Factors contributing to variable sound localization performance in bilateral cochlear implant users
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INTRODUCTION
Bilateral cochlear implant (BCI) users generally demonstrate better sound localization abilities compared to unilateral CI users. 1, 2 However, among BCI users, localization ability varies dramatically. 3 ...as BiCI users approach normal hearing localization performance...while others can only detect whether the sound is coming from the left or right.

Several factors may contribute to this variability:
- Hardware and engineering limitations 3, 4
- Surgical-based limitations 5, 6
- Patient-dependent factors

The aim of this study was to investigate whether patient-dependent factors related to hearing history contribute to the observed variability of sound localization ability in BCI users.

METHODS
Stimuli
- Train of four pink noise bursts, 170 ms each
- Inter-stimulus-interval (ISI) = 50 ms
- Signal presented at 50 dB SPL ± 4 dB SPL level rove ± 10 dB spectrum rove
- Stimuli were randomly presented from each of the 19 speaker locations 15 times. A total of 285 trials were obtained per subject.

Task
Participants listened to stimuli in the free field through their clinical speech processors and indicated on a graphical user interface the perceived location of the signal.

Analysis
- Two metrics were calculated to estimate sound localization ability

1. Root-mean-square (RMS) localization error
   - Evaluates sound localization precision

2. Angle at which d prime (d') equals 1
   - Localization responses were linearized by applying an arcsine transformation; then d' was calculated for each left/right location of the same angular value. A line, constrained to pass through zero, was fitted to the d'-values and the angular discriminability was estimated as the point where d'=1. 7
   - Responses were analyzed from -50° to 50°.

RESULTS
CONCLUSIONS
Factors related to hearing history do not appear to account for the variability in either of the metrics used to assess sound localization ability in this study.
This suggests that other factors – such as individual differences in the placement of electrodes, hearing aid use, processor type, and the extent of neural degradation – might account for the observed variability.

REFERENCES

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