EXPERIMENT 1: SIMULATIONS WITH NH SUBJECTS:

Acoustical stimuli for NH subjects:

24 conditions: 4 F0s x 2 Frequencies regions (F) x 3 Band-Widths (Bw)

- F0 = 20,35,60,104 Hz
- Bw = 1/3, 1, 3 dB/oct

As a function of F0 and F: Simulates different electrodes

As a function of Bw: Simulates single- vs multi-electrodes

Rate discrimination with NH subjects:

As a function of F0 and F:

- Best performances were obtained with F0 = 60 Hz (p = 0.01)
- Interactions are significant between F0 and F

As a function of Bw:

- Best performances were obtained with Bw = 3 dB/oct (p = 0.01)
- Interactions are significant between Bw and F (p = 0.01)

Rate discrimination as a function of F0:

As a function of F0:

- Threshold differences are significant: CIs vs NH
- Performance improves when we stimulate a more apical region

As a function of Bw:

- Threshold differences are significant: CIs vs NH
- Performance improves when we stimulate a more apical region

How does pitch discrimination behave at fairly low rates?

When Bw increases, performance improves, but this improvement is smaller at higher rates.

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Discussion:

- Performance of CI users: not finished yet, but preliminary studies on 3 subjects suggest that:
  - there is some variability between subjects.
  - overall performances are worse than for NH.
  - seem to be better when we stimulate the apex.

Confirm and extend the results obtained by Krumbholz et al. (2008).

Who used same F0 in Hz at different F:

- -3dB/oct

Electrode ranking:

- 20 vs 40, 40 vs 80, 80 vs 160 pps

Comparative in Bw

Continuous background pink noise; mask distortion products

- Narrow Bw stimulus set at 15 dB SL
- Fixed SNR at each auditory filter output
- Overall signal levels vary from 47 dB SPL to 65 dB SPL

INTERVENTION

Temporal pitch discrimination

Electrical biphasic pulse trains. anodic-first

500 ms duration monopolar configuration 45 µs/phase

Electrode selection:

- stair step error

Effects:

- F0 (p < 0.01)
- F (p < 0.01)

Interactions:

- F0 x F (p < 0.01)

Discriminations thresholds get lower when:

- F0 or F increase.

The threshold difference (between F0 = 1200 and 3600 Hz) gets slightly better when the F0 increase.

The same results are plotted separated for each F:

- F0 = 1200 Hz (basal)
- F0 = 3600 Hz (apical)

Performance significantly improves when we stimulate a more apical region

Discussion:

- Performance of NH: - improves when F0 increases
  - also slightly improves when we stimulate a larger portion of the cochlea (larger Band-widths), effect of loudness?

Performance of CI users: not finished yet, but preliminary studies on 3 subjects suggest that:

- there is some variability between subjects.
- overall performances are worse than for NH.
- seem to be better when we stimulate the apex.

References:

- Carlyon et al., 2008, JASA, vol 108(3): 1170-1181
- Long et al., 2005, Ear Hear Vol 26(3): 251-313

This work was supported by a grant from the French National Research Agency (ANR-11-PDOC-0022)