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ASSESSMENT OF SPATIO-TEMPORAL AND CONTEXTUAL MEMORY IN PATIENTS WITH STROKE.

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Abstract:-
Background: This study aimed to assess eventual disturbances of spatio-temporal end contextual memory in patient with stroke in order to better grasp these patient's attitudes so as to track their neuropsychological accompaniments.
Method: fifty-five (55) patients with stroke, after having traveled a loop, had to recognize among 27 pictures of the CHU of Cocody (Cote d'Ivoire) those belonging to the previously traveled path in the company of the experimenter. The pictures were presented to the participants. The participants had to say if "yes" or "no" the pictures presented belongs to the previously traveled path in the company of the experimenter. Then the photographs are presented by pair to the subject who is required to give the exact order of the photographs as seen on the route traveled.
Results: When recognizing pictures with order effect, we found a significant difference ($F(46) = 12.45$, $p = 0.0010$) between the number of exact responses given by patients with stroke and that given by healthy controls subjects.
Conclusion: patients with stroke were deficient in establishing the chronological order of succession of views.

Key words:- *Stroke, spatio-temporal, contextual, memory.*

BACKGROUND

Memory can be defined as the function that enables an organism to acquire, then retain, and evoke information or behavior related to a sensory experience [1]. This definition covers both the most basic forms of memory such as habituation and awareness, as well as more complex and elaborate forms such as working memory [2]. This fundamental function is particularly vulnerable in the case of a stroke. Indeed, stroke is the second most common cause of cognitive impairment and dementia and can significantly affect attention, memory, ability to plan, and other executive functions. Strokes are usually classified into two broad categories: ischemic stroke and hemorrhagic stroke. The first type of stroke, or cerebral infarction, is due to the obstruction of a blood vessel while the second, or cerebral hemorrhage, causes bleeding in the brain. Stroke is caused by a decrease or even a sudden cessation of blood flow in the branches of the vascular network in connection with the vessel undergoing rupture of its wall or blockage by a clot. Thus, the nerve cells fed by these branches are suddenly deprived of oxygen and sugars, causing in a few minutes their deterioration or death. In the hemorrhagic case, the decrease is mainly due also to a compression of the nerve cells by the hematoma resulting from the bleeding. As a result, axons of neurons can be sectioned by mass displacement of nerve tissue. Stroke causes cognitive impairment by lacunar infarcts, ischemic white matter disease, and cerebral hypoperfusion in old age [3–4]. In Côte d'Ivoire, where stroke is a real public health problem, few studies have documented memory problems associated with stroke. The objective of this study is to evaluate the perturbations of the spatio - temporal and contextual memory following the cerebrovascular accident in patients; in order to better understand the attitudes of these patients in order to optimize their neuropsychological accompaniment.

MATERIAL AND METHODS

Study population

The study described here totaled 75 participants of both sexes. The age of the subjects varies between 40 years and 65 years. They are distributed as follows:

- 20 control subjects with no history of neurological, psychiatric and stroke disorders. They were chosen from the general population;
- 55 patients with stroke were recruited from the Department of Neurology of C.H.U CocodyAbidjan (Ivory Coast). Patients had focal brain damage due to stroke.

Technical material

We had a CANON EOS 1300 D digital camera to take the pictures.

Methods

The subjects had to travel an average loop of 10 minutes in the university hospital of Cocody.

The trip was done twice, successively and all the participants were accompanied, both times, by the experimenter. A total of 27 pictures were chosen according to certain criteria. They were taken in the direction of walking, according to the same angle of perception, and corresponded to what the subject could see during his journey inside the CHU of Cocody. 11 out of 27 pictures were taken from a distance and 11 of 27 pictures were taken close up. After the trip, the photos, 27 in total, all belonging to the CHU of Cocody are presented one by one to the subjects. The participants had to say if "yes" or "no" the pictures presented belongs to the previously traveled path in the company of the experimenter. Then the photographs are presented by pair to the subject who is required to give the exact order of the photographs as seen on the route traveled. After a full description of the subject study, written consent was obtained.

For the statistical analysis of the data, we used statistica version 6 software. The ANOVA was used to compare the performances of the participants; it was significant for $P < 0.05$.

RESULTS

Healthy control subjects (n = 20, mean age 50.5 years) and patients (n = 55, mean age 53.5 years) were matched for age (Table 1). No significant difference ($t(46) = 0.65$, $p = 0.52$) existed between the two populations. We also matched our subjects with their level of study (Table 1), using the bachelor's degree (BAC = 12 years of study) as a reference. There was no significant difference ($t(37) = 0.64$, $p = 0.52$) between our two populations.

Table 1: Age matchings, level of study of participants

Participants	Ages (years)	Level of study (years)
control subjects	50,5	11,62
Patients	53.5	12,3

We counted the number of responses given by the different participants during the recognition of pictures without order effect (Figure 1). The results indicated that there is no significant difference between stroke patients and healthy controls in terms of exact and false responses. These results showed that patients would not be deficient in the perception and recognition of spatial scenes presented in visual form.

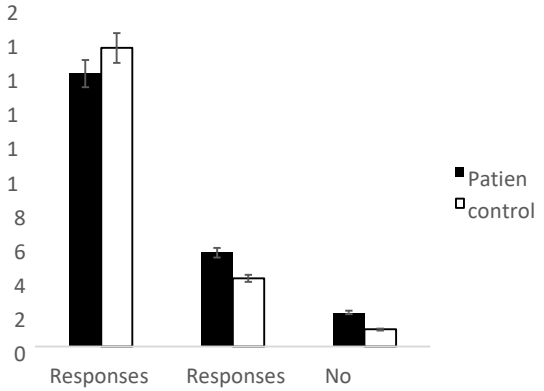

Figure 1: Average number of responses when recognizing photos without order effect
(Figure 2) shows that there was no significant difference between the performance of patients and those of healthy control subjects when the picture is taken closely. It therefore seems that patients could distinguish, encode and recognize the details of a spatial scene.

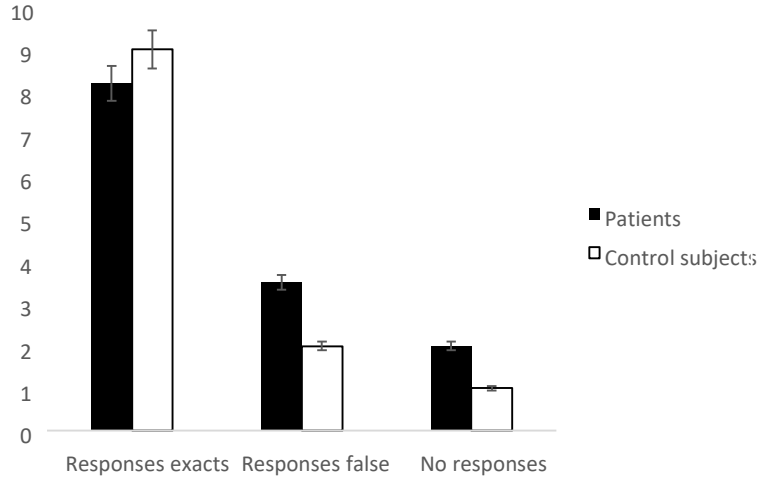

Figure 2: Average number of responses when recognizing photos without order effect seen closely.
Note, however, in (Figure 3) that there was a significant difference between the performance of patients and those of healthy controls when the picture was taken from a distance.

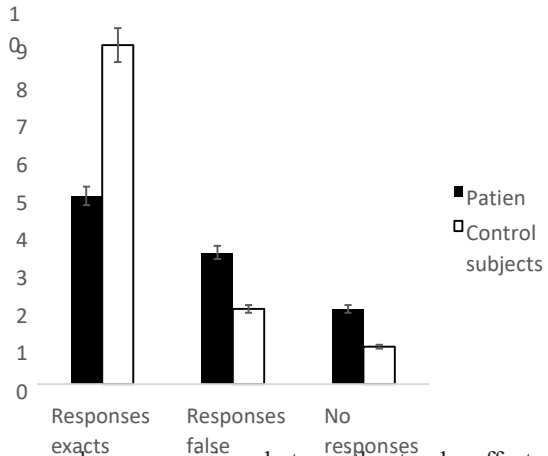

Figure 3: Average number of responses when recognizing photos without order effect seen from a distance.
This is true for the number of correct responses ($F(46) = 2.425$, $p = 0.020$) and the number of false responses ($F(46) = 2.058$, $p = 0.045$) given. Patients compared to healthy control subjects were therefore poor in their responses when the photo is taken by far. It therefore seems that patients had difficulties in encoding and global recognition of a spatial scene. When recognizing

Was low. In this type of test, recognition task with order effect or recognition of succession of views, patients made significantly more errors than healthy control subjects. Thus, these patients were deficient in the reconstruction pictures with order effect (Figure 4), there was a significant difference ($F(46) = 12.45$, $p = 0.0010$); ($F(46) = 8.98$, $p = 0.0044$) between the numbers of exact and false answers given by patients and those given by healthy control subjects. The number of non-responses from participants of the chronology of the markers encountered along the path.

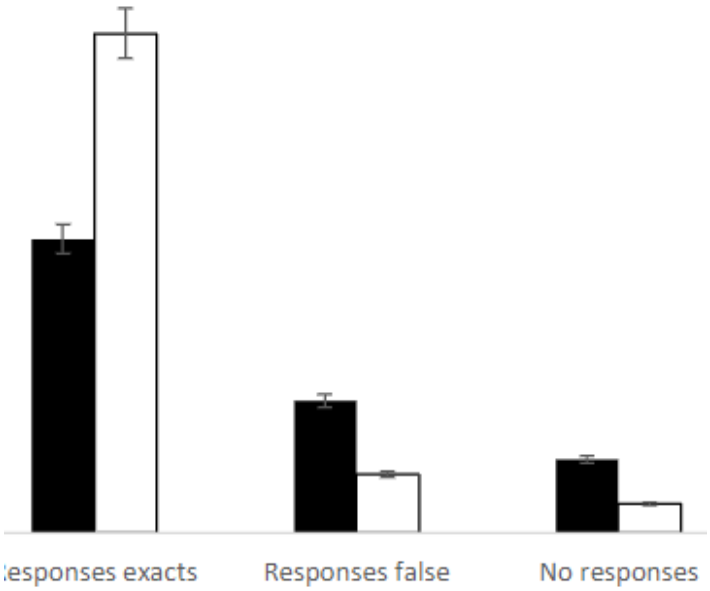

Figure 4: Average number of responses when recognizing photos with order effect.

DISCUSSION

In the picture recognition trial without order effects, patients with stroke compared to healthy control subjects, are not in deficit. Patients get good results in this task showing that they encoded the landmarkers encountered during the trip. They remember well the scenes encountered during the trip, which are now presented to them in visual form (picture). Thus these patients are not deficient in the recognition of scenes belonging to a previously visited environment and presented independently of each other. For this same task, the photos were taken according to two different angles of perception: from near and far. The angle of perception of meadows corresponds to the detailed perception of a spatial scene, on the other hand the angle of perception of distance corresponds to the global perception of this same scene. It is therefore in recalling and recognizing the overall vision of the scene that our patients are deficient compared to healthy control subjects. This result suggests that patients would have early visual information processing deficits with possible magnocellular pathway. As mentioned [5] in a similar study, performed in schizophrenic patients. This magnocellular pathway intervenes rapidly in the primary visual information, corresponds to the "where" of a fact or an event and captures the global information of a visual event [6]. On the other hand, the parvocellular route would be intact in the patients because they were not deficient at the angle of perception of the near. This path comes in a second time, corresponds to the "what" of an event or fact and deals with the details of an information or a visual event [6]. As for the recognition of the pictures with order effects, the patients with stroke have real difficulties in the reconstruction of the chronological order of the marks met along the way. These results can be compared to those found on episodic, contextual and spatiotemporal memory deficits observed in epileptic patients. In fact, episodic long-term memory is defined as a system of recording and storing events personally experienced in a context of precise temporal and spatial acquisition [7]. She plays a key role in building autobiographical memory to become aware of one's own identity and mentally travel in time and space [8]. The episodic, contextual and spatiotemporal memories according to different studies of the literature, involve the hippocampus [9]. Thus, the deficits we observed in patients in this task of recognition with order effect could be related to hippocampal lesions due to stroke. Indeed, specific circuits and structures play an important role in the topographic orientation, particularly the regions of the medial temporal lobe, including the hippocampus, parahippocampus, lingual gyrus and retro-splenial cortex [10-11]. A loss of local localization and learning ability has been observed after focal lesions, particularly affecting the right cerebral cortex [12].

CONCLUSION

Our study shows that patients with stroke are able to recognize previously visited sites from the moment they do not have to establish sequential links between them. They would be deficient in recalling and recognizing the overall vision of the scene. These deficits are rather perceptual deficits than cognitive deficits. On the other hand, the patients are deficient in establishing the chronological order of succession of views. Patients and their parents should be well informed about their existence and the nature of these disorders.

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