

Evaluation of visual memory in individuals with multiple sclerosis in the Algerian clinical setting (Kabylie region A study of 4 cases)

تقييم الذاكرة البصرية عند الأشخاص المصابين لاتصلب اللويحي في الوصل الإكلينيكي الجزائري (منطقة القبائل، دراسة لأربع حالات)

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Abstract:

The topic of memory is considered important in the field of speech therapy and cognitive neuroscience, and researchers continue to be interested in it and all cognitive processes. We specifically aimed to study visual memory, where our current study explored the evaluation of visual memory in patients with multiple sclerosis and the extent to which it is affected by the disease. This study was conducted on a group consisting of four cases of multiple sclerosis patients with almost the same specifications, relying on a descriptive method based on case studies and using a set of scientific tools represented in interviews, medical files, neuropsychological assessments, and the DMS48 neuropsychological test. Its impact by multiple sclerosis, the study concluded with the revelation and evaluation of visual memory and the indication of the degree

Keywords: Multiple sclerosis, memory, visual memory.

ملخص:

إن موضوع الذاكرة يعتبر موضوعا مهما في ميدان الأروطوفونيا والعلوم العصبية المعرفية، ولزال الباحثون يهتمون به وبجميع العمليات المعرفية، فاردنا على الوجه الخصوص ان ندرس الذاكرة البصرية حيث استكشفت دراستنا الحالية تقييم الذاكرة البصرية لدى المرضى المصابين بالتصلب اللويحي ومدى تأثرها به، قد تمت هذه الدراسة على مجموعة متكونة من (04) حالات مصابة بمرض التصلب اللويحي لهم تقريبا نفس المواصفات و اعتمادا على المنهج الوصفي القائم على دراسة حالة

وذلك باستخدام مجموعة من الوسائل العلمية المتمثلة في المقابلة ،الملف الطبي ،الميزانية النفس عصبية واختبار النفس عصبي (DMS48).

خلصت الدراسة الى الكشف وتقييم الذاكرة البصرية وتبيان درجة تأثرها بالتصلب اللويحي كلمات مفتاحية: .التصلب اللويحي، الذاكرة، الذاكرة البصرية.

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1. Introduction

Undoubtedly, the brain is the essential part that regulates and manages human motor activities and cognitive abilities. However, it is susceptible to various injuries and disorders, whether at the level of these organs or knowledge. These can be temporary or chronic, causing a loss of its higher functions, which in turn affects life. Among these injuries is what is known as multiple sclerosis, which affects the central nervous system (the organ) and leads to a functional impairment affecting higher cognitive processes such as attention, language, perception, and memory.

Multiple sclerosis is considered one of the most common neurological diseases due to the degeneration of myelin, which plays a role in protecting the axon at the level of the nerve cell. It is also known to affect women more than men and primarily impacts young adults aged between 20 and 40 years.

Researchers' interest in the topic of multiple sclerosis and its resulting psychological and cognitive damages is continuously increasing, as it leads to the deterioration of an individual's performance in all areas of life, whether academic, professional, or familial. Among these cognitive damages, we mention the process of memory, which is the subject of our study, particularly visual memory.

Through our review of research on memory and our practical application, memory appeared to us as that complex cognitive process that relies on several steps of learning and encoding, followed by recognition. It involves various mental processes such as attention and perception, allowing a person to know their identity by recalling their previous perceptions. Given the importance of this process, we wanted it to receive more attention, so we chose it as the subject of our study.

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Study Problem:

A person lives a life full of experiences and perceptions, acquiring various kinds of knowledge. However, he goes through health crises that affect this quality of life, causing them numerous disorders due to these health crises. Among these are psychological disorders, which manifest as mood swings and constant anxiety leading to depression, and cognitive disorders that affect cognitive processes such as information processing, attention, language,...and memory. Given the complexity of the latter, as it is a combination of learning and recalling information when needed, and because it is related to knowledge and the mind, with its center being the nervous system, it would be beneficial to address it by linking it to one of the diseases that affect this system. Due to the widespread prevalence of one of these diseases, known as multiple sclerosis, we have decided to investigate the extent to which a type of memory is affected by multiple sclerosis. We will focus on evaluating the visual memory of these patients to determine whether it is impaired or not.

The French doctor Charcot, known in the field of neurology and a pioneer in the study of multiple sclerosis, was the first to reveal the disruption of cognitive processes, including memory, in 1868. Then came Galton in 1879, who conducted studies on memory with the aim of exploring how memory works and the differences in individuals' abilities to recall events, personal experiences, and the emotions associated with these events. Following him was Freud in 1893, who was influenced by his mentor Charcot during the treatment of neuroses, relying in psychoanalytic therapy on the recollection of perceptions and emotional events experienced by the person in childhood (Nicola, 2003).

In the late 19th century, Theodule Ribot emerged in the field of neuropsychology to focus on the topic of memory and its connection to the brain and the areas responsible for storing and retrieving memories. He hypothesized that memory disorders are due to the failure to consolidate and stabilize in the brain regions, and that the gradual deterioration and loss of memories begin with recent facts, which are rarely repeated, thus almost losing their connection. In contrast, older memories remain for a longer

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period. The deterioration extends to the loss of ideas and the retrieval of information that requires interaction between memories until the loss affects actions and activities. This principle became a law by the scientist Théodule Ribot, known as the law of progressive deterioration. Consequently, Ribot's works allowed for the adoption of an approach that links cognitive processes with brain injury and the abandonment of the idea that memory is a spiritual faculty, as philosophers consider it.

CUEVRO Lampard, 2006, pp 45-46

studies have shown that there is a decline in cognitive processes among individuals with multiple sclerosis, regardless of its type, whether in attention and perception, verbal fluency, or even in the speed of information processing and memory. Zakzanis (1983-1997) conducted a study to demonstrate the relationship between these cognitive psychological processes and multiple sclerosis, which was carried out on 1,845 cases. The results were centered on the fact that attention and the slowing of information processing speed affect memory. Therefore, our current study will focus on the topic of visual memory.

The scope of studies on memory has expanded, and research on this topic has proliferated. Researchers have become increasingly interested, both in European and Arab countries, leading to studies on this subject in the Algerian clinical setting. Among these, we mention a study by Jihida Ghazali, which evaluated cognitive processes in general among individuals with multiple sclerosis. However, it did not address the evaluation of memory in all its forms. Therefore, we chose visual memory, attempting to assess it and demonstrate the extent of its impairment due to multiple sclerosis.

CODEFRAY O, 2008, p 62

Through our field practice, we decided to study the evaluation of visual memory in these individuals and pose the following general question:

Does the process of visual memory get affected by multiple sclerosis?

And from here, the following sub-questions were included:

What is the state of visual memory among multiple sclerosis patients in the

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clinical setting of the Kabylie region?

Is there a difference in the levels of visual memory among patients with multiple sclerosis?

General hypothesis:

Visual memory is affected by multiple sclerosis.

Partial hypothesis:

Secondary progressive multiple sclerosis affects visual memory.

Visual memory impairment is affected at different degrees from one patient to another in multiple sclerosis patients in the clinical setting of the Kabylie region.

2- Study objectives:

The objectives of the current study are as follows:

Understanding the reality of visual memory in patients with multiple sclerosis and revealing the extent of its impairment.

Removing the ambiguity regarding the presence or absence of varying degrees of visual memory impairment

Providing opportunities for other health specialists to create therapeutic protocols.

3- Importance of the study:

a- Addressing the process of visual memory from a neuropsychological perspective in a clinical setting allows us to test the validity of our hypothesis.

b- Interaction with individuals suffering from multiple sclerosis and equipping them with techniques and culture to handle neuropsychological tests, as well as encouraging them to engage in mental exercises and activities that help activate and enhance most cognitive processes.

Defining concepts:

Among the most prominent terms of the current study that we needed to clarify are:

4-Memory:

Memory is defined as the higher and fundamental cognitive process that occurs through a series of operations that involve receiving stimuli,

encoding them, and then sending them to the brain for analysis and linking them to prior perceptions, thereby giving them meaning to be stored and retrieved when needed

محمد محمود بن يونس 2013 ص 250

4.1.2. Visual memory:

The first who developed the term "visual memory" was the renowned and specialized neuropsychologist Neisser in 1967. He coined the term "iconic memory" for visual memory after conducting his experiments, which necessitated giving it the name iconic memory, as he saw it as a continuous image that lasts for a few seconds even after the stimulus disappears, and it remains clear for up to five seconds in the dark medium, but its persistence does not exceed one second in the bright medium. (Sperling, 1960-1963).

URLIC Neisser ,2014, p 20

4.3. Multiple sclerosis:

Multiple sclerosis is defined as a chronic neurological disease that destroys the myelin substance in the brain and spinal cord, leading to episodes followed by periods of remission.

It is also known as a common disease that affects young people, usually more women than men, and begins with intermittent episodes of neurological symptoms, but it enters a progressive stage after several years.

G. DAVID Perkin ,2002, p179

5. Study methodology:

During our field study, we relied on the descriptive method based on case study, as it is a method of analysis and interpretation in an organized scientific manner to reach a scientific truth and specific objectives for a social problem . Al-Sa'ati defines the descriptive approach as the method adopted to study the phenomenon as it exists in reality, describe it accurately, and analyze it based on the principle of quantity and quality

محمد حسن غانم ، 2003، ص 8

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6- Research group:

In order to achieve the goal of this study, our research sample consisted of 4 cases of multiple sclerosis with varying degrees

Table 1: (Characteristics of the study sample)

cases	Gender	age	Level of education	Age at disease
First case	Woman	48years old	university	33 years old
second cas	Woman	30 years old	High school	25 yeas old
Thierd cas	Woman	50 years old	university	29 years old
Fourth cas	Man	54 years old	Middle school	38 years old

6-1-presentationThe first case:

It concerns Mrs. B.N, 48 years old, residing in Tizi Ouzou, married and mother of three children, is an obstetrician.

6.1.1.History of the disease: The onset of the disease dates back to when she was 33 years old, which is 15 years ago. It started as tingling in the extremities in a gradual manner, accompanied by urinary disturbances that lasted for about a month. However, these disturbances disappeared for six months and then reappeared more severely with muscle weakness and loss of balance. The disease was diagnosed as relapsing.

6.1.2.Neurological examination: MRI showed the presence of cerebellar syndrome leading to balance disorders and impaired coordination.

6-2-The second case: It concerns Mrs. Rabia.30-year-old woman living in Tizi Ouzou, married and a mother of a boy, a housewife with a high school education.

6.2.1.History of the disease: The onset of the disease dates back to when she was 25 years old, which is 5 years ago. It started as motor disturbances that spontaneously receded after a few days. These attacks recurred in close succession, and the motor disturbance intensified, with heaviness in the

upper limbs. The disease was diagnosed by a neurologist at the Balloua Hospital in Tizi Ouzou as relapsing-remitting multiple sclerosis.

6.2.2Neurological examination: MRI showed multiple inflammatory areas in the subcortical and cortical regions.

6.3.The third case:

Mrs. A.A high school teacher, 50 years old, mother of three children.

6.3.1.Medical history:

Her illness dates back to the age of 29, initially characterized by sudden visual disturbances that gradually receded. After two years, she experienced a second attack affecting the motor function of the upper limbs, hands, and shoulders, even the neck. Three years later, she had another attack, leaving behind a pyramidal and cerebellar syndrome affecting balance and coordination.

6.3.2.Neurological examination: Magnetic resonance imaging showed the presence

Demyelinating lesion of the white matter in favor of multiple sclerosis.

6.4.The fourth case :

He is Mr. M.H., 54 years old, residing in Boumerdes, married, a father of three children, with a primary education level. He is unemployed due to frequent forgetfulness. He was in the hospital accompanied by his wife.

6.4.1.Date of the disease: The first symptoms of multiple sclerosis appeared when the man was 38 years old. The visual disturbances and motor problems lasted for several days but disappeared spontaneously. However, the same symptoms reappeared and faded away again. Recently, he developed severe motor problems in the lower limbs, which required hospitalization. The disease was diagnosed as secondary progressive type.

6.4.2.Neurological examination:

The posterior cord syndrome

Above and below the tentorium

Frontal and cerebellar cortical atrophy

7.Study tools: In our research, we relied on a set of tools that help us answer our questions and verify the validity of the hypotheses. These tools

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include:

8.Neuropsychological assessment:

We used this method to collect data that serves our research, including administrative information, medical history, and neurological examination.

9.Neuropsychological test:

It is a test to assess visual recognition memory, specifically developed for the early diagnosis of Alzheimer's disease. It can be used with patients who have memory problems and those suffering from language disorders and neurological disorders such as aphasia.

This test was created by Barbo and his colleagues and consists of 48 pairs of images divided into three designs. Each design consists of 48 individual images used in the learning phase, which is the initial phase, followed by the storage phase, which consists of 48 pairs of images. Each pair contains the previously acquired image and a distractor image.

the target and distractor images are presented side by side.

We ask the patient in the encoding phase to count the colors in the pictures one

after another to enhance the mechanisms of executive learning, specifically the frontal lobes.

As for the storage phase, which occurs after a short period, we ask the examinee to recognize the image they saw earlier.

In the third stage, after a longer period, one hour, the examinee tries to recognize the image they saw initially.

The evaluation: it will be in the form of percentages that we will include in the test application table

Tableau (2): performance based on the number of correct answers or errors

Number of images recognized	Number of errors	Performance
48	0	100%
47	1	98%
46	2	96%
45	3	94%
44	4	92%
43	5	90%
42	6	88%
41	7	85%
40	8	83%
39	9	81%
38	10	79%
37	11	77%
36	12	75%
35	13	73%
34	14	71%
33	15	69%
32	16	67%
31	17	65%
30	18	63%
29	19	60%
28	20	58%
27	21	56%
26	22	54%
25	23	52%
24	24	50%
23	25	48%
22	26	46%
21	27	44%
20	28	42%

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Application of the test:

Table (03): represents the results obtained by each case in the three sets

Test cases	Set 1	set 2	Set 3
Case 1	25/48	43/48	42/48
Case 2	41/48	28/48	31/48
Case 3	30/48	39/48	36/48
Case 4	21/48	23/48	26/48

10.Qualitative and quantitative analysis:

10.1. Quantitative analysis for the first case:

This case obtained 25 correct answers out of 48 in the first design, which corresponds to 52%.

As for the second design, she obtained 43 correct answers, which is equivalent to 90%.

In the third design, the case obtained 42 correct answers, which is equivalent to 88%.

10. 2.Qualitative analysis for the first case

We noticed during the test that this case was distracted and appeared tired, which are among the characteristics of the disease, as well as poor concentration. It took more than 15 minutes in the first design, which explains the slow information processing speed. However, in the second and third designs, the case focused more after breaks and thus succeeded in selecting the correct images.

10.3.Conclusion for the first case:

There is a severe difficulty in acquisition, thus indicating a moderate impairment in visual memory during the acquisition process as well as during recognition.

10.1.Quantitative analysis of the second case:

This case in the first design, which is in the coding phase, received 41 out of 48 responses, which is equivalent to 85%.

As for the second design, it (case) got 28 correct answers, which equals 58%.

Whereas in the third design, it got 31 correct answers, which is equivalent to 65%.

10.2.Qualitative analysis of the second case:

In the first design, there was no difficulty in the acquisition phase as it took less than 8 minutes to respond, with the patient being calm and cooperative. However, in the second phase, we noticed difficulty in recalling the image, as the patient hesitated in choosing the image and even denied seeing both images.

In the third stage, one hour after the second stage, she found it difficult to recognize the images, but not to the extent of her inability in the storage phase.

10.3.Conclusion of the second case :

From the above, we conclude that the second case did not encounter difficulties in acquisition, but it was quite disturbed in the storage and recall stages.

Therefore, it can be said that this case suffers from a moderate degree of visual memory impairment.

10.3Third cas

10.1.Quantitative analysis of the third case:

This case obtained 30 correct answers out of 48, which is equivalent to 42%.

In the second design, the case got 39 correct answers, which equals 81%. While in the third design, the case obtained 31 correct answers, which is

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equivalent to 65%.

10.2. Qualitative analysis of the third case:

In the first phase, there was difficulty in counting the colors, and we noticed the examinee's fatigue as well as their anxiety, which led to difficulty in attention and concentration. Spending a long time completing this phase resulted in not recognizing all the images.

As for the second phase, after his break, the examinee seemed focused at the beginning of the design, but his mood quickly changed, and he found it difficult to recognize the images. The same thing happened with the third design; he started recognizing the images at the beginning of the design, but he lost his focus and hesitated in choosing the correct image. At times, he randomly selected an image.

10.3. Conclusion of the third case :

We conclude from the above that this case suffers from a disruption in the basic processes of memory, thus indicating a disorder in visual memory ranging from mild to moderate.

10.1 Quantitative analysis of the fourth case:

The case obtained 21 correct answers in the first design, which is equivalent to 44%.

In the second design, the case obtained 23 correct answers, which is equivalent to 48%, while in the third phase, it obtained 26 correct answers, which is equivalent to 54%.

10.2 Qualitative analysis of the fourth case:

We noticed that the examinee does not focus on counting the colors but answers hastily, taking even two minutes, as if he (the patient) were in a hurry.

In the second and third stages, he did not recognize the images he had seen before. The examinee chose in a way that lacked focus, and his selections were characterized by impulsiveness.

10.3. Conclusion of the fourth case :

We conclude that this case suffers from a noticeable disorder in visual memory.

11.General conclusion:

After reviewing the neuropsychological assessment for each examinee and based on the semi-structured interview, and after applying the neuropsychological test to the four cases, it became clear to us that these cases suffer from a disturbance in one or all processes of memory. Based on what we presented in the theoretical aspect and what was previously mentioned in the quantitative and qualitative analysis, multiple sclerosis results in disturbances in visual memory. The first case of women scored 52% of correct answers in the first design, indicating a severe disturbance in the acquisition process. In the storage and recognition processes, we observed a mild disturbance. Therefore, visual memory is affected by multiple sclerosis.

We also observed a moderate to mild disturbance in the third case, and it is worth noting that these two cases have a high level of education.

Regarding the second case, we noticed a disturbance in visual memory ranging from mild to moderate. It is also worth mentioning that this case is 30 years old.

And finally, the fourth case is a man suffering from a visual memory disorder, despite the different type of multiple sclerosis he has, which is of the secondary progressive type.

And since all cases of multiple sclerosis, regardless of its type and the gender and age of the patient, suffer from a disturbance in visual memory, this indicates that this study has been validated and answered the questions, which imply that yes, multiple sclerosis affects visual memory.

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