



Pires, G., Nunes, U., and Castelo-Branco, M. (2012) 'Comparação de um dispositivo de escrita de linha-coluna vs. um novo dispositivo de escrita lateral baseado em carater único: Avaliação de ICC em pacientes com limitações motoras graves' [Comparison of a row-column speller vs. a novel lateral single-character speller: Assessment of BCI for severe motor disabled patients]. [*Clinical Neurophysiology*](#) 123(6), 1168-1181

Abstract

Objective:

Non-invasive brain-computer interface (BCI) based on electroencephalography (EEG) offers a new communication channel for people suffering from severe motor disorders. This paper presents a novel P300-based speller called lateral single-character (LSC). The LSC performance is compared to that of the standard row-column (RC) speller.

Methods:

We developed LSC, a single-character paradigm comprising all letters of the alphabet following an event strategy that significantly reduces the time for symbol selection, and explores the intrinsic hemispheric asymmetries in visual perception to improve the performance of the BCI. RC and LSC paradigms were tested by ten able-bodied participants, seven participants with amyotrophic lateral sclerosis (ALS), five participants with cerebral palsy (CP), one participant with Duchenne muscular dystrophy (DMD) and one participant with spinal cord injury (SCI).

Main findings

We propose a novel P300-based lateral single-character (LSC) speller, that explores layout, event strategy and hemispheric asymmetries in visual perception to improve the performance of brain-computer interfaces.

The online performance of the LSC paradigm is compared to that of the standard row-column (RC) paradigm.

The paradigms are tested by individuals with neuromuscular disorders (amyotrophic lateral sclerosis, cerebral palsy, Duchenne muscular dystrophy, and spinal cord injury).

Results:

The averaged results, taking into account all participants who were able to control the BCI online, were significantly higher for LSC, 26.11 bit/min and 89.90% accuracy, than for RC, 21.91 bit/min and 88.36% accuracy. The two paradigms produced different waveforms and the signal-to-noise ratio was significantly higher for LSC. Finally, the novel LSC also showed new discriminative features.

Conclusions:

The results suggest that LSC is an effective alternative to RC and that LSC still has a margin for potential improvement in bit rate and accuracy.

Significance:

The high bit rates and accuracy of LSC are a step forward for the effective use of BCI in clinical applications.

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