Introduction: spatial hearing is poor with bilateral cochlear implants. Bilateral cochlear implants (BCIs) facilitate improved sound localization; however, even with two implants, performance in patients is worse than that of people with typical hearing (TH) [Fig. 1a] [1]. BCI listeners can use interaural level difference (ILD) cues for sound localization [2], but lack access to interaural time difference (ITD) cues [3], rendering ITD sensitivity poor in BCI patients (Fig. 1b) [4, 5].

The following factors contribute to poor ITD sensitivity with BCIs:

1. Asymmetric insertion depth
2. Different lengths in electrode arrays across ears
3. Asymmetric neural health
4. Different electrode-nerve interface.

ITD sensitivity varies along electrode array, due to:

- Asymmetric insertion depth
- Different lengths in electrode arrays across ears
- Asymmetric neural health
- Different electrode-nerve interfaces.

Methods

Individualized "mixed rate" strategy improves localization when using the ITDs delivered via direct stimulation in TH listeners [6]. We hypothesize that ITD sensitivity is a prerequisite for improved localization in free field when using the mixed-rate strategy. By using a research processor to deliver synchronized ITDs at low rates, we predict that listeners with lower ITD thresholds at the "best" electrode pair will have better localization when using the individualized mixed-rate strategy as compared to clinical-like strategies, since the latter do not deliver synchronized ITDs at low rates.

Hypothesis

We hypothesize that ITD sensitivity is a prerequisite for improved localization in free field when using the mixed-rate strategy. By using a research processor to deliver synchronized ITDs at low rates, we predict that listeners with lower ITD thresholds at the "best" electrode pair will have better localization when using the individualized mixed-rate strategy as compared to clinical-like strategies, since the latter do not deliver synchronized ITDs at low rates.

Summary

Bilateral CI users show poor spatial hearing abilities. When using clinical processors, binaural cues are limited or absent. We used a research processor that allows presentation of stimuli either through direct stimulation or via free field to test the efficacy of mixed-rate strategies. Early stages of this experiment suggest that an individualized (i.e., best) or interlaced mixed-rate strategy improve localization with direct stimulation. However, the extent to which these benefits translate to free field localization remains uncertain.

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