



**HAL**  
open science

## Do experimenters have an influence on MI-BCI user training?

Aline Roc, Léa Pillette, Bernard N’Kaoua, Fabien Lotte

► **To cite this version:**

Aline Roc, Léa Pillette, Bernard N’Kaoua, Fabien Lotte. Do experimenters have an influence on MI-BCI user training?. Journée Jeunes Chercheurs en Interfaces Cerveau-Ordinateur et Neurofeedback (JJC-ICON’2019), Mar 2019, Lille, France. hal-02095113

**HAL Id: hal-02095113**

**<https://inria.hal.science/hal-02095113v1>**

Submitted on 10 Apr 2019

**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.

# Do experimenters have an influence on MI-BCI user training?

Aline Roc<sup>1,2</sup>, Léa Pillette<sup>1,2</sup>, Bernard N’Kaoua<sup>3</sup>, Fabien Lotte<sup>1,2</sup>

<sup>1</sup>Inria, France

<sup>2</sup>LaBRI (Univ. Bordeaux, CNRS, Bordeaux-INP), France

<sup>3</sup>Handicap, Activity, Cognition, Health, Univ. Bordeaux, Bordeaux, France

Throughout MI-BCI studies, human supervision plays a central role [7]. While providing emotional and social feedback [5], experimenters present the technology to users and ensure their smooth progress with BCI use. Though, very little is known about the influence experimenters might have on the obtained results. Literature from different fields such as ethics and business [3], social research [6] or economic research [9] indicate an effect of experimenters, and specifically their gender, on experimental outcome. Such an effect was recently suggested in neurofeedback training [8]. Yet, it had never been tested in BCI.

We investigated the potential influence of the experimenters’ gender depending on the participants’ gender on MI-BCI performances and progress, i.e., the evolution of performances. Six experimenters (3 men / 3 women) trained 59 randomly assigned healthy MI-BCI naïve participants they did not know (30 men / 29 women) during one MI-BCI session (following the Graz protocol [4]) during which they had to learn to perform two MI-tasks, i.e., imagine right or left hand movements.

Our results suggest that, overall, women experimenters seem to influence positively participants’ performances compared to men experimenters, more precisely they seem to induce better Quality-Weighted Accuracy performance (a metric considering the classifier output that participants were instructed to improve, inspired by the SensoriMotorRhythm quality score [1]) for both men and women participants.

Further analysis are needed regarding other variables that might influence or provide insights on our results, e.g. traits, state, experimenters’ teaching competence, subjects’ motivation or quantity and quality of interaction between participants and experimenters. There might also be other analysis to perform based on different performance metrics reflecting user performances independently of the classifier output [2]. Taking experimenter-related factors into account might lead to a conjoint progress of the global BCI performance and the validity and understanding of BCI experimental results.

## References

1. Grosse-Wentrup, M., & Schölkopf, B. (2012). High gamma-power predicts performance in sensorimotor-rhythm brain-computer interfaces. *Journal of neural engineering*, 9(4), 046001.
2. Lotte F, Jeunet C. Defining and quantifying users' mental imagery-based BCI skills: a first step. *Journal of neural engineering*. 2018;15(4):046030.
3. Miyazaki AD, Taylor KA. Researcher interaction biases and business ethics research: Respondent reactions to researcher characteristics. *Journal of Business Ethics*. 2008;81(4):779-795.
4. Pfurtscheller G, Neuper C. Motor imagery and direct brain-computer communication. *Proceedings of the IEEE*. 2001;89(7):1123-1134.
5. Pillette L, Jeunet C, Mansencal B, N'Kambou R, N'Kaoua B, Lotte F. Peanut: Personalised emotional agent for neurotechnology user-training. In: 7th International BCI Conference, 2017.
6. Rosnow R, Rosenthal R. *People studying people: Artifacts and ethics in behavioral research*. WH Freeman, 1997.
7. Sexton CA. The overlooked potential for social factors to improve effectiveness of brain-computer interfaces. *Frontiers in systems neuroscience*. 2015;9:70.
8. Wood G, Kober SE. EEG Neurofeedback Is Under Strong Control of Psychosocial Factors. *Applied psychophysiology and biofeedback*. 2018;43(4):293-300. [9] Zizzo DJ. Experimenter demand effects in economic experiments. *Experimental Economics*. 2010;13(1):75-98.