

Chapter 17

Quantum Cognition and Its Influence on Decrease of Global Stress Level Related With Job Improvement Strategies: Quantum Brain and Global Stress

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ABSTRACT

The quantum mind or quantum consciousness group of hypotheses propose that classical mechanics cannot explain consciousness. Quantum theory is used to insert models of cognition that target to be more innovative than models based on traditional classical probability theory, which includes cognitive modeling phenomena in science. At the moment we can say that there is no clearly defined neurophysiological mechanisms of creation of the quantum-like representation of information in the brain, but we can mention the hypothesis of matching the information processing in the brain with quantum information and probability with contextuality as the key word. Using limited cognitive resources, incompatibility provides humans the means for answering an unlimited number of questions, thus promoting parsimony and cognitive economy.

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INTRODUCTION

The idea that quantum mechanics has something to do with the workings of the mind was proposed by Eugene Wigner who suggested that wave function collapses due to its interaction with consciousness. Freeman Dyson argued that “mind, as manifested by the capacity to make choices, is to some extent inherent in every electron.” (“Quantum Approaches to Consciousness”, 2011; Dyson, 2004).

Many scientists considered this option as improbable describing it as a myth with no scientific basis.

David Chalmers argued against quantum consciousness. He instead discussed how quantum mechanics may relate to dualistic consciousness. Chalmers is skeptical of the ability of any new physics to resolve the hard problem of consciousness.

The main argument against the quantum mind hypothesis was the assertion that quantum states in the brain would lose coherency before they reached a scale where they could be useful for neural processing, which was elaborated by Tegmark, who made calculation in which quantum systems in the brain decohere at sub-picosecond timescales, which are considered to be too short to control brain function. If there is no brain-mind identity, mind-states could be in an abstract space that is not affected by decoherence. (Khrennikov,2009; Van den Noort,2016).

Quantum cognition represents an innovative field which applies the mathematical formalism of quantum theory to model of cognitive phenomena such as information processing by the human brain, language, decision making, human memory, concepts and conceptual reasoning, human judgment, and perception. This field makes a great difference from the quantum mind as it is not reliant on the hypothesis that there is something micro-physical quantum mechanical about the brain as it is based on the quantum structure paradigm. The main mechanism or concept is based on a information processing by complex systems such as brain structures. It is hypothesised that contextual dependence of information and probabilistic reasoning could be mathematically described in the framework of quantum information and quantum probability theory (Caves, 2002;Tversky, 1992; Savage, 1954).

Quantum theory is used to insert models of cognition that target to be more innovative than models based on traditional classical probability theory which includes cognitive modeling phenomena in science. Since the use of a quantum-theoretic framework is for modeling purposes, the identification of quantum structures in cognitive phenomena does not presuppose the existence of microscopic quantum processes in the human brain (Pothos, 2009).

We can observe the brain as macroscopic physical system operating on the scales (of time, space, temperature) which differ crucially from the corresponding quantum scales. But as alive organ it holds some temperature and is simply too hot to be able to perform the real quantum information processing, and use the quantum carriers of information such as photons, ions, electrons. Neuron is by definition a morphological unit of central nervous system and the brain as well. From this perspective we can say that neuron presents also basic unit of information processing. Neuron couldn't be in the superposition of two states: firing and non-firing. Hence, it cannot produce superposition playing the basic role in the quantum information processing. Superpositions of mental states are created by complex neural networks of neurons. The activity of such neural networks can produce effects which are formally described as interference and entanglement (Khrennikov,2009).

The quantum cognition project is based on the observation that various cognitive phenomena are more adequately described by quantum information theory and quantum probability than by the corresponding classical theories.

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