Optimising Place-Pitch Perception for CI users: Adjustment of the Frequency Allocation to the Electrodes
Mary L Grasmeder, Carl A Verschuur

Research Question:
Should frequency allocation be adjusted on an individual basis?
Consider the issues:
- Cochlear implant recipients mostly use the default frequency allocation
- A frequency map matched to the normal acoustic tonotopic frequencies may be beneficial for cochlear implant (CI) users (e.g. Baskent and Shannon (2004)).
- CI users access the auditory system via spiral ganglion cells not hair cells (Fayad and Linthicum, 2006).
- Insertion depths vary widely (Radloff et al, 2008)
- There is limited place-pitch sensitivity towards the apex, at least for some CI users (Boyd, 2011).

Frequency Allocation Experiment:
Participants tried 3 allocations for at least 6 weeks but could return to their everyday map if they wished.
The maps were their clinical map, a Greenwood (tonotopic) map and a mapping to the position of the spiral ganglion (SG). A fourth allocation (Reduced Frequency Range, RFR) was tried during the last session only.

Outcome Measures:
- BKB sentences in fixed noise performed immediately after fitting and after acclimatisation
- Map quality questionnaire completed
- Electrode discrimination ability assessed

Participants:
- 12 adult CI users; 10 with good quality X-rays included in the analysis
- CI for at least 1 year and BKB score >= 80% correct in quiet
- MED-EL device with standard electrode array

Results:
- Limited use of the SG and Greenwood maps
- SG and Greenwood maps rated as having poorer sound quality than the clinical map (F(2,18)=14.7, p<0.001)
- No acclimatisation effect observed

Discussion
- RFR map may help to make some speech sounds more discriminable if discrimination ability is poor for apical electrodes
- Greenwood map offered poor performance; experienced CI users have acclimatised to the clinical map

Conclusions
- Frequency allocation should be determined on an individual basis
- The insertion angle and/or a measure of ability to discriminate electrodes may help to optimise the fitting

References: