Abstract / Annals of Physical and Rehabilitation Medicine 54S (2011) e55–e61

Robotino.— Le sujet déplace le robot sur 3 parcours, d’un point de départ vers 4 cibles et retour en utilisant a) l’interface, b) un interrupteur. S1 a réalisé plus rapidement le parcours 1 par contrôle mental (323.66 versus 345.37 sec) tandis que S2 a une meilleure performance mentale pour les parcours 2 et 3.

QualiWORLD.— S2 écrit par la pensée des nombres de 1 à 5 chiffres et des mots de 1 à 6 lettres. Elle fait 73 erreurs pour écrire 135 caractères par la pensée. Le temps nécessaire pour écrire un caractère était de 47.83 sec. Malgré les résultats un peu décevants, S2 était satisfaite de sa performance.

Discussion.— Les 2 sujets sont satisfaits de découvrir les possibilités de contrôler l’environnement par la pensée (interaction cerveau-ordinateur), et se voient utiliser le prototype testé à domicile. Quelques difficultés persistent : nécessité d’un tiers pour utiliser hard-/software ; le temps de latence entre l’ordre et la réponse de l’appareil. L’interface cerveau-ordinateur ouvre des perspectives intéressantes. Le concept demande encore des améliorations en termes de performance et facilité d’utilisation.

Pour en savoir plus


Version anglaise

P036–EN
Brain-computer interaction: Potential in improving the daily lives of the disabled
H. Dimassi*, N. Pattaroni, A. Al-Khdairy
Clinique romande de réadaptation-Suvacare, Physiothérapie, avenue Grand-Champsec 90, CH-1950 Sion, Switzerland
*Corresponding author.
Keywords: Brain-computer interaction; EEG; Handicap; Assistive technology

Objectives.— TOBI (Tools for Brain-Computer Interaction) is a European multicentric project supported by the European ICT Program Project FP7-224631 aiming at developing practical technology for brain-computer interaction that will improve the quality of life of disabled people and the effectiveness of rehabilitation. EEG signals are used to control a binary system.

Patients and methods.— The subjects included have a motor deficit predominantly in the upper limbs (muscle dystrophy, multiple sclerosis, tetraplegia, amputation, etc.). A 16 channel EEG is used to record the signals evoked by motor imagery (handshaking of either hand, dorsiflexion of feet). The signals are analysed so as to select the two most reproducible. After training on BCI, the subject will choose one or more prototypes to train on:
- communication and environment control;
- motor substitution;
- motor recovery;
- entertainment.

Results.— Since September 2010 six subjects have participated in the study. Two with muscle dystrophy trained on controlling mentally a robot (Robotino®) and a text entry program QualiWORLD®. The performances were not identical with one or the other prototypes. Two other subjects dropped-out after a few training sessions because BCI signals were altered by either bruxism or involuntary head movements. Two other subjects are undergoing BCI training. Results of the first two subjects are detailed in another communication.

Discussion.— All subjects were satisfied with their participation to the project. They expressed the feeling that BCI can offer much in the future for people with severe motor deficiency. The close collaboration between the 12 participating centres in the project has so far enabled hardware and software improvements facilitating the use of BCI.

Pour en savoir plus


P037–EN
Brain-computer interaction: Preliminary results in two subjects
H. Dimassi*, N. Pattaroni, A.W. Al-Khdairy
Clinique romande de réadaptation-Suvacare, Physiothérapie, avenue Grand-Champsec 90, CH-1950 Sion, Switzerland
*Corresponding author.

Keywords: Robotino; QualiWorld; Brain-computer interaction; Technologie d’assistance

Introduction.— Our institution is one of the 12 members of the European TOBI (Tools For Brain-Computer Interaction) and one of the 4 clinics applying the technology with patients. We collaborate closely with the Ecole Polytechnique Fédérale de Lausanne. After giving their consent, subjects with severe upper limb deficiency train on the brain-computer interface. Once they succeed, they can choose either to drive a robot (Robotino®) or to use a text entry program (QualiWORLD®). Presently 6 subjects have been enrolled. We present the results obtained with 2 patients suffering from muscle dystrophy: S1, a 28-year-old male and S2, a 33-year-old female.

Observations.— Before each session, questionnaires evaluating motivation (VAS), mood and depression (CES-D, QCMBCI2000, VAS) were introduced. After each session, the NASA Task Load Index provided an overall workload score based on a weighted average of ratings on six subscales: Mental demand, physical demand, temporal demand, performance, effort and frustration. After the whole protocol was over, the patient’s and therapist’s satisfactions regarding the prototype was evaluated by VAS and TUEBS 1.0.

Robotino.— Both had to drive the Robotono along 3 paths, from a starting point to 4 targets and back using a) the interface, b) manual switch. The time needed to perform pathway 1 was shorter with the mental command for S1 (323.66 versus 345.37 sec) while S2 had a quicker mental command for pathways 1 and 3.

QualiWorld: S2 was asked to write mentally 1- to 5-figure numbers and 1- to 6-letter words. She made 73 mistakes to write 135 characters. She needed on average 47.83 seconds to write down one character. In spite of some disappointing results, S2 was satisfied with her performance.

Discussion.— Both subjects were satisfied to discover the possibilities to mentally (Brain Computer Interaction) control assistive technology and are eager to use the technology at home. However, a third person is still necessary for using both hard- and softwares, and the latency between the command and response of the prototypes is still long. BCI leads to interesting perspectives. The concept needs improvement in performance and easiness to use.

Further reading

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