

## Research

**Multiple Sclerosis: Stress and Cognitive Performance in Executive Functions****Morgana S**

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**Received** August 08, 2016; **Accepted** September 01, 2016; **Published** September 03, 2016**Copyright:** © 2016 Morgana S

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Multiple sclerosis is a Central Nervous System (CNS) disorder with an inflammatory autoimmune etiology, demyelinating [1], unlikely course and probably multifactorial cause. The onset of disease occurs in people around 30 years of age, and the peak incidence is between 23 and 24 years. The symptoms vary vastly and depend on the CNS structure affected as the resulting inflammatory reaction. Some of these symptoms may occur associated with focal neurological deficits such as changes in motor function, sensitivity changes, vision changes, difficulty in speaking and swallowing, bladder and bowel control problems, depression, as well as behavioral changes and cognition [2].

Achiron and colleagues [3] evaluated the cognitive profile of 1500 individuals diagnosed with Multiple Sclerosis. The study demonstrated performance differences in cognitive domains one standard deviation below the average of reference. Domains included, in prevalence order: Information processing speed (36.9%); executive functions (31.4%); motor skills (28.5%); visuospatial perception (28.2%); memory (27.6%); attention (27.4%); and verbal functions (23%).

Regarding cognitive impairment, some studies have shown possible relation to a dysfunction of the Hypothalamic-Pituitary-Adrenal axis (HPA-axis) in individuals diagnosed

with Multiple Sclerosis. This dysfunction may affect the performance of cognitive processes such as executive functions. These functions are characterized by essential cognitive skills in behavioral targeting and search of goals. These functions are also related to the process of adapting to demands and environmental changes [4]. However, studies relating changes in cortisol levels to executive functions are scarce and the existing results are controversial [5]. Since the initial diagnosis and discovery of Multiple Sclerosis performed by Charcot in 1877, studies were conducted to investigate the relationship between stressful life events and their exacerbation of Multiple Sclerosis. Life events that perceived as stressors can result in activation of the HPA axis [6]. Such stress response can be seen as a set of welfare regulation processes, stimuli perceived as threatening, irrespective of physical, social or psychological order, can be translated into changes in neuroendocrine and mental process [7,8]. Thus, Multiple Sclerosis, as previously stated, is a disease that affects young adults, its emotional consequences and psychosocial limitations due to cognitive impairments can be devastating. Preservation of executive functions is important for individual skills of self-management, especially in tasks not related to daily routine [9].

Frontal circuits, especially the pre-frontal region, are closely involved with the performance of executive functions. Since this region presents a large number of glucocorticoid receptors it is suggested that dysfunction of the HPA axis can impact the executive functions. This is thought to occur especially through the high levels of cortisol [5], a glucocorticoid hormone released as effector and modulator of HPA-axis activation. Deficits of executive functions in Multiple Sclerosis are involved with the decision making, abstract reasoning, the concept of training, as well as the loss in inhibitory ability and cognitive flexibility [10-16].

In the literature, there is an emphasis in the study of memory loss, attention and processing speed. Cognitive domains like the different components of the executive functions, and its association with measures of subjective and physiological stress are poorly studied in Multiple Sclerosis. Thus, neuropsychological evaluation and follow-up studies become essential in identifying probable cognitive, behavioral and emotional damages. Moreover, neuropsychological studies become crucial to understand the maintenance of certain executive functions in order to treat them. The combination of cognitive, emotional and physical aspects must be taken into account in the assessment of patients without dissociating its functionality.

The importance of cognitive involvement in Multiple Sclerosis requires a comprehensive and meaningful assessment; such assessment is considered appropriate for individuals diagnosed with this condition over time. Early detection of cognitive deficits can be useful for identifying specific therapeutic strategies directed to a specific patient.

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