

# Mindset – A BCI Access Solution for Communication

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## Introduction

- Communication is challenging for children without expressive speech and functional movements.
- Brain-computer interfaces (BCIs) provide an access method that allows users to control applications with only their brain activity.
- We developed Mindset, a BCI access solution that allows users to control augmentative and alternative communication (AAC) applications.

## Research Question

Can children with disabilities use a BCI system to communicate simple messages with AAC interfaces?

## Methods

- 20 children (between 8 and 19 years old) with special communication needs will be recruited for 2 study sessions.
- Participants will wear the Emotiv EPOC X, a consumer-grade electroencephalography (EEG) headset and train a visual P300-based BCI system.
- Participants will select pre-determined buttons on personalized symbol-based AAC interfaces (created in Tobii Dynavox Communicator 5) using the BCI system.
- Online BCI performance for each subject will be measured by the classification accuracy and information transfer rate.
- Surveys will be administered to assess usability and cognitive workload of the BCI system

# Brain-computer interfaces provide a new access method for children with disabilities to communicate.



Scan me!

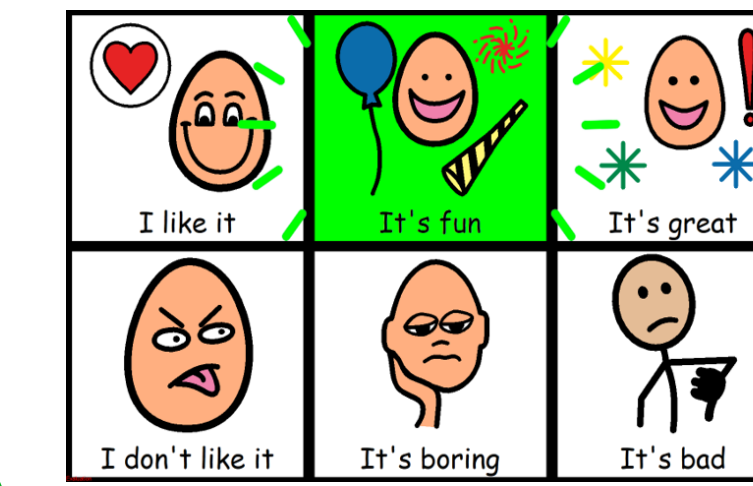


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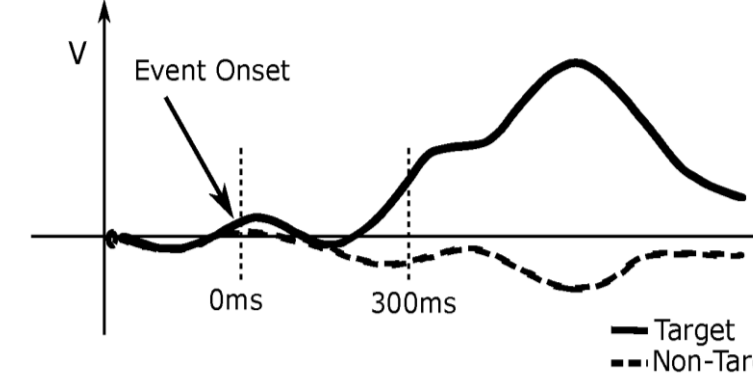
EEG signals are measured as the user is presented with a grid of buttons in a communication interface

2



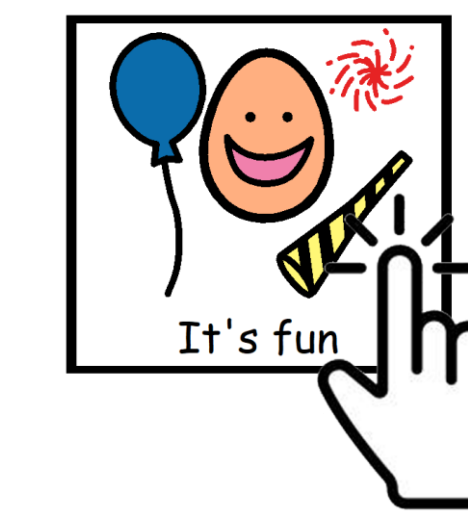
Each button flashes at a different interval, and the user is instructed to look at the button they want to select

3



A peak in the EEG signals is generated in response to a flashing button

4



The BCI system analyzes the EEG signals to determine the target button and selects it for the user

Fig. 1. Overview of the BCI communication system

## Results

We expect the performance of the proposed BCI communication system for a 6-button and 12-button symbol-based grid to be comparable to that of P300 spellers that use research-grade EEG headsets reported in the literature.

## Significance

Mindset provides children with a new access method for communication that bypasses the need for speech and physical movements. This research demonstrates the feasibility of a BCI communication system built upon affordable consumer-grade hardware and software.