PBL Design Video Overview

Rubric
Role
Time stamps
Research

1. Introduction (Alyssia) [~10 seconds]
    a. Names
    b. Project name/brief description
2. **Drawing of the device** (Michael) [1 minute]
    a. Include an original, clear drawing of the device that demonstrates its operation (if using solidworks, can add an engineering drawing?)
        i. laldkfj
    b. **Benefits of the device**
        i. Who is your device designed for? What are their specific needs?
            1. Elderly and Disabled Persons with cases of sever motor impairment such as ALS, Spinal Cord Injury, an cerebral palsy
        ii. How does the device's actions relate to the needs of the user
3. **Safety and feasibility** (Ruhiyah) [40 seconds]
    a. Based on the typical limitations of BCI devices, is it feasible and safe?
    b. The device is pretty feasible because it's a wearable device
    c. Will it work accurately and comfortably for the user over an extended period of time?
4. **Flow Chart** (Kelsey) [1 minute]
    a. Include a flow chart that clearly and accurately describes the flow of information and actions in the device
    b. Some important questions to consider in your design:
        i. For each command, what feature of the EEG will be measured (for example a specific frequency band or waveform)?
        ii. How will the computer know when the patient wants a command to be carried out? (What if the patient just wants to watch tv or sleep – will the BCI be attempting to carry out commands based on the spontaneous brain signals that occur during these periods?)
        iii. Will recognition of the intended commands be robust to normally occurring features of the EEG, such as eye blinks, muscle activity, and the alpha rhythm when the eyes are closed?
            1. [insert flow chart picture]
5. **Signal decoding** (Garrett & Talah) [3 minutes]
    a. Include how EEG signals are turned into actions by the device
        i. What signals do we use? At which point? (Refer back to flowchart if needed)

ii. Monitoring for stroke (Details)
    1. Reason for why we used
iii. Confirming a call (Details)
    1. Reason for why we used SSVEP

b. Describe the electrode placement and signal feature being measured

6. **SMR:**
   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7203763/
   https://www.sciencedirect.com/topics/medicine-and-dentistry/sensorimotor-rhythm
   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6068279/
7. Conclusion (Alyssia) [10 seconds]

Script:

1) **Intro**
2) **Drawing of the Device**
3) **Flow Chart**

Important questions to consider in your design:

1) For each command, what feature of the EEG will be measured (for example a specific frequency band or waveform)?
   a) **Previously mentioned in the stroke detection slide, we are looking at the delta, alpha and beta frequency bands. These show the most change when a patient is having a stroke and by tuning our device to recognize the frequencies under a stroke, our device refines it's detection output for higher accuracy.**
2) How will the computer know when the patient wants a command to be carried out? (What if the patient just wants to watch tv or sleep – will the BCI be attempting to carry out commands based on the spontaneous brain signals that occur during these periods?)
   a) **At the last decision chart, the computer will get an option for patient input if their signals transcribed are relatively minor compared to the frequency bands and they have not been notified of their change within the past 5 minutes. This option is for patients to choose a contact from their emergency contact list, directly phone 911 alongside an emergency contact, or cancel the action altogether. SSVEP will be used for these patient interactions in tandem with their phone screen by flashing 4 quadrants of color to signify a specific contact or to cancel the entire action of calling. Each color flashing has a unique frequency that will be recognized by the computer when the patient is interacting with the screen to choose their option. However, in the downtime without patient's needing to call, the device is continuously monitoring the patients signals and comparing them to literature based EEG stroke signals. This will not be affected by the patient and can commit to routine check-ins without patient interaction.**

3) Will recognition of the intended commands be robust to normally occurring features of the EEG, such as eye blinks, muscle activity, and the alpha rhythm when the eyes are closed?

a) Refer to the answer above