Simplifying AAC for People with Critical Medical Conditions: Safe-Laser Keyboard & Speech Buttons Prototype

AAC in Medical Settings
- Need for communication options that are easy to use, maintain, and operate
- Early work with eye safe laser prototype demonstrated potential of system to support communication for those with minimal movement due to brainstem stroke and to "train" head control capabilities to access AAC

Prototype Design Features
- Access with minimal head, hand, or foot movement
- Support low-tech communication boards without speech output
- Support communication boards with digitized speech output
- Support letter-by-letter text generation on a conventional laptop or desktop computer
- Support environmental control with X10

- Support "environmental pointing"
- Lightweight (less than 5 lbs)
- Approximately 12"x12" front profile
- Stand upright on flat surface with or without additional mounting support
- Mountable to wheelchair, bed, or chair
- Moveable with one hand by staff and/or communication partners
Laser pointer mount on base unit for battery charging and transport
Battery powered (at least 6 hours)
Battery rechargeable for the base unit and the laser pointer simultaneously with a single power cord
Sealed surfaces for easy cleaning/infection control

Following introduction of the Safe-Laser Keyboard, data were collected on the following:
- Amount of physical ability required to use device
- Communication functions served by device
- Rate and accuracy
- Ease of use, fatigue, and ease of set-up
- Impact of environmental lighting and positioning on use
- Use of laser pointer to facilitate communication regarding environmental information
Case Illustration 1

- 46-year-old female—diagnosis of paraneoplastic syndrome (mimics the degenerative path of ALS)
- Tetraplegic, mechanical ventilation
- Difficulty using eye gaze and head tracking (Vmax with Eye Max accessory and HeadMouse Extreme)
- Safe Laser Keyboard prototype was introduced as simplified method for AAC

Movement Excursion

- Safe Laser Keyboard prototype:
  - 2” left/right 1” up/down
- Vmax/HeadMouse:
  - 4” left/right 3” up/down
  - *additional “quick” 2-inch movements required to recalibrate

Rate and Accuracy

- Dwell time was set for 1 sec. for both devices
- Safe Laser Keyboard prototype:
  - 16 self corrections, average of 1.15 minutes per sentence
- Vmax/HeadMouse:
  - 65 self corrections, average of 2.53 minutes per sentence

Communication Functions

1. Spell messages related to care, detailed needs, and social communication with family.
2. Communicate basic and detailed needs and ask questions regarding medical condition to staff (nursing and respiratory).
3. The participant, family, and staff indicated that the effectiveness of communicative interactions was greater using the Safe Laser Keyboard compared to low-tech AAC strategies (e.g., less frustrations, less misinterpreted messages, less repetitions required).
4. Used the prototype to point to objects in environment on several occasions during trial (e.g., pointing to a picture on the wall to clarify topic of conversation, pointing to calendar on wall to clarify appointment).

Ease of Use, Fatigue, and Ease of Set up

- Ease of use (1 = very easy, 5 = very hard)
  - Safe Laser Keyboard prototype = 1
  - Vmax/HeadMouse = 4
- Fatigue (1 = no fatigue, 5 = very fatiguing)
  - Safe Laser Keyboard prototype = 2
  - Vmax/HeadMouse = 4
- Ease of Set-up (1 = very easy to set up, 5 = very difficult to set up)
  - Safe Laser Keyboard prototype = 1
  - Vmax/HeadMouse = 3
Safe-Laser Button

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