Perspective

Science behind Synchronization of Our Brains during Conversation

Narendra D. Sharma*

Abstract

Recently, a study published in 'Scientific Reports', led by the Basque Research Centre (BCBL) reported that the rhythms of brainwaves between two people taking part in a conversation begin to match each other. It appears that something as simple as an everyday conversation causes the brains of the participants to begin to work simultaneously. According to these scientists, this 'inter-brain synchrony' may be a key factor in understanding language and interpersonal communication. Scientists even measured the movements of their brainwaves simultaneously and confirmed that their oscillations were taking place at the same time. Firstly, the research of these scientists is discussed in this article, and then, an attempt is made scientifically explaining this phenomenon and deliberates upon the mechanism of interbrain synchrony which happens in the 'Field of Consciousness', established among participants.

Keyword: Consciousness, Interbrain synchrony.

Introduction

Until now, most traditional thought and research had suggested the hypothesis that the brain 'synchronizes' according to what is heard, and correspondingly adjusts its rhythms to auditory stimuli. However, now some scientists from the Donostia-based research centre have gone further to understand and simultaneously analysed the complex neuronal activity of two individuals who hold a dialogue even for the first time. The team led by scientists Alejandro Pérez, Manuel Carreiras and Jon Andoni Duñabeitia, has confirmed by recording cerebral electrical activity that the neuronal activity of two people involved in an act of communication 'synchronize' in order to allow for a 'connection' between both subjects.

'It involves inter-brain communion that goes beyond language itself and may constitute a key factor in interpersonal relations and the understanding of language', explains Jon Andoni Duñabeitia[1]. Thus, the rhythms of the brainwaves corresponding to one, the speaker and other, the listener adjust according to the physical properties of the sound of the verbal messages expressed in a conversation. This indeed creates a connection between the two brains, which begin to work together towards a common goal of communication amongst them. *'The brains of the two people are brought together, thanks to language, and communication creates links between people that go far beyond what we can perceive from the outside'*, added the researchers

*Correspondence: Narendra Dutt Sharma, Former Controller, Bhabha Atomic Research Centre, Mumbai.
Email: ndsharma57@gmail.com.

from the Basque Research Centre. They say that, *'We can find out if two people are having a conversation solely by analyzing their brain waves'*[1].

Neural Synchrony- What is it?

For the purposes of this study, the BCBL researchers used 15 dyads of people of the same sex, complete strangers to each other, separated by a folding screen. This ensured that the connection generated was truly established. Following a script, the dyads held a general conversation and took turns playing the roles of speaker and listener. Through electroencephalography (EEG) - a non-invasive procedure that analyses electrical activity in the brain - scientists measured the movement of their brainwaves simultaneously and confirmed that their oscillations took place at the same time. '*To be able to know if two people are talking between themselves, and even what they are talking about, based solely on their brain activity is something truly marvellous. Now we can explore new applications, which are highly useful in special communicative contexts, such as the case of people who have difficulties with communication'*, Duñabeitia pointed out[1].

Scientists view that the understanding of this interaction between two brains would allow for the comprehension and analysis of very complex aspects of the fields of psychology, sociology, psychiatry, or education, using the neural images within an ecological or real-world context. *'Demonstrating the existence of neural synchrony between two people involved in a conversation has only been the first step',* confirmed Alejandro Pérez. *'There are many unanswered questions and challenges left to resolve'*. Pérez thinks that the practical potential of the study is enormous. *'Problems with communication occur every day. We are planning to get the most out of this discovery of inter-brain synchronization with the goal of improving communication'*, he concluded. The next step for the researchers may be to learn by applying the same technique and pair dynamic, if the brains of two people 'synchronize' in the same way when the conversation takes place in their non-native language.

Science behind the Phenomenon

Science behind this phenomenon could be explained as follows:

Above study has concluded that the rhythms of brainwaves between two people taking part in a conversation begin to match each other and according to these research scientists, this inter-brain synchrony may be a key factor in understanding language and interpersonal communication. This phenomenon actually happens in a *'Field of Consciousness'. As soon as the two individuals are in communication, they establish a field amongst them, which we may call as the 'Field of Consciousness'.* The 'Thoughts' exchange themselves in this field. Let us now make use of the Maxwell's equations of 'Electromagnetic Fields' as an analogy. Electromagnetic field has parameters, 'B', the magnetic flux density ; and 'H', the electric field intensity, however, the both being related together by a constant called 'permeability of the medium', and the famous B-H curve, which is linear in vacuum (free space) and non-linear in a material, because of non-linear material behaviour. Parameter 'J' is the currents density.

Let us give the analogy of two laws, i.e. 'Gauss's Law' of magnetism and 'Ampere's Circuital law' for a field around a current carrying conductor (without Maxwell's factor, to start with). Gauss's law states that there are no magnetic mono-poles possible, and the total magnetic flux through a closed surface is zero, which also means that flux entering at a point/surface is equal to the flux leaving the point/surface. The Ampere's circuital law on the other hand, signifies that the magnetic field induced around a closed loop is proportional to the electric current enclosed by the loop. These two laws are explained mathematically as follows:

$$\nabla \times H = J \qquad (1)$$

$$\nabla . B = 0 \qquad (2)$$

In a similar fashion, we define the 'Field of Consciousness', and denote it by 'F_{con}'. The transmission of thoughts among the individuals takes place in this field. We define the thoughts as 'T_h'. Now, we formulate two equations as follows;

$$\nabla \times F_{con} = T_h \qquad (3)$$

$$\nabla . F_{con} = 0 \qquad (4)$$

The equation 3 means that the 'thoughts' (like current) propagate in a field called a 'Field of Consciousness' (like in an electromagnetic field consisting of magnetic field B and electric field H, both however being related through a constant). Similarly, equation 4 means that the 'field' is only a medium through which the thoughts move. At any point in space in the field of consciousness, thoughts input is equal to the thoughts output.

This 'Field' does not generate any thoughts as such, but is only a medium for the transmission of thoughts. Thoughts are generated by the individuals who are in conversation and are in synchrony with each other. This could also mean that in the absence of thoughts in either of the person i.e. in a state of 'thoughtlessness', there could not be any communication in the field of consciousness amongst them. Though it may look weird, but it appears to be quite true, because if one is in the vicinity of a sage under deep meditation, who is in a state of so called 'thoughtlessness', it may not be possible to establish any kind of contact with him (because he is in contact with Supreme-consciousness !) .

It is this field of 'Consciousness' which helps to create a synchrony among the people in question. These two equations could then be termed as the, "Equations of Field of Consciousness".

Question may now arise in the intellectual minds that how to measure this 'F_{con}', and 'T_h' in quantitative terms (as the empirical science demands), since these are understood only qualitatively. But, it is presumed that once the mathematical equations are formulated for such an abstract phenomenon, this aspect could also be looked into in future.

This concept of 'Field of Consciousness' has already been discussed by the author in one of his recently published papers [2]. It was in reference to the idea that human emotions do create physical reality and this mechanism may be happening in the 'Field of Consciousness', where any phenomenon is not limited by the concept of 'Space-Time', theorized by Einstein more than a century ago. It was also emphasized in that deliberation that the entangled particles instantaneously reflect the same action or state, even if they are separated by any distance whatsoever.

These concepts could be further extended once the 'Field of Consciousness', and 'Thoughts', are considered as the 'waves', rather 'waves of probability', exactly like deliberated in 'Quantum Theory'. If it is so, one could even apply mathematics to work out the details further. One could even develop so called, 'Wave theory of Quantum Consciousness'. But for the time being, let us leave it to the mathematicians and theoretical physicists to accomplish this task at a later date.

Reference

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