



UNIVERSITY OF
CAMBRIDGE

SOUND 
Sensory Optimisation Using Neuroscience for Devices

Cambridge
Hearing Group 

SOUND Lab Update

Music Studies

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SOUND



Sensory Optimisation Using Neuroscience for Devices

Improving sound perception with hearing devices for adults and children with hearing loss

- Measuring **brain responses** and conducting **listening tests** to understand how people **hear** and how it affects **speech perception** and **music enjoyment**
- Changing **hearing device settings** to **optimise sound delivery**
- Develop **training schemes** to help **make the most of hearing**



- We are a mixture of researchers including PhD & Masters students, clinician-researchers and academic researchers

- We work closely with patients to design our research and feedback summaries of ongoing work

LOUIS' PROJECT



“Characterizing and alleviating distortions in sound and music quality in adults using cochlear implants: a music re-engineering approach”

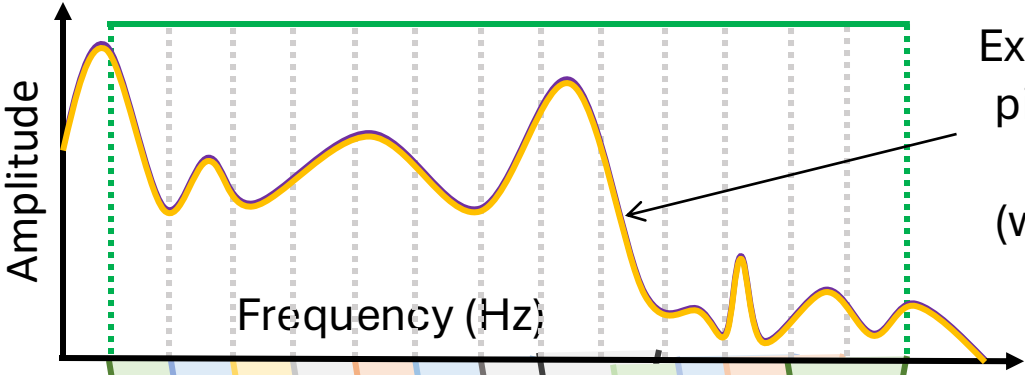
Goal 1 – Assess sound quality

Understand what may cause problems for sound quality of music and speech.
example: electrode insertion depths

Goal 2 – Improve sound quality

Finding ways to improve and/or compensate for poor sound quality.
example: modifying the mapping strategy

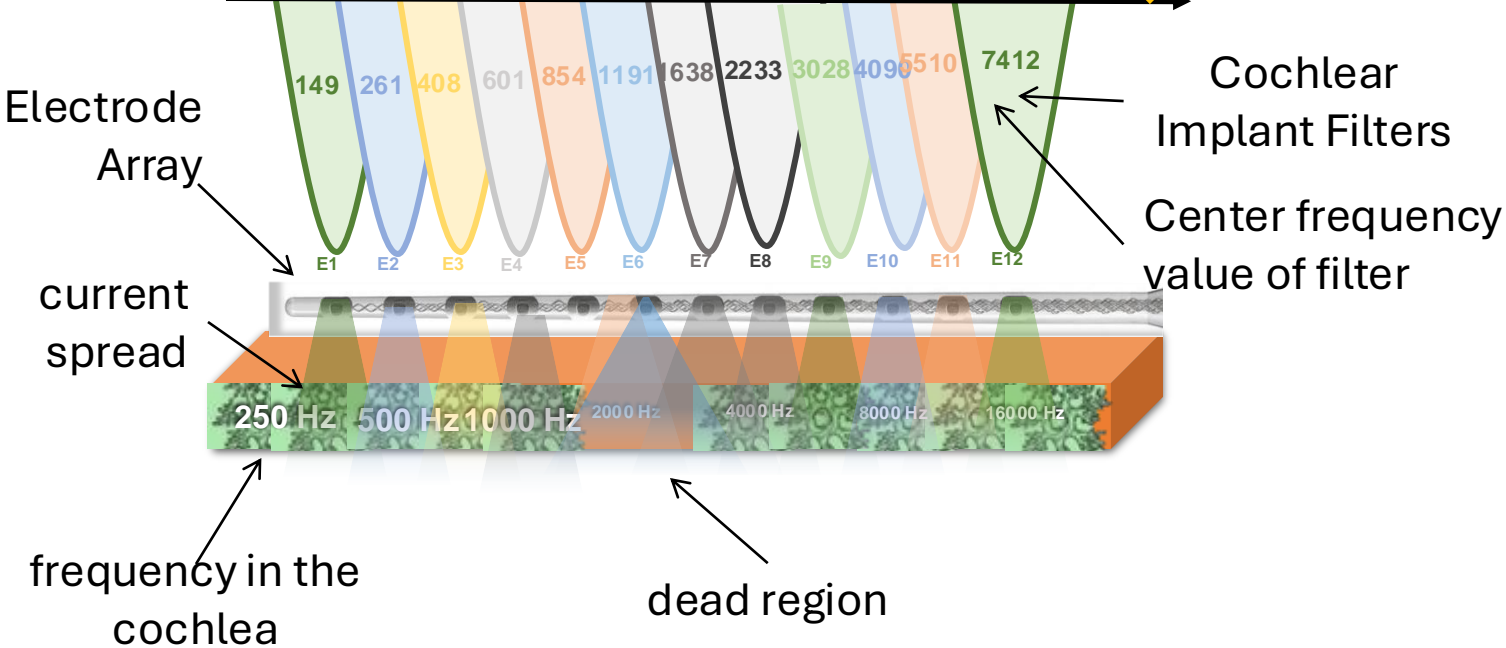
INDIVIDUAL FACTORS?



Example of a picture of a sound (waveform)

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Understand what may cause problems for sound quality of music and speech. example: electrode insertion depths

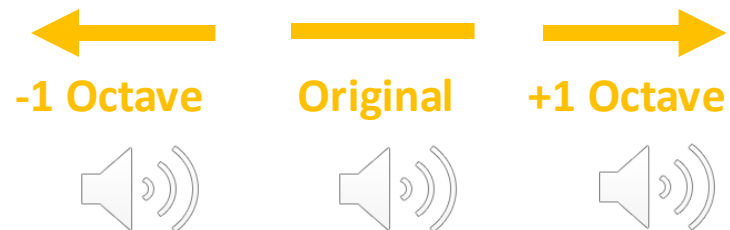
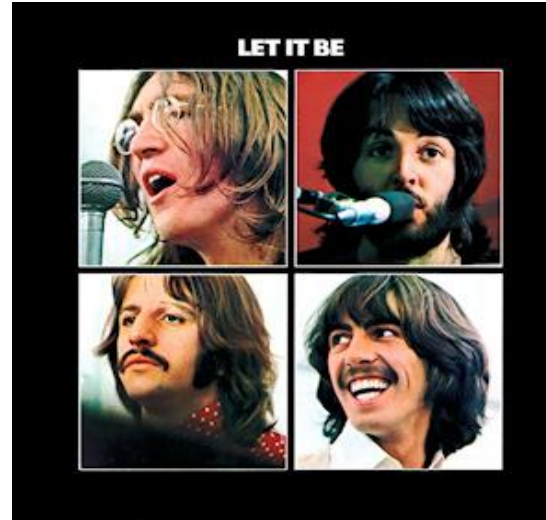


ASSESSMENT?

Change frequencies played to different electrodes to see if it is better

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Change frequencies played to different electrodes to see if it is better



Once we understand what affects sounds for an individual, what can we do to improve sound quality?

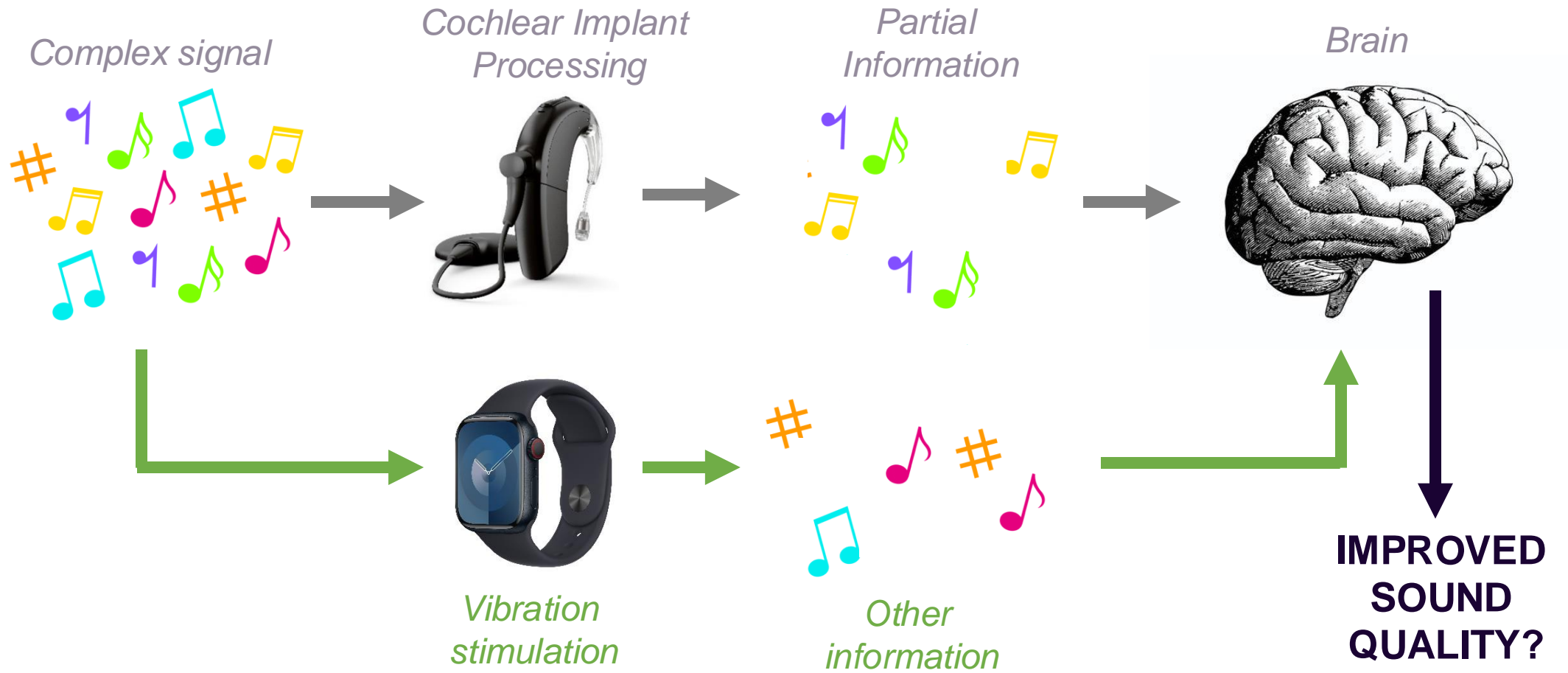
Goal 2 – Improve sound quality

Finding ways to improve and/or compensate for poor sound quality.

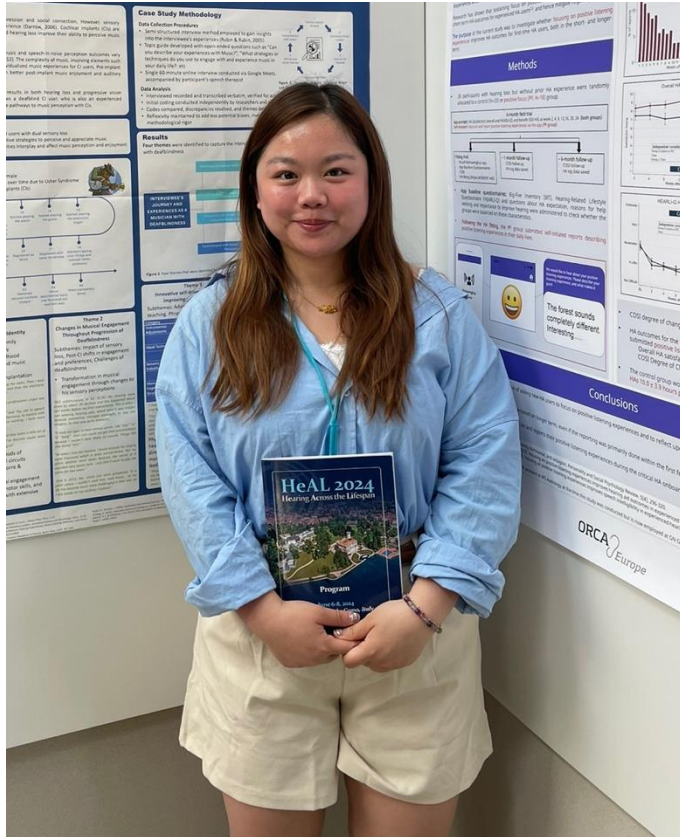
example: modifying the mapping strategy

- Strategy 1– Adjust frequency settings**
- Strategy 2– Convey differently information...**

For example... by using an Apple Watch



Cynthia's project



"Frequency discrimination and music enjoyment in cochlear implant listeners"

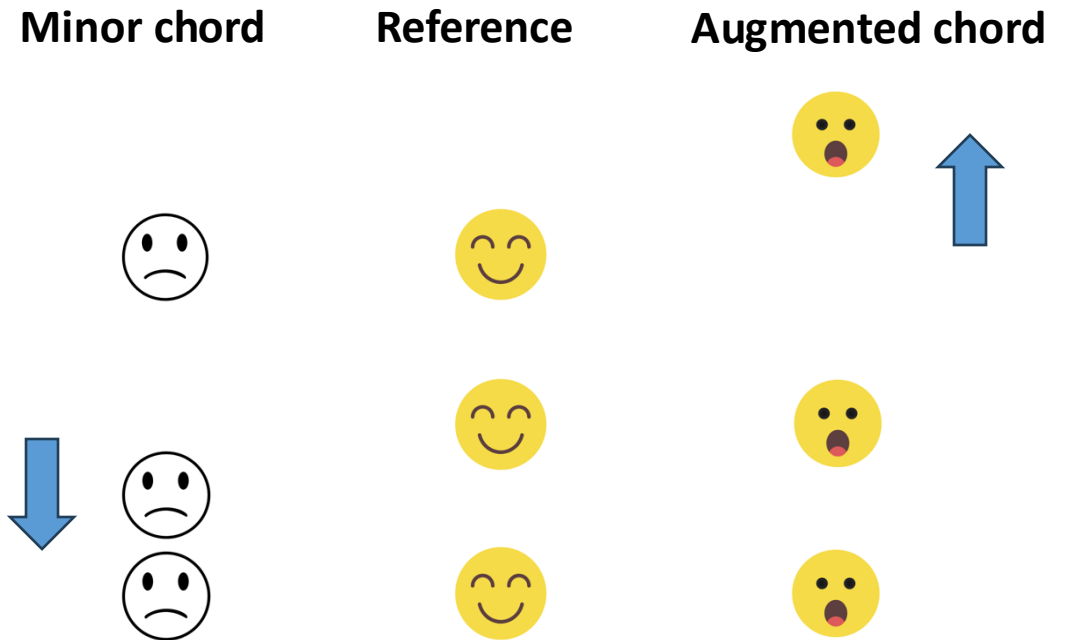
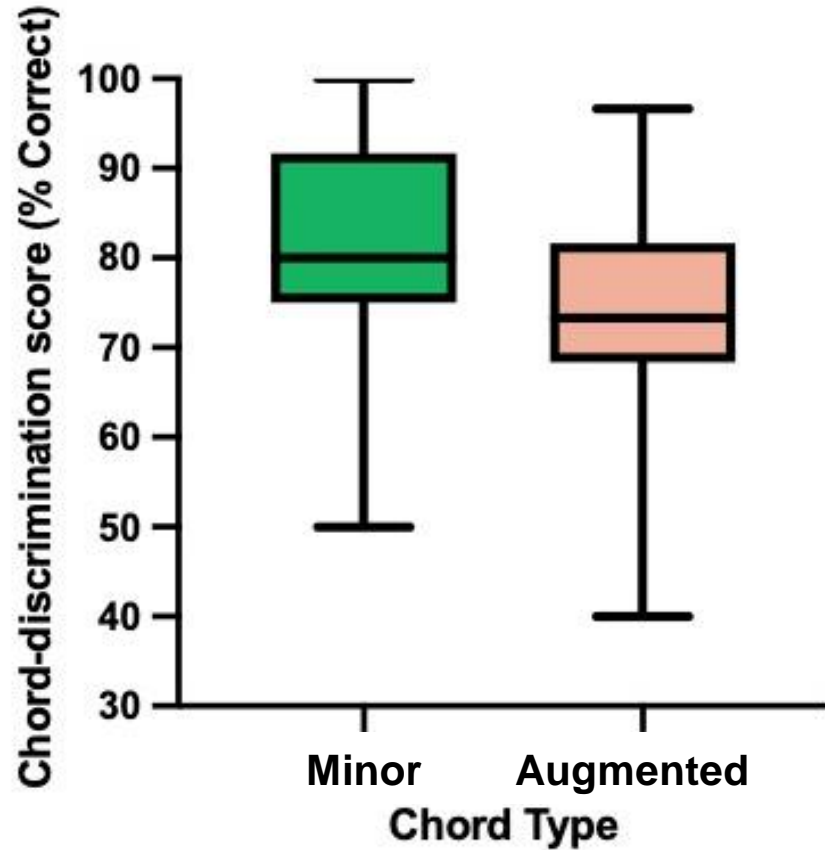
Goal: To understand more about how CI listeners hear sounds that are similar

Affect speech-in-noise?

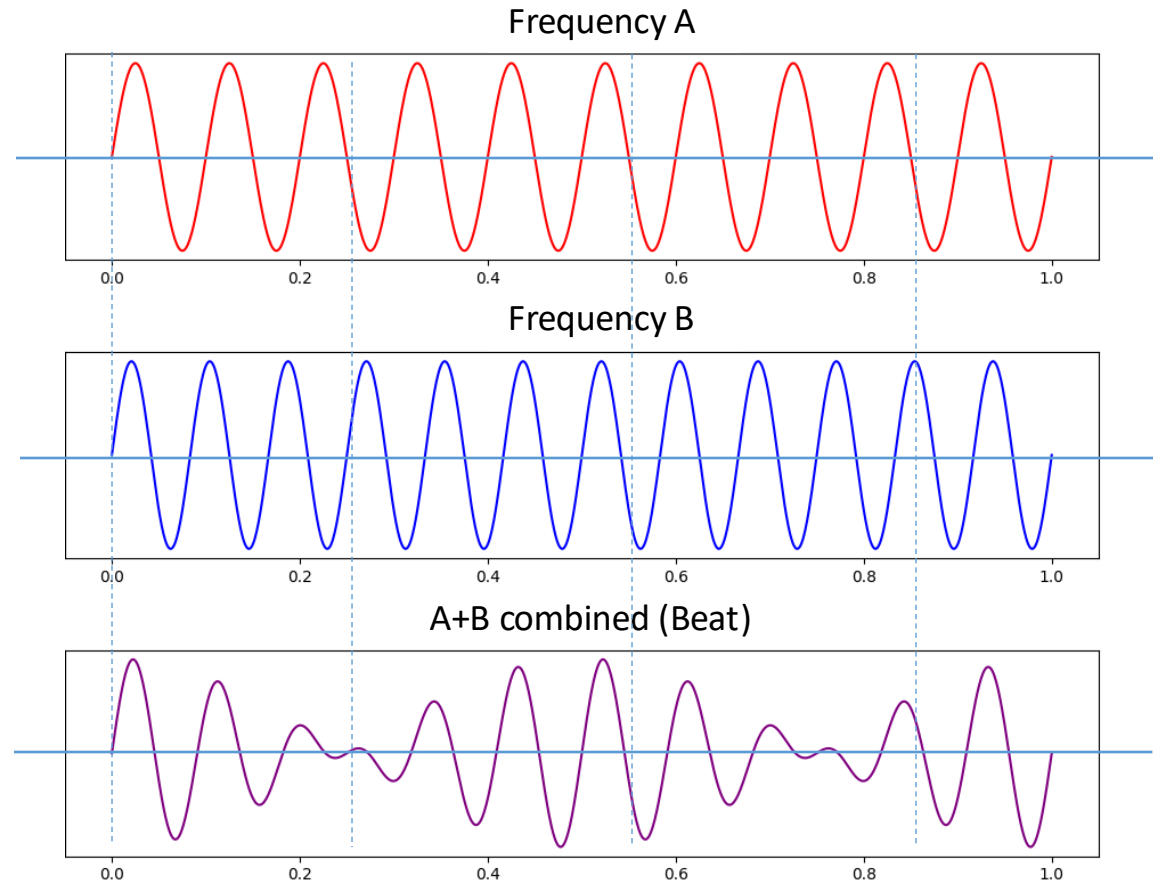
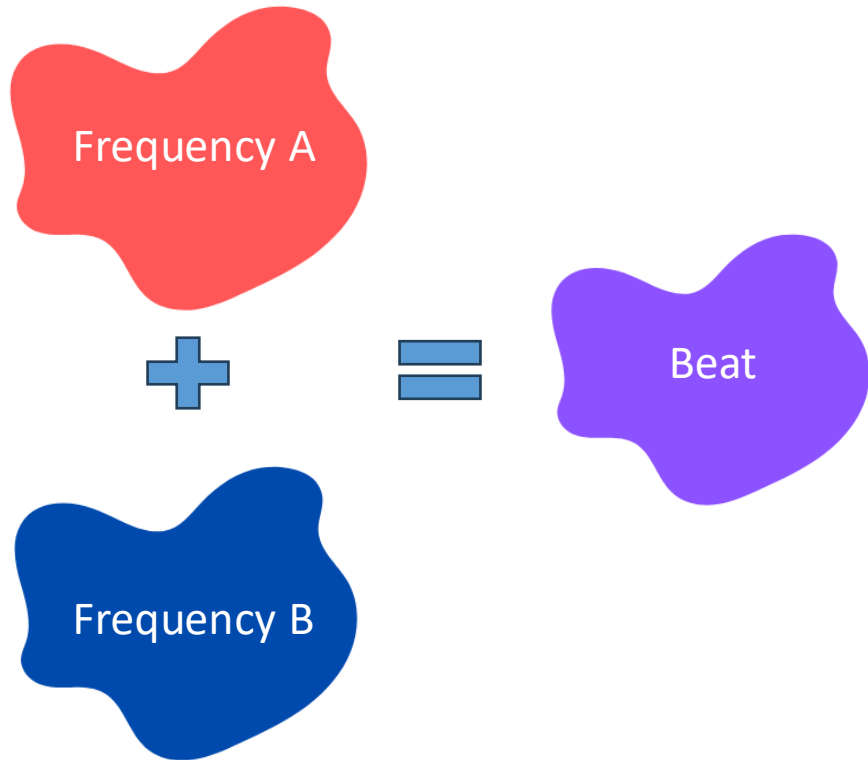
Affect music?

Affect music enjoyment?

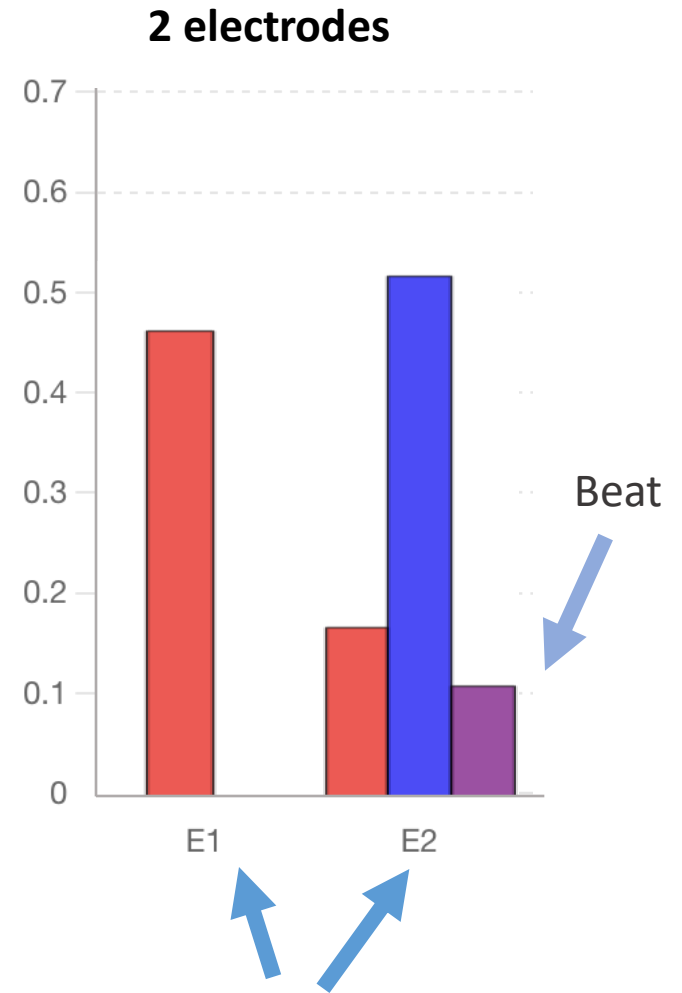
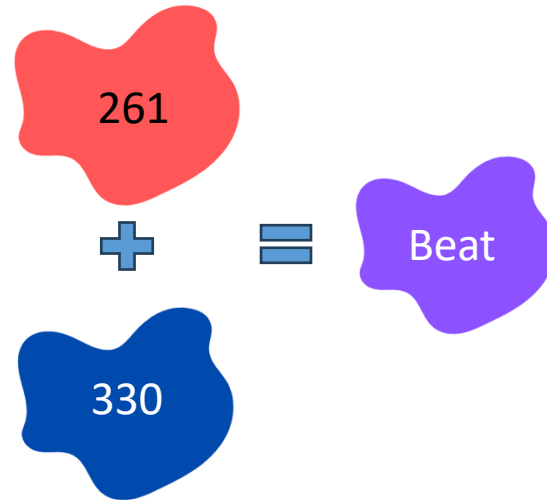
Cochlear implant users can hear minor chords better than augmented chords!



What happens when frequencies are close together?



What do cochlear implant listeners hear?



The sounds may stimulate the same or adjacent electrodes

Can cochlear implant listeners use beats in hearing sounds?

Maybe! It depends!

Low frequency sounds



High frequency sounds



Next steps?

Why are CI users able to use beats in low frequencies but not high frequencies?

Does it affect music and speech-in-noise perception?

Does this affect music enjoyment?



Printed sheets about cochlear implant candidacy next steps

Anonymous, but if you want us to keep you updated please add name and email address

A last section on research, if you have any ideas please write them down.

If you are interesting in helping with research please add your name and email address in that section.

Survey of next steps for cochlear implant candidacy

Please can you indicate top three things to do with changing the cochlear implant candidacy guidelines that we should be looking at. Please write 1 (top priority), 2 or 3 next to the options or write other ideas in comments. You can use just one number if you prefer

- Cochlear implants for people with a hearing loss in one ear
- Cochlear implants for people with a hearing loss in both ears but one not in criteria so currently don't receive any implants
- Bilateral cochlear implants for adults
- Candidacy assessed per ear
- Changing lowering the hearing thresholds for cochlear implants so that people with better hearing can be offered one
- Special criteria for people who can use electro-acoustic (enough hearing in implant ear to have hearing aid and implant combined)
- Change speech tests to better reflect challenges faced in everyday life e.g. test with noise or test both ears together

Any other suggestions or comments on candidacy



Thank you for
your ongoing
support for our
research

We couldn't do
it without you

ongoing work