FUNCTIONAL BRAIN PLASTICITY INDUCED BY REAL-TIME FMRI NEUROFEEDBACK IN PATIENTS WITH PHANTOM PAIN: A PROOF OF CONCEPT STUDY

INSTITUTO D'OR PESQUISA E ENSINO

PPG - IDOR DOUTORADO

Guimarães B.P.P.F [1]; Rodrigues, E.C [1,2]; Basilio, R [1]; Hoefle, S [1]; Carvalho, T.L [2] ; Marins, T.F [1]; Guimarães, J.A.M [3]; Ramalho, B.L [3]; Duarte, M.E.L [3]; Tovar-Moll, F[1]

[1] D'Or Institute for Research and Education, Rio de Janeiro, Brazil; [2] Rehabilitation Sciences Program, UNISUAM, Rio de, Brazil; [3] National Institute of Traumatology and Orthopedics, Rio de Janeiro, Brazil

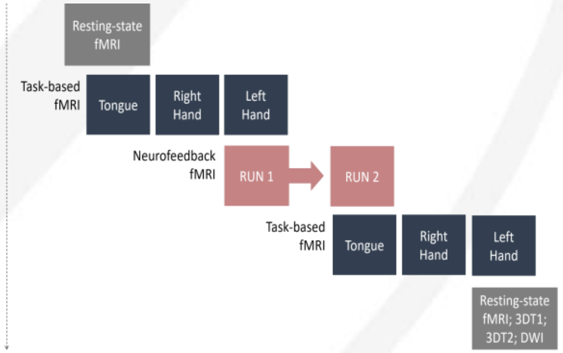
Introduction

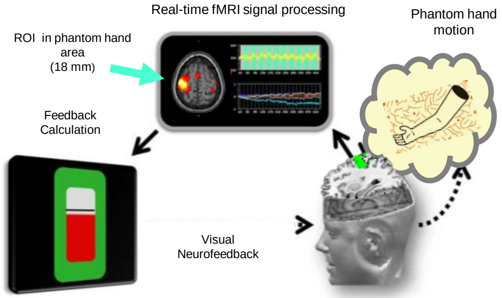
An unprecedented increase in spatial resolution allowed real-time fMRI neurofeedback to target tiny regions within the sensorimotor cortex that represent a small body part which is crucial to investigate the reorganization in the phantom phenomena.

Can real-time fMRI neurofeedback induce brain plasticity?

We performed a proof of concept study to investigate whether modulation of sensorimotor areas during phantom hand movement by NFB-fMRI training can induce brain plasticity.

Methods

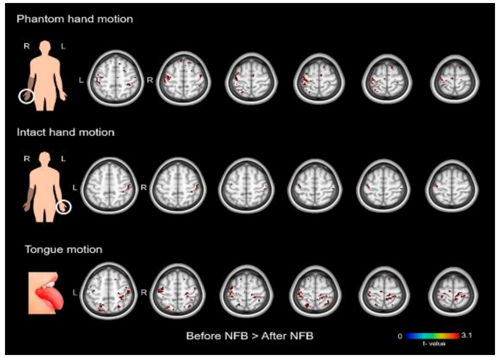


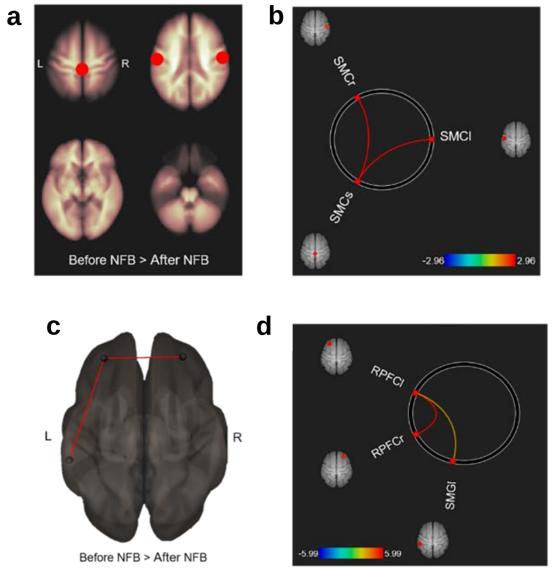


Adapted from Papoutsi, 2017

Eight patients with unilateral upper limb phantom pain due to traumatic amputation and sustained phantom hand movements; Behavioral and phantom sensation assessments: KVIQ-10; Short-form McGill Pain Questionnaire; Stanford Sleepiness Scale, Limb Deficiency and Phantom Limb Questionnaire version 2.0

Results





The NFB-fMRI reduced the activation of the sensorimotor area contralateral to the phantom hand during phantom hand and tongue movement and intact hand. A cortical activation displacement was found for all patients during tongue and phantom hand tasks. We also observed reduced connectivity of the sensorimotor network in the intact hand task and the salience network in the resting-state. There were no significant statistical differences in phantom sensation.

Conclusion

These results indicate that NFB-fMRI can modulate brain connectivity networks in patients with phantom pain.

FAPERJ CAPES CNPq

contact: piresbp@gmail.com

Sussex, U. of. Limb deficiency and phantom limb questionnaire. (2008); Malouin, F. et al. The Kinesthetic and Visual Imagery Questionnaire (KVIQ) for Assessing Motor Imagery in Persons with Physical Disabilities: A Reliability and Construct Validity Study. J. Neurol. Phys. Ther. 31, 20–29 (2007); Da C. Menezes Costa, L. et al. The Brazilian-Portuguese versions of the McGill Pain Questionnaire were reproducible, valid, and responsive in patients with musculoskeletal pain. J. Clin. Epidemiol. 64, 903–912 (2011); Hoddes, E., Zarcone, V., Smythe, H., Phillips, R. & Dement, W. C. Quantification of Sleepiness: A New Approach. Psychophysiology 10, 431–436 (1973).

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brazil (CAPES) - Finance Code 001; Council for Scientific and Technological Development (CNPq).