

Effect of task on writing in Wernicke's agraphia*

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Background

The motivation for this study was to contrast two approaches in assessment of agraphia – Russian physiological and psychological tradition with the cognitive neuropsychological approach (CNP).

According to Russian psychology and physiology:

- 1) the goal oriented activity of the subject affects the structure of function (Bernstein, 2008; Anokhin, 1980);
- 2) specificity of human psychological functions is culturally and historically determined (Vygotsky, 2005, Luria, 2000; Leontiev, 2000).

These positions are not always taken into account in the CNP, that explain the pattern of errors observed across most cases as a result of damage to one or more cognitive components or pathways.

Goal

to reveal a reorganization of the writing disorder dependent on the cultural content of writing tasks in patients with Wernicke's agraphia.

Methods

3 tasks requiring communicative, mnestic and regulatory functions of writing and 3 traditional writing tasks designed to diagnose the state of specific structural components of writing.

“Functional” tasks (FT):

- writing a letter,
- written description of a picture in order to remember it among 15 distractors,
- writing out a plan for execution of tasks.



The patient performs mnestic task



The patient performs regulatory task

Traditional tasks (TT):

- picture naming,
- written sentences making,
- dictation.

FT was equalized in frequency, length and phonetic complexity in relation to the TT.

Procedure

At the first stage a comprehensive neuropsychological examination by the method of A.R. Luria was performed. It was used to identify

Wernicke's agraphia syndrome and extent of its severity. Then experimental writing tasks were presented. To avoid the effect of the sequence all tasks except dictation, were presented according to the scheme of a balanced Latin square. Writing dictation was performed at the last meeting with participants in order to avoid forming attitude to study writing.

Participants

Tasks were administered to 29 right-handed, Russian-speaking patients aged from 34 years to 67 years (mean age - $53 \pm 9,28$) with Wernicke's agraphia. The severity of agraphia ranged from mild to moderate. All patients were diagnosed with stroke in left middle cerebral artery. The study was conducted hospital-based in Center for Speech Pathology and Neurorehabilitation (Moscow).

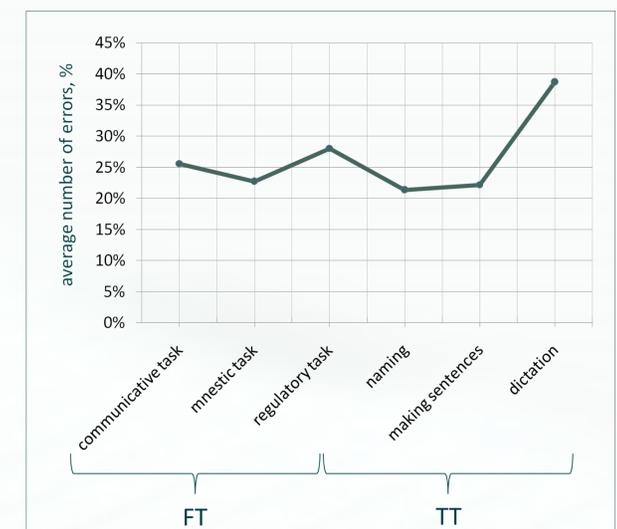
Results

Pairwise comparison of the overall number of errors revealed significant differences

- 1) within the group FT,
- 2) between dictation and all the other tasks,

According to non-parametric Wilcoxon tests the overall number of errors in the regulatory task was significantly greater than the number of errors in the mnestic task ($z = -2.01$, $p = .044$). The number of errors in dictation exceeded communicative task ($z = -2.887$, $p = .004$), mnestic task ($z = -3.211$, $p = .001$), regulatory task ($z = -2.211$, $p = .027$), written naming task ($z = -3.914$, $p = .000$) and written sentences making ($z = -3.480$, $p = .001$).

Differences in the number of errors were not affected by the frequency of words and their phonetic complexity. This result is explained by low importance of spelling accuracy in the regulatory task. On the other hand, the mnestic task requires an accurate description, as the participants had to use the text in a week and choose on the basis of their description one of large number of very similar pictures. Increase in the number of errors in dictation can be caused by excessive demands for sound-to-letter analysis, which is implemented in a dictation 2 times - at the stage of acoustic speech perception and at the stage of motor execution of words.



Distribution of the overall number of errors in writing tasks

Conclusion

Changes in the overall number of errors, depending on the tasks, identical in formal linguistic criteria indicate a functional reorganization of the structure of writing disorders in different tasks. These differences are due to less need for error-free writing in the regulatory task in comparison to other FT, as well as the specifics of the primary defect in Wernicke's agraphia.

These findings provide evidence that cultural functions of writing will determine reorganization of impaired mental process. These characteristics of cognitive processing are not considered in the CNP approach that instead focuses on the functional architecture of the written language system irrespective of task. Despite these differences, disorders of writing in Wernicke's agraphia include the phenomena that are assumed in both paradigms, such as multicomponent structure of mental functions.

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