Aim:

The goal of our project is to harness the technology of consumer-grade EEG (Muse) in order to assist study habits.

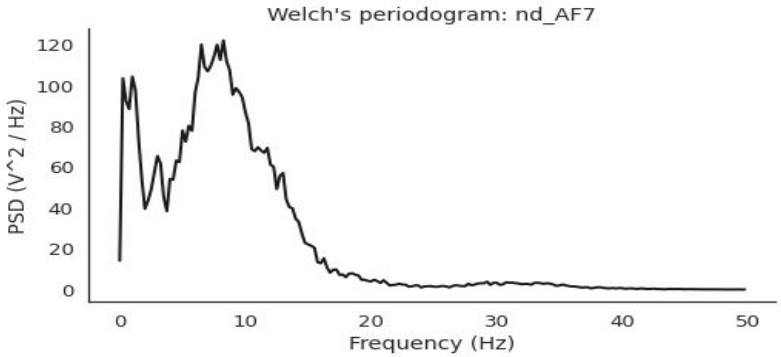
Methods:

Previous literature has shown a high correlation between focused attention and EEG waves in the beta frequency band. So, we decided to start with a signal-processing approach to see if we could decode the users' attention levels from the Muse 2 headset's four dry electrodes.

For data collection, we collected EEG data from 8 distinct participants who performed two different studying tasks, one with distraction and one without. The second link highlights the 16 main file readings, along with self-reported details about the session of EEG signal collection.
https://docs.google.com/datacollection

Our Colab, linked below, details the signal processing techniques we used to break down our participant EEG dataset into their individual frequency bands.
https://colab.research.google.com/dataanalysis

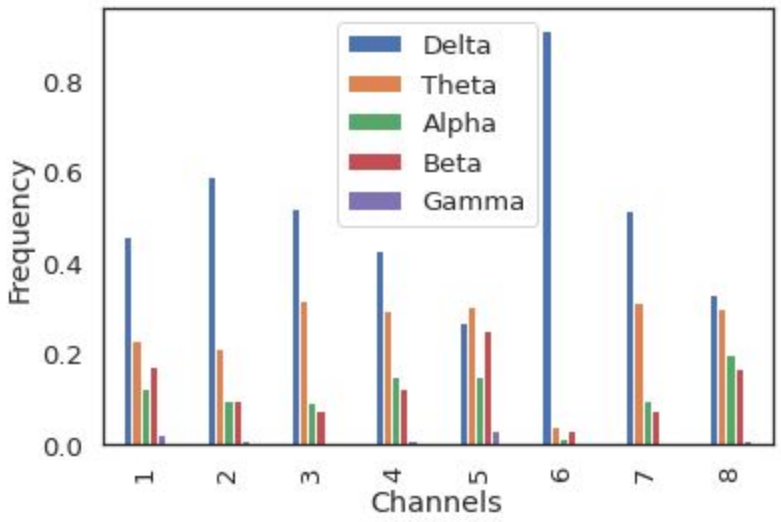
The 16 main file readings were then imported into our Colab, where we analyzed per participant by looking at their non distracted and distracted EEG readings. For each dataset, there were 4 main arrays of values, with each array corresponding to the 4 electrode channels on our Muse headset. The signal processing functions began afterwards, with an implementation of Fast Fourier Transform to produce a Welch's periodogram for each channel that displayed the PSDs vs the frequency. An example is shown below. The periodogram below shows PSDs for a non distracted testing on the AF7 channel. This process was done for each of the 4 channels in each dataset, producing 8 periodograms for each participant. We filtered up to 50 Hz.



From our periodograms, we then established frequency ranges for each bandwidth, as shown in the table below.

Delta	**0 - 4 Hz**
Theta	**4 - 8 Hz**
Alpha	**8 - 12 Hz**
Beta	**12 - 34 Hz**
Gamma	**34 - 50 Hz**

Based on these ranges, we were able to calculate the relative frequency power for each band, which allowed us to perceive which frequency band is most important in our analysis. The graph below is an example of one of the participant's relative frequencies graphed for each channel. The first 4 channels represent the non distracted frequencies and the last 4 channels represent the distracted frequencies.



Results:

Areas to Expand: