



Attentional markers during auditory BCI: healthy subjects and patients with locked-in syndrome

Perrine Rose Rose Seguin, Emmanuel Maby, Anatole Otman, Mélodie Fouillen, Dominique Morlet, Jacques Luauté, Pascal Giraux, Jérémie Mattout

► To cite this version:

Perrine Rose Rose Seguin, Emmanuel Maby, Anatole Otman, Mélodie Fouillen, Dominique Morlet, et al.. Attentional markers during auditory BCI: healthy subjects and patients with locked-in syndrome. Cortico days 2022, Mar 2022, Autrans, France. . hal-04095581

HAL Id: hal-04095581

<https://hal.science/hal-04095581>

Submitted on 11 May 2023

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.



Distributed under a Creative Commons Attribution 4.0 International License

Attentional markers during auditory BCI: healthy subjects and patients with locked-in syndrome

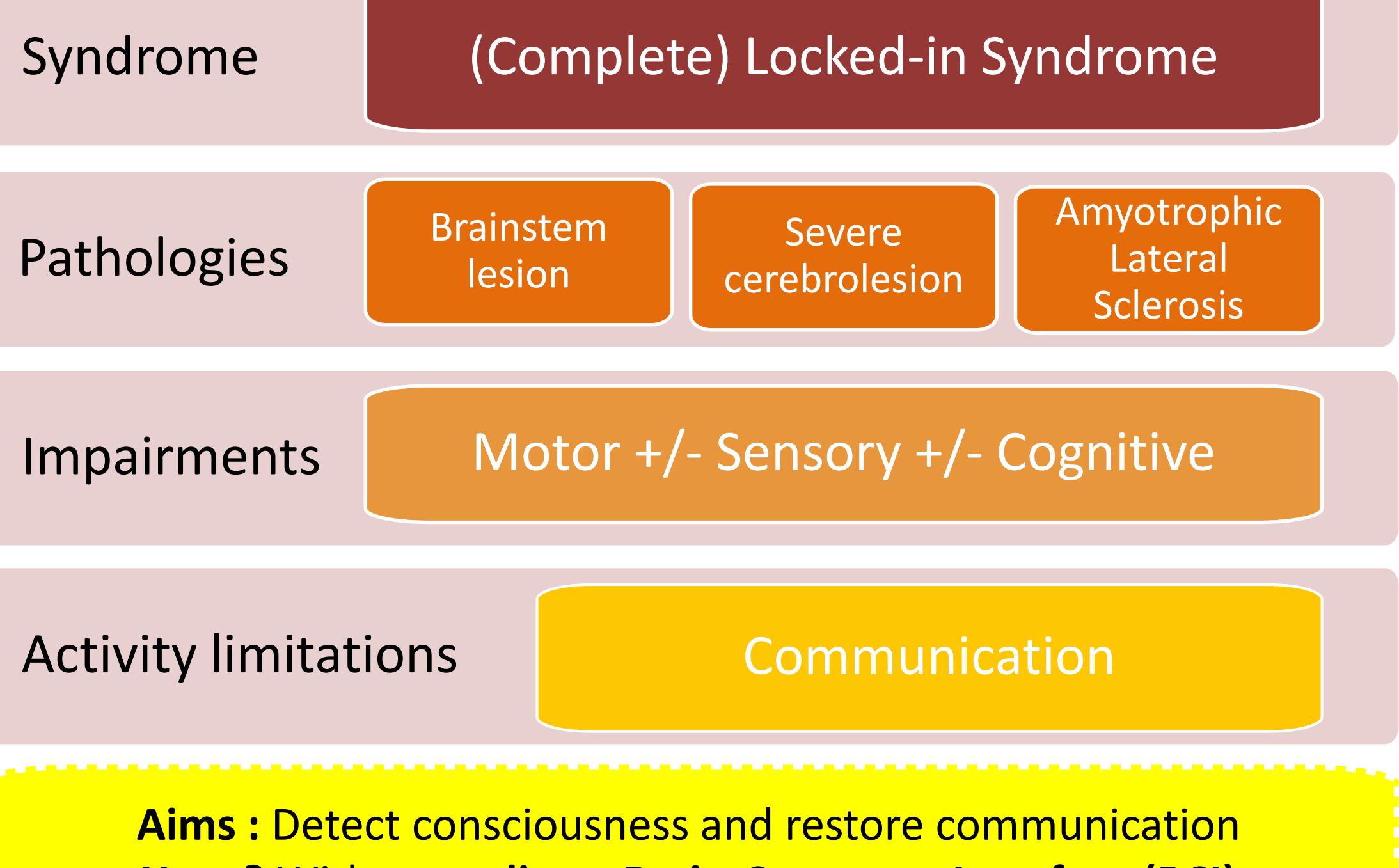
P. SÉGUIN^{a, b}, E. MABY^a, A. OTMAN^a, M. FOUILLEN^a, D. MORLET^a, J. LUAUTÉ^{a, c}, P. GIRAUX^{a, b}, J. MATTOUT^a

^aCentre de Recherche en Neurosciences de Lyon, INSERM U1028-CNRS, UMR5292, 69000 Lyon, France; Université Lyon 1, France

^b Médecine Physique et de Réadaptation, Hôpital Bellevue, CHU de Saint-Etienne, France

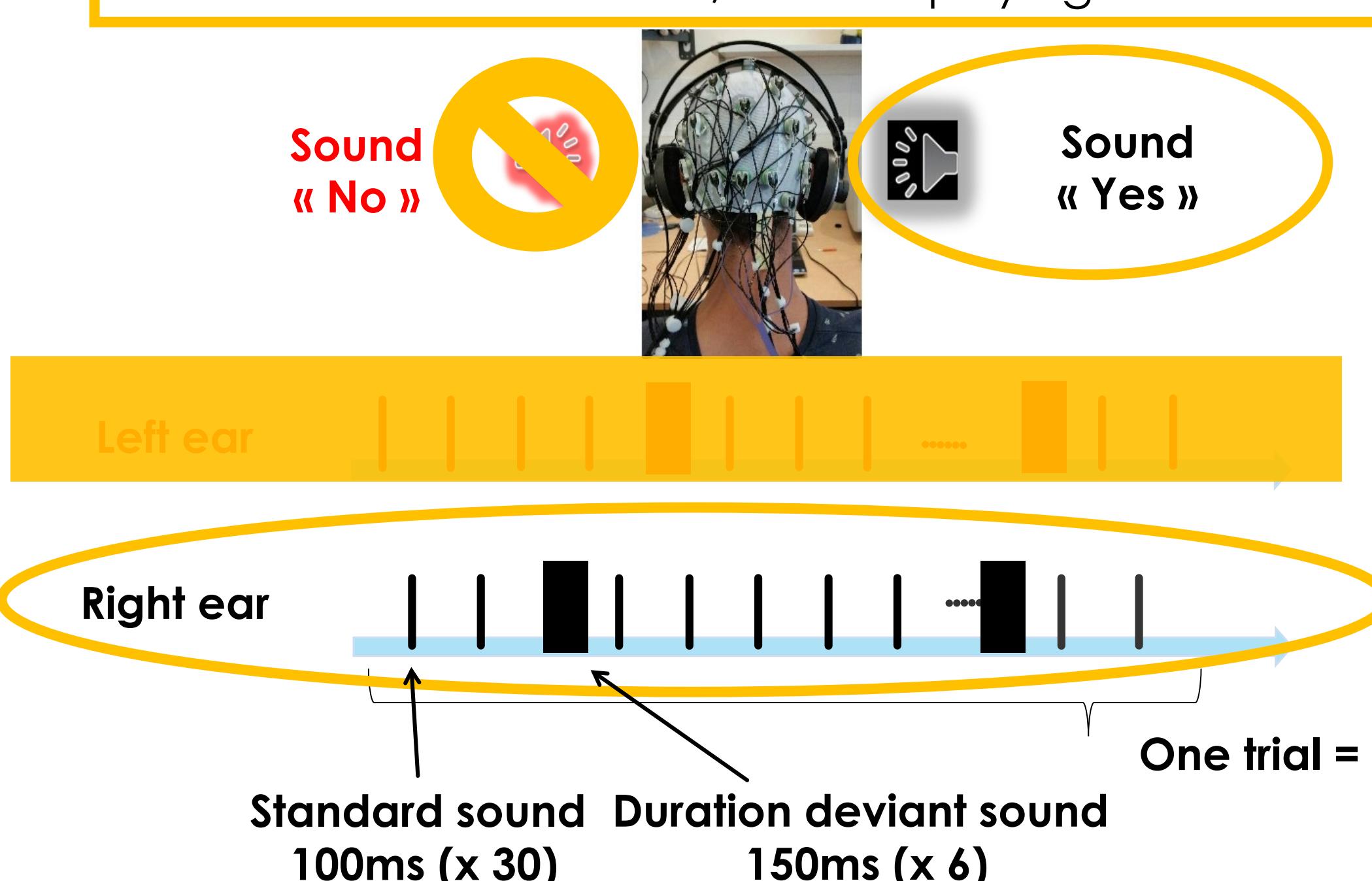
^c Médecine Physique et de Réadaptation, Hôpitaux civils de Lyon, Hôpital Henry Gabrielle, Mouvement et Handicap, Saint-Genis Laval 69230, France

Introduction



Protocol

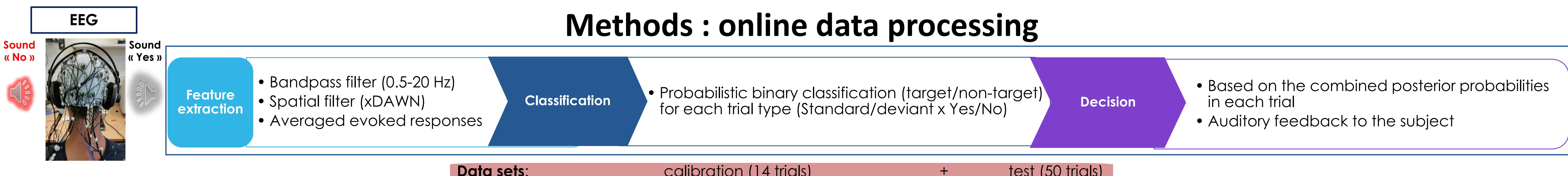
Instructions: To answer « Yes » : Please, pay attention to the right audio stream and try to count the deviant sound « Yes », without paying attention to the left.



Analysis:
 -Online (real-time) : BCI accuracy**
 -Offline (a posteriori) :
 ▪ evoked responses,
 ▪ design optimization

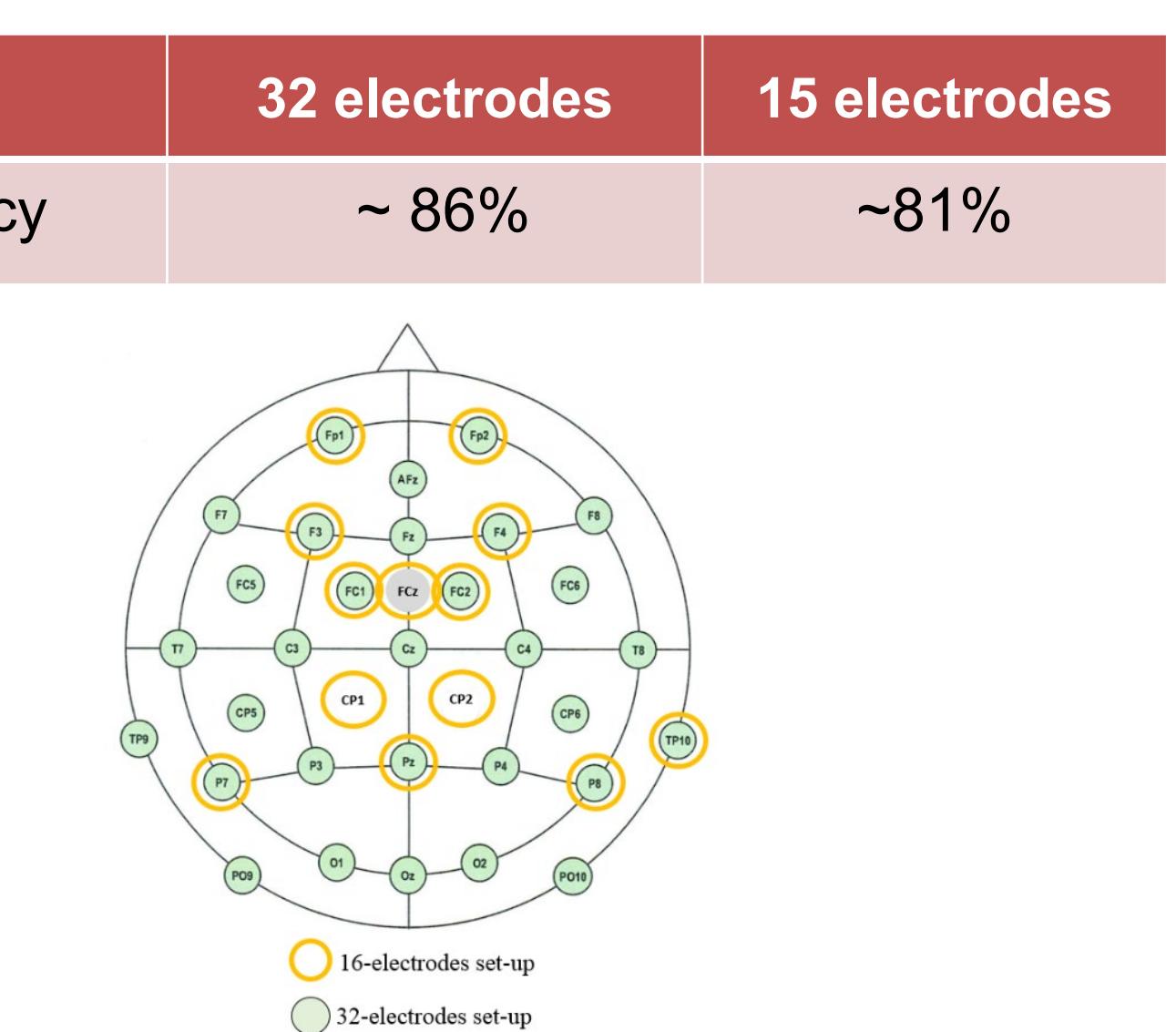
Datasets:
 - 18 healthy subjects
 - 7 patients

Methods : online data processing

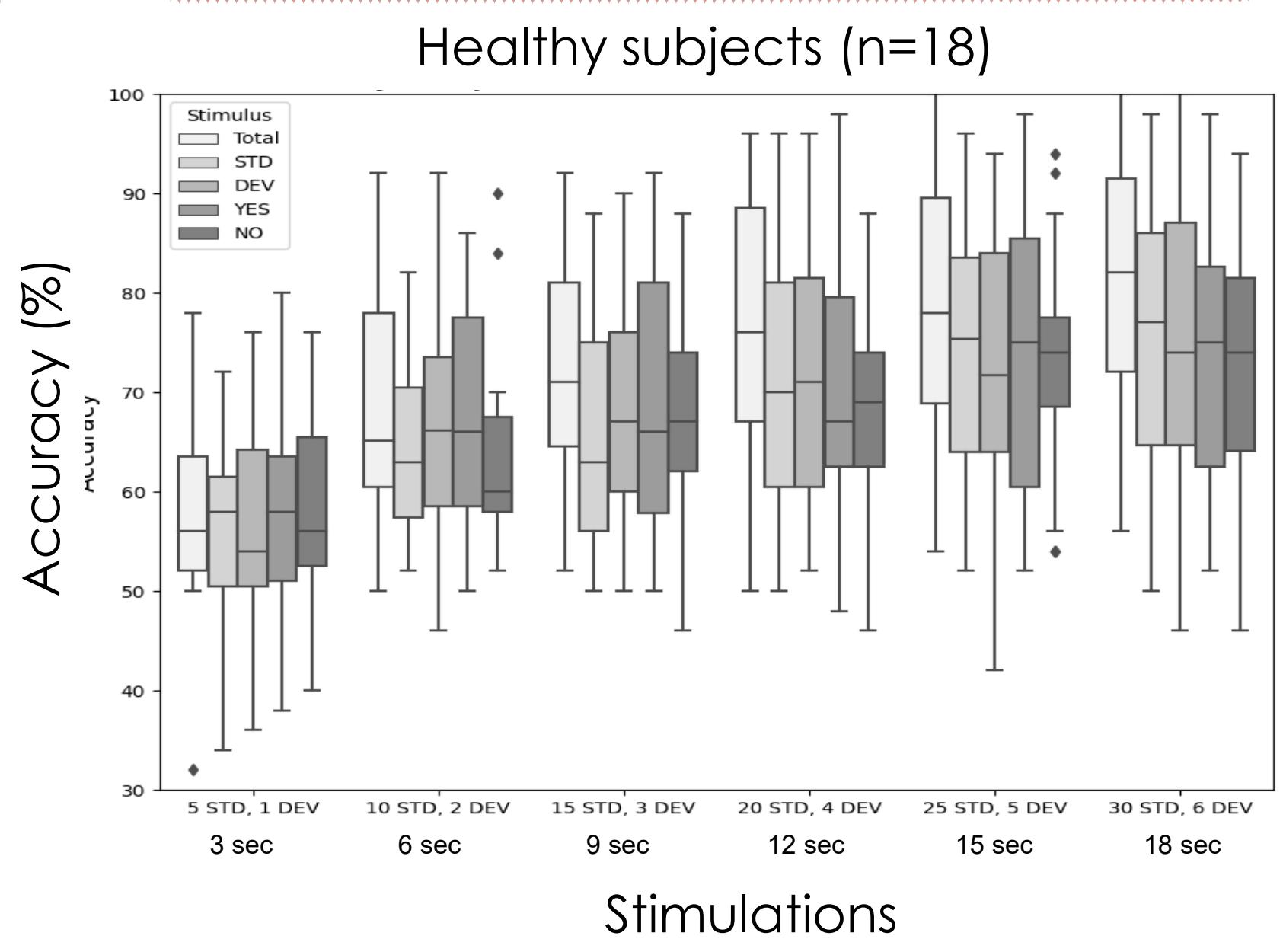


Offline results

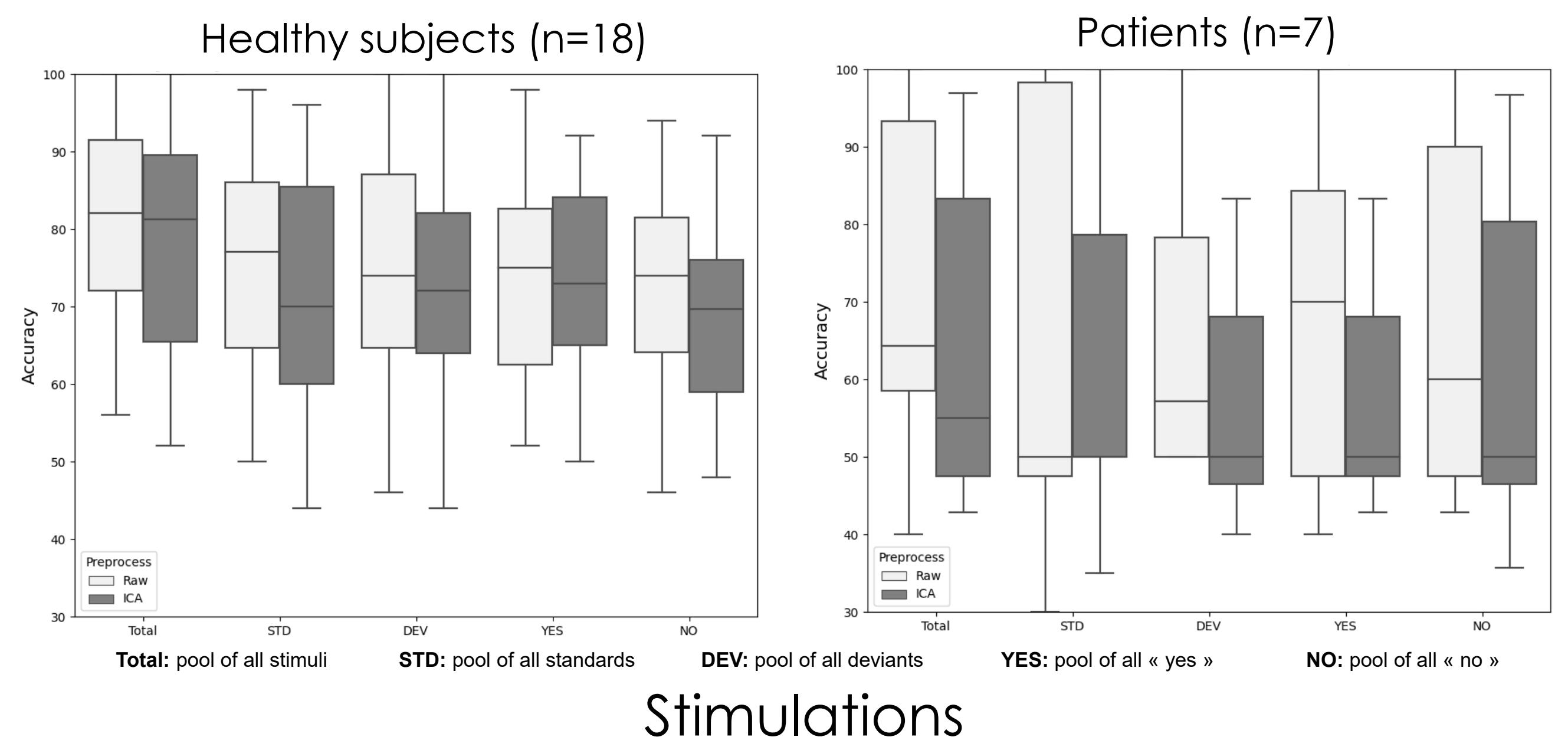
Offline reduction of the number of electrodes



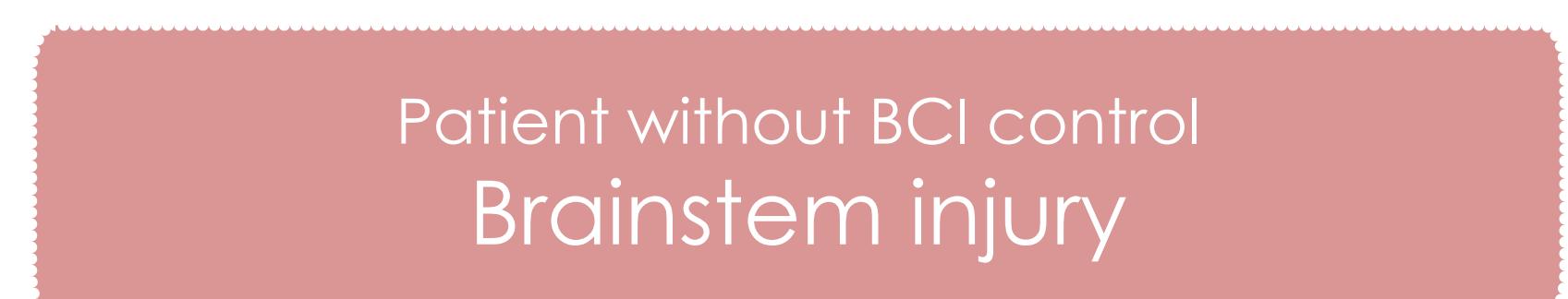
Offline reduction of trial duration



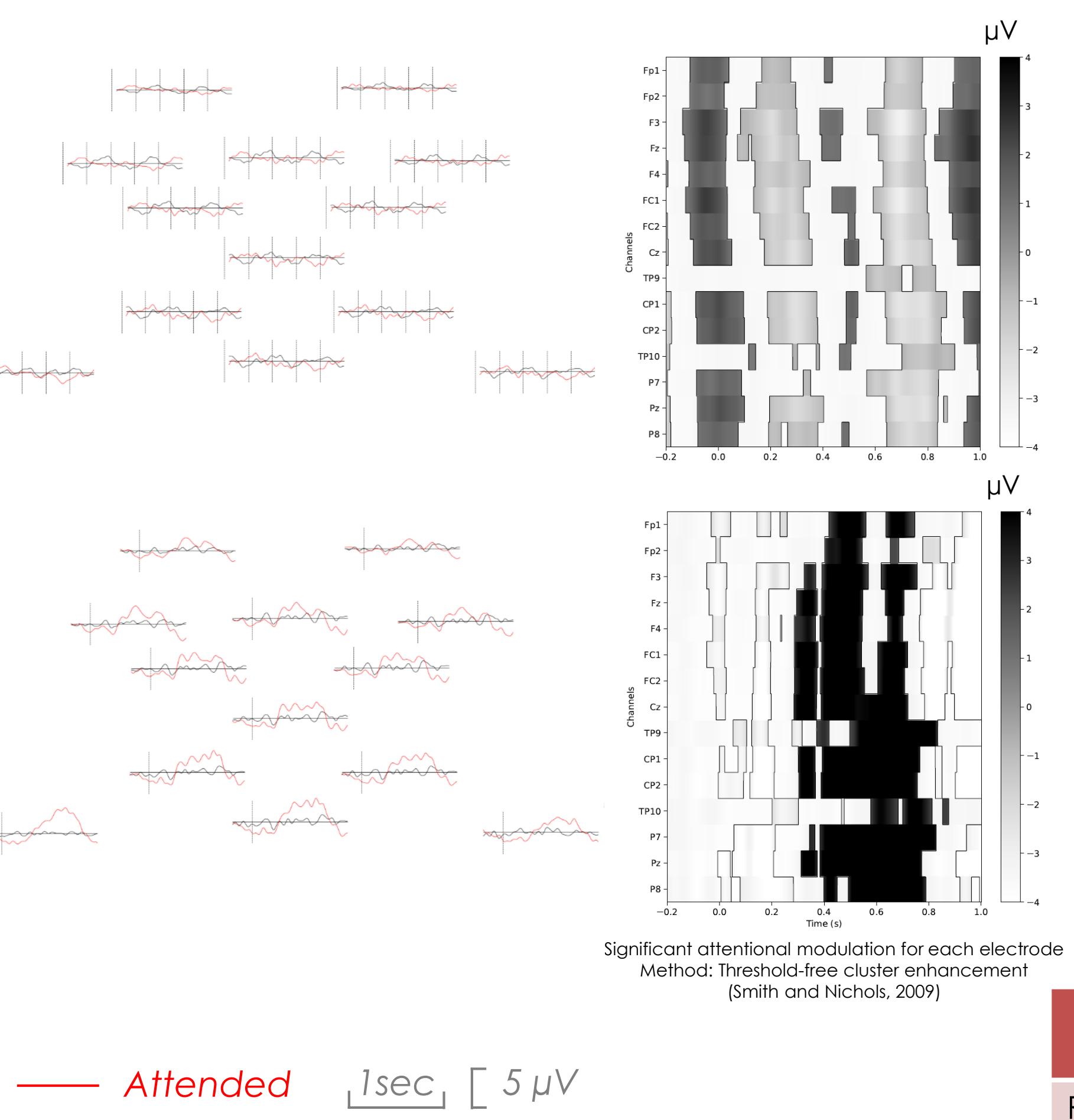
Effect of ICA pre-processing



Individual evoked potentials



STANDARDS
DEVIANTS



	Healthy subjects	Patients
Response to deviance	94 % (17/18)	29 % (2/7)
Attentional modulation on STD	83 % (15/18)	29 % (2/7)
Attentional modulation on DEV	72 % (13/18)	42 % (3/7)

Discussion

Attentional markers

- **Standards:** a steady-state potential arises at the frequency of the attended stimulus, its shape varies across subjects
- **Deviants:** they elicit a P3b component

Clinical results

- Even when they control the BCI, patients show abnormal attentional modulation patterns
- The impact of oculomotor impairment onto covert attention has to be further explored

Conclusion

Auditory BCI

- Show a drop of performance in conscious but severely paralyzed patients
- Patients tend to show a very frontal activity that has to be explored
- Attention abilities may be affected in case of severe (oculo-)motor impairment