

Mini Review

The Role of Mirror Neurons in Autism Spectrum Disorder

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***Corresponding author:** Guedes Neta, ML, Av: Moura Ribeiro, nº 125/ 178 – Marapé – Santos – SP – CEP 11070-061, Brazil**Received:** October 11, 2015; **Accepted:** January 13, 2016; **Published:** January 20, 2016**Abstract**

The objective of this scientific research was to review studies investigating whether mirror neurons were or were not impaired in ASD individuals. Currently, these neurons have proved to be responsible for empathy. In other words, they would be responsible for our ability to put ourselves in someone else's position.

This innate human ability is impaired in ASD. Consequently, a question comes up: is empathy impairment in ASD individuals caused by impaired mirror neurons?

Among 17 studies reviewed here most of them see the hypothesis of impaired mirror neurons in autism as promising.

Given the relevance of these findings, it is essential to consider the importance of investing in this area and developing research that is more detailed. This leads us to question whether activities that stimulate empathy would contribute to a better brain functioning in individuals with autism in order to improve reciprocal social development.

Keywords: Autism; Mirror neurons; Empathy; Brain**Abbreviations**

ASD: Autism Spectrum Disorder; IBGE: Instituto Brasileiro De Geografia e Estatísticas (The Brazilian Institute of Geography and Statistics); DSM-5: Diagnostic and Statistical Manual of Mental Disorders.

Introduction**Autism and mirror neurons**

Autism is seen as a heterogeneous neurodevelopmental disorder which affects one in 165 children and is four times more incident in boys than in girls [1]. According to the DSM-5, the main criteria for diagnosing autism are: persistent damage to the reciprocal social communication and to the social interaction (such as imitation and empathy); restrict and repetitive behavioral patterns, interests or activities. The symptoms are also evident in the early childhood and limit or impair daily life [2].

In the 80's, the first studies in autistic patients making use of magnetic resonance were carried out [3]. The 90's were considered the brain decade, as most studies about the human brain were undertaken during this period. Rizzolati et al. accidentally discovered the existence of mirror neurons [4]. These researchers were studying electrical signals of a certain kind of motor neuron in monkeys, and realized, accidentally, that their motor neuron discharged not only when they performed and action, but also when they saw another monkey or one of the researchers performing the same action [5].

Ramachandran states that these neurons are essential to the human being because they can deduct intentions [6]. According to him, these neurons enable the imitation of other people's actions and, therefore, are seen as the "empathy neurons". This author defends

that this discovery represents to Psychology what the discovery of the DNA represented to Biology [7].

According to Williams, impairment of the mirror neuron system can affect imitation, producing a constellation of symptoms which characterize ASD [8].

The studies carried out to confirm or not this hypothesis were based in functional magnetic resonance imaging studies [1,9], that is a technique for measuring brain activity and electroencephalography study monitoring activity of the brain [10,11]. In most of these studies the neurons of the ASD individuals and control groups were monitored while they observed the action of another person.

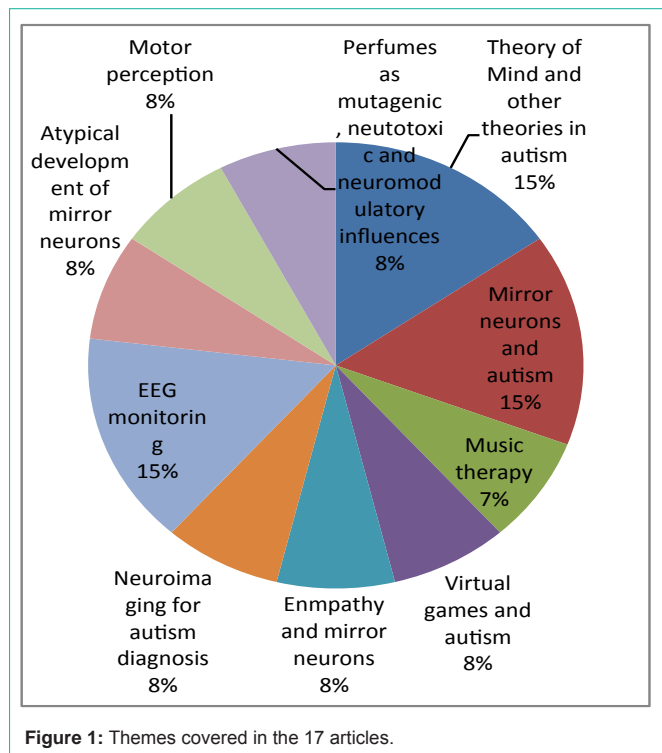
The proposal of this review was, therefore, to go through recent neuroscientific studies about this group of neurons and its connection to autism since it intrigues researchers and neuroscientists all around the world.

Initially, our objective was to analyze articles in English and Portuguese published between 2008 and 2013 in the SciELO and LILACS databases. However, there were no articles in Portuguese connected to the theme. Thus, the review was developed based only in texts in English. Out of the 17 articles found, 5 were experimental studies [1,9-12] and 12 were bibliographical reviews [4,8,13-22].

Results

The articles found presented different themes as shown in (Figure 1).

Analyzing the articles, 76% of them were favorable to the participation of mirror neurons in autism [1,4,8,12-22] and 24% were not [9-11,16,20].



The analysis investigated the countries where the articles were published. Figure 2 shows that even though these articles came from various countries, most of them had North-American authors, which indicates that in this country there are more advances in the investigation of the role of mirror neurons in cases of autism compared to other countries. (Figure 2).

Conclusion

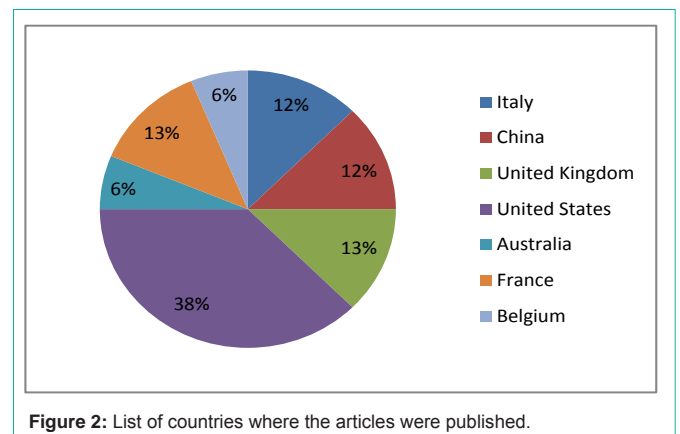
Based on the fact that not even one article was found in Portuguese, it is possible to conclude that research about the role of mirror neurons in the Brazilian scientific community is still incipient. According to the latest IBGE data (2010), the Brazilian population outnumbers 190 million people [23]. Among them, 0.3% is diagnosed as having ASD, which means approximately 570 thousand people [24]. This relevant figure points out to the urgent need to develop studies concerning autism, particularly relating mirror neurons to ASD.

This study has demonstrated that, despite the divergence of findings among different research groups, there is a tendency to confirm the hypothesis that an impaired mirror neuron system is associated to the incidence of ASD.

It is evident that investments in advanced technology researches can lead to extremely socially relevant discoveries, as they could help professionals and caretakers who deal with and/or live with ASD individuals.

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