
MIRROR NEURONS and LANGUAGE

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Mirror mirror on the wall, tell me who is the fairest of them all? Well, unfortunately I'm talking about neither that kind of mirrors nor any fairytales. But if there is something I find more magical than a fairytale, that's our body. Are you one of those who can put themselves into someone's shoes? Or have you ever been drawn like a moth to flame when you see somebody yawning? Have you ever thought about why yawning is contagious? The reason may lie behind little tiny *mirror neurons*. So, mirror mirror on the wall, tell me:

What is Mirror Neuron?

The function of mirror neurons can be seen everywhere in our daily life. Scientists believe that mirror neurons can be related to ability of imitation, empathy and language. Mirror neurons are a special class of neurons that fire both when we perform an action and when we see someone else perform the same action.¹

How was Mirror Neuron Discovered?

Mirror neuron was discovered unexpectedly during a neurological study by Italian researchers in the early 1990s, and this discovery considerably changed the point of view about our brain and ourselves. Together with his colleagues at the University of Parma, Neuroscientist Giacomo Rizzolatti M.D. first discovered mirror neurons during a study. A team of Italian researchers found individual neurons in the brains of macaque monkeys that responded equally when the monkeys grabbed a peanut and also when the monkeys watched another monkey grab the same object.² They found these neurons in the front lobe of monkeys and identified them as “mirror neurons” - a different type of motor neurons which were until quite recently thought as brain cells directly or indirectly controlling only muscles and glands. And then, they started to research if humans have mirror neurons, as well. It hasn't been proved that humans have individual mirror neurons, yet it was shown that we have a more general mirror system.³ Thus, studies and writings on mirror neurons peaked in 2005 following the discovery of mirror

¹ Fabbri-Destro, M. & Rizzolatti, G. (2008). Mirror Neurons and Mirror Systems in Monkeys and Humans. *Psychology*, 23(101152), 171.

² Winerman, L. (2005). The Mind's Mirror. [Weblog]. Retrieved from <http://www.apa.org/monitor/oct05/mirror.aspx> on 17.04.2016,

³ De Solla Price, L. (2016). Mirror Neurons Fire When Observing and Performing an Action - Fact or Myth?. [Weblog]. Retrieved from <http://factmyth.com/factoids/mirror-neurons-fire-when-observing-and-performing-an-action/> on 17.04.2016.

neurons. Thanks to this discovery, there are new theories and studies on several fields. These studies lead us to

- new insight into how and why we develop empathy for others,
- more knowledge about autism, schizophrenia, and other brain disorders shaped by poor social interactions,
- new therapies to help stroke victims, and
- a new theory about the evolution of language.⁴

Mirror Neurons on the Evolution of Language

There are many theories and approaches with regard to the origin of language and how it evolved. It is still an issue of discussion. To shortly mention, all of the main theories can be summarized in Charles Darwin's following words:

“I cannot doubt that language owes its origin to the imitation and modification, aided by signs and gestures, of various natural sounds, the voices of other animals, and Man's own instinctive cries.”

One of the approaches claims that language faculty is a God given gift. According to this approach, humans have had the ability to speak since Adam and Eve. Another theory is that language originated from the imitation of natural sounds. And there is gestural theory which proposes that human language developed from gestures which were used to communicate.⁵

The origin of language is one of the most controversial issues in the history. Discussions about it are still going on. And after the discovery of mirror neurons, a new theory has been put forward. Mirror neurons are found in frontal cortex which is close to Broca. The Broca area is one of the language regions of the brain and it is believed that mirror neurons could have a role

⁴ Perry, S. (2008). Mirror Neurons. [Weblog]. Retrieved from <http://www.brainfacts.org/brain-basics/neuroanatomy/articles/2008/mirror-neurons/> on 17.04.2016.

⁵Language Origin Hypothesis. (2016). Origin of Language. Retrieved from https://en.wikipedia.org/wiki/Origin_of_language#Language_origin_hypothesis on 20.04.2016.

in language.⁶ There is a close relationship between imitation and language. Imagine the process when an infant tries to learn to speak. This would be like continuously repeated sounds such as “papa” or “mama”. The baby needs to match the sound with the sound he/she produces to be able to talk. Now, it has been proved that when a person hears the sounds of someone else, neurons in the motor cortex are activated. This helps to reproduce that sound, making this mirror (neuron) system very useful in learning to reproduce words we hear from other people. The way babies speak gibberish can be training or development of their mirror system. So, there is a link between the mirror system and language⁷.

When, where and how language originated and evolved is still being discussed. Whether mirror system has a role in the evolution of language is still doubted; however, it is certain that with the discovery of mirror neurons so many things changed and developed.

⁶ Hickok, G. (2009). The Role of Mirror Neurons in Speech and Language Processing. [Weblog]. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2813993/> on 20.04.2016.

⁷ Mirror Neurons and Language Acquisition. (2016). [Weblog]. Retrieved from <https://www.dnalc.org/view/1966-Mirror-neurons-and-language-acquisition.html> on 20.04.2016.

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