Mirror-box Training in Healthy Subjects and a Patient with Hemiparesis

Roman Rosipal1, Natálie Poruhcová2, Peter Barančok3
Barbora Cimrová2, Igor Farksš2

1 Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia
2 ProCare Central Clinic, Bratislava, Slovakia
3 Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava, Slovakia

Objective
Mirror therapy (MT) is an approach of neurorehabilitation improving motor functions after stroke. MT represents a mental process by which an individual rehearses a given motor action by reflecting movements of the non-paretic side in a mirror as if it were the affected side. Although a number of small-scale research studies have shown encouraging results, there is no clear consensus about the effectiveness of the therapy. The aim of this study is to investigate objective changes in EEG after MT.

Methods
Seven healthy volunteers carried out five mirror-box training sessions. The same training was carried out twice a week with a patient with hemiparesis. Averaged PSD before (blue curve) and after (red curve) motor exercise with the mirror box. PSD values were estimated using FFT of 4-second long EEG segments, with cleaned up artifacts and normalized with the overall power spectrum in the range of 4–30 Hz.

Conclusion
By comparison of the resting EEG prior to and after training, we found statistically significant increase of the motor-related oscillatory activity in a hemiparetic patient. In addition, atomic decomposition of EEG reveals stable space-frequency components of motor-related synchronization and desynchronization of EEG in a hemisphere contralateral to the mirror box.

Acknowledgements
This research was supported by the Slovak Research and Development Agency, grant number APVV 15-04-0309, and by the Ministry of Health of the Slovak Republic, grant number VEGA 2013/35-014694.