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# EEG-fMRI study of primary mechanisms of speech recognition in patients after stroke

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## Abstract

Determining the level of speech disorders by combining non-invasive imaging techniques is promising for prognosis of rehabilitation and understanding mechanisms of speech perception in normal and pathological conditions. The aim of the current study was to test the hypothesis of possible impairment of the primary speech perception stage in people with sensory aphasia. For this purpose we used a passive odd ball paradigm with presentation of Russian syllables "ba" as the standard stimulus and "pa" as deviant, aimed to obtain a component of event-related potentials - mismatch negativity (MMN). Paradigm with non-speech stimuli, harmonic tones of the same loudness and duration as speech syllables, was used for a control condition. Both paradigms have been adapted for the simultaneous recording of fMRI and EEG. 25 subjects participated in the study: 15 healthy volunteers and 10 patients with sensory aphasia on the background of general decline in language function after stroke in the left hemisphere of the brain. Analysis of BOLD signal revealed the following areas of cortical activation: Heschli gyrus, parts of the superior temporal gyrus and the angular gyrus. The activation was larger for syllables than for tones in both groups. In patients with aphasia a distribution of the active clusters differed from the control group and depended on size and location of damaged regions. Delayed MMN to both syllables and tones was obtained in patients comparing with the control group. Further long-term investigation of BOLD and MMN responses is needed to track down cortical mechanisms of speech recovery after stroke.

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