b347b694e998abd
[18] https://penntoday.upenn.edu/sites/default/files/2019-08/P-100717-Master-V1-023X.jpg
[19] https://m.media-amazon.com/images/I/61yeJbZkwmL._SY355_.jpg

