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A Conceptual Insight for Experimental Analysis of Binaural Beats.

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ABSTRACT

These days stress, anxiety, insomnia is the major issue facing by the human due to busy schedule, workload, and many other reasons. Consequence of these human is unable to stay focused on his work. Hence, the performance of human is decreasing. One of the way is to achieve this by using meditation could be possible. Another way is to use the Brainwave Entrainment (BWE). Brainwave Entrainment is also referred to as brain entrainment, audiovisual stimulation (AVS), audiovisual entrainment (AVE), photic stimulation, or auditory entrainment. This system was designed to produce the auditory beats stimuli (Binaural Beats), check and analyze with the help of audacity software tools respectively.

Keywords Brainwave Entrainment (BWE), brain entrainment, audiovisual stimulation (AVS), audiovisual entrainment (AVE).

INTRODUCTION

As per D. S. Jog, sound is classified into two types one type is noise and another type is known as musical sound. Some sound classified as neither musical sound nor noises, such type of sound is human speech. Where disordered sound is known as noises, these type of sound is very complex and in the other hand the ordered sound is known as musical sound. Musical sound power can be used to stimulate to specific feeling and sentiments [1].

The human brain is most complex organ. The brain is such organ of human that has been studied by many types of practitioners like doctors, engineers, philosophers, neuroscientists, physicians and many other people are considering while their practices [2][4]. So therefore, it is become necessary to understand the brain of human, and the effect of auditory tone on brain may be used to stimulate the state of brainwave. According to Charles R. Noback, Norman L. Strominger et al. 2005, the brain can usually be divided into different part namely cerebrum, brainstem, and cerebellum. The cerebrum is having the pair of cerebral hemispheres as well as the diencephalon. The brainstem consists of midbrain, pons, and medulla [3].

Many research articles have said that the human brain is having the millions of neurons, and having electrical activity between these neurons, creates small signal voltages are known as brainwaves [5].

Scientists have classified these wave patterns and there are many different waveforms associated with many different types of electrical mental activity. An electroencephalogram (EEG) is a technology that can be use to record electrical activity of the brain at the different electrode site [2][5]. EEG signals are often studied for determining the relationship between the frequencies of electrical activity of the brain and corresponding mental state, emotional as well as cognitive state [6].

I. Brainwave Entrainment (AWE)

The brain's electrical response to rhythmic sensory stimulation like pulses of either sound or light is referred as Brainwave entrainment [2]. Whenever the brain is having stimulus, through the ears, through eyes, or some times through it could be an other senses, it throw the electrical charge in response, is called as Cortical Evoked Response. These types of electrical responses passes throughout the brain to become what you hear as well as see. One may be able to measure this type of activity measuring using sensitive electrodes attached to the scalp [2].

II. Binaural Beats

As per Gerald Oster, a German experimenter named as H. W. Dove in 1839, has discovered binaural beats [6][7]. To get better perception of binaural beats one can use stereophonic earphones [7]. The perception of binaural beats can be better when carrier frequency is about 440 Hz (Hertz) [6]. When frequencies that are more than the 1000 Hz completely vanish. To produce the binaural beats use low pitch frequencies [6]. There are some investigation also reported that the beats could be perceived by the tones, which have the frequencies up to almost 1500 Hz [6][7]. Otherwise, it may be difficult to find out the beats scale. In addition to that there could be a possibility that the subject may get confused if the tones, which are used to produce beats, have frequencies below about 90 Hz [6].

As shown in the figure 1.1, to produce binaural beats each oscillator is having slightly different frequencies tuned separately to each ear, it is also having the 6Hz binaural beats.

Binaural beats are having following characteristic as Binaural beats are subjective percept, Preparation of neighboring frequencies to each ear separately, It is central, Processed in the medial superior olivary nuclei, Require combined action of both ears, Present when beat frequencies are low and with carrier tones below 1000 Hz [8].

III. Brainwave Frequency

An electroencephalogram (EEG) is a technology to record electrical activity of the brain at the different electrode site [2][5]. EEG signals frequently studied for determining the relationship between the frequencies of electrical activity of the brain and corresponding mental state, emotional as well as cognitive state [2].

IV. Experimental Analysis Bases on the following:

To analyze the binaural beats following cases must be match;

i. Noise could be shown as occasional peaks, but we are not really looking for that one, actually what we are looking for peaks that stay the same, that is the peaks.

ii. Carrier frequencies, which are used to produce the binaural beats that must not be higher than the 1000 Hz, some investigator used 1500 Hz.

iii. The difference between carrier frequencies must matches with the predefined frequency range of

brainwave frequency such as delta, alpha, beta, theta, and gamma.

Table 1.1: Comparison of Brainwave Frequency Range

Type	Frequency Range	Usually associated with
Delta	0 – 4 Hz	• Deep sleep, unconsciousness • Affect adults or babies slow sleep • Deep dreamless sleep
Theta	4 – 8 Hz	• Young children, drowsiness or arousal in older children and adults • Memory, deep relaxation, daydreaming • Light sleep, creativity, insight • Random eye movement sleep, Drowsiness
Alpha	8 – 12 Hz	• Relaxed / reflected, closing the eyes • Relaxed attention • Relax state, daydreaming, light form of meditation • Calm, peaceful yet alert state • Relaxation, Awake but relaxed • Relaxed, alert state of consciousness
Beta	12 – 30 Hz	• Alert/ working, active, busy or anxious thinking, active concentration • Thinking, concentration, information processing • Normal, waking consciousness • Focusing, and (high beta) for intensity or anxiety • Alert, working, active, busy, anxious thinking and active concentration • Concentration, alertness, arousal, cognition, and higher level beta for anxiety
Gamma	30 – 100 Hz	• Certain cognitive or motor functions stress • High-level information processing

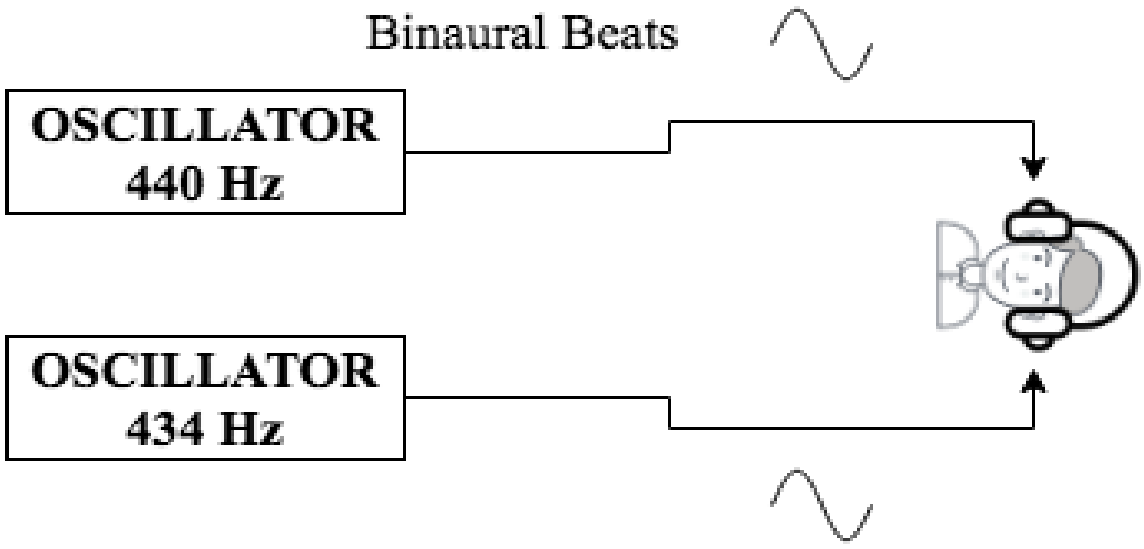

Figure 1.1: Diagrammatical representation of method for generating binaural beats by Gerald Oster [6]

CONCLUSION

In this research paper, we comprises comparison between different brainwave frequencies, and their associated mental state. This paper also conceptually demonstrated how to produce the binaural beats. After reviewing multiple research article we came to know that the Binaural beat's (BB) effect is subjective. And later in this work stated some points to verify the binaural beats.

Conflicts of interest: The authors stated that no conflicts of interest.

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