



The pattern of language deficits in neurosurgical patients

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Introduction

Prior to a neurosurgical resection, most patients with tumors or epileptogenic foci in the left hemisphere of the brain show normal or close to normal language abilities. After the surgery, however, many patients present with significant language decline, which often resolves over several months (Duffau et al. 2003). Previous studies report different rates of aphasia in the acute post-operative phase, ranging from 17% to 100% (Papagno et al. 2012). The mechanisms of postsurgical language deficits are not fully understood. Most studies that attempted to analyze postsurgical language outcomes used incomprehensive language testing (Davies et al. 2005); in others, subjective scoring of tests was extensively used (Wilson et al. 2015). We used the comprehensive and objectively rated Russian Aphasia Test (Ivanova et al. 2016) to examine the pattern of language deficits in the acute phase in patients who underwent a neurosurgery in the left hemisphere.

Methods

Participants

- 30 monolingual native Russian-speaking patients (16 female; age range 18-63, mean 41 y.o.)
- all but one right-handed (1 – ambidextrous)
- first surgery (28 patients underwent awake craniotomy, 2 were operated under general anesthesia)
- with gliomas, cavernomas, metastatic tumors or epileptogenic foci in left-hemisphere perisylvian language regions

Language Tests

- All patient were assessed with the Russian Aphasia Test (RAT; Ivanova et al. 2016), before and 1-8 days after the surgery (median=5)
- Each testing session took ~1 hour

	Comprehension	Production
Phonological level	phonological judgment of minimal pairs of pseudowords	repetition of pseudowords
Lexical level	word-to-picture matching for objects and actions	picture naming of objects and actions
Syntactic level	sentence-to-picture matching	sentence construction in response to a picture

Discussion

Though in the long-term perspective language recovery rate after neurosurgeries is high, in the acute post-surgical phase most of the patients demonstrate a decline in language abilities. Our results suggest that the observed deficits are rather non-specific in nature and are modulated by the cognitive load of the task. Future studies that would include lesional data and follow-up longitudinal studies are needed to further inform the nature of post-surgical language deficits.

Results

1. Overall results

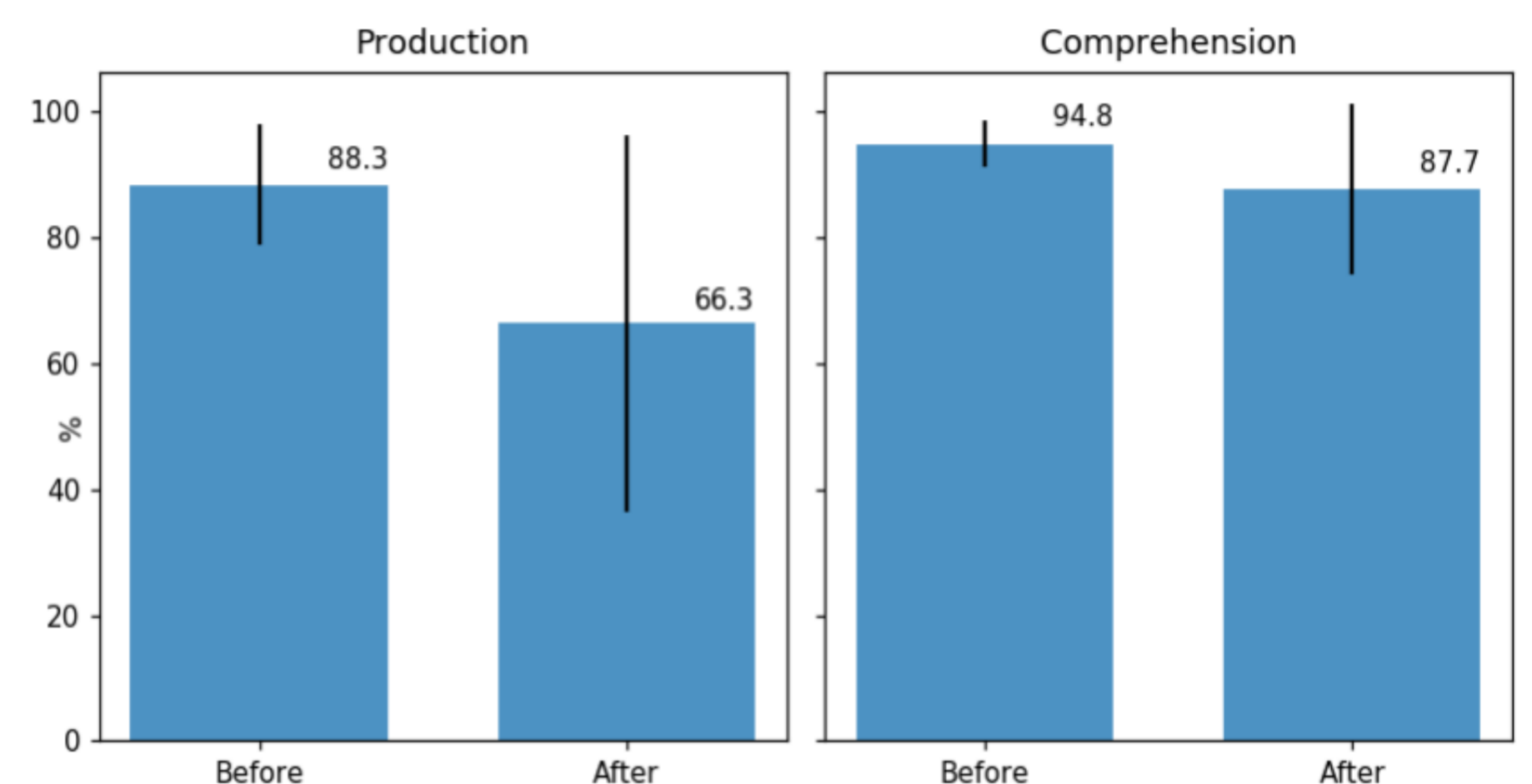


Figure 1. Performance on comprehension and production tests (averaged across processing levels) before and after the surgery. Mean percentages with standard deviations are shown.

- Before the surgery **90%** of patients showed **normal** or close to normal language abilities
- 70%** of subjects showed **worsening** after the surgery
- Production** was affected significantly more than comprehension: $t(29)=3.24, p=0.003$

2. Changes in patients' performance: the effect of the processing level

- Comprehension:** no significant difference between the tests
- Production:** significant differences between all levels of processing (p -values corrected for multiple comparisons): worsening in **syntactic** > **lexical** > **phonological**

3. Correlations between postsurgical scores of all 6 tests

- All except one were strong and positive
- Compare to typical post-stroke aphasia: In the control group of 30 stroke survivors the pattern was vastly different, i.e. patients with post-stroke aphasia showed correlations between functionally related linguistic levels only (e.g., phonological perception correlated with word comprehension).

References

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