



Noninvasive EMG-Based Augmented Communication System For Aphasic Patients

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Introduction

Aphasias often accompany neurological disease, impairing quality of life and compromising quality of care. This investigation characterizes functionality of a communication technology in neurological patients to determine those for which such a system is efficacious.

Methods

We have constructed an EMG based communication system which records single-channel surface electromyographic activity and have begun studying its performance with patients with a variety of aphasias and neurological conditions. A wireless EMG sensor transmits voluntary muscle activity to an analysis system, which performs real-time EMG signal processing, enabling the subject to control a time-sensitive switch to select characters and construct sentences using visual feedback.

Results

A pilot sample of 10 subjects comprising 6 normal controls and 4 language impaired patients has been studied to date. Average communication rates for controls were found to be 6.7 characters per minute (cpm) (variance 0.56). Among communication impaired subjects, the best performance of 2.9 cpm was achieved by a patient with Parkinson's disease and mild hypokinetic dysarthria. Performance in stroke patients varied with degree of language area involvement. The slowest of 0.55 cpm was observed in a patient with a left MCA infarct and global aphasia. A less impaired performance of 0.88 cpm was seen with a left thalamic intracerebral hemorrhage. Higher performance of 2.3 cpm was realized in a limited left MCA infarct involving Broca's area.

Conclusions

Noninvasive EMG signals hold varying degrees of promise in generating useful text in patients with a spectrum of etiologies and varying degrees of communication impairment. Performance is greater in patients with higher levels of preserved expressive and receptive language function. We seek to further characterize performance across a range of etiologies and degrees of functional deficits to better characterize those conditions in which such an augmented communication system may be efficacious.

Learning Objectives

By the conclusion of this session, participants should be able to:

1. Discuss the promise and limitations of a new approach to augmented communication
2. Describe correlations between compromise of functional language areas and impairment of communication rate.

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