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Neuroplasticity: Neural Networks in the Brain

Charlie Atkinson*

Department of Neurology, Newcastle University, Newcastle upon Tyne, England

Neuroplasticity also called as brain plasticity or neural plasticity. Neuroplasticity is the ability of neural networks in changes in the brain growth and reorganization. This changes in brain ranges from the individual neuron pathways and makes new connections to systematic adjustments like cortical remapping. Examples of the neuroplasticity include circuit changes and network changes which result from learning a new ability, practice, psychological stress, and environmental influences [1].

Developing brain shows a higher degree of plasticity than the mature adult brain. Activity-dependent plasticity has significant implications for the healthy development, learning, memory, and recovery from brain injury/brain damage [2]. Neuroplasticity are of two types. They are: structural neuroplasticity and functional neuroplasticity.

Structural Neuroplasticity

Structural plasticity understands the brain's ability to change the brain neuronal connections. New neurons are constantly produced and integrated into the CNS (Central Nervous System) throughout the life. Now-a-days researchers use multiple cross-sectional imaging methods (i.e. MRI (Magnetic Resonance Imaging), CT (Computerized Tomography)) to study the alterations of the human brains structure. This neuroplasticity type regularly studies the effect of various internal or external stimuli on the brain and its reorganization. The changes of grey matter proportion or the synaptic strength in brain is considered as example of structural neuroplasticity. Currently, structural neuroplasticity is investigation is more within the field of neuroscience [3].

Functional Neuroplasticity

Functional plasticity refers to the ability of brain. It is to alter and adapt the functional properties of the neurons. The changes occur in response to earlier activity (activity-dependent plasticity) to acquire the memory or in response to malfunction or damage of neurons (reactive plasticity) to compensate the pathological event. Functions from one part of the brain transfer to another part of the brain based on the demand to produce recovery of behavioural or physiological processes. Regarding physiological forms of activity-dependent plasticity, involves synapses which are referred to as synaptic plasticity. The strengthening or weakening of synapses results in increase or decrease of firing rate of the neurons which are called as long-term potentiation (LTP) and long-term depression (LTD), respectively. These are considered as examples of synaptic plasticity which are associated with the memory. It has become clearer that synaptic plasticity can be complemented by another form of activity-dependent plasticity involving the intrinsic excitability of neurons, which is referred to as intrinsic plasticity recently. This is opposed to the homeostatic plasticity which does not necessarily maintain the overall activity of neuron within the network but contributes to encode the memories [4].

Treatment for Brain Damage

Neuroplasticity is the vital issue which supports the basis of scientific of acquired brain injury treatment with the goal-directed experiential therapeutic programs in context of rehabilitation approaches to the functional consequences of the injury [5].

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***Address for Correspondence:** Atkinson *Charlie , Department of Neurology, Newcastle University, Newcastle upon Tyne, England; E-mail: atkindon.charlie@ac.edu*

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