Bimodal EEG-fMRI Neurofeedback for stroke rehabilitation
Giulia Lioi, Mathis Fleury, Simon Butet, Anatole Lécuyer, Christian Barillot, Isabelle Bonan

To cite this version:

HAL Id: inserm-01932954
https://www.hal.inserm.fr/inserm-01932954
Submitted on 23 Nov 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Bimodal EEG-fMRI Neurofeedback for Stroke Rehabilitation

Giulia Lioi*1, Mathis Fleury1, Simon Buter2, Anatole Lécuyer1, Christian Barillot1 and Isabelle Bonan2

1. Teams Visages and Hybrid, Univ Rennes, Inria, CNRS, IRISA
2. Service MPR, CHU Pontchaillou, Rennes

BACKGROUND

Neurofeedback (NF) has potential to be applied for stroke rehabilitation [1],[2] however the effectiveness of NF for stroke has not been thoroughly assessed yet.

Bimodal EEG-fMRI NF [3],[4] is a promising technique to achieve a more efficient and specific self-regulation, which may be crucial for clinical application.

AIMS

Within the project HEMISFER (Hybrid Eeg-Mri and Simultaneous neuro-Feedback for brain Rehabilitation), the aims of this preliminary study are to:

- Test the feasibility of applying bimodal EEG-MRI NF for stroke rehabilitation in two chronic patients affected by left hemiplegia (subcortical lesion).
- Identify problematics and guidelines in view of a clinical study on stroke patients.

PRELIMINARY RESULTS

Figure 3a. Lesion and corticospinal tract (CST) of patient 1 (Right ischemic stroke). The CST was estimated from tractography of diffusion weighted images [6].

Figure 3b. Lesion and CST of patient 2 (Right hemorrhagic stroke).

Figure 4. EEG and fMRI NF scores during a NF session. Example from one patient (1). The left column shows the filter and the ROI selected for NF computation during calibration.

Figure 5. Average BOLD activations maps over the two NF sessions for patient 1 (left) and 2 (right) (TASK>REST, k > 10 voxels).

Figure 6. IMRI signal regulation as a function of the selected ROI. The bar plots represent BOLD activity in the selected ROI with respect to background (mean+std across blocks) during rest and NF. Relative statistics are showed (Wilcoxon tests, * p<0.05, ** p<0.01)

CURRENT AND FUTURE WORKS

- Improve performances and simplify the workflow of the bimodal NF platform.
- Clinical study on Stroke patients to test the efficacy of multisession bimodal NF for rehabilitation.

REFERENCES


*contact: giulia.lioi@inria.fr