Modelling the Acceptance of BCI-based Stroke Rehabilitation Procedures: Heading for Efficiently Personalised Therapies

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Introduction: BCI-based stroke rehabilitation procedures (BCI-SRPs) have demonstrated their efficiency to improve patients' motor and cognitive abilities [1]. In the coming years, they are expected to substantially improve stroke patients' quality of life. Still, BCI efficiency is known to be modulated by several factors, including the so-called *technology acceptance* [2]: the patients' levels of agency, anxiety or mastery confidence (inter alia) will most likely influence the BCI-SRP efficiency. Yet, until now, this dimension of technology acceptance has mostly been neglected. We hypothesise that optimising BCI acceptance by personalising BCI-SRPs will increase patients' engagement and consequently enhance the efficiency of these procedures. In order to design such personalised BCI-SRPs, we have to determine what factors influence BCI acceptance, to estimate how much they influence BCI acceptance and to uncover how they interact with one another. As a first step towards this objective, we introduce a model of BCI acceptance that is based on the Technology Acceptance Model 3 (TAM3) [3].

BCI acceptance model: According to the TAM3, BCI-SRP acceptance is determined by both the *perceived usefulness* and *ease-of-use* of the technology. These two parameters modulate the patients' *behavioural intention* and consequently their *use behaviour*. Four dimensions would influence this BCI-SRP acceptance: system characteristics, facilitating conditions, individual differences and social factors. This influence has been suggested to be altered by the patients' levels of *experience* and *voluntariness* in the use of the technology. The Fig.1 provides a schematic representation of our model.

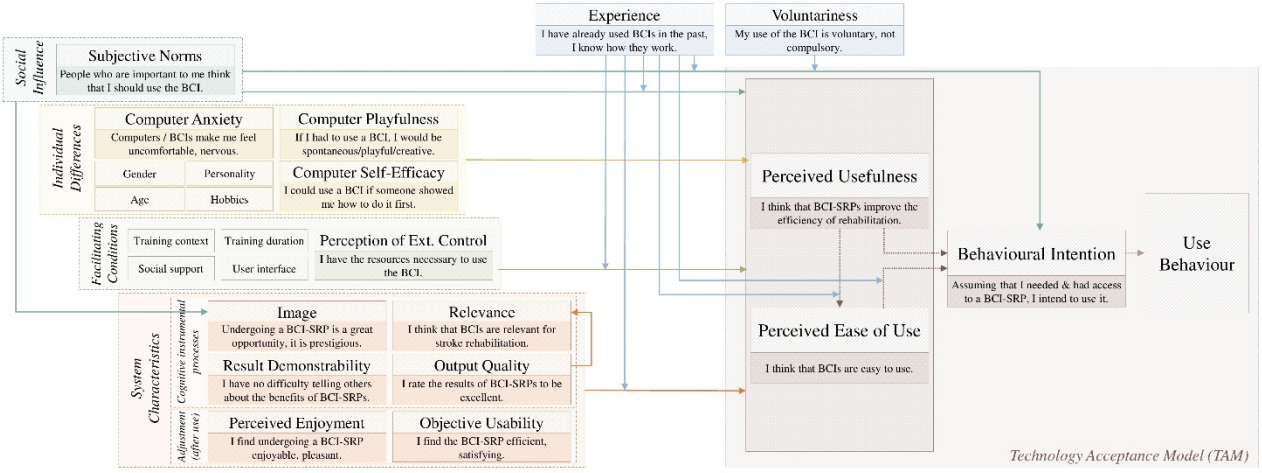

Figure 1. *Schematic representation of the BCI-SRP acceptance model in the context of stroke rehabilitation procedures. Each factor of the model is associated with an illustrative item that will be used in our online questionnaire to build a probabilistic model of BCI-SRP acceptance.*

Future work: We are currently implementing an online questionnaire that will be circulated to a representative sample of the population, including both healthy subjects and stroke patients. Each factor of the model will be assessed through at least three items, examples of which are provided in Fig. 1. Based on this model architecture and on the scores allocated to each factor by the people who completed the questionnaire, we will use a reinforcement learning approach to train a probabilistic model that will enable us to estimate how much each factor influences BCI-SRP acceptance, and how these different factors influence each another.

Significance: Thanks to this model, it will be possible to adapt BCI-SRPs to each patient, based on their profiles. We expect this approach not only to improve BCI-SRP acceptance, but also to enhance the efficiency of these procedures, which remains to be verified through a prospective randomised controlled trial.

References

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