
Emotions and Brain Waves

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ABSTRACT

Emotions play an important role in everyone's life. The brain waves tell us the difference in the emotions the person is going through. This research studies the alfa brain waves in happy and sad emotion. For doing the research EEG machine is used and to elicit the happy and sad emotion movie clips are used. The result show there is difference in the Alfa waves in happy and sad emotions.

Keywords: *Happy emotion, Sad emotion, Alfa Waves.*

Emotion is a subjective experience of prolonged feelings. The term 'emotion' has been derived from the Latin word "emovere" which -means 'to move', 'to excite', 'to stirrup', or 'to agitate'. Arousal-behaviour is emotion, which is an affect-laden state of the organism. When we say that we love, fear, and hate. Some of the other emotions are joy, acceptance, surprise, sadness, anger, and disgust etc. emotion is often defined as a complex state of feeling that results in physical and psychological changes that influence thought and behavior. Emotionality is associated with a range of psychological phenomena including temperament, personality, mood and motivation. According to author David G. Meyers, human emotion involves "...physiological arousal, expressive behaviors, and conscious experience." Emotion is an acute disturbance of the organism as a whole, psychological origin involving behaviour, conscious experiences, and visceral functioning. In emotion, the total behaviour including the receptors, effectors nervous systems, and related psychological processes is affected. The major theories of emotion can be grouped into three main categories: physiological, neurological, and cognitive. Physiological theories suggest that responses within the body are responsible for emotions. Neurological theories propose that activity within the brain leads to emotional responses. Finally, cognitive theories argue that thoughts and other mental activity play an essential role in the formation of emotions.

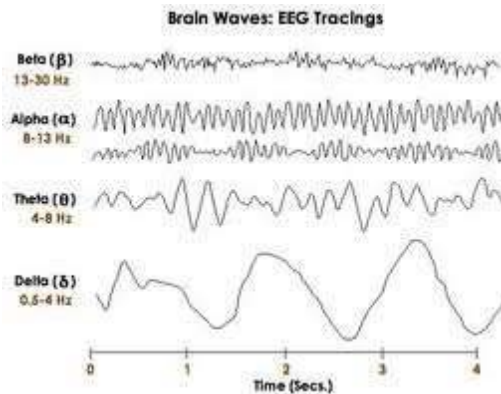
Traditionally, EEG-based technologies were used only in medical applications like epilepsy and seizures. *The electroencephalogram (EEG) is a measure of brain waves and used in the*

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*evaluation of brain disorders. EEG signal are the effect of the superimposition of diverse processes that takes place at a point of time in the brain. It uses the electrical activity of the neurons inside the brain. When the neurons are active, they produce an electrical potential. The combination of this electrical potential of groups of neurons can be measured outside the skull, which is done by EEG. The neurons of the brain produce together a rhythmic signal that is constantly present. This signal can be divided into several bands, based on the frequency: i. **Delta band:** The delta band is the frequency band up to 3Hz. Delta activity is mainly seen in deep sleep. ii. **Theta band:** The theta band consists of frequencies between 4Hz and 7Hz. This activity can be observed with drowsiness or meditation. iii. **Alpha band:** The alpha band is the so-called 'basic rhythm' and contains the frequencies between 8Hz and 12Hz. It is seen when people are awake, and is known to be more apparent when eyes are opened. iv. **Beta band:** The beta band contains frequencies between 13Hz and 30Hz. This band is apparent with active thinking or concentration.*



Beta waves are connected to an alert state of mind, whereas alpha waves are more dominant in a relaxed person. Research has also shown a link between alpha activity and brain inactivation, which also leads to the same conclusion. This beta/alpha ratio could therefore be an interesting indication of the state of arousal in the subject.

This study is a first and a small step to understand the relation between the brain waves and the emotional state. In this research only alpha and beta waves are studied in relation with the happy and sad emotion.

Lee Y-Y, Hsieh S (2014) did a study which aimed to classify different emotional states by means of EEG-based functional connectivity patterns. Forty young participants viewed film clips that evoked the following emotional states: neutral, positive, or negative. Three connectivity indices, including correlation, coherence, and phase synchronization, were used to estimate brain functional connectivity in EEG signals. Following each film clip, participants were asked to report on their subjective affect. The results indicated that the EEG-based functional connectivity change was significantly different among emotional states. Furthermore, the connectivity pattern was detected by pattern classification analysis using Quadratic Discriminant Analysis. The results indicated that the classification rate was better than chance. We conclude that estimating

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EEG-based functional connectivity provides a useful tool for studying the relationship between brain activity and emotional states.

Lauren Hanson, et al (2014) Alpha waves are most prevalent when eyes are closed or are exposed to visual stimulus. The purpose of this study was to test if change in emotions due to visual stimuli would appear in alpha waves on an EEG. Participants were shown three videos that stimulated happy, sad, and scared emotions, which were then compared to a baseline alpha wave measurement. All 10 participants were shown the same three videos and went through the same procedure. The control of this experiment was the baseline alpha wave measurement that was taken at the beginning for each participant. Through statistical analysis and the use of an ANOVA, it was found that the data collected was not statistically significant. The p-value found was 0.322, which was greater than the significance value of 0.05. The data found was not significant meaning that there was not enough difference between the baseline alpha waves and the emotional alpha waves, therefore emotion cannot be detected through the use of alpha waves.

Du, Ruoyu; Lee, Hyo Jong (2014) Many researchers reported successful emotion classifications. The aim of this study is to find out neuro-physiological characteristics of brain waves while affective pictures elucidate emotion. Ten healthy college students volunteered for the stimulus experiment with the standard IAPS affective pictures. All brain waves showed active patterns over four lobes of the brain. The significances of emotion change were found in the frontal lobe and Occipital lobe for the Alpha band. Beta and Gamma bands also showed significance for emotion change around the parietal lobe. This study revealed that the basic waves of Alpha, Beta and Gamma changed significantly at limited locations due to changed emotional status.

Ahmed, Mohammed Abdulkareem (2013) The important role of communication between human's brain and computer has been increased during the last years. In this research, the main focus of this thesis is analyzing brain waves that are associated with the internal emotion of human. The analyzing process is achieved by reading the EEG signals from the user's brain. NIA device is used in this research to read the signals from the frontal lobe of the brain. This study is based on reading brain wave signals in order to be represented as an avatar's facial expression. The aim of this research is to show the influence of alpha and beta brain waves toward emotion classification through EEG signals. In addition, the research is analyzing brain signals in order to represent happy and sad emotions. The classification of human emotion through a brain-computer interface can be interpreted through the speed of brain waves signals. The velocity is used to calculate the speed of brain signals for each emotion. The results proved that the velocity of sad emotion is faster than happy emotion. As a conclusion, this research shows the speed for each emotion which can be used to specify the internal emotion characteristic of a user. User emotion is represented as a facial expression of a virtual human in a 3D environment. These results can be used to create a good classification because it specifies the average of speed for each emotion.

METHODOLOGY

Objective of the study:

- The objective of the study was to understand.
- Brain waves in happy emotions and sad emotions.

Hypotheses:

Alfa waves will be high in happy emotion than sad emotion

Sample:

Two volunteers of 22 yrs age were in the study. One was male and other was female. With the help of EEG 40 Alfa waves were taken for the study.

Research Tool:

- Video clip of sad and happy emotion, the clip were from popular movie 3IDOT. Each clip was shown for 10 min. At the same time brain waves were recorded.
- EEG machine- The machine recorded the waves of the brain. For the study only Alfa waves were studied.

Procedure of data collection:

The sample was shown the clips of 3IDOT movie. The sad and happy clip was shown for each 10 min. this was carried out for four days. The values of EEG for 2 sec were taken. This was done to avoid the artifacts like the moment of eyes, muscular moments. Due to this the values differ on a large scale. The experiment was done on 2 samples so we got 40 Alfa for each sample.

RESULT AND DISCUSSION

Table no :1 Showing value of Alfa waves for happy and sad emotions

Alpha Waves	Mean	SD	N	df	t value
Happy Emotion	5.64	6.06	40	78	2.46*
Sad Emotion	3.24	1.02	40		

*significant at 0.01 level (1.99)

From the above table it is clear that there is difference in the alpha waves of happy and sad emotions. The mean of happy emotion is 5.64 and SD is 6.06. here the SD is more than the mean this is due to the some very extreme values in the Alfa waves. The mean for sad emotion is 3.24 and SD id 1.02. The t value is 2.46 which OS significant at 0.01 level.

Here the hypothesis “Alpha waves will be high in happy emotion than sad emotion” is accepted. When the individuals are awake and alert, there brain is operating in the beta state of activity. Beta waves are fast. Beta brainwaves are important for effective functioning throughout the day,

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but they also can translate into stress, anxiety and restlessness. The voice of that “nagging inner critic” can get louder the higher you go into the Beta range.

When a person is happy he or she is very excited and full of energy, enthusiastic. When they are happy and are relaxed and do not have any sort of stress or very low stress alpha waves are seen. As we know that the Alpha waves Frequency range: 8 Hz to 12 Hz (Moderate) and it promotes feelings of deep relaxation. Alpha brainwaves are present during quietly flowing thoughts, but not quite meditation. Alpha is ‘the power of now’, being here, in the present. Alpha is the resting state for the brain. Alpha waves aid overall mental coordination, calmness, alertness, mind/body integration and learning. So here while seeing the happy scene from the movie the sample felt relaxed than at the time of sad emotions.

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