EFFECT OF FREQUENCY-PLACE MAPPING ON SPEECH INTELLIGIBILITY: IMPLICATIONS FOR A COCHLEAR IMPLANT LOCALIZATION STRATEGY

Matthew J. Goupell[1], Bernhard Laback[1], Piotr Majdak[1], and Wolf-Dieter Baumgartner[2]

[1]Acoustics Research Institute, Vienna, Austria
[2]ENT-Department, University Hospital, Vienna, Austria

The current generation of cochlear implants (CI) is not optimized for sound localization. Nonetheless, developing a sound localization strategy should not hinder a cochlear implant's main function, to help the listener understand speech. The Oldenburger Sentence Test was used to test speech intelligibility in quiet and at several different signal-to-noise ratios with seven CI and six normal hearing (NH) listeners using a CI simulation. The experimental parameters that were varied were the upper frequency boundary (M) and the number of electrodes or channels (N). Both "matched" frequency-place conditions (M = N) and "unmatched" frequency-place (M ≠ N) conditions were tested. The lower frequency boundary of the speech was always fixed, different from previous studies on the number of channels for speech understanding.

It was found that for the matched conditions the number of channels can be decreased from 12 to 8 and speech intelligibility is not significantly affected, even for the lowest signal-to-noise ratios. It was also found that for the unmatched conditions speech intelligibility was insensitive to small spectral changes (±2 M or ±2 N) but not large ones. In the end, 5 of 17 different frequency-place mappings were found to provide the same speech understanding as the normal CI mapping.

The results have implications for new mapping strategies for CI listeners. A sound localization strategy would need to implement both interaural cues (for horizontal plane localization) and spectral cues (for vertical plane localization). If spectral cues are superimposed on the normal speech spectrum, this might be detrimental to speech understanding in CIs. These results show that it would be possible to separate the spectral cues from the speech information, which may help speech understanding in the localization strategy.

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