

## DYNAMICS OF COGNITIVE INDICATORS IN POST-STROKE PATIENTS UNDERGOING REHABILITATION USING AN EXOSKELETON OF THE HAND, CONTROLLED BY THE "BRAIN COMPUTER" INTERFACE

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**Introduction.** Stroke is one of the main factors of both motor and cognitive deficits. Post—stroke cognitive disorders are disorders that are detected in the first 3 months after a stroke and, as a rule, no later than a year [1, 2]. Cognitive dysfunction is observed in 40-70% of people who have suffered a brain stroke, and the risk of developing dementia occurs at least for several years after

stroke [3, 4]. Patients who have suffered a cerebral stroke, as a result of which a cognitive deficit has arisen, have less adherence to rehabilitation treatment and secondary prevention. Consequently, early detection of cognitive deficits and their compensation contributes to a more effective recovery of the patient [5, 6].

**Objective:** to study the effect of neurorehabilitation using "BCI + exoskeleton of the hand" on the restoration of cognitive functions in post-stroke patients.

### Materials and methods of examination

The study involved 10 patients who had suffered a brain stroke. To assess the dynamics of their cognitive functions, the following tests and scales were used: frontal Dysfunction Battery (FAB), Luria test, 10-word memorization test, and the Xhosa Cubes test.

In the course of the study, we used a complex including a personal computer with software for synchronous data transmission, the allocation of EEG indicators and the classification of signals to determine the control command, an encephalographic analog-to-digital converter NVX52 manufactured by Neurobotics LLC, an electroencephalographic cap ActiCap manufactured by BrainProducts for EEG registration, an exoskeleton brush manufactured by NPO Android Technology, controlled by electric motors.

During the procedure, mental tasks were set on the monitor screen in front of which the patient was in a specialized chair.

When they were performed correctly, which was recognized by the classifier, the opening of the hand followed. Each procedure of work on the "IMC + exoskeleton of the hand" included 3 sessions of 10 minutes with pauses for rest.

### Research results and their discussion

During the FAB test, it was noted that fluency of speech ( $p < 0.05$ ) and dynamic praxis ( $p < 0.01$ ) significantly improved after a course of rehabilitation with the use of "BCI + exoskeleton of the hand".

During the Luria test, there is a positive trend in memorizing words during the first and last attempts to reproduce words, and by the tenth time this trend becomes reliable ( $p < 0.05$ ).

A 10-word memorization test conducted after a course of classes on "IMC + exoskeleton of the hand" showed that at the first attempt to reproduce 10 suggested words ( $p < 0.05$ ) and with categorical hints, a significantly better memorization result was noted ( $p < 0.01$ ).

When patients repeated the "Kos Cubes" test at the end of the procedures, positive dynamics was noted in the form of the appearance of the correct concept in the performance of the task, an increase in the number of correctly completed tasks or a reduction in the time spent on the test.

#### Conclusion

The use of "BMI + exoskeleton of the hand" for neurorehabilitation of patients with post-stroke motor disorders significantly improves the state of cognitive functions. Movement imagination training courses using BCI + exoskeleton contribute to the restructuring of spatial thinking, the concept of memorization, which is manifested by a significant improvement in short-term memory, fluency of speech and praxis.

#### Literature:

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