



FUNCTIONALITY OF BRAIN WAVES IN VARIOUS STAGES

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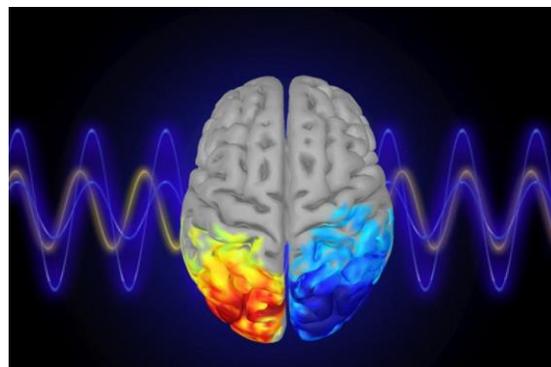
Abstract: Noise signals amplifies the electrical signals in the human brain. This paper explains the definition of brain waves and mentions about the functionality of brain waves at various stages. It explains about brain waves in two different stages of human sleep that is REM and Non-REM. This completely tells you about brain activities. The process of detecting brain waves is also discussed.

Index Terms - Brain waves, REM, Non-REM, Stochastic resonance, frequency, signal, Beta, Alpha, Theta, Delta waves.

I. INTRODUCTION

- Electric signals in the human brain can be amplified by noise signals. This is called as stochastic resonance. It was firstly discovered by Japan physicists Toshio Mori and Shoichi Kai from the University of Kyushu.
- **Stochastic resonance** was first used by **Roberto Benzi in the year 1980** at NATO International School of Climatology. **Stochastic** meaning 'random'. By coinciding the noisy peak signals with the peaks of periodic signals, weak periodic signals can be strengthened. The too weak signal can also be detected by sensors using these phenomena. The frequencies of original and noise signals resonate with each other, with which the frequency of original signals gets amplified.

Discussion - Ned Herrmann, an educator found a group in the year 1980 developed the models of brain activity and included them for teaching and management trainings. Researchers said that a brain can generate 10 watts of electric power, it's an electrochemical organ. It is said that when a billion numbers of nerve cells are interconnected can produce 5-5- millions of volt. Electrical activity released by the brain can be studied in the form of BRAIN WAVES. Based on their activity status, these brain waves are categorized into 4 types. That is Beta, Alpha, Theta, and Delta.



Types of Brain Waves –

Beta Waves – Its frequency ranges from 15-40 cycles per second with low amplitude, and is faster compared to other three waves. Strongly engaged brain can be the best example. Teacher, speaker, and a debater will be in Beta state while in their duties. A person in beta state has a skill of problem solving and logical thinking. Also this associates with happiness. Listening to beta binaural beats easily increases beta waves. These are the fastest of all brain waves.

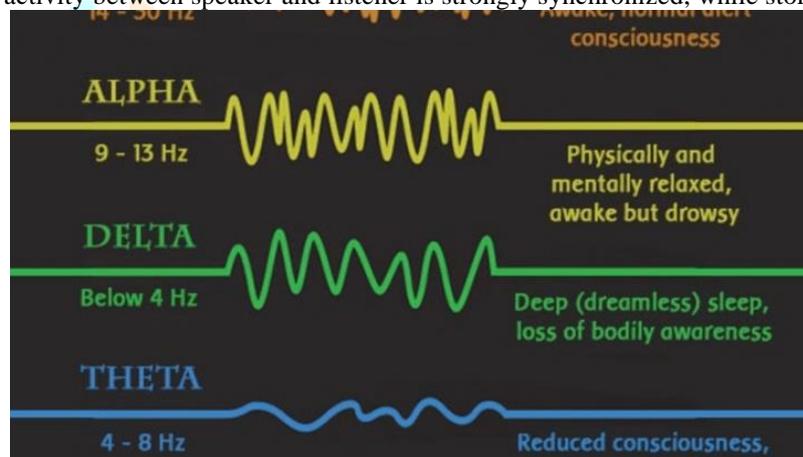
Alpha Waves – Its frequency ranges from 9-14 cycles per second with high amplitude. Alpha is non-arousal stat, where beta is arousal state. A person walking, relaxing, meditating will be in the alpha state. When a person reads a book, the information through eyes will be received by the brain which processes the words and applies the meaning for which is read. Signals spark in a pattern electrically thus brain waves are created.

Although there are many other processes, meditation enables a person to stay long in the alpha state.

Theta Waves – Frequency of this state is of greater amplitude and lower frequency ranging between 5-8 cycles per second. Mental relaxation is low when in compared to that of Alpha state. An individual in this state will have a flow of ideas. This is the stage where a person mentally disengages from his tasks and is done automatically.

Delta Waves – This is the final of all waves. It is of greatest amplitude and slowest frequency. It ranges around 1.5-4 cycles per second. It generally falls down to zero, which means that the brain is dead. A person with the lowest frequency that is 2-3 cycles per second will be experiencing the deep dreamless state. The slowest brain waves recorded are delta waves, mostly found in young children. Sleeping is the best way to increase these delta waves.

It is found that the neutral activity between speaker and listener is strongly synchronized, while story telling.



These brain waves can be explained much clearly with the following example.

Functionality of Brainwaves -

A person attempting to sleep will be in Beta state, and slowly falls down to alpha, then theta and to delta when is completely falls asleep.

REM and Non – REM –

As the frequency increase from delta to theta, active dreaming can be clearly experienced and it is called as Rapid Eye Moment. A sleep of a person happen between two stages that is REM and Non-REM. REM is of short period, when the eyes move around but no information is sent to brain. REM lasts basically till 10 minutes, and gets periodically extended and lasts up to an hour too. It is the active state of brain which helps with learning.

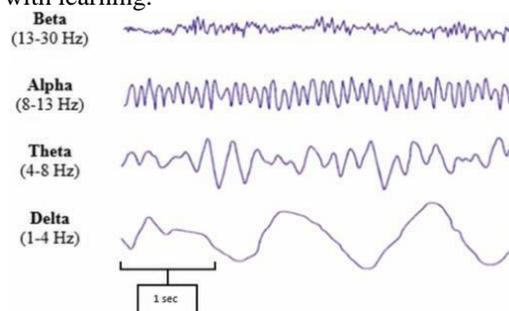


Fig- Eye Movement in different states

Detection of Brain Waves -

There is a test which detects the abnormalities in brain **waves**; it detects the electrical activity of the brain called as EEG. EEG is abbreviated as Electroencephalogram. The **electrodes consist** of small metal discs. The electric charges released as the result of brain waves are detected by the electrodes which are pasted on the scalp with thin wires. The charges get amplified and recorded as graph on the computer screen. Special attention is required to study this. EEG is also used to detect different disorders of brain. It is used to evaluate trauma, drug intoxication and to monitor blood flow during some medical procedures.

Conclusion –

When a person after a deep sleep prepares to get up, brain wave frequencies increase from delta to beta state gradually.

Research concludes that depending on the brain wave state, there is mixture of other three states in all times.

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