INTRODUCTION

- In spatial unmasking of speech, children with bilateral cochlear implants (BiCIs) do not receive intelligibility benefits mainly from head shadow, by attending to the ear with better signal-to-noise ratio (SNR) of the target speech
- Most children with BiCIs do not seem to benefit from interaural difference cues, i.e., interaural time and level differences (ITD and ILD), and some even demonstrate an “anti-benefit” or interference when a spatial separation between the target and masker is introduced
- Previous work on spatial unmasking is limited to using 90° angular separation between target and masker to quantify benefits from head shadow and interaural differences
- In this study, we enlarged the target-masker angular separation to 180° in virtual auditory space (VAS) and systematically assessed intelligibility benefits from individual and co-occurring auditory cues in spatial unmasking

METHODS

- Participants
  - BICI group: 9 children; all Cochlear N5 or N6 users with ACE strategy
  - NH group: 19 children; age-matched to bilateral experience among BICI group between 6 to 12.9 yrs old. All had ≤20 dB HL from 125-8000 Hz.
- Speech reception thresholds (SRT) measured at 50% correct adaptively
  - Target: AuSTIN sentences [3]; Masker: 2-talker babble (e.g., science news)
- Test Conditions
  - Target-masker spatially co-located vs. 180° angular separation
  - VAS created with individual head-related transfer functions (HRTF) recorded behind-the-ear (BTE) from BICI users and with KEMAR HRTFs recorded in-the-ear (ITE) for NH children
  - Binarual vs. Monaural
  - Direct audio input to CI processors or circumaural headphones for NH children
  - Stereo vs. better-ear (BICI) or left-ear (NH) only

METHODS

- Formula to Calculate Intelligibility Benefit
  - Differences provided up to 6 dB benefits
  - Target hearing and from KEMAR HRTFs measured BTE.

RESULTS 1: ITD and ILD Calculated from Individual HRTFs

- BICI users had similar ITD (<1.5 kHz) from BTE HRTFs as NH children tested with KEMAR HRTFs, but smaller ILDs between 4-8 kHz

RESULTS 3: Intelligibility Benefit from Unmasking Cues

- All children in the BICI group showed a head shadow benefit >2 dB
- Very small benefit from summation likely due to intensity in the added ear
- In the BICI group, interaural differences provided up to 6 dB benefits except for one child who demonstrated an “anti-benefit”
- The ranges of intelligibility benefits from monaural and binaural cues are similar between BICI and NH groups

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