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"What Fires Together, Wired Together": How Neuroplasticity Shaped Neuropsychology

Opinion

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Author Details

*Valeska Kouzak**

Behavior Neuroscience Laboratory, Brazil

*Corresponding author

Valeska Kouzak, Behavior Neuroscience Laboratory, Department of Physiology - Biology Institute, University of Brasília, Brazil

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Opinion

This opinion article is about the importance of neuroplasticity to the development of neuropsychology as a science field and clinical practice. From the concept of plasticity, our knowledge expanded to important discoveries about how the brain develops, changes over time and recover from injuries. Moreover, it was from that idea that neuropsychologists were able to understand how to provide better and efficient training to excel neurological potential. So, the article has the purpose to outstand the association of neuroscience and psychology and highlight the possible applications from this knowledge.

I came across a book called "The Brain that Changes Itself: Stories of personal triumph from the frontiers of brain science" from Normam Doidge [1]. It is a compilation of ordinary people's of successful stories of ordinary people and scientists discovering how the brain can change through plasticity. To neuropsychologists the idea is not new, however it was an intriguing and lovely reading to remind the history and development of the concepts that we all work daily.

Kant at the Critique of Pure Reason proposed that "How much more difficult, naturally, must it be for a reason to enter upon the secure path of a science if it does not have to deal with itself, but it has to deal with objects too." [2]. Exploring the knowledge that is beyond our view, understanding how our body learns through the nervous system is in advance of observation going to the objective lens of experiments. The idea of plasticity of the brain started at the end of 19th century with Willian James [3]. describing how brain changes over time based on observation and simple experiments of learning, and later, in 1949, Kornorski coined the term "Neuroplasticity" [4], which refers to changes in brain structure and function throughout lifespan. Moreover, brain changes enable us to organize and reorganize our connection in relation to the internal and external world in an interactive manner [5], that is, the brain is the only organ that depends on the interaction with the environment to develop.

Contemporary to Kornorski, Donald Hebb, proved a central element of plasticity, the neurons behavior in a learning process, the Hebbian network plasticity principle is that the cross- wired neurons in the cerebral cortex also strength their connection with the nearest neighbors, consequently when the brain is engage in an activity inputs are activated simultaneously and strengthen together, increasing their responses, leading to a neural teamwork, supporting a learning based behavior and increasing connectivity [6]. Consequently, Hebb was able to demonstrate that neuroplasticity enables us to learn from the environment and build nervous tissue.

Therefore, from the early development the human interaction is organizing the brain, we are born dependent from others to develop our body and psychic, Piaget [7]. established that cognitive development is based on the ability to think, but the first moment of development is the sensorimotor stage, when babies are exploring its environment by movement and feeling, afterwards, there will be memory, language and thoughts. Moreover, Winnicott affirmed that a child is not able to live alone [8], is born in a family a society, and firstly in the interaction with its mother that the world will be present to it. Hence, neurodevelopment implicates in a high demand stage for neuroplasticity. Nowadays, it is well known that plasticity goes beyond early brain development and continues through lifespan, not at the same pace as in early years, but still happens. As well as, with the stimulation process a recovery from brain injury is made by reconnecting lost functions through plasticity, which is the main objective of rehabilitation [9].

To that end, neuropsychologists can extract human potential of individuals that have their neurophysiological condition changed by accident or from birth creating neurorehabilitation projects, research and training that change brain plasticity and excel potential. To conclude, back to Kant, neuroscience provided a further look to psychologists, moving from human observation to the object, nervous system, and by the experimental scientific method could be able to get the answers that clinicians needed to articulate novel treatments that are in line with results.

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