03/21/2016 Progress Report for "Clinical Analysis of Speech Rhythm in Language Development using MATLAB"

The goal of our project is to develop a program that will analyze the rhythm in the speech of children with and without language impairment. Our analysis process will exist entirely in one program, MATLAB. This will increase efficiency, decrease time spent on data analysis, and automate the speech analysis process. Ultimately the code will output two scores representative of the individual's rhythmic abilities, for self and global-synchrony, determined by Circular Statistics analysis conducted in MATLAB. Our hardware component, a Scarlett i2i sound card, will simultaneously play a metronome and record the patient's speech. The collected data will be transferred to MATLAB for analysis and output the patient's synchrony scores. Previously we were working on the Circular Statistics analysis MATLAB code and had gotten the code to output self-synchrony scores. We were also translating Dr. Jacoby's soundcard code. We had also been facing problems in peak detection with our MATLAB code.

Previously we had been collecting data with the soundcard, exporting it from the soundcard's software (AudioLive Light) and importing it into MATLAB. Recently we have been working on a MATLAB code, which will allow for the direct collection of speech data into MATLAB by the soundcard. For the past two weeks we have been attending Dr.Gordon's pilot studies and collecting data from children. Furthermore, we translated and implemented of Dr. Gordon's Global-Synchrony Circular Statistics MATLAB code into our peak analysis code. We can now successfully output both self and global-synchrony scores. We have also met with Alison from Dr.Gordon's lab. She provided further insight in our code and suggested that we use the "circular statistics toolbox" in MATLAB and use "mean vector length" as a parameter to calculate scores. Past week we also decided to add a "Hand Adjustment" part to our code to ensure the detection of every peak in our data. Now, after data is collected, prior to analysis, our code displays the speech waveform and a box appears asking if the collected peaks are correct. If the user clicks "Yes", data analysis continues, if the user clicks "No", then a cursor appears with which the user can select the correct peak data points. We have also purchased a pair of sound blocking headphones to be used in the studies.

One problem we have encountered is that we realized that our hand adjustment process is not very efficient. Although our hand adjustments part in our code has fixed our problem of peak misdetection, it takes very long for the user to click on every peak, and is unnecessary if only few peaks have been misdetected in a small part of the code. Additionally we downloaded and started using the circular statistics toolbox, however we have not been able to get the code to run properly yet. Every time we run our code MATLAB outputs a score higher than 0.9, where 1 is a perfect score, whether the subject has good or bad rhythmic abilities. The final problem we have encountered has been getting the soundcard to play a metronome and record speech at the same time.

In the upcoming few weeks we plan to collect data from children enrolled in the Music and Cognition Lab's research trials. The lab is planning to use our setup to collect speech samples from both children with normal language development, as well as children with SLI. For the trials we are working to have our external sound card functioning to mimic our Design Day setup and to avoid having to record in Audio Live Lite. We also will continue to work to improve the consistency of our existing analytic code by dividing the speech waveform into sections and adding the option of conducting hand-adjustments only in the selected section. We will also be meeting with Alison again to discuss how to accurately calculate mean vector length and output scores. We will also continue working on Dr. Jacoby's soundcard code.

We expect to meet our stage-gates in time with the proposed schedule as depicted in our Gantt Chart. There appears to be no additional hardware or software components that is needed to be purchased at the time.