Effects of Age and Hearing Loss on Working Memory Capacity and Speech Recognition: Some New Findings with PRESTO
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HYPOTHESES
1) Individuals with hearing loss will perform better on HINT than PRESTO, and better in Quiet than in Noise
2) Age and Hearing Loss will be related to performance on both HINT and PRESTO, as well as working memory tests.

METHODS
Participants
• 16 subjects (9 female, 7 male)
• Age: 21-64
• Hearing Status at 500, 1000, 2000 & 4000 Hz
  • Normal hearing: N=8
  • All thresholds ≤ 30 dB HL
  • Asymmetric hearing loss: N=4
  • Threshold ≥ 35 dB HL,
  • ≥ 15 dB difference across ears
  • Bilateral hearing loss: N=4
  • Threshold ≥ 35 dB HL,
  • ≤ 10 dB difference across ears

Sentence Tests
• HINT (Hearing in Noise Test)
• PRESTO (Perceptually Robust English Sentence Test, Open-set)
• Presented in 6-talker babble (0 dB SNR)

Memory Tests
• Auditory Short-Term Memory
  • Digit Span Forward
  • Word Span
• Visual Short-Term Memory
  • Spatial Span Forward
  • Auditory Working Memory
  • Digit Span Backward
  • Visual Working Memory
  • Spatial Span Backward

RESULTS
Summary of participant age, hearing loss, and memory scores

<table>
<thead>
<tr>
<th>Age</th>
<th>Asymmetric</th>
<th>Bilateral</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
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<tr>
<td>49.25 (18.84)</td>
<td>34.00 (22.52)</td>
<td>29.25 (10.71)</td>
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Worst 4 Fq PTA
| 38.75 (24.94) | 31.25 (11.46) | 10.63 (6.98) |

Digit Span Forward
| 6.25 (0.96) | 6.67 (1.53) | 6.38 (1.19) |

Digit Span Backward
| 4.50 (1.00) | 5.00 (2.00) | 5.00 (0.93) |

Spatial Scan Forward
| 6.25 (0.96) | 9.33 (4.04) | 9.88 (3.27) |

Spatial Scan Backward
| 10.75 (1.50) | 8.33 (2.89) | 9.25 (2.38) |

Word Span
| 3.75 (0.96) | 2.00 (1.73) | 4.00 (0.53) |

Hypothesis 1: HINT Performance > PRESTO Performance (F(1,15)=28.59, p<.05)
Performance in Quiet > Performance in Noise (F(1,15)=113.681, p<.05)
Change due to Noise: PRESTO > HINT (F(1,15)=10.886, p<.05)

Hypothesis 2: Correlation between age and PRESTO in Noise: r=.521, p=.038
Correlation between age and Wordspan for all subjects: r=.544, p=.029

MAIN POINTS
• In all hearing categories, performance on HINT was better than PRESTO, & performance was better in quiet than noise.
• Accuracy on HINT in quiet was at ceiling for all 16 subjects.
• Performance on PRESTO showed correlation with performance on memory tests, but HINT did not.
• For all 16 subjects, increased hearing loss was associated with decreased forward digit span scores.
• For all 16 subjects, increased age was associated with poorer performance on PRESTO in noise & word span.
• For bilateral hearing loss group age was correlated with poorer performance on forward digit span, forward spatial span, word span

CONCLUSIONS
Individuals with greater hearing loss performed more poorly on memory tests, due to inaudibility. Aging was also related to poorer performance on short-term memory tests. In addition, aging was associated with poorer performance on PRESTO in noise, but not on HINT. PRESTO may be a useful clinical test for evaluating speech perception in older adults because it may be sensitive to cognitive factors as well as audibility, which are both important considerations for treating the aging population.

FUTURE DIRECTIONS
• Continue to evaluate the contribution of short-term and working memory to speech perception
• Recruit more subjects to better understand correlations between categories
• Continue testing to determine PRESTO sensitivity to individual differences and cognitive factors, especially under adverse listening conditions

KEY REFERENCES

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