

# Recovery of an Addicted Individual by Controlling Brain Waves

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**Abstract-** Addiction is one of the chronic disorders which results when a person injects a substances like alcohol, cocaine, nicotine which is characterized by the repeated use of those substances or engages in the activities like Overeating, Gambling, Alcohol drinking, Taking Narcotic Drugs and Certain Mannerisms that can be pleasurable at the time of consumption but the continued act will become compulsive and interferes in their daily responsibilities. In this paper we are going to see about a design of device that can entirely avoid addiction. The device "Brain waves controller" is based upon the principle of controlling "Brain waves".

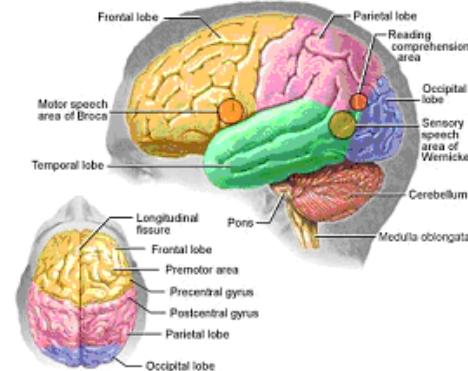
**Keywords** -Brain waves controller; Binaural beats; Entrainment; Stimulated frequency.

## I. INTRODUCTION

Our paper is based on the "Brain waves controller". some of the terms we are going to discuss "The Brain", "Brainwaves" and "Addiction". Brain is an organ of soft nervous tissue contained in the skull of vertebrates, functioning as the coordinating centre of sensation and intellectual and nervous activity. brain is made up of billions of brain cells called neurons, which use electricity to communicate with each other. The combination of millions of neurons sending signals at once produces an enormous amount of electrical activity in the brain, which can be detected using sensitive medical equipment (such as an EEG), measuring electricity levels over areas of the scalp. The combination of electrical activity of the brain is commonly called a Brainwave pattern.

### A) The Brain

The Brain is an electrochemical organ. The Brainwaves are produced by the temporal lobe of the brain. It processes auditory information from the ears and relates to the parietal lobe and the motor cortex of the frontal lobe. The amygdale is located within the temporal lobe and controls social and alcohol consupption and other emotions. The limbic system is important in emotional behavior and controlling movements.



Researchers have speculated that a fully functional brain can generate as much as 10 watts of electrical power. Even though this electrical power is very limited, it does occur in a very specific ways that are characteristic of the human brain.

### B) Brainwaves

Brainwaves are nothing but, Electrical activity from the brain is displayed in the form of brainwaves. There are four categories of these brainwaves, ranging from most activity to least activity. These are delta waves, theta waves, alpha waves and beta waves. Delta waves are waves with high amplitude. It has a frequency of 0.5 – 4 Hertz. 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 Hertz. Theta waves are waves with amplitude lesser than that of delta waves and have a greater frequency of 5 – 8 Hertz. A person who has taken time off from a task and begins to daydream is often in a theta brainwave state. Alpha waves are waves with amplitude lesser than that of theta waves and have a greater frequency of 9-14 Hertz. A person who takes time out to reflect or meditate is usually in a alpha state. Beta waves are the waves that have the lowest amplitude and have the highest frequency of 15 – 40 Hertz. These waves are again classified into low beta waves and high beta waves according to their range of frequencies. The low beta waves have a frequency of 15 – 32 Hertz. A person making an active conversation would be in the low beta state. The high beta waves have a frequency of 33 – 40 Hertz. A person in a stress, pain or addiction would be in the high beta state.

Table

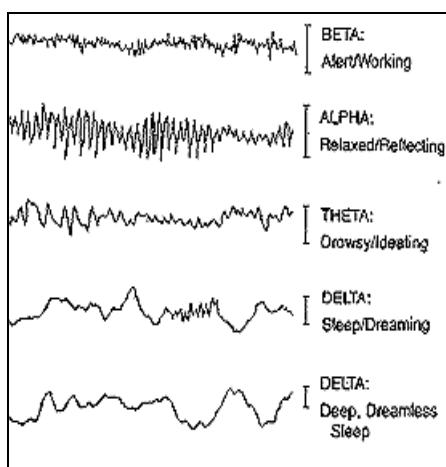
S.No.	Brainwaves	Frequency range (Hertz)
1)	Delta	0.5 – 4
2)	Theta	5 - 8
3)	Alpha	9 – 14
4)	Low Beta	15 – 32
5)	High Beta	32– 40

## V.ADDICTION

There are two types of addiction: Physical dependency and Psychological dependency.

### A) Physical dependency

Physical dependence on a substance is defined by appearance of characteristic withdrawal symptoms when the drug is suddenly discontinued. Some drugs such as cortisone, beta blockers etc are better known as 'Antidepressants' rather than addictive substances. Some drugs induce physical dependence or physiological tolerance - but not addiction - for example many laxatives, which are not psychoactive; nasal decongestants, which



can cause rebound congestion if used for more than a few days in a row and some antidepressants, most notably Effexor, Paxil and Zoloft, as they have quite short half-lives, so stopping them abruptly causes a more rapid change in the neurotransmitter balance in the brain than many other antidepressants. Many non-addictive

prescription drugs should not be suddenly stopped, so a doctor should be consulted before abruptly discontinuing them.

### B) Psychological dependency

Psychological addictions are a dependency of the mind, and lead to psychological withdrawal symptoms. Addictions can theoretically form for any rewarding behavior, or as a habitual means to avoid undesired activity, but typically they only do so to a clinical level in individuals who have emotional, social, or psychological dysfunctions, taking the place of normal positive stimuli not otherwise attained. Psychological addiction, as opposed to physiological addiction, is a person's need to use a drug or engage in a behavior despite the harm caused out of desire for the effects it produces, rather than to relieve withdrawal symptoms. As the drug is indulged, it becomes associated with the release of pleasure-inducing endorphins, and a cycle is started that similar to physiological addiction. This cycle is often very difficult to break.

We are going to consider the psychological addictions in designing the Brain waves controller device.

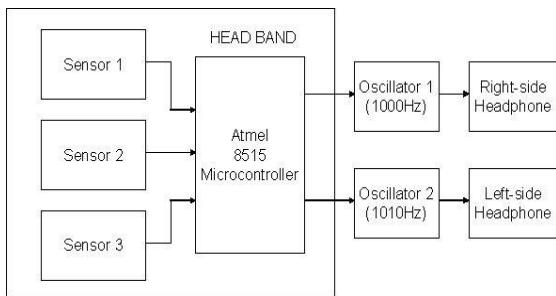
## III. BRAIN WAVES CONTROLLER

The principle behind this device is '**Binaural Beats**'. It is an auditory illusion perceived when two different pure-tone sine waves with different frequencies are subjected to the listener's ear. Third tone will be produced, due to the coincidence of the vibrations of those two different sounds which is known as binaural beats. The brain produces a similar phenomenon internally, resulting in low-frequency pulsations in the loudness of a perceived sound when two tones at slightly different frequencies are presented separately, one to each of a subject's ears, using stereo headphones. A beating tone will be perceived, as if the two tones mixed naturally, out of the brain. The frequency of the tones must be below about 1,000 to 1,500 hertz. The difference between the two frequencies must be small (below about 30 Hz) for the effect to occur; otherwise the two tones will be distinguishable and no beat will be perceived. Binaural beats can influence functions of the brain besides those related to hearing. This phenomenon is called *frequency following response*. The concept is that if one receives a stimulus with a frequency in the range of brain waves, the predominant brain wave frequency is said to be likely to move towards the frequency of the stimulus (*a process called entrainment*). Directly using an infrasonic auditory stimulus is impossible, since the ears cannot hear sounds low enough to be useful for brain stimulation. As we know that Human hearing is limited to the range of frequencies from 20 Hz to 20,000 Hz, while the frequencies of human brain waves are below about 40 Hz. To account for this, binaural beat frequencies must be used.

According to this view, when the perceived beat frequency corresponds to the delta, theta, alpha or beta range of brainwave frequencies, the brainwaves entrain to or move towards the beat frequency. For example, if a 315

Hz sine wave is played into the right ear and a 325 Hz one into the left ear, the brain is supposed to be entrained towards the beat frequency (10 Hz, in the alpha range). Since alpha range is usually associated with relaxation, this is supposed to have a relaxing effect. Some people find pure sine waves unpleasant, so a pink noise or another background (e.g. natural sounds such as noises of rivers, air movement) can also be mixed with them.

#### IV. BLOCK DIAGRAM



There are three sensors used in this circuit. The sensor sends the analog brainwave signal into the 8515 microcontroller. The Atmel 8515 microcontroller is a 40 pin. It has an internal analog to digital converter (ADC) and internal battery. The signal that is sent by the sensors is converted from analog to digital signal. The oscillator produces a particular audio wave below 1500 Hz. The block diagram consists of the following parts as below:

##### A) Sensors

These sensors consist of a 0.7 inch diameter hard plastic outer disc housing with a pre-jelled Silver chloride snap style post pellet insert. These sensors do not contain any latex and don't need any conductive gel.



The sensor sends the analog brainwave signal into the 8515 microcontroller.

##### B) Microcontroller

The Atmel 8515 microcontroller is a 40 pin, 4 MHz 8bit microcontroller and has 8K FLASH, 512 EEPROM, 512 SRAM. The AT90S8515 is a low-power CMOS 8-bit microcontroller. It has an internal analog to digital converter (ADC) and internal battery. The signal that is sent by the sensors is converted from analog to digital signal. The microcontroller has a pre-defined program, which analyses the digital signal and compares it with the digital signal equivalent of the analog signal having the frequency

range of 32 – 40 Hz which is already stored in the memory of the microcontroller. If on comparison the analyses on two signals are nearly same then the microcontroller acknowledges and triggers the oscillator 1 and oscillator 2.

##### C) Oscillators

The oscillator is designed in such a way that it produces a particular audio wave below 1500 Hz. The oscillator will be designed such that it has 10 – 13 Hz difference in frequency with oscillator 1. This difference in frequency creates **Binaural Beats**. Thus if the brain of an individual produces 32 – 40 Hz (High Beta waves) i.e. if he/she is in stress or addicted to some substance, the binaural beats having a frequency of about 10-13 Hz creates a stimulus making the brain to move towards the stimulated frequency.

##### D) Stereo Headphone



This is done by sending audio waves from one oscillator to one of the two sides of the headphone and another oscillator to another side of the headphone.

#### V. CONCLUSION

Brain waves controller is the safest and simplest device to use in prevention of Addiction. The headband used is made of rubber is easy to use. The whole device is light weight and can be carried anywhere we want. The device including sensors microcontroller and headphone is cheap and costs only about Rs.1000 – 3000. It is used for any type of addiction like addiction caused by taking narcotic drugs or alcohol and simple addictions like overeating, sexual intercourse and mannerisms.

##### Future Prospects

Brain waves controller can be used to cure stress or tension on any individual. The concept of binaural waves can be further researched and used to find a device for communication with deaf and dumb individuals. It can be further used to study the resonance of brain during brain diseases.

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