Sentence reading in poor and good adult readers: fMRI study

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The study aimed investigation of reading mechanisms in adults (27 persons mean age 19.5±0.8[SD] years old) with different levels of written text comprehension (below 16 percentile — 13 “poor” comprehenders, above 94 percentile — 14 “good” comprehenders) using fMRI. The main objective was to analyze brain mechanisms of sentence comprehension, while classifying them by literal and metaphoric meaning. SENTENCE reading compared to gaze FIXATION in group of “good” comprehenders was characterized by significantly increased BOLD signal in the MFG BA46 of the right hemisphere and marginal activation level in the IFG, BA9 in the left hemisphere. In group of “poor” comprehenders the same task increased BOLD signal in the left hemisphere (IFG, BA9). Activations of the frontal areas were accompanied by BOLD signal increase in parietal-occipital cortex in both groups with more spread activation in group of “good comprehenders”. Within group results were obtained through T-tests with $p<0.001$, FWE corrected.

On behalf of psychological data the Group of “good” comprehenders was able to read significantly ($z=-2.3$; $p<0.05$) more items in self-paced mode (mean time for sentence reading 1237±167ms[SD]), than “poor” comprehenders (mean time for sentence reading 1463±194ms[SD]) and gave higher percent of the correct answers ($z=2.0$; $p<0.05$) during discrimination of the phrases. We suppose “good” comprehenders made judgment about metaphoric/literal meaning relied more on simultaneous processing more relevant to activation of the right frontal areas, while “poor ” comprehenders presumably evolved formal logic decision processing relevant to the frontal lobe zones activation in the left hemisphere.

Supported by RFBR 15-06-08349.

Keywords: text comprehension, sentence reading, fMRI.