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02/29/2016 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. Unlike other current methods of speech analysis, 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, for self (nuclear) -synchrony and global-synchrony, determined by Circular Statistics analysis conducted in MATLAB. The scores will be representative of the individual's rhythmic abilities. In the previous weeks we added a new hardware component, a Scarlett i2i soundcard, to our design, started working on circular statistics MATLAB codes and created a code for speech and metronome peak analysis which we continue to improve each week.

Since February 15th we completed the translation of the Self-Synchrony Circular Statistics MATLAB code which had been used in the analysis of speech data from Dr. Gordon's previous studies. We altered and implemented the code into our peak analysis code. Currently our code can successfully output self-synchrony scores. The scores range between 0-1, where a score of 0.5 indicates normal/good synchronization. We have also translated the global-synchrony code, however the code does not output global-synchrony scores yet. In our previous report we had mentioned encountering challenges with speech data collection with our soundcard and subsequently inputting the data to MATLAB for analysis. After installing PsychPhysics MATLAB toolbox and translating Dr.Nori Jacoby's code for data collection with the same type of soundcard, we can now record speech with the soundcard, upload it to MATLAB and run our speech analysis code on the data collected with the soundcard. In the past week we also collected data from Dr.Gordon's daughter to test our design with a representative of the intended population for the Music Cognition Lab's research studies.

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The implementation of the global-synchrony circular statistics code has been more challenging than self-synchrony. The self-synchrony score is an indication of how synchronized an individual's rhythm stays throughout the speech recording, whereas the global-synchrony code determines how well an individual can synchronize the first and last(3rd) syllables of his/her speech along with a metronome. Therefore the global-synchrony code requires the simultaneous recording of speech and playing of metronome which is a current challenge we are working on. Uploading and playing a metronome track with our soundcard is another challenge we are currently facing. We were able to get one metronome track in the soundcard, however the uploading process changed the frequency of the metronome. Additionally our peak processing code needs further improvements as the 60% peak detection is not perfect yet.

Moving forward we will work on our global-synchrony code and write a script to upload a metronome track, simultaneously play a metronome and record speech and output a global synchrony score. Furthermore we will work on obtaining a 90 beats/minute metronome track in the soundcard. We have recorded and saved sample speech data with our soundcard. We are writing a separate code in MATLAB to analyze this data until we can get our soundcard to play a metronome track. Furthermore, we will work on improving our peak determination code as our advisor Dr.Gordon is hoping to use our design in a research study in the coming weeks.

We expect to meet our stage-gates in time with the proposed schedule as depicted in our Gantt Chart. Currently there are no additional hardware or software components needed to be purchased.