



Study of mental flexibility with verbal fluidity in patients with multiple sclerosis

Estudo da flexibilidade mental com fluidez verbal em pacientes com esclerose múltipla

Estudio de la flexibilidad mental con fluidez verbal en pacientes con esclerosis múltiple

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ABSTRACT

Through these lines, we wanted to highlight mental flexibility with verbal fluidity in patients with multiple sclerosis. This disease is beginning to gain magnitude in our society especially among women, we also noticed in hospitals that the age group affected is increasingly younger; the after-effects left by this disease prevent this category of society from enjoying a pleasant and full life. To carry out this study, we used the TMT tracking test to measure mental flexibility and a rapid battery to assess verbal fluidity, on a sample of cases, all with sclerosis, ages between 20 and 50 years old, who were pursuing their treatment at Mustafa Pasha University Hospital in the capital, Algiers. After analyzing the results, we identified difficulties at the level of the mental flexibility function, as well as difficulties at the level of verbal fluidity in people with sclerosis. The results obtained after applying the BREF battery to measure verbal fluidity and the TMT test to measure mental flexibility show that the first hypothesis that verbal fluidity is impaired in people with multiple sclerosis has been confirmed. The second hypothesis, which states that there is impairment in mental flexibility in people with multiple sclerosis, was proven for the first two cases, but not for the third case.

Keywords: Mental Flexibility. Verbal Fluidity. Multiple Sclerosis. BREF Battery. TMT Test.

RESUMO

Por meio dessas linhas, queríamos destacar a flexibilidade mental com fluidez verbal em pacientes com esclerose múltipla. Esta doença está começando a ganhar magnitude em nossa sociedade, especialmente entre as mulheres, também notamos nos hospitais que a faixa etária afetada é cada vez mais jovem; as sequelas deixadas por esta doença impedem que esta categoria da sociedade



desfrute de uma vida agradável e plena. Para realizar este estudo, usamos o teste de rastreamento TMT para medir a flexibilidade mental e uma bateria rápida para avaliar a fluidez verbal, em uma amostra de casos, todos com esclerose, com idades entre 20 e 50 anos, que estavam em tratamento no Hospital Universitário Mustafa Pasha na capital, Argel. Após analisar os resultados, identificamos dificuldades no nível da função de flexibilidade mental, bem como dificuldades no nível de fluidez verbal em pessoas com esclerose. Os resultados obtidos após a aplicação da bateria BREF para medir a fluidez verbal e do teste TMT para medir a flexibilidade mental mostram que a primeira hipótese de que a fluidez verbal está prejudicada em pessoas com esclerose múltipla foi confirmada. A segunda hipótese, que afirma que há comprometimento da flexibilidade mental em pessoas com esclerose múltipla, foi comprovada para os dois primeiros casos, mas não para o terceiro caso.

Palavras-chave: Flexibilidade Mental. Fluidez Verbal. Esclerose Múltipla. Bateria BREF. Teste TMT.

RESUMEN

A través de estas líneas, hemos querido poner de relieve la flexibilidad mental con fluidez verbal en pacientes con esclerosis múltiple. Esta enfermedad está empezando a ganar importancia en nuestra sociedad, especialmente entre las mujeres, también hemos observado en los hospitales que el grupo de edad afectado es cada vez más joven; las secuelas dejadas por esta enfermedad impiden a esta categoría de la sociedad disfrutar de una vida agradable y plena. Para llevar a cabo este estudio, hemos utilizado el test de seguimiento TMT para medir la flexibilidad mental y una batería rápida para evaluar la fluidez verbal, en una muestra de casos, todos ellos con esclerosis, de edades comprendidas entre los 20 y los 50 años, que seguían su tratamiento en el Hospital Universitario Mustafa Pasha de la capital, Argel. Tras analizar los resultados, hemos identificado dificultades a nivel de la función de flexibilidad mental, así como dificultades a nivel de fluidez verbal en personas con esclerosis. Los resultados obtenidos tras aplicar la batería BREF para medir la fluidez verbal y el test TMT para medir la flexibilidad mental muestran que se ha confirmado la primera hipótesis de que la fluidez verbal está alterada en personas con esclerosis múltiple. La segunda hipótesis, que plantea que existe un deterioro de la flexibilidad mental en las personas con esclerosis múltiple, se comprobó en los dos primeros casos, pero no en el tercero.

Palabras clave: Flexibilidad Mental. Fluidez Verbal. Esclerosis Multiple. Batería BREF. Test TMT.

1 INTRODUCTION

It caught our attention the increasing number of people with sclerosis at the level of all age groups compared to what was previously where we only noticed it in a certain age group. Multiple sclerosis is classified as a degenerative disease



and is considered a chronic illness that affects the nervous and autoimmune system, leading to the nerve's destruction, thus affecting nerve transmission.

Multiple sclerosis is defined as an autoimmune disease that causes inflammatory and demyelinating lesions in various parts of the central nervous system. It has a progressive, fluctuating and unpredictable clinical course that, and for the moment this disease has no curative treatment (Sirbu, 2015).

Choosing this topic was based on the increasing number of cases of multiple sclerosis at an early age, especially among women. Furthermore, the lack of studies on mental flexibility in patients with multiple sclerosis as well as verbal fluidity in the same category, especially in the Algerian hospital environment.

The aim of the study is to shed light on the disorders associated with multiple sclerosis such as verbal fluidity and mental flexibility so that they can be addressed later in the treatment process.

2 PROBLEMATIC

This disease has clear effects on the level of brain structure, cognitive abilities and operational functions such as inhibition and mental flexibility and can affect verbal fluidity which is the ability to generate as many elements as possible at a given moment (words, drawing, events, resumes... etc.) (Defer.G, Brochet.B, Betier.J, 2016, p 92)

"Cognitive deterioration can be seen as difficulty in multitasking or decision-making, poor attention and poor speed of processing of information" at the outset of the disease (Yazdani.s, 2019, p 44)

A study by (Brugun Justine, Portal Marine, 2013, p15)entitled " Etude des performances à l'épreuve de fluence verbale des patients atteints de sclérose latérale amyotrophique» has proven that patients make errors with instructions as well as numerous recurrences and interventions have been observed.

A study by (Brand Stadter, 2017) on a sample of individuals with MS in its early stage using the Controlled Oral Word association Test (COWAT) and Name Efficiency Test (TONE) To discover word-finding capabilities, the results showed that MS patients' performance in the TONE test was significantly weak compared to COWAT results indicating problems with their verbal fluidity.



As for mental flexibility, it is defined as the ability to adapt an individual's choices to emergency situations (Gil.R, 2006, p. 165). It is also one of the most important factors of the ability to think creatively and innovatively, and also means the ability and willingness to change one's areas of thinking during various activities.

Flexibility also refers to the degree of ease and pliability with which an individual changes an attitude or idea, and this has left many scientists interested in the concept of flexibility and its relationship with other variables and their impact on the professional and academic level through adaptation, ease and smoothness of ideas.

It is also defined as "the ability of the learner to change his state of mind by changing his attitude, and flexibility is characterized by the ability to generate a range of differentiated responses, showing unfamiliar uses of something familiar" (Arafa Mahmoud, 2006, p. 94) Also, it is the ability to move and shift mentally from rigidity to multimodal ideas and the ability to choose; through which it realizes the perception of relationships, the awareness of the individual and the desire to be adapted and flexible to the new situation (Ben Hussein, 2017, p. 14)

From studies on mental resilience, we find a study by (Cyntia, & Steven, 2013) entitled "Assessing mental resilience through a new global recognition test, personality and individual differences", Aiming to recognize the assessment of both automatic and adaptive mental resilience in university students and disclose the relationship between mental flexibility, whether automatic or adaptive, and the ability to solve problems, creative thinking, divergence and innovation. The results of the study resulted in a lack of statistically significant differences between students' score averages in the automatic or adaptive mental flexibility test, A positive correlation between automatic or adaptive mental flexibility and problem-solving ability and a correlation between mental flexibility and creative, and innovative thinking.

Based on what was cited above, we can draw the following questions:

Is mental flexibility impaired in people with multiple sclerosis?

Is verbal fluidity impaired in people with multiple sclerosis?



Hypotheses

Mental flexibility is impaired in people with multiple sclerosis.

Verbal fluidity is impaired in people with multiple sclerosis.

2.1 DEFINITION OF MULTIPLE SCLEROSIS

Multiple Sclerosis is a chronic neurological disease that affects young adults between the ages of 20 and 40, affecting more women than men, about 3 women to 2 men. It develops at an unpredictable pace in the form of shifts (attacks) accompanied by stages of improvement (remission). It is an inflammatory disease of the central nervous system, characterized by the presence of areas of damage to the myelin tissue. Its causes remain unclear but the hypotheses are due to an immune system dysfunction. (Gonsette Richard, p15).

Multiple sclerosis is represented as a neurological disease that is manifested by the occurrence of focal inflammatory lesions, being named plaques that are located in the white matter, as a representative form of demyelination (Stroe, 2020).

Multiple sclerosis is a disease with an unknown cause. Studies have concluded that the cause could be autoimmune of unknown origin and, in any case, multifactorial, with the intrication and interaction of different genetic sensitivity factors and different environmental factors (Docu Axelerad, 2020).

- Chronic diseases constitute psychosocial trauma to the patient and the patient's surroundings, leading to a dramatic change in the life of the patient and those around him, owing to a functional deficit, which increases the patient's suffering, and affects his quality of life and self-effectiveness. Multiple sclerosis is a serious and chronic disease that affects the constructive and functional unit of the nervous system.

Multiple sclerosis patients also suffer from a lot of problems, most notably, the patient's inability to cope and adapt to his daily life and the 2015 Mahouche study showed that the quality of life in patients with sclerosis was moderate, due to the nature of the disease, as it is unpredictable and its symptoms are not visible, especially new ones, and therefore the patient has insufficient capacity to adapt to the new situation or to cope with and solve life's problems And here comes the role



of specialists to research and develop appropriate strategies, especially the category of patients whose disease has reached the level of relapsed sclerosis. (McCabe, 2006) (Munira Saleh Al-Juwaii, Shatha Abdul Aziz Al-Ajlan 2020).

2.2 SYMPTOMS OF MULTIPLE SCLEROSIS

Patients with sclerosis have a range of symptoms, including motor symptoms that are 90% present in cases, they may include: paralysis of the lower limbs, paralysis of one limb or paralysis of the four limbs, facial paralysis and muscle spasticity. (Micheau Antonie, 2004, p 65)

Visual symptoms are found in 70 percent of the cases, the most important are optic neuritis, strabismus, and double-vision.

Sensory symptoms are very variable and are characterized by numbness, tingling, and burning sensations.

Vestibular symptoms are very common and are characterized by voice disorders, speech disorders of neurological origin, and respiratory disorders.

2.3 CAUSES OF MULTIPLE SCLEROSIS

There is still no definitive cause for this disease, but there are some hypotheses that attribute the cause to a malfunction in the human immune system which attacks the marrow in the brain and spinal cord, this causes the emergence of inflammatory sites leading to myelinolysis (the degeneration of myelin).

Other studies have shown other factors such as the environment, genetics, geographical and climatic factors, as well as hepatitis B vaccine. And vitamin D or B12 deficiency both important in myelin production.

2.4 MENTAL FLEXIBILITY

Mental flexibility is considered an executive function related to making plans, strategies, solving problems, and processing data and information. Mental flexibility is also defined as: "the smooth flow of an individual's thoughts and his ability to shift his thinking according to the changing stimuli of the situation he



faces" (Ran, 2009, p 23)

Mental flexibility or mental resilience is defined as the ability to move fluently and quickly from one type of information processing to another (Noel, 2007, p. 130).

- **Mental flexibility disorder:**

Disorders of mental flexibility function are defined as the inability to shift cognitive organization and thought processes to meet the changing needs of a given moment. The inflexible response results in stereotyped involuntary functional behavior and difficulties in organizing and modifying motor actions (Lewis, 1997, p. 241).

Mental flexibility disorder is also called mental rigidity, it is the inability to change a previous idea or take into account new changes in the situation, which requires adaptation to the current situation, which appears in the form of abnormal repetition of a certain behavior or idea after the disappearance of what caused it, or appears in absent-mindedness and confusion about how to act, which indicates slowness and intellectual and motor inertia. (Le chevalier, 2008, p. 804)

2.5 VERBAL FLUIDITY

Verbal liquidity is defined as the ability to summon as many appropriate verbal responses as possible alternatives or synonyms as a response to a demand or verbal trigger in a specified period of time, it is an optional recall of previously learned words and concepts on two types of phonological and semantic verbal fluidity.

Semantic or factional fluidity is the pronunciation of as many words as possible belonging to the same semantic category (Ergis. Gierski, 2004)

It requires the production of elements belonging to the same semantic network and related through dependency relationships or class coordination.

As for Phonological or literal fluidity, it is producing as many words that start with a particular letter as possible, either orthographically or phonetically; in other words it can be dictated or used by sound.

- **Factors affecting the performance of verbal fluidity:**

The performance of verbal fluidity is based on the strategies used and the



degree of intelligence, as well as the educational level and age of the examinee. It also relies heavily on a range of cognitive abilities such as memory, attention, and recall mechanisms to access the lexical repertoire.

- **Types of verbal fluidity:**

There are several types of fluidity, the most common of which are semantic and phonological fluency. However, there are other types, including practical fluidity, which consists of recalling as many action verbs as possible, giving indications of the availability and retrievability of the verbs in long-term memory (Hillis, 2004).

We also find alternating fluidity, which is the alternation of fluidity from producing as many words as possible by systematically alternating between two different parameters, and all kinds of fluidity influences that involve flexibility and inhibition to a greater extent than in the classical situation. (Haras E. Macia C, 2014) (Haras E. Macia C, 2014).

2.6 METHOD USED

To conduct this study, the descriptive method was adopted through a case study because it allows for a precise monitoring of each case and recording the weaknesses and strengths that characterize each case.

This was done at the Mustapha Bacha University Hospital in Algiers, Neurology Department. The sample consisted of individuals with Multiple Sclerosis between the ages of 20 and 50, all of whom were of the same sex, i.e. women, all of whom had a high level of education and no motor disorders.

Two tests were used in this study: Battery for Rapid Frontal Assessment (BREF) and the Trail Making Test (TMT), we found the following results:



Table 1: case results in the BREF test:

Items	First Case Results	Second Case Results	Third Case Results
Similarity	03	03	03
Verbal fluidity	02	02	00
Sequence of movements	03	03	03
Opposite instruction	03	03	03
GO/NO/GO	00	03	03

Source: Prepared by the author of the article: Dr. DJAOUT Fatiha

The first case, a 47-year-old woman who developed the disease at the age of 38, and the second, a 35-year-old woman who developed the disease at the age of 28, were unable to recall words beginning with the letter "S" except after stimulation, with slowness and difficulty in recall, and the result was 7 words, while in the normal case at least 10 words or more must be mentioned to obtain the full score, indicating a mild disorder at the level of verbal fluidity.

As for the third case, a 21-year-old woman who was diagnosed with Multiple Sclerosis at the age of 14, she was unable to recall more than two words despite stimulation, noting slowness and confusion in recall and the desire to change the letter thinking that the results would improve, showing a severe disorder of verbal fluidity.

Table 2: results in the TMT:

Items	First Case Results	Second Case Results	Third Case Results
Phase A	1 minute 45 secondes (i.e. 105 seconds)	46 seconds	35 seconds
Phase B	7 minutes 07 seconds (i.e. 427 seconds)	02 minutes 21 seconds (i.e. 141 seconds)	1 minute 43 seconds (i.e. 103 seconds)
Errors made in Phase A	01	00	00
Errors made in Phase B	01	01	00
GO/NO/GO	00	03	03

Source: Prepared by the author of the article: Dr. DJAOUT Fatiha

As for the results of the TMT, In the first case; we had registered The time taken in phase A was 105 seconds, and in phase B the time taken reached 427 seconds, which is a long and satisfactory time, and we recorded one error in both phase A and B when moving from the number to the letter, and we also noticed that the examinee was slow, confused and hesitant when completing the test, with an unwillingness to complete test B due to her inability to make the connection between numbers and letters.



The second case took 46 seconds in phase A and 141 seconds in phase B, which is also considered long and satisfactory, and this case also made a mistake once in phase B when moving from the number to the letter, like the first case.

In this case, we also observed slowness and hesitation in completing the test, indicating a disorder at the level of mental flexibility in both the first and second cases.

As for the third case, her response was 35 seconds in phase A and 103 seconds in phase B, which is considered a normal duration, and the case did not record any error or any difficulty in completing the test, which shows that the mental flexibility function is preserved, which may be due to her young age and her commitment to treatment.

3 CONCLUSION

In this study on mental flexibility and verbal fluidity in a sample of women with multiple sclerosis attending the neurology department of Mustapha Bacha University Hospital in Algiers, and through the application of the BREF test battery to measure verbal fluidity, the results obtained showed the presence of a disorder in verbal fluidity where the cases were not able to recall the appropriate words.

Regarding mental flexibility, the results of the TMT showed that people with multiple sclerosis have a disturbance in mental flexibility.

The results obtained after applying the BREF battery to measure verbal fluidity and the TMT test to measure mental flexibility show that the first hypothesis that verbal fluidity is impaired in people with multiple sclerosis has been confirmed.

The second hypothesis, which states that there is an impairment in mental flexibility in people with multiple sclerosis, was proven for the first two cases, but not for the third case, perhaps due to her young age and follow-up therapy sessions.

The study dealt with the important topic of verbal fluidity and mental flexibility in people with multiple sclerosis, a disease for which studies have not yet been able to identify the direct cause of its occurrence, but have shared the cause of its symptoms, which is damage to the myelin tissue within the neurons transmitting synaptic connections in the central nervous system and the spinal cord.



Due to the lack of nerve supply to the body, the symptoms of the disease begin to appear in varying proportions between cases, as several factors such as the type of injury, the duration of the diagnosis and the treatment provided intervene.

In addition to suffering from many difficulties, people with sclerosis suffer from speech disorders and voice disorders, so this study was conducted to find out the extent of verbal fluidity disorder by applying the BREF battery, the results of which revealed the presence of a disorder in verbal fluidity, which is confirmed by the study of (Burgun Justine and Portal Marine). In a study titled (A study of verbal fluency performance in patients with amyotrophic lateral sclerosis).

The study found that the performance of verbal fluidity tests is poor compared to those who do not have amyotrophic lateral sclerosis.

The study also aimed to find out the extent of mental flexibility disorders in people with multiple sclerosis. For this purpose, the TMT was applied, and the results showed that there is a disorder in mental flexibility in varying proportions in cases with multiple sclerosis.



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