

## Abstract

**Title:** Brain Source Activity Changes During the Visual Training of the Imagination Viewed by sLORETA Imaging.

**Objectives:** The research study aims to determine which changes in brain source activity occur before and after an intervention in the form of a three-week visual training of motor imagery. The electrical activity of the brain was recorded using scalp EEG and transferred to the sLORETA program, in which the source brain activity was evaluated.

**Methods:** The research was concluded on 13 healthy subjects aged between 20-30 years. The Czech standardized version of The Vividness of Movement Imagery Questionnaire – 2 (VMIQ – 2) was used for the survey. The electrical activity of the brain was recorded using a scalp EEG *Nicolet TM EEG Wireless Amplifier 32/64* by *Natus Neurology*. The research consisted of initial and control measurements, the measurement included several phases. First, an initial measurement took place, which always included measurements of resting EEG (5minutes eyes open and 5 minutes eyes closed), action observation in VR (3 minutes) and subsequent measurement of the motor imagery with eyes open (3 minutes). Between the individual measurements, there was a three-week visual training of motor imagery, which included action observation in VR and the individual motor imagery three times per week. The measurement included filling out a questionnaire (VMIQ – 2) at the initial and control measurements. The data obtained from the experiment was transferred to the sLORETA program, in which it was statistically evaluated and displayed in a 3D Talairach atlas. Statistical evaluation of significant changes in brain activity was performed using a paired t-test with a aliasing parameter of 0.5 using a permutation method using 5000 randomizations. The data obtained from the questionnaire survey was statistically evaluated using statistical functions in MS Excel using Student's paired t-test with one-tailed distribution.

**Results:** Data from the statistical comparison revealed a significant statistical difference in the brain activity in the paired group comparing the brain activity between the control measurement of motor imagery with eyes open and action observation in VR in the beta-1 frequency band in BA 6, 7, 3, 4, 5 and 2, as well as in the beta-2 and gamma frequency bands mainly in BA 6, 7, 40, 18, 19, 10 and 9. A statistically significant difference in brain activity was also found in the paired group comparing the brain activity

between the initial measurement of motor imagery with eyes open and action observation in VR in the beta-1 and gamma frequency bands mainly in BA 6, 7, 10 and 11. There was no statistically significant difference between the control measurement of motor imagery with eyes open and the initial measurement of motor imagery with eyes open. The statistical evaluation of the questionnaire survey revealed no statistically significant difference between the initial and control values.

**Keywords:** imagery, motor imagery, action observation, virtual reality, imagery training, mirror neurons, EEG, sLORETA