

Consciousness an EEG Perspective

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Abstract

Electroencephalograph (EEG) is regularly used as a part of combination coherent fields. EEG allows the physician to monitor the brain's background electrical activity and possible seizures. Consciousness has been a mystery from very early civilization. After rapid development of science and technology, consciousness has been the subject of intense research in psychology, neuroscience and quantum mechanics. Neuroscience is the most promising field and has made significant progress in understanding the structure and function of brain. Brain wave is rhythmic neural activity in the brain. Brain waves are classified in five bands with different frequencies. The present paper findings with regard to the application of EEG techniques to measure the level of consciousness.

Keywords: Brain waves, Consciousness, , EEG, Brain rhythms, Conscienc constant.

I Introduction

EEG stands for electroencephalography and it as relative inexpensive brain-scanning technique. EEG these EEG is typically noninvasive, with the electrodes placed along the scalp, although invasive electrodes are sometimes used in specific applications. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations (popularly called "brain waves") that can be observed in EEG signals. [1,2, 3, 4] that the neurons produce. Scientists have agreed to split these frequencies in different frequency bands. consciousness as function of brain waves and consciousness constant Conscienc C discussing the source and distribution of brain waves and consciousness. . Brainwaves are produced by synchronized electrical pulses from masses of neurons communicating with each other. Brainwave is rhythmic or repetitive neural activity in the brain seen in Table 1. The interaction between neurons can give rise to oscillations at a different frequency than the firing frequency of individual neurons. In general, oscillations can be characterized by their frequency, amplitude and phase. Synchronized activity of large number of oscillating neurons communicating with each other gives rise to brain wave.

Table I: Brain rhythms

Rhythms	Mental condition	Consciousness
Gamma 40 – 100 Hz	Cognitive functioning, Learning	Very High
Beta 12 – 40 Hz	Judgment, decision making	High
Alpha 8 – 12 Hz	Mental ,alertness, calmness	Medium
Theta 4 – 8 Hz	Deeply relaxed, semi hypnotic State	Low
Delta 0.5 – 4 Hz	Dreamless sleep, meditation	Very low

Frequency of the brain wave changes with the mental activity. Hence, mental activity is a function of brain wave frequency. When the brain wave frequency is high, brain is very active. When we are in the state of deep sleep or meditation, the brain activity is very low and brain wave frequency is 4 Hz and less. When we are in deeply relaxed, then the brain activity is low and the brain wave frequency is between 4 Hz to 8 Hz. When we are calm and alert, our brain activity is getting higher and the brain wave frequency is between 8 Hz and 12 Hz. When we are engaged in mental activities like problem solving, decision making etc. our brain activity is high and brain wave frequency is between 12 Hz and 40 Hz. When we are engaged in extremely busy mental function, our brain activity is very high and the brain frequency is between 40 Hz and 100 Hz hence, it is obvious that brain activity is proportional to the brain wave frequency (BWF). A physical constant is a physical quantity that is universal in nature and has constant value in time. Consciousness energy E per brain wave frequency f for unit brain wave amplitude is given by $E = Cf$, where C is the consciousness constant *Conscienc*.

Let us analyze brain waves of a person in problem solving state. In this case, the dominant waves will be in Beta range, but there will be additional waves in Gamma, Alpha and even Theta ranges. Let us call the brain wave frequencies in Beta range as $f_{b1}, f_{b2}, f_{b3}, f_{b4}$ and f_{b5} and their amplitudes $A_{b1}, A_{b2}, A_{b3}, A_{b4}$ and A_{b5} , in Gamma range f_{g1}, f_{g2}, f_{g3} and their

amplitudes A_{g1} , A_{g2} and A_{g3} . Similarly, brain waves and brain wave frequency in Alpha range f_{a1} and its amplitude A_{a1} . Hence the total brain wave energy BWE would be

$$\text{BWE} = C.A_{b1}^2.f_{b1} + C.A_{b2}^2.f_{b2} + C.A_{b3}^2.f_{b3} + C.A_{b4}^2.f_{b4} + C.A_{b5}^2.f_{b5} + C.A_{g1}^2.f_{g1} + C.A_{g2}^2.f_{g2} + C.A_{g3}^2.f_{g3} + C.A_{a1}^2.f_{a1} = C(A_{b1}^2.f_{b1} + A_{b2}^2.f_{b2} + A_{b3}^2.f_{b3} + A_{b4}^2.f_{b4} + A_{b5}^2.f_{b5} + A_{g1}^2.f_{g1} + A_{g2}^2.f_{g2} + A_{g3}^2.f_{g3} + A_{a1}^2.f_{a1})$$
, since energy of a brain wave is proportional to the square of its amplitude. Consciousness is created by brain wave energy. If there is no brain wave, hence no brain wave energy, there is no consciousness. Consciousness constant *Consciere* C is physical constant of brain wave, hence brain wave energy. Consciousness is a fundamental property of brain wave. consciousness is fundamental property of brain wave energy, hence brain wave. If there is no brain wave, there is no consciousness. If we can measure the brain energy and can plot its wave in frequency domain, then we can find out the value of the consciousness constant *Consciere* C . The brain wave energy of brain waves is so weak that it is hardly measurable at all with current tools. As technology advances, it would be possible to measure such weak signal. Then the value of consciousness constant C in joules (X) or in electron volt (eV) (Y) can be determined as $C = X$ joules or Y eV per Hz. $1 \text{ joule} = 1 \text{ Kg m}^2 \text{ s}^{-2} = 6.24 \times 10^{18} \text{ eV}$

Conclusion

Consciousness must be physical property of brain waves.

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