More research is required to determine whether a P300 speller can be an effective form of communication for children with disabilities.

Background

Brain-computer interfaces (BCIs) decode brain activity and translate them into external commands.

P300 Speller – An application of BCI

- User presented with grid of characters
- Characters flash in random sequence
- User visually focuses on desired character
- When target character is flashed a distinct brain activity, the P300 response, is triggered
- Allows the BCI to differentiate between target and non-target stimuli

Research Question

Can a P300-based BCI speller be an effective form of communication for children with disabilities?

Methods

Developed a flash sequence algorithm to eliminate all occurrences of adjacent flashes and double flashes.

The speed of the algorithm and the amount of double/adjacent flashes were compared to the previous flash sequence generation method, which was random selection of flash groups.

Results

The algorithm was successful in eliminating all double/adjacent flashes.

<table>
<thead>
<tr>
<th>Number of Characters in Grid</th>
<th>Average Double and Adjacent Flashes in 1 Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Double Flashes</td>
</tr>
<tr>
<td>11</td>
<td>27.067</td>
</tr>
<tr>
<td>40</td>
<td>18.933</td>
</tr>
<tr>
<td>102</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Time for All Characters to be Uniquely Identifiable

Difference between original and new flash algorithms

Time difference becomes more significant for larger grid sizes. Largest time difference was 1.1 seconds for a grid with 57 buttons.

Next Steps

1. Recruit participants ages 8-19 with disabilities to test the communication system
2. Develop auditory and tactile P300 systems for individuals with visual impairments

Relevance to Holland Bloorview

A P300 speller can provide an alternative form of communication for Holland Bloorview clients who have not found a reliable access method.