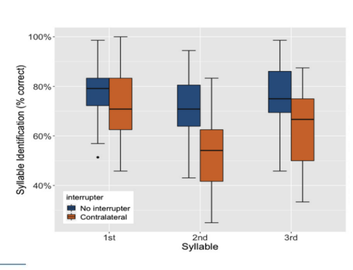
The Effect of Reverberation on Interrupted Spatial Attention

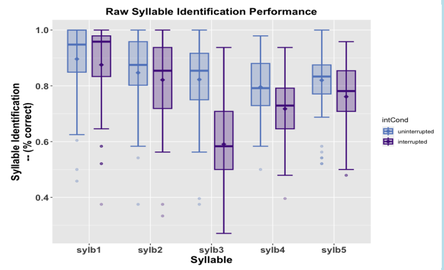
Victoria Figarola[1], Wusheng Liang[1], Abigail Noyce[1], Christopher A. Brown[2], Barbara G. Shinn-Cunningham[1]

[1]Carnegie Mellon University, [2]University of Pittsburgh

Background

In anechoic simulations, unexpected, salient "interrupters" disrupt spatial selective attention.[1]





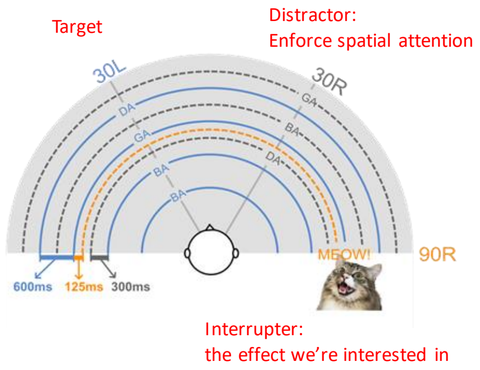
Reverberation can interfere with speech intelligibility and impede selective attention by smearing out features (temporally and spectrally)[2-9]

A way to model how a sound source is perceived coming into our ears in a reverberant environment is through binaural room impulse responses (BRIRs)

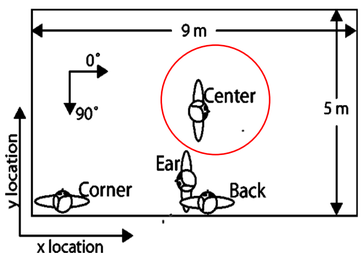
Conducted online spatial selective attention experiments to investigate how reverberation affects 1) target stream recall and 2) disruption from novel, unexpected events

Approach

- Two competing syllable streams
  - Temporally interleaved
  - Spatialized using BRIRs
  - With and without random interruptions
- 96 total trials, with 50% trials
  - Target left/right (randomly intermingled)
  - Interrupted/uninterrupted (randomly intermingled)
  - Pseudo-anechoic/reverberant
    - Experiment 1: randomly intermingled
    - Experiment 2: blocked separately



- Classroom BRIRs[9]:
  - 1m distance
  - 0-deg elevation
  - Ears ~1.5m above the floor
  - Azimuths left and right 30-deg and 90-deg



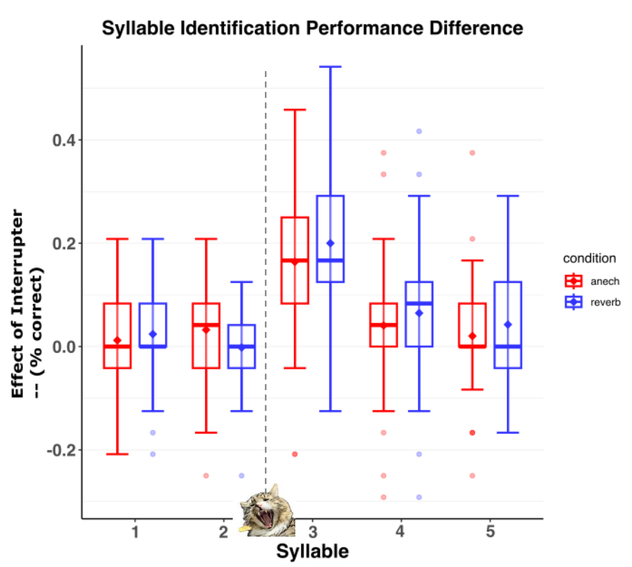
Conclusions

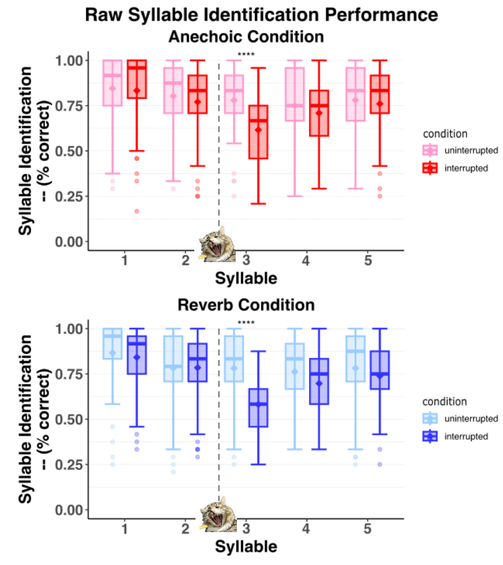
- There was no difference in performance across subject groups
- Reverberation had **no significant effect** on overall performance
- Reverberation had **no significant effect** on overall disruptions caused by interrupters
- In both reverberant and pseudo-anechoic conditions, **interrupter reduced recall accuracy** of the syllable immediately after interrupter by 20%

Results

Experiment 1: Reverberation had no effect on performance

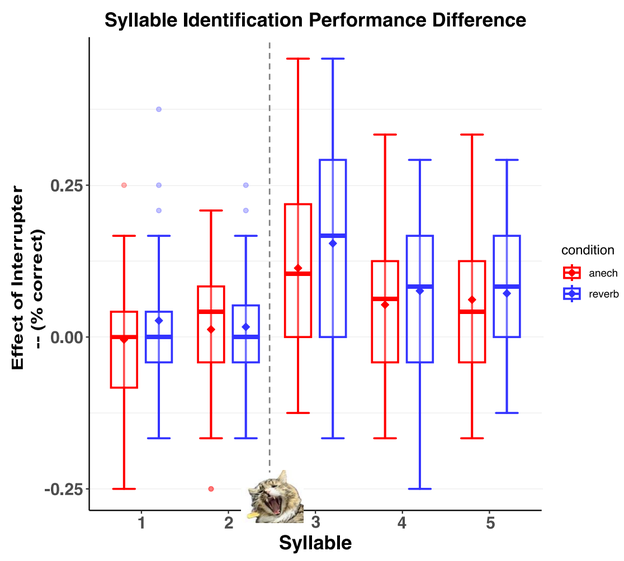
- N=45 (self-reported normal hearing)
- RT60: 743ms
- Anechoic & Reverberant conditions were randomly intermingled

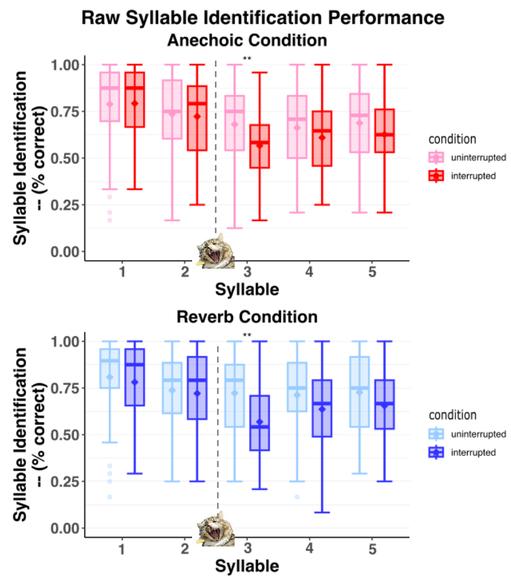




Experiment 2: Blocking also yielded no difference

- N=45 (self-reported normal hearing)
- RT60: 743ms
- Anechoic & Reverberant conditions were blocked

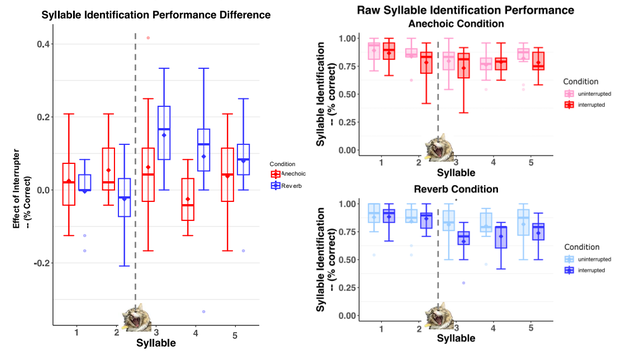




Next Steps

- Finish task 3 data collection
  - Recorded BRIRs (RT60: 1.919 sec)
  - Similar design as task 2
- EEG and pupillometry to study how neural signatures of spatial attention are impacted by reverberation
- Expand to hearing impaired population

Pilot results (N=10):



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Contact: vif@andrew.cmu.edu

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