Identifying profiles of patients to personalise BCI-based procedures for motor rehabilitation after stroke

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Acceptability of BCI-based procedures for motor rehabilitation after stroke: A questionnaire study among patients

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Introduction: Stroke leaves around 40% of surviving patients dependent in their activities, notably due to severe motor disabilities[1]. BCIs have been shown to favour motor recovery after stroke [2], but this efficiency has not reached yet the level required to achieve a clinical usage. We hypothesise that improving BCI acceptability, notably by personalising BCI-based rehabilitation procedures to each patient, will reduce anxiety and favour engagement in the rehabilitation process, thereby increasing the efficiency of those procedures. To test this hypothesis, we need to understand how to adapt BCI procedures to each patient depending on their profile. Thus, we constructed a model of BCI acceptability based on the literature [3], adapted it in a questionnaire, and distributed the latter to post-stroke patients (N=140).
Methods: The questionnaire consisted of i) 3 target factors used as a proxy of BCI acceptability, namely the perceived usefulness (PU), perceived ease of use (PEoU) intention to use (IU) and ii) 23 explanatory factors that could influence acceptability. First, k-mean clustering analyses were performed to identify different profiles of patients. Then, for each cluster, elastic net regressions were used to identify the explanatory factors that predicted PU, PEoU and IU the best, i.e., to identify the factors that are the most important to personalise for each patient.
Results: Five clusters (c1 to c5) were identified. The regression analyses indicated that the following factors had to be considered: **(c1 & c5)** "*scientific relevance"* & "*ease of learning"*; **(c2)** "*benefits/risks ratio"*, "*ease of learning"*, "*visual aesthetic"* & "*result demonstrability"*; **(c3)** "*scientific relevance"* & "*benefits/risks ratio";***(c4)** none.
Perspectives: We will use those results in a clinical study to personalise the BCI procedures to each patient. We expect lower anxiety and better motivation, acceptability and motor recovery with this personalised setting than with a standard one.

Sources

[1] Inserm, 2019
[2] Cervera, María A., et al. "Brain-computer interfaces for post-stroke motor rehabilitation: a meta-analysis." *Annals of clinical and translational neurology* 5.5 (2018): 651-663.
[3] Blain-Moraes, Stefanie, et al. "Barriers to and mediators of brain–computer interface user acceptance: focus group findings." *Ergonomics* 55.5 (2012): 516-525.