

AAC: Adapting to ALS

Goal:

To provide **Augmentative and Alternative Communication** (AAC) devices to individuals with Amyotrophic Lateral Sclerosis (ALS) in a way that is **personally** tailored to the individual.

What is ALS?

- ALS is a neurodegenerative condition in which the person gradually loses all ability to **speak** and **move**
- It presents a “moving target” in terms of providing adaptive communication technology
- The progression of ALS is relatively predictable, so communication devices can follow a similar trend across most patients

Why Focus on ALS?

- ALS patients **do not have the ability to communicate** for themselves, either through speech or through body language
- Without an alternative method of communication, the person would be “locked into” their own body
- Communicating under these circumstances requires letter boards and a major time investment
 - Letter boards increase frustration and reduce communication with the individual
 - Utilizing personally tailored technology makes communication easier for both **the individual and his/her caregivers**
- AAC devices can be personally tailored to the individual’s specific needs at a given time, making communication **faster** and **easier**
- The ultimate goal is to **improve quality of life** for individuals affected by ALS

Evolution of AAC with Regard to ALS



Button

Used in the early stages of ALS, when speech is difficult or impossible but the person can still move to press a button



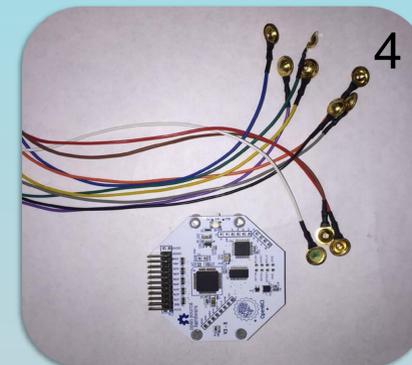
Twitch Switch

Used when any movement is still possible. Sensitivity can be changed to respond to smaller movements.



Eye Gaze

Uses eye-tracking technology to follow the user's eyes across a screen and “select” the quadrant that is stared at.



BCI (future work)

Used to read the brainwaves of the user, eliminating eye-strain and making controlling devices easier.

Results:

Button

- We had limited success with the button
- Setup is simple, and the device can be left in one spot so **setup is only required once**
- It worked well for a short time but required too much muscle strength once the ALS progressed further

Twitch Switch

- We had great **success with the twitch switch for over a year**
- First it was placed on the great toe. We eventually moved it to the forehead where it was **triggered by eyebrow movement**
- It became tiring to constantly move the eyebrows and facial muscles so we moved away from this technology

Eye Gaze

- **Very successful for late-stage ALS**
- We are using it with software that allows **control of the lights, television, and word/phrase selection**
- Easy setup and fast calibration reduces burden on caregivers
- ~53% of ALS patients use an AAC device that includes Eye Gaze technology

Future Work:

Brain-Computer Interface (BCI)

- The user will be able to **control** computerized speech, a wheelchair, lights, and other aspects of the environment by **thought**.

References:

- The ALS Association Greater New York Chapter | New York | New Jersey. (n.d.). Retrieved March 15, 2016, from <http://www.als.org/>
- Augmentative and Alternative Communication (AAC). (n.d.). Retrieved March 16, 2016, from <http://www.asha.org/public/speech/disorders/AAC/>
- David Beukelman, Susan Fager, and Amy Nordness. “Communication Support for People with ALS,” *Neurology Research International*, vol. 2011, Article ID714693, 6 pages, 2011. Doi: 10.1155/2011/71469

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