The Effect of Resonance on Human Consciousness

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ABSTRACT
Neurochemical processes in human brain are measured by wave function which is nothing but Brain Wave. These waves are measured by EEG machine are indirect means of assessing of the mind consciousness. Depending upon consciousness level these are categorized into four frequency band as beta, alpha, theta, and delta waves depending upon activeness of mind. No single brainwave state exists but it is mix of all four and one is predominate at any given time. These waves are the outcome of binaural beat phenomenon which is the auditory brainstem responses originate in the superior olivary nucleus of each hemisphere. As even low-powered oscillations can have enormous effects on standing waves by resonance effect. This technique can also be applied to brainwave entrainment, where binaural beat can be changed through audio binaural beat resonant entrainment techniques by applying sonic frequency through stereo headphone. This paper reviews the use of this technique of consciousness management to alter the state of mind.

Keywords
Brainwave, Binaural Beat, Entrainment.

1. INTRODUCTION
Any existence can be explain by simple wave functions, for example photon, energy emission, color, sound likewise even neurochemical processes of human consciousness our very thoughts ring with their own distinct wave patterns [1]. These thoughts rings are the result of two hemispherical vibration, which are due to the fact that two hemisphere resonate at two different frequency due the neurochemical processes taking place in human being and result into differential component. Thus brain is an electrochemical organ, generate electrical waves called brain wave which are measured by EEG, these reflect different consciousness of human mind [2]. Research has shown that the human brain operates at a wide range of frequencies, but generally stays in four major levels of awareness known as beta (13 to 30 cps), alpha (8 to 12 cps), theta (5 to 7 cps), and delta (1 to 4 cps) depending upon activeness of mind [3].

Waves interact with other waves, even low-powered oscillations can have enormous effects on standing waves, physical structures, and even the human brain [1].The principle which describes this particular wavelength interaction is known as resonance. By applying a constant resonant frequency to a standing wave, can intensify, reinforce, and prolong the standing frequency of that wave. By applying these concepts of resonance to waves emitted by the brain, it is possible to induce altered brain states [4]. A steady frequency of tiny waves would eventually create enormous ripples if they were timed just right. This was a principle of resonance known as entrainment - the ability of a frequency to cause a less powerful frequency to fall into rhythm simply by placing the two frequency emitters in close proximity. By experimenting with the effects of sonic frequencies on the brain, successfully isolated a little-known state of awareness which was totally separated from the physical body, called it an Out-of-Body Experience, an astonishing result emerged in mind alteration [5]. The audio binaural beat frequency modulation methods of "brainwave entrainment" are based on discoveries made by the 19th century inventor Nikola Tesla.[1] Audio Binaural beat frequency result in brain wave entrainment and can induce altered states of consciousness [4]. Some have called it instant meditation unlike mind altering drugs which people use to achieve altered states, binaural beat brainwave entrainment technology is legal and non-toxic [6]. This new technology is based on binaural beat frequencies and their effect on the sub cortical auditory system of the brain. After five minutes, the resonant entrainment effect has induced vast areas of the brain to resonate at the same frequency. The result is a dominant brain wave pattern at the desired frequency [6].

2. HUMAN CONSCIOUSNESS AND VARIOUS BRAINWAVES- DIFFERENT THOUGHT RING PATTERN
The consciousness is the result of electrochemical neurological activity [6]. The brain is made up of billions of brain cells called neurons, which communicate with each other using electrical signal. All of these neurons sending signals at once produce a large amount of electrical activity commonly called a Brainwave pattern [7]. Electrochemical activities in the brain, under fully functioning generate as much as 10 watts of electrical power. Other more conservative investigators calculate that if all 10 billion interconnected nerve cells discharged at one time that a single electrode placed on the human scalp would record something like five millionths to 50 millionths of a volt [8]. EEG measurements of Brainwave are an indirect means of assessing the mind-consciousness, interface with neurological structure of the brain [9].

There are four categories of these brainwaves, ranging from the most activity to the least activity reflect consciousness of human mind.

3. BRAIN WAVES

3.1 Beta Wave
When the brain is aroused and actively engaged in mental activities, it generates beta waves. These beta waves are of relatively low amplitude and high frequency among the four different brainwaves [9]. The frequency of beta waves ranges from 15 to 40 cycles a second [7]. Beta waves are characteristics of a strongly engaged mind. A person in active conversation would be in beta. A debater would be in high beta. A person making a speech, or a teacher, or a talk show host would all be in beta when they are engaged in their work [10].

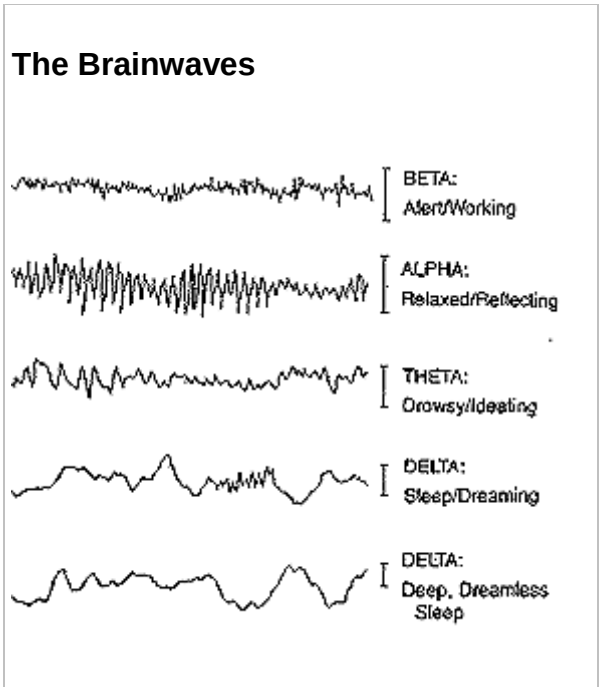

Fig 1: The Different Brainwave Patterns [11]

3.2 Alpha Wave

The next brainwave category in order of frequency is alpha where beta represented arousal, alpha represents non-arousal [9].Alpha brainwaves are having lower frequency and higher in amplitude. Their frequency ranges from 9 to 14 cycles per second.[7]. A person who has completed a task and sits down to rest is often in an alpha state. A person who takes time out to reflect or meditate is usually in an alpha state. A person who takes a break from a conference and walks in the garden is often in an alpha state [9].

3.3 Theta Wave

The next state, theta brainwaves, is typically of even greater amplitude and slower frequency. This frequency range is normally between 5 and 8 cycles a second [7]. A person who has taken time off from a task and begins to daydream is often in a theta brainwave state. A person who is driving on a freeway, and discovers that they can't recall the last five miles, is often in a theta state--induced by the process of freeway driving. The repetitious nature of that form of driving compared to a country road would differentiate a theta state and a beta state in order to perform the driving task safely [9].

Individuals who do a lot of freeway driving often get good ideas during those periods when they are in theta. Individuals who run outdoors often are in the state of mental relaxation that is slower than alpha and when in theta, they are prone to a flow of ideas. This can also occur in while shaving or brushing your hair. It is a state where tasks become so automatic that you can mentally disengage from them. The ideation that can take place during the theta state is often free flow and occurs without censorship or guilt. It is typically a very positive mental state [9].

3.4 DELTA WAVE

The final brainwave state is delta. Here the brainwaves are of the greatest amplitude and slowest frequency. They typically center around a range of 1.5 to 4 cycles per second [7]. They never go down to zero because that would mean that you were brain dead. But deep dreamless sleep would take you down to the lowest frequency. Typically, 2 to 3 cycles a second [9]

When we go to bed and read for a few minutes before attempting sleep, we are likely to be in low beta. When we put the book down, turn off the lights and close our eyes, our brainwaves will descend from beta, to alpha, to theta and finally, when we fall asleep, to delta [4].

It is a well known fact that humans dream in 90 minute cycles. When the delta brainwave frequencies increase into the frequency of theta brainwaves, active dreaming takes place and often becomes more experiential to the person. Typically, when this occurs there is rapid eye movement, which is characteristic of active dreaming. This is called **REM**, and is a well known phenomenon [6].

When an individual awakes from a deep sleep in preparation for getting up, their brainwave frequencies will increase through the different specific stages of brainwave activity. That is, they will increase from delta to theta and then to alpha and finally, when the alarm goes off, into beta [9]. The same four brainwave states are common to the human species. Men, women and children of all ages experience the same characteristics brainwaves [3].

4. WHAT ARE BINAURAL BEATS?

Binaural beats are auditory brainstem responses which originate in the superior olivary nucleus of each hemisphere. They result from the interaction of two different auditory impulses, originating in opposite ears, below 1000 Hz and which differ in frequency between one and 30 Hz [12].For example, if a pure tone of 400 Hz is presented to the right ear and a pure tone of 410 Hz is presented simultaneously to the left ear, an amplitude modulated standing wave of 10 Hz, the difference between the two tones, is experienced as the two wave forms mesh in and out of phase within the superior olivary nuclei [4]. This binaural beat is not heard in the ordinary sense of the word (the human range of hearing is from 20-20,000 Hz). It is perceived as an auditory beat and theoretically can be used to entrain specific neural rhythms through the frequency-following response (FFR)--the tendency for cortical potentials to entrain to or resonate at the frequency of an external stimulus. Thus, it is theoretically possible to utilize a specific binaural-beat frequency as a consciousness management technique to entrain a specific cortical rhythm [13].

5. RESONANT ENTRAINMENT OF OSCILLATING SYSTEMS TO GENERATE BINAURAL BEAT

Resonant entrainment of oscillating systems is a well-understood principle within the physical sciences. If a tuning fork designed to produce a frequency of 440 Hz is struck (causing it to oscillate) and then brought into the vicinity of another 440 Hz tuning fork, the second tuning fork will begin to oscillate. The first tuning fork is said to have entrained the second or caused it to resonate [1].The physics of entrainment apply to biosystems as well. It is found that two hemispheres resonate at two different frequencies due the neurochemical processes taking place in human being and result into differential component of interest, here are the

electromagnetic brain waves [13].These waves can be objectively measured with sensitive equipment like EEG machine [7]. Brain waves frequencies change based on neural activity within the brain which reflect human consciousness [9]. Because neural activity is electrochemical, brain function can be modified through the introduction of specific chemicals (drugs), it is found that it can also be changed through audio binaural beat resonant entrainment techniques [6].

6. EFFECT OF RESONANCE ON HUMAN BRAIN

Normally, the two hemispheres of the brain vibrate at different frequencies, but they could be easily synchronized by experimenting with the effects of sonic frequencies on the brain and successfully isolated a little-known state of awareness which was totally separated from the physical body [5]. The sonic principle he was using was already known to electronic engineers as binaural beat frequency modulation a key concept used in all radio receivers today. However this idea from the field of radio-electronics is applied to bioelectronics. This discovery is called as Hemispherical Synchronization or HemiSync for short [13].

To achieve these novel mind-states, two channels of audio data were recorded using a stereo tape recorder. On one channel was recorded a frequency of 200 cps, and on the other channel was recorded a frequency of 208 cps. When it was played the recording back through a pair of stereo headphones, it was discovered that while one ear heard the 200 cps tone, and the other ear heard the 208 tone, the brain interpreted the tones as an eight cps frequency, and began to entrain itself to that frequency [5]. In other words, the brain could only distinguish the eight cps difference, and this frequency was powerful enough to entrain brainwaves and change mind state. This experiment found to have astonishing effect for consciousness management by switching over to different frequency of brain wave that is four major levels of awareness known as beta, alpha, theta, and delta waves [4].

Lucid dreams, altered states, deep relaxation, euphoria, increased intuition, awareness, enhanced creativity, accelerated learning, psychic abilities, elimination of insomnia and the symptoms of stress, increased endorphin levels have been attributed to the use of binaural beat audio technology used for hemispherical synchronization [13]. A technology that permits the control of brainwave frequency patterns allowing the intentional inducement of altered states.

7. CONCLUSION

There are four brainwave states that range from the high amplitude, low frequency delta to the low amplitude, high frequency beta. These brainwave states range from deep dreamless sleep to high arousal. The same four brainwave states are common to the human species. Men, women and children of all ages experience the same characteristic brainwaves.

Research has shown that although one brainwave state may predominate at any given time, depending on the activity level of the individual, the remaining three brain states are present in the mix of brainwaves at all times . These are measure of consciousness as they are the result of electrochemical neurological activity of brain. These brain functions can be modified through resonant entrainment techniques by audio binaural beat technology.

This safe and effective binaural-beat entraining technique offers a wide variety of applications which include, but are not limited to: relaxation, meditation, enhanced creativity, intuition development, enriched learning, improved sleep, wellness, and the personal exploration of expanded states of consciousness.

The present study reveals that if audio binaural beat blended in music this can be used for "brainwave entrainment" to alter the state of mind and hence consciousness management through entraining specific cortical rhythm .

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