Committee Meeting Summer 2015

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Overview

1. Section I: Research to date
   - September 2014 - May 2015
2. Section II: Research Plan
   - June 2015 - September 2016

Holes in hearing

- Holes in hearing, cochlear dead regions, lacunae
- Diagnosing holes in hearing with audiogram
- Application with hearing aids
- Can be diagnosised with **psychophysical tuning curves (PTC)**

Psychophysical Tuning Curves

- Task: participants must detect a signal in narrowband noise
- Signal cycles between on and off (beeping)
- Level of the masker increases or decreases
- Expectation if normal hearing: masker is most efficient at signal frequency
- If masker is more efficient at a distal frequency, hole in hearing is suspected

Psychophysical Tuning Curve

INCLUDE FIGURE OF PTC HERE FROM PROGRESS REPORT

Psychophysical Tuning Curve

INCLUDE FIGURE OF hearing impaired PTC HERE FROM PROGRESS REPORT

Psychophysical Tuning Curve

INCLUDE screen shot of the program and discuss specifications

Analysis of PTC

- Quantifying the PTC: tip frequency and sharpness
- Two point moving average
- Curve fitting: quadratic function or double linear regression
- q10: measure of sharpness

Study I

- Objective: Assessing the correlation between PTC and audiograms
- Participants had their audiograms conducted
- Participants then had PTCs done for every frequency corresponding to the audiogram
- Expectation: audiogram thresholds strongly correlate to PTC
- Participants all had healthy hearing

Results of Study I

INCLUDE DATA ANALYSIS FIGURES FROM TONY'S PROJECT HERE

Loudness Growth

- Loudness is a *perceptual* value that correlates with sound intensity, **it is not intensity**
- Loudness growth curves are a depiction of how participants perceive sound as the intensity is increased

Loudness Growth Curve

INCLUDE EXAMPLE OF LOUDNESS GROWTH CURVE

Characterizing Loudness Growth

- Many different tasks try to quantify loudness
- Tasks are often subjective
- Cross modality mapping (CMM), cut a physical piece of string
- Task with high repeatability and without many instructions: loudness growth in half octave band (LGOB)

Describe LGOB task

- give stats on it, describe it
- show a picture of it

LGOB task

- give stats on it, describe it
- show a picture of it

Auditory Brain Stem Response

- Electrophysiological measure
- Measures a population of neural responses
- Identifiable waves based on morphology and latency
- ABR waveform has predictable changes in morphology and latency with changes in the stimulus intensity
- Has been used to record loudness growth curves

Problems with the Auditory Brain Stem Response

- Low signal to noise ratio
- Trade off between SNR and frequency specificity
- Tonebursts are frequency specific and have been successfully used to measure loudness growth
- However, many repetitions must be run when using tonebursts because the SNR is still quite low

Solution: Chirp stimuli

- Chirps are frequency specific
- Less repetitions needed to achieve desired SNR (Fsp)
- Have not been used to assess loudness growth

Research Plan Overview

- Step 1)Compare behavioural loudness growth curves with tone bursts and chirp
- Step 2)Administer tone burst and chirp ABR to participants

Additional Information

- I have completed a Coursera on R and Python
- I plan to take a computer science course this summer and another one in the fall
- Learned to administer clinical tasks in the Roberts lab (audiogram, bone conduction meter, tympogram)
- Learned to use the hardware and software in the ERP lab (Tucker Davis, Visual Basic, etc)
- Mentored and organized 5 undergraduate students through their QQ3 projects

Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)

Title of the publication

Journal Name 12(3), 45 – 678.

The End