

Abstract

Title: Cerebral projection of haptic contact via sLORETA imaging

Objectives: The aim of this work is to evaluate changes in intracerebral source activity via sLORETA imaging during haptic stimulation of hands, while this contact is modified by a mirror illusion in comparison to calm state with open eyes. The work seeks to specify localization of such activity.

Methods: Ten healthy volunteers aged 23–42 participated in the experiment. The electrical brain activity was detected with scalp EEG. The experiment was divided in 5 phases. First we measured the brain activity during calm state with open and with closed eyes, each for 5 minutes. Afterwards the subjects were seated at a table with a mirror occluding their right hand and reflecting their left hand. The brain activity was then recorded during 4 modifications of the experiment in duration of 2 minutes each. The first modification contained symmetrical haptic contact on both hands, modification 2 involved stimulation on the left hand only, during modification 3 the stimulus was applied on the right hand only and modification 4 had no tactile stimulus on neither side. The order of modifications for each individual was randomized. The EEG data were converted into sLORETA program, which allows to localize the source of the recorded brain activity and also to view the findings in 3D Talairach cortical atlas. The statistical analyses of the data were also conducted via sLORETA. To evaluate statistically significant changes in the source activity we used pairwise t-test with logarithmical transformation of the data with the aliasing parameter of 0,5 with permutation method using 5000 randomizations.

Results: A statistically significant difference in the source brain activity was found within all four modifications in the beta2, beta3 and delta frequencies in various Brodmann areas at the significance level of $p \leq 0.05$.

Keywords: haptic contact, touch, mirror neurons, mirror therapy, neuroplasticity, Brodmann areas, EEG, sLORETA