Timely use of Technology to Reduce Perpetuate Stress Impacts

Shubhangi Gond, Bhavna Ambudkar, Afzal Ali Syed

Abstract: Stress has become a common thing in today's life. Because of the fast pace, it is a top health concern. Psychologists say that if they don't learn healthy ways to manage stress now, it could have serious long-term health implications, such as depression, anxiety, high blood pressure, diabetes. Currently people are suffering from stress issues everywhere. Since last few decades stress has been detected in most of the people and there has been recorded severely increasing effect of stress on human body. Stress can alter complete health which leads to reducing the tolerating power of the human. In metro cities this condition is more severe. Hence it is necessary to identify stress before it causes any serious harm and treat on it. In this project we are presenting stress detection technique and lower it with the help of Music therapy. As there are many benefits of music so by taking advantage of it we are minimizing stress level to normal state. Detection of stress using brainwaves is a non-invasive method. We have selected 42 students who were about to go for their exam. Firstly we have recorded brainwaves before they were going to exam, then immediately after finishing their exam we have recorded brainwaves lastly they were allowed to listen to their favorite music and then recorded their brainwaves. From analysis it is clear that stressed brainwave were reduced to 29% by listening music.

Keywords : Brainwaves, stress, music impacts, stress relief.

I. INTRODUCTION

From the survey made by Global Health Organization, 80% of employees are suffering from stress at work, 60% of employees want to quit their jobs due to workplace stress, 1 in 2 employees suffers from anxiety and depression, 90% of employees are interested to participate in corporate stress management programs[5]. Fig.1 shows Stress Statistics of India, from which we find that in India maximum stress of 36.8% is found at work place where people don't get respect as they desire[4]. Secondly because of personal responsibilities, 30.1% India's people are stressed. Next, due to growing population there is tremendous competition in almost every field. This gives rise to stress of winning which can causes hypertension and in India this stress contribute to 23.6% of total stress as shown in figure 1. Approximately 1 out of 75 people may experience panic disorder. Depression is among the leading causes of disability worldwide. Fewer than 25% of those with depression world-wide have access to effective treatments [2].

There are some types of stress such as acute stress, episodic acute stress, chronic stress. Acute stress is most often caused by reactive thinking. Negative thoughts predominate about situations or events that have recently occurred, or upcoming situations, events, or demands in the near future[1]. Acute stress causes signs and symptoms in the body + brain + emotions, but does not cause the significant amount of damage as Episodic Stress and Chronic stress.
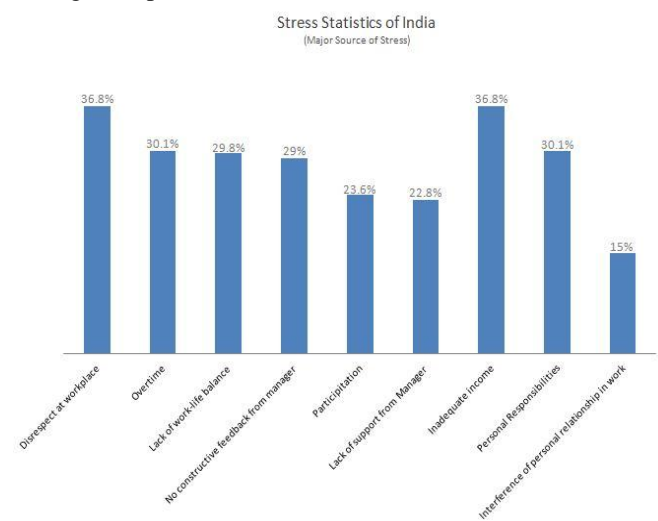
Source: SHRM[4]

Fig. 1.Stress statistics of India

The individuals who frequently suffer acute stress often live a life of chaos and crisis. They are always in a rush or feel pressured. They take on many responsibilities, and usually can not stay organized with so many time demands. These individuals are perpetually in the grips of acute stress overload. Chronic stress is the most harmful type of stress. If chronic stress is left untreated over a long period of time, it can significantly and often irreversibly damage your physical health and deteriorate your mental health. People with Chronic stress require extended medical and psychological treatment that includes behavioral and stress management. Chronic stress kills through suicide, violence, homicide, heart attack, stroke and, perhaps, even cancer.

II. EFFECTS OF STRESS

Acute stress can be helpful as it may motivate us to complete our work in given period of time. But chronic stress may lead to serious depression. If this condition is left unnoticed it may have serious effects on body[2].

When any person is in stress, the human body releases stress hormones called adrenaline and

cortisol. This makes our heartbeats run at faster rate. Other changes in human are body tighten up and blood pressure rises also there can be trouble in breathing. Chronic stress may lower our immune system, digestive system and even our reproductive system and damage them to great extent. It also cause heart attack or stroke. Stress can also speed up our aging process [2][3]. Stress can cause serious problems on human body such as high blood pressure, heart disease, obesity, diabetes and even when a lady is pregnant it can cause abortion. Stress can alter the immune system which leads to reducing the tolerating power of the human [3]. Stress causes 60% of the overall illness of our body[5].

There are many more such effects of stress which can damage our healthy life unknowingly. Hence care must be taken before it takes a giant condition.

III. STRESS RELIEF TECHNIQUES

There are many stress relief techniques such as yoga, exercise, listening music, take a nap, play with pets

Source: verywellmind.com

IV. MUSIC IMPACTS ON STRESS

- **Increases happiness:** When we listen to our favorite music for at least 10-15 minutes our brain releases dopamine, which is a neurotransmitter which leads to raise the happiness, joy and excitement when listening to music
- **Decreases stress and Increases health:** Music affects our hormones directly. When we listen to our favorite music it lowers the cortisol level in our body, which can counteract on chronic stress [5].
- **Improves sleep:** A study showed that over 30% of the population suffers from insomnia. But listening to classical or relaxing music before going to bed improves the sleep quality significantly .
- **Strengthens learning and memory:** Researchers say that listening music can help us learn and recall anything very effectively.

Music is a way to bypass rational side of our life and to get in touch with the emotional side of our life. Hence with all these advantages Music is used in this project as a tool for reducing stress

V. WORK SETUP

Brainwave recorder is designed using types of amplifier such as instrumentation amplifier, operational amplifier, high conductive electrodes which are dry gel type as they give excellent trace results. Overall gain of 500 is required which is obtained as given below:
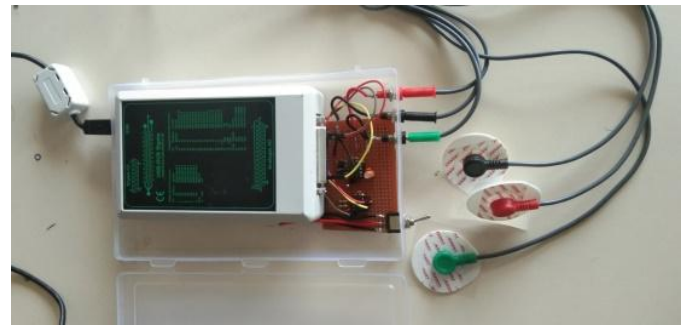

Fig. 2.Experimental Setup

- Instrumentation Amplifier:

AD620 is a low cost high accuracy instrumentation amplifier which requires only 1 external resistor to set gain upto 1 to 10000. The gain can be calculated as

$$G = (49.4K-Rg) / Rg \quad ………(1)$$

Where Rg is the external gain resistor connected between pin 1 and pin 8 of the IC.

Here we want gain as 5. Hence by substituting the value of G as 5, we get Rg as 7.4Kohm.

- Operational Amplifier :

Here for amplification we are using Operational amplifier i.e. Op-amp IC741.This IC comes in 8-pin package whose output pin is 6, inverting input is pin 2 and non-inverting input is pin 3. Pin 7 is Positive supply +Vcc and pin 4 is negative supply –VCC. Pin 1,5 and 8 are for offset null.

We have to build a non inverting amplifier with gain 100

Therefore, $G = 1+R1/R2$ ….. the ratio of R1/R2 must be 99

So practical value of R1 will be 100Kohm and R2 will be 1kohm

$$G = 1+100k/1k$$
$$G = 1+ 100$$
$$G \sim 101$$

VI. WORK DONE

Brainwaves of 42 students were recorded in three phases.
- 30 minutes before exam
- Immediately after exam
- After giving music

Students were from Dr. D. Y. Patil Institute of Technology Pimpri Pune. These students were selected such that they were about to attend there exam. Hence before going for exam each student's readings were recorded, then after they finish their exam brainwaves were recorded for each and finally a music was allowed to listen for 2-3 min for each student and again brainwaves were recorded. Hence we got three

set of readings i.e. before exam, after exam and after listening music. Finally a graph was plot which shows that students who were stressed before and after going to exam, their stress was released after listening their favorite music. Table I shows sample of the recorded brainwave and figure 5 shows the statistical representation of recorded brainwaves.

A. *Steps followed during recording of Brainwaves:*

- If the recorded wave is stressed, then music was played and ones again brainwaves were recorded
- The music played was of the students choice
- This music played for 4 minutes.
- Later to which brainwaves were recorded.

Table- I: Sample of recorded Brainwave

Sr. No.	Before Exam	After Exam	After Listening Music	Frequency difference	Time for music in min
1	16.27	11.55	11.5	0.05	2.3
2	14.12	11.16	11.29	-0.13	3
3	14.14	9.76	9.85	-0.09	2.4
4	11.5	11.61	11.29	0.32	2.1
5	11.29	11.29	11.08	0.21	2.9
6	14.85	9.38	11.8	-2.42	2.7
7	14.58	16.27	11.88	4.39	2.8
8	13.33	14.11	9.11	5	2.4
9	11.29	11.16	10.32	0.84	2.6
10	11.08	11.31	9.36	1.95	2.5
11	13.3	11.25	10.76	0.49	3.1

VII. BRAINWAVE ANALYSIS

From the recorded brainwave frequencies we can calculate the amount of brainwaves dropped after listening music.

Therefore,

% decrease in stress = {(stress freq – No stress) / stress freq} * 100

= <u>28.67%</u>

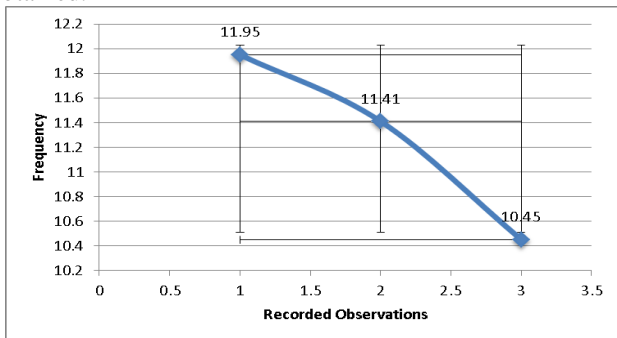Hence it is found that approx. 29% of decrease in stress is obtained.

Fig. 3.Statistical Analysis of Brainwave

The above figure shows the details of recorded brainwaves in various stages. It indicates that music effects does impact the stress. Figure 3 shows the decrease in stress after giving the music.

VIII. RESULT AND DISCUSSION

We have used Neural Networks for feature extraction. Here we have processed on normalized magnitude data for feature extraction. Fig 6 shows Pattern recognition of Neural Network.
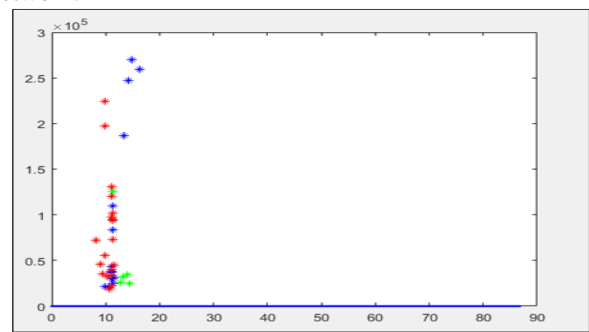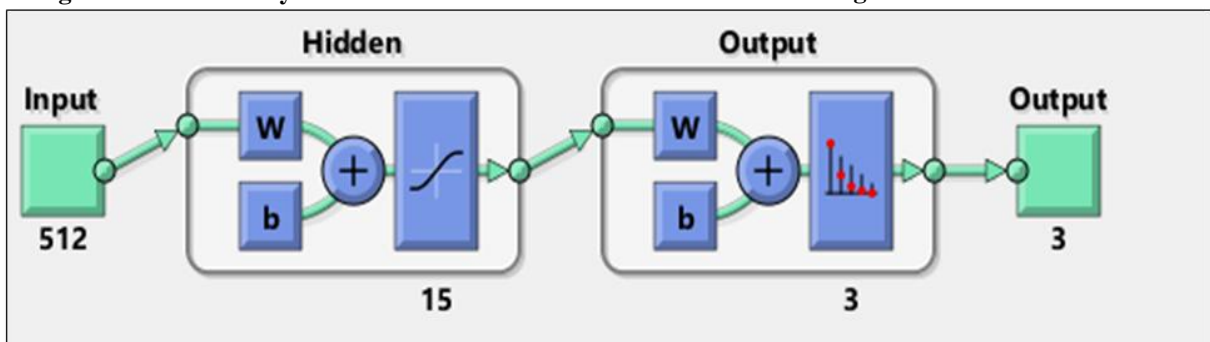

Fig. 4.Scattered Plot

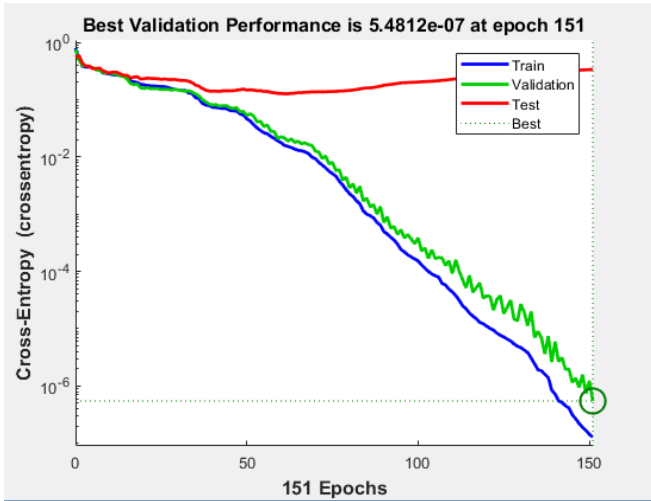**Fig. 5.Pattern Recognition using Neural Network**

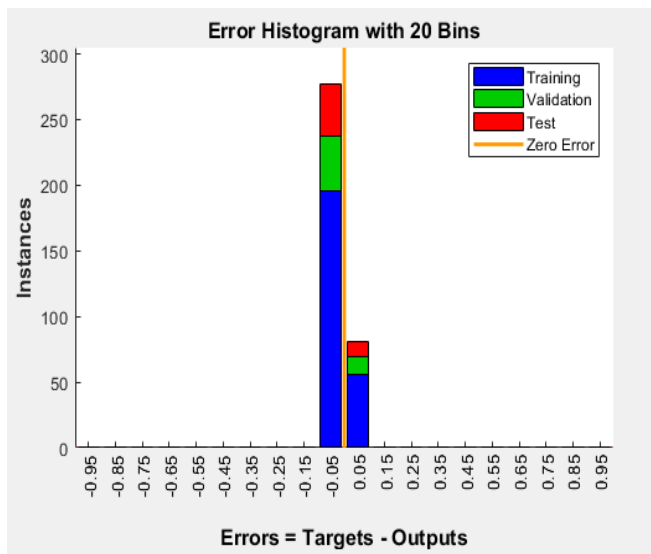**Fig. 6.Neural Network Training Performence**

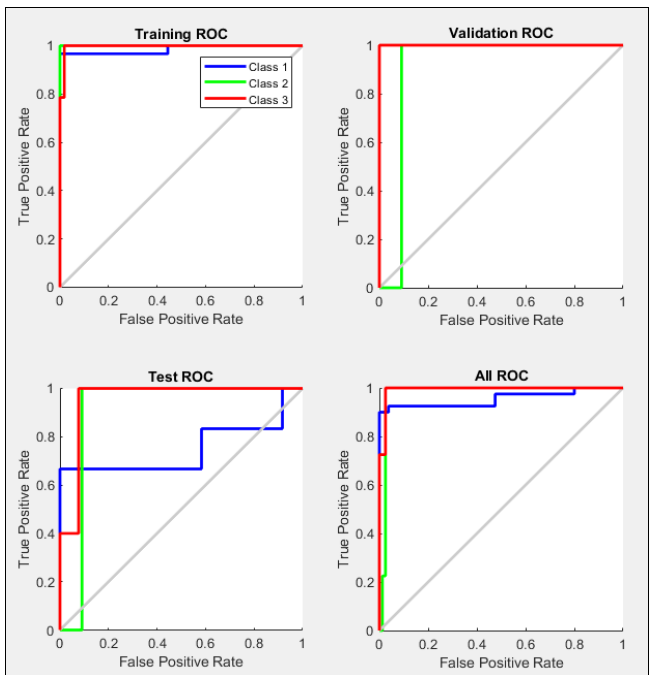**Fig. 7.Error Histogtam**

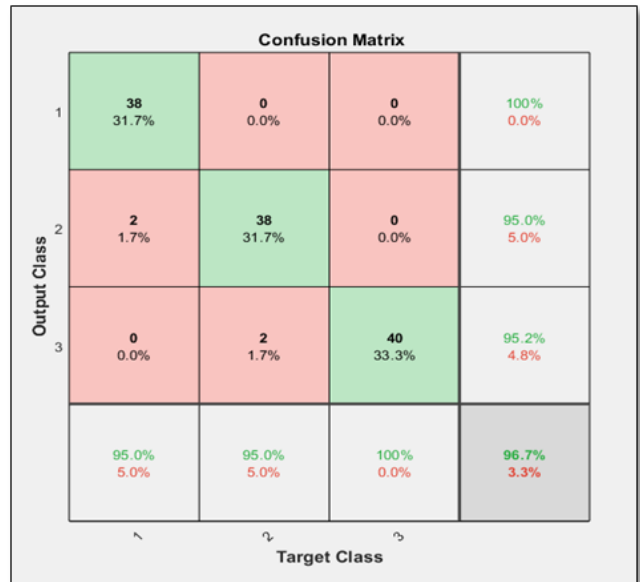**Fig. 8. Receiver Operating Characteristic**

Fig. 9.Confusion Matrics

IX. CONCLUSION

A simple, easy, portable and economical system is developed to record brainwave. This does not need any technical efficient person to use it but needs to be used under expert supervision. This system will prevent leading to stress disorder like post-traumatic stress disorders, acute stress, episodic stress and chronic stress. Hence use of this system can timely avoid use of abnormalities.

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