Objective Assessment of Speech in Noise Abilities & the Effect of Amplification in Children with Hearing Loss

Samantha Gustafson, Au.D., Alexandra P. Key, Ph.D., Benjamin W.Y. Hornsby, Ph.D., Fred H. Bess, Ph.D.
Department of Hearing and Speech Sciences, Nashville, TN

INTRODUCTION

- Individuals with hearing loss have difficulty understanding speech in background noise, even when the signal-to-noise ratio is optimal.
- Compared to children with no hearing loss (CNHL), children with hearing loss (CHL) require a more favorable signal-to-noise ratio (SNR) for optimal speech understanding.
- When compared to children with no hearing loss (CNHL), children with hearing loss (CHL) require a more favorable signal-to-noise ratio (SNR) for optimal speech understanding. Children with CHL who have been provided with amplification showed less robust (p<.05) P1 response when compared to CNHL.

METHODS

- Objective assessment of speech in noise abilities & ERP across stimuli.
- Data were collected as part of a larger ongoing study examining listening effort and fatigue in school-age children with hearing loss.

RESULTS – Sound Detection in Quiet and Noise

- Figure 3: Mean cortical response (±1 SD) to speech at the Pz location for the target syllable in CNHL, CHL-aided, and CHL-unaided. Asterisks indicate significant differences between conditions.
- Aided CHL showed less robust P1 response (p<.05) and more robust N1 response (p<.05) compared to CNHL.
- In CHL, unaided P1 responses to speech onset were more robust than aided responses (p<.05).
- Unaided CHL showed less robust response to speech onset for P2 (p<.05).

RESULTS – Hearing Aid Use

- Figure 9: Mean differences (±1SD) of P1 and N1 to target syllables to compare responses recorded at the P1 location in unaided and aided listening conditions for children who do and do not use hearing aids on a typical school day. Data falling above the zero line indicate critical mean response for target syllable compared to CNHL.
- CHL who use hearing aids on a typical school day show improved speech in noise ability on the use of their hearing aids.
- CHL who do not use hearing aids on a typical school day do not show this benefit with speech in noise.

SUMMARY & CONCLUSIONS

- Early cortical responses to the onset of multi-talker babble and to the onset of speech in multi-talker babble suggest sensory processes different from those of CNHL, and may influence at least some speech-recognition processes in noise.
- Children with CHL and unaided CHL showed reduced P1 and N1 relative to CNHL.
- Children with CHL showed reduced P1 and N1 relative to CNHL.
- No differences between unaided and aided responses to speech onset in noise.

KEY REFERENCES

- First et al., 2022. Effects of sensorineural hearing loss on cortical event-related potentials (ERPs) in children with hearing loss.
- First et al., 2022. Effects of sensorineural hearing loss and personal hearing aids on cortical event-related potentials (ERPs) in children with hearing loss.
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