The Conscious experience on listening to music or viewing art: Does it complement scientific analysis of reality?

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Abstract: The scientific method has been traditionally used to describe and analyze reality. However the complete reality has been postulated to consist of three worlds: physical, mental and mathematical. The conscious response to music and arts is correlated with EEG patterns. The EEG patterns and other synchronous neural activity may be a result of the consciousness field generated in the brain due to quantum computation in the microtubules. Furthermore, the microtubules themselves may be arranged in the form of Quantum Cellular automata or Quantum Hopfield Networks. The continuity of Quantum Cellular Automata or Quantum Hopfield networks may be maintained by many structures including the gap junctions. Since the conscious response to arts and music is correlated with EEG patterns which may in turn be related with quantum computation, these responses are a result of activity in the real world. Hence these responses must complement scientific description and analysis of reality in order to arrive at a comprehensive picture.

The "scientific" picture of the reality has traditionally included the description and analysis of the physical world using scientific methods. However the complete reality has been postulated to include the physical world, the mental world and the mathematical world. The mental world consists of our conscious perceptions. The physical world contains the “actual world”. The mathematical world has been described as the Platonic world of mathematical forms (Penrose, 1994) .The mental world contains our experiences. Since the mental world is a part of the reality, our description and analysis of the reality and a coherent picture of the universe should include the conscious experiences that are evinced while viewing art and listening to music.

How is the conscious response of human mind to art and music generated?

It has been reported that consciousness is associated with subatomic particles. How do these particles generate consciousness in the human brain has also been elucidated using the concept of consciousness vector (Grover, M., 2011). The microtubules have been proposed to act as qubits in human brain. These microtubules are arranged in the form of Quantum Hopfield networks (QHNs) in the brain or they may be arranged in the form of quantum cellular automata (QCA). The QHNs and the QCAs may be involved in generating the consciousness field and the consciousness vector. The generation of consciousness field may result in synchronous brain activity which in turn leads to a specific EEG pattern. This pattern, in turn, may be correlated with the conscious experience in viewing art and listening to music. For example with a heterogeneous sample of human subjects, alpha abundance in the EEG patterns, an inverse function of cortical arousal, was found to increase with greater complexity of a series of 18 nonrepresentational works of art. (Nicki and Gale 1977)

The studies on human brain show that there is no dramatic difference between the human and primate brain with reference to the processing centers except for cerebral hemisphere specialization. This specialization corresponds to two different operational modes. One mode is involved in sequential analysis of single-channel information for example as required in speech, language and thought processing which is the characteristic of the "dominant" hemisphere. The second hemisphere involves a synthesis of various different parallel channels to accomplish the "synthesis" of input stimuli.

Keeping the above in the mind it has been postulated that music is a language like phenomenon and by which humans communicate with each other (Pribram, 1982).This would suggest that processing of musical parameters such as harmony and melody are primarily related to the "minor" hemisphere. On the other hand processing of musical symbols such as hierarchically arranged phase structures should predominantly involve the “dominant” hemisphere. The posterior cortical convexity should be involved in semantic processing of both musical indicants and symbols. On the other hand the frontolimbic cortical

formations should be involved in the practical processing of a user's musical expression and experience. It has been proposed that the syntactic structure of music might be more dependent on semantic processing and finally the motor system of the brain, to which both posterior and frontal cortical formations project should be involved in comprehending this syntactic structure of music. (Skaric et al. 1997) It has been concluded in a study that EEG power changes during listening to music are quite individual. In this study significant raise of power (i.e. relaxation) in theta and alpha bands of EEG was observed on listening to “pleasant” music in contrast to the cases with drop in EEG power and unpleasant musical experiences (Skaric et al.1997).

Neural synchrony

Evidence from several fields supports a correlation between consciousness and synchronous brain activity. Electrical recording from implanted electrodes, scalp or brain surface shows the presence of synchrony at various frequencies of the electroencephalogram. The gamma frequency range between 30 and 70 Hz correlates best with the consciousness. Gray and Singer (1989) showed coherent gamma oscillations in LFPs of cat visual cortex that were strongly influenced by specific visual stimulation. Varela (1995) , Crick and Koch (1990) and von der Malsburg and Singer (1988) postulated that neural correlate of any conscious content is an assembly of neurons excited coherently at approximately 40 Hz. Many animal studies demonstrate synchrony within and across hemispheres, cortical areas and sensory/motor modalities (Singer and Gray 1995, Singer 1999). Among human studies gamma synchrony correlates with the binding of visual elements into unitary percepts, somatic perception (Desmedt and Tomberg, 1994), face recognition (Mouchetant-Rostaing et al. 2000), working memory (Tallon-Baudry et al. 1996, 1997), attention (Fries et al. 2002, Tittinen et al. 1993), REM dream states (Llinas and Ribary, 1993), with the magnitude of synchrony diminishing with the stimulus repetition (Gruber and Muller, 2002). The onset of general anaesthesia is accompanied by a loss of consciousness which in turn is accompanied by a decrease in gamma EEG activity (John, 2002).

How is the neural synchrony maintained in the brain?

Gap junctions are open connections between adjacent cells formed by structures consisting of a class of proteins called connexins (Herve, 2004, Rouach et al. 2002). Gap junctions occur between dendrites and axons, between glia, between neurons and glia, between axons and dendrites, between neuronal dendrites (Traub et al. 2001, 2002, Froes and Menezes, 2002, , Bezzi and Volterra, 2001). Gap junction connected neurons have continuous membrane surfaces and continuous cytoplasms. Neurons connected by gap junctions depolarize synchronously as they are electrically coupled. The gap junctions fulfil the criteria for Hebbian assemblies and are also capable of undergoing synchronous excitations. With in each cortical hemisphere there are big interneuron gap junction networks, hyperneurons. The gap junctions mediate brain wide gamma synchrony and are believed to be the best electrophysiological neural correlate of consciousness. Some of the salient features of gap-junction hyperneurons are continuous dendritic membranes that depolarize coherently and continuous cytoplasm.

The collective response behaviour is a key feature in intelligence. A nonlinear Scrodinger wave equation has been used to model collective response behaviour in intelligence. It has been shown in the same study that such a paradigm can make model more intelligent. It may be hypothesized that response of human brain to music and arts can be modelled by using a nonlinear Schrodinger wave equation to model the quantum brain. . Such a model has already been used to model eye tracking behaviour. While simulating the quantum brain model two important features have been observed. Firstly as eye sensor data is processed in a classical brain, a wave packet is triggered in the quantum brain. This wave packet behaves as a particle. Secondly, when the eye tracks a fixed target, this wave packet moves in a discrete mode instead of continuous mode. The details of classical and quantum brain processing in response to music and arts remains to be elucidated. (Behera et al. 2006).

Conclusions

Music and arts generate conscious responses. The consciousness in turn has been proposed to be a sequence of quantum computations in microtubules within brain, which may lead to neural synchrony in the brain (Hameroff, 2006). This may be cause of EEG patterns. Since response to arts and music has been correlated with EEG patterns, the conscious response to arts and music may also be related to quantum computations in microtubules. As conscious response to arts and music is a consequence of physical activity in the brain such responses are part of reality and must complement scientific analysis of reality

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