

How many settings does an OTC hearing aid need?

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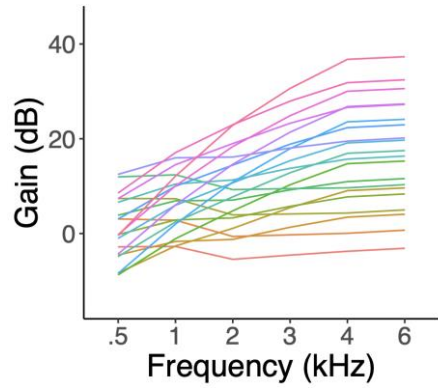


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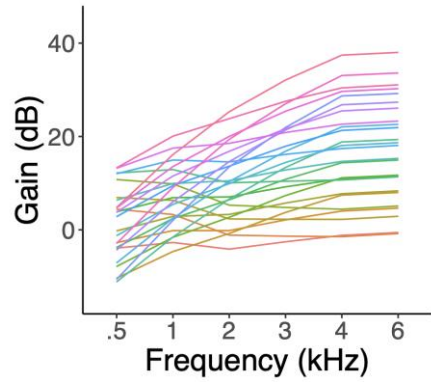


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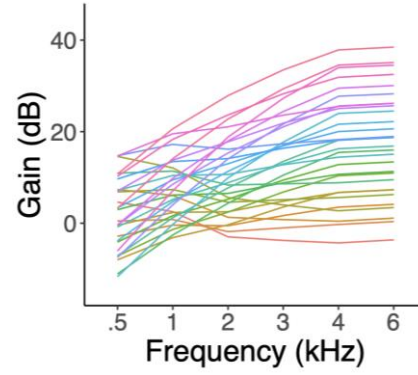
20 Settings



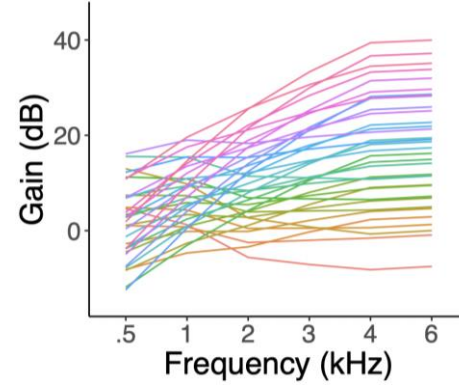
25 Settings



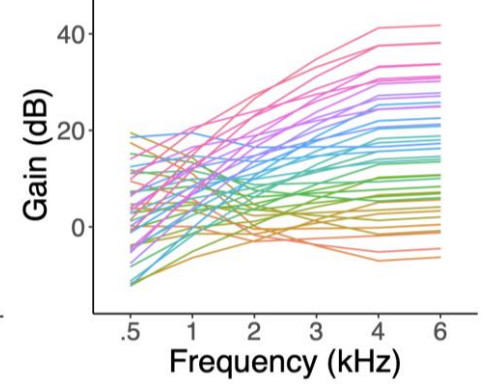
30 Settings



35 Settings



40 Settings



How do you design OTC hearing aid settings so that any user could find a setting that gave them good audibility and that they liked?

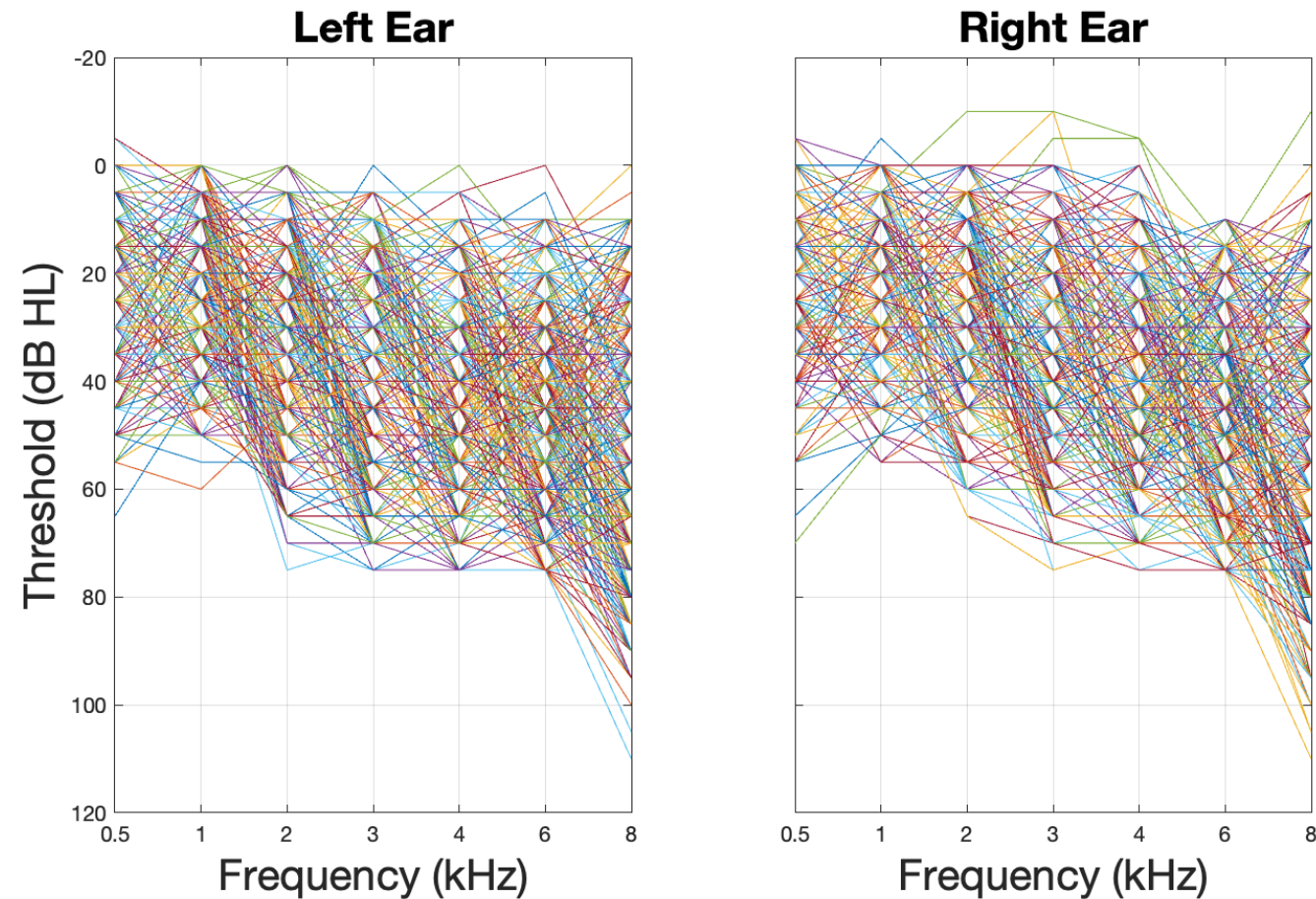
How many settings would you need to cover most people?



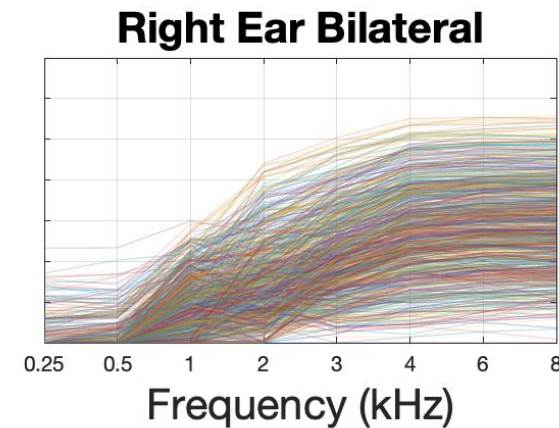
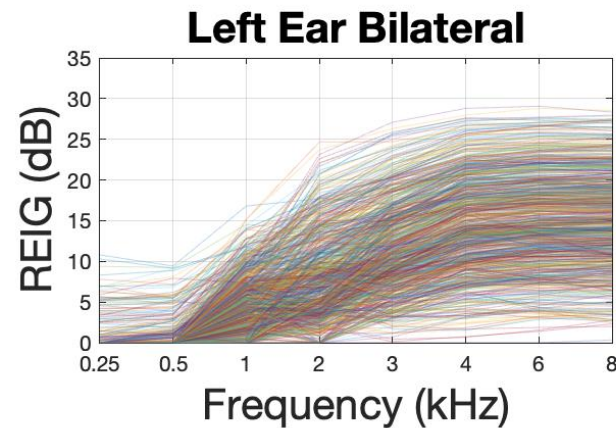
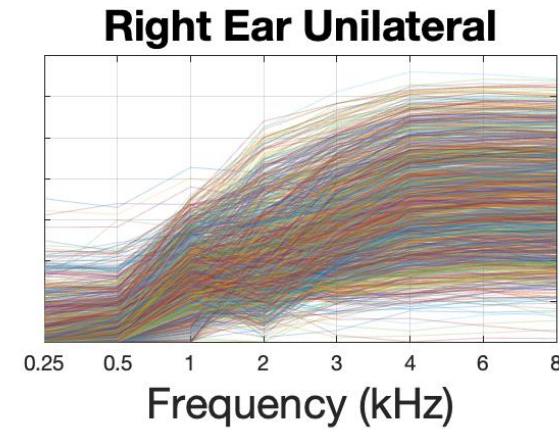
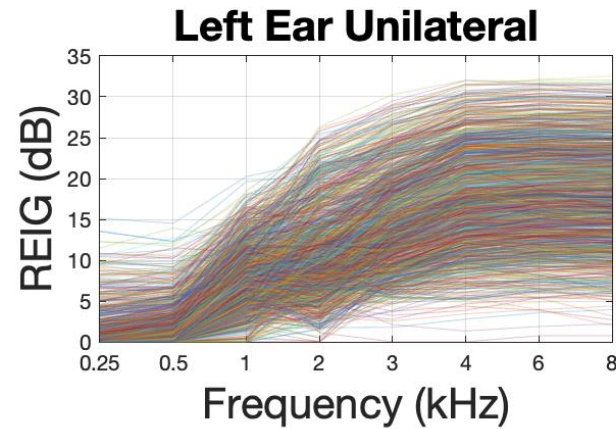
Designing the OTC Settings



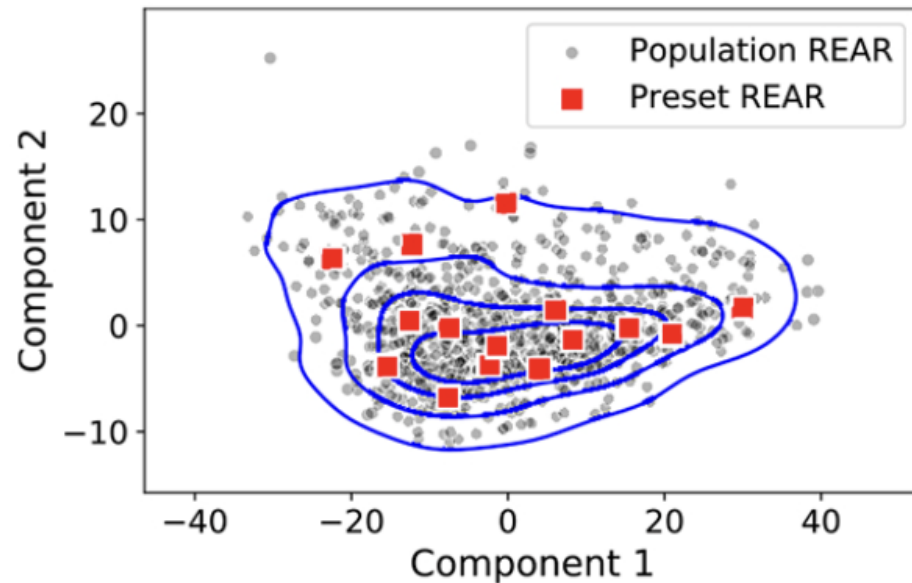
Step 1: Estimate the hearing losses in the user population.



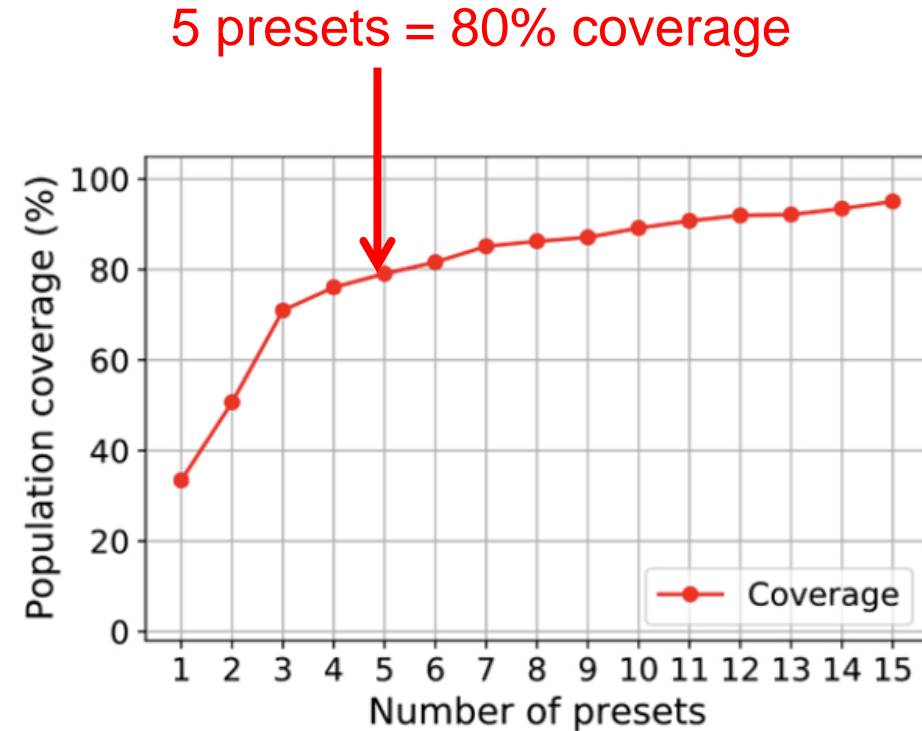
Step 2: Calculate all possible NL2 target configurations.



Step 3. Find presets that cover as many users as possible.



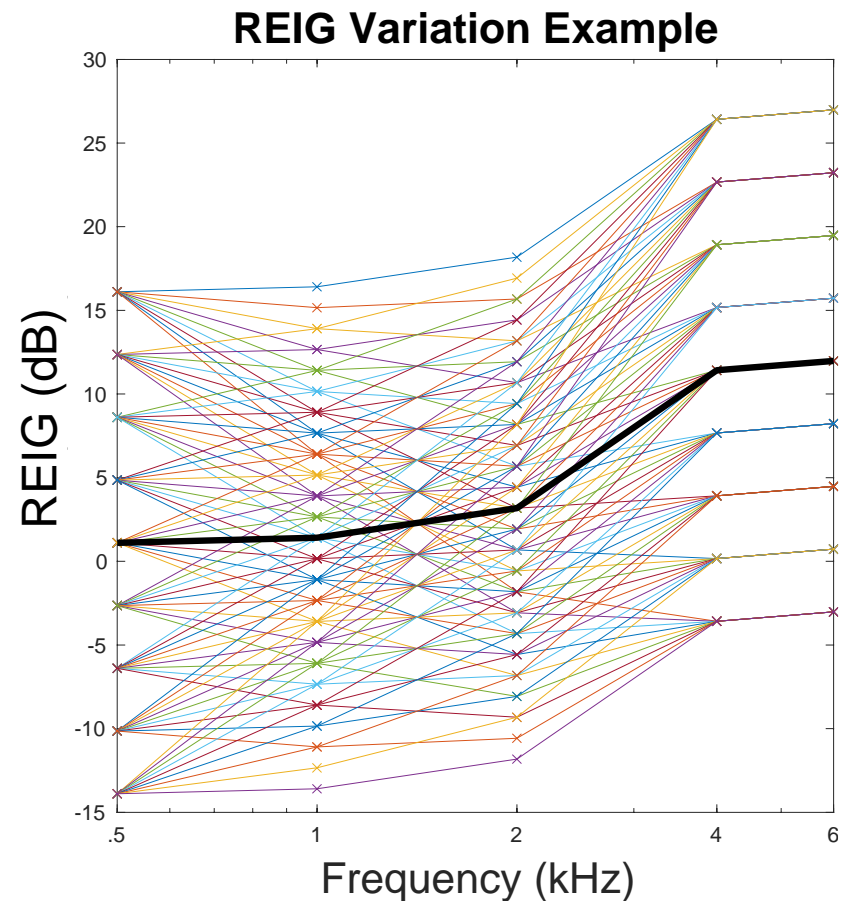
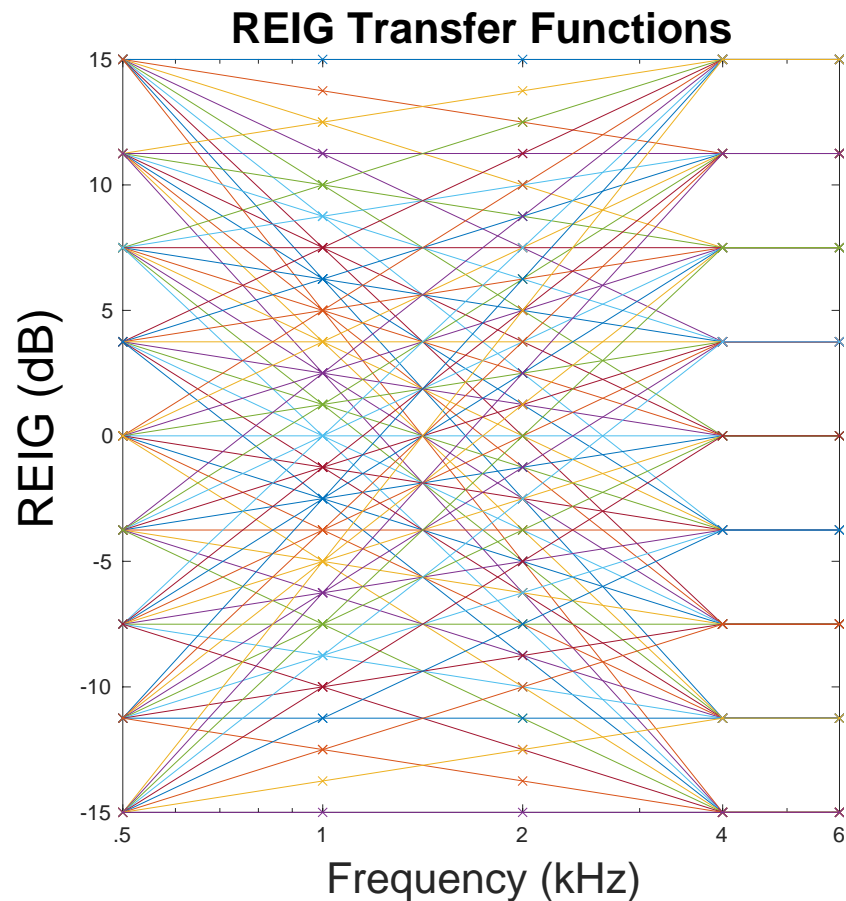
(a) PCA embedding of the 15 presets



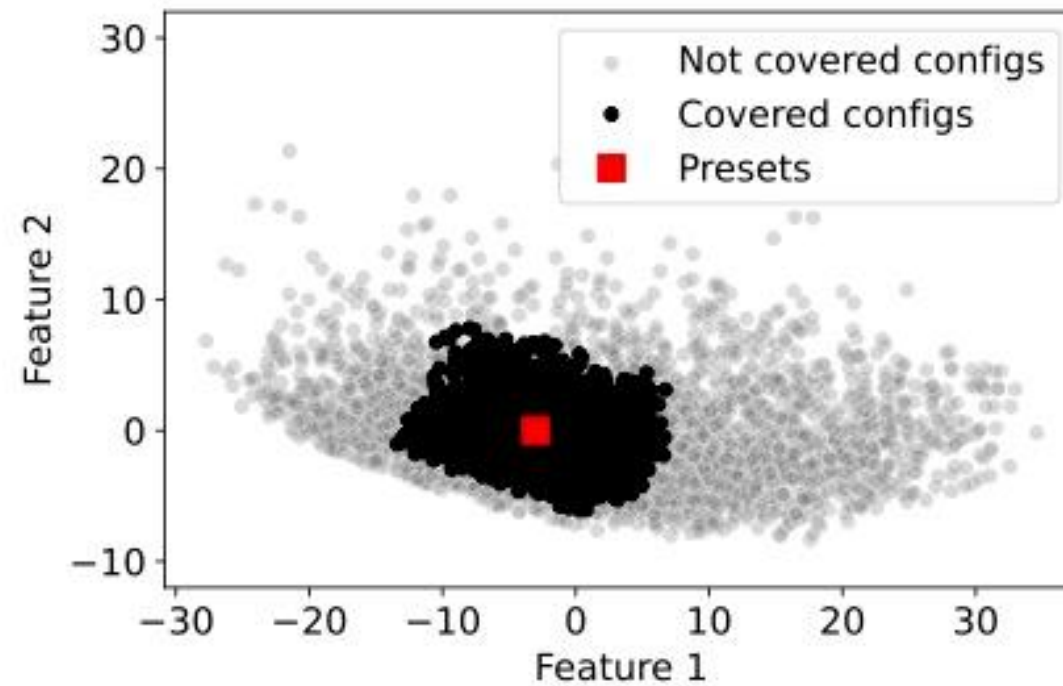
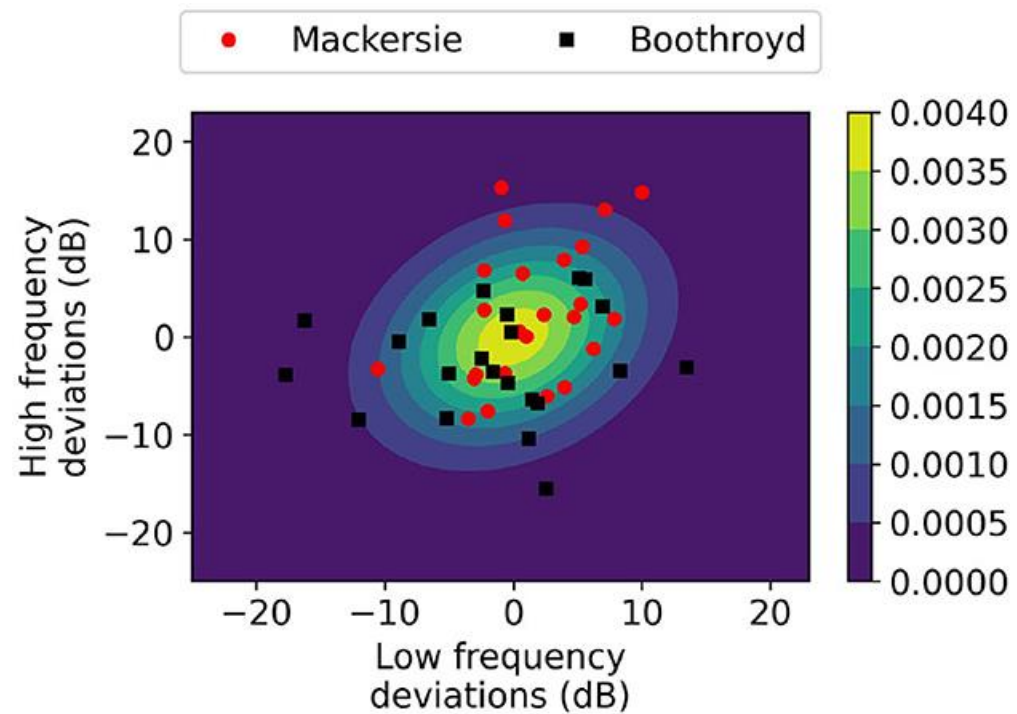
(b) Coverage as presets are increased

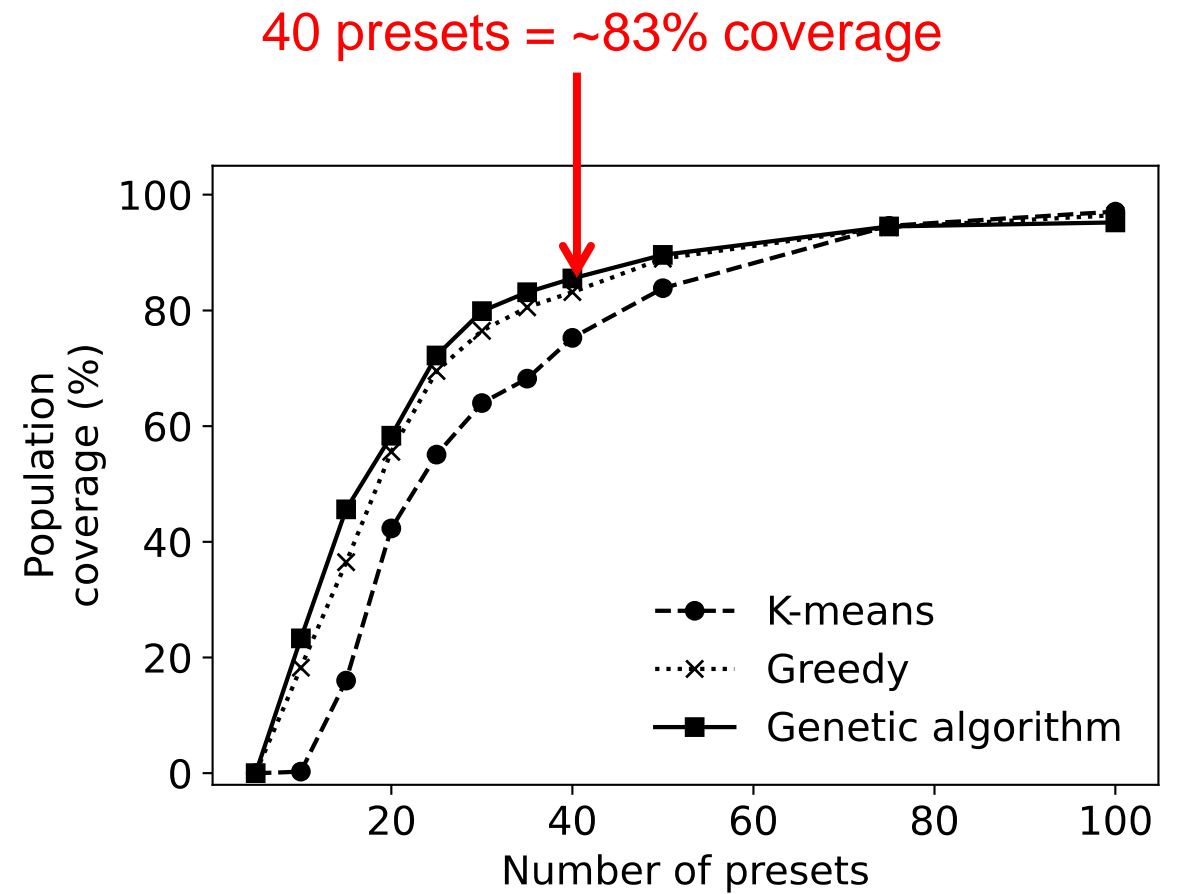
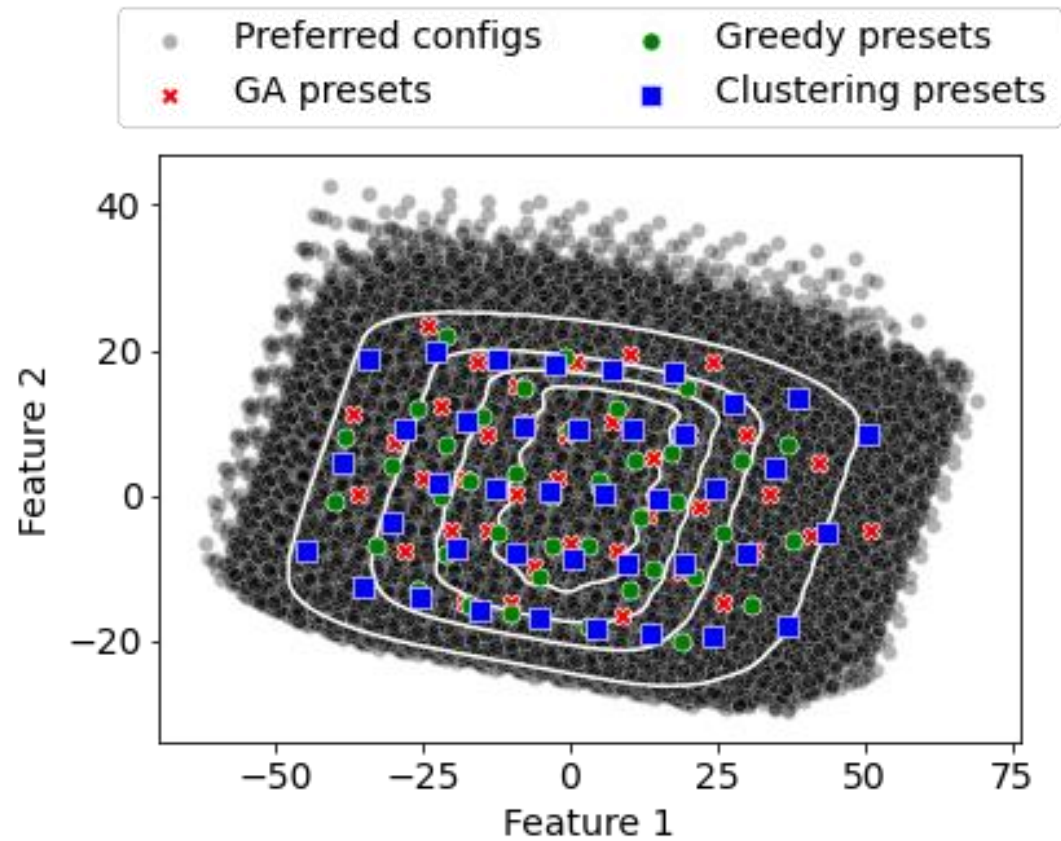


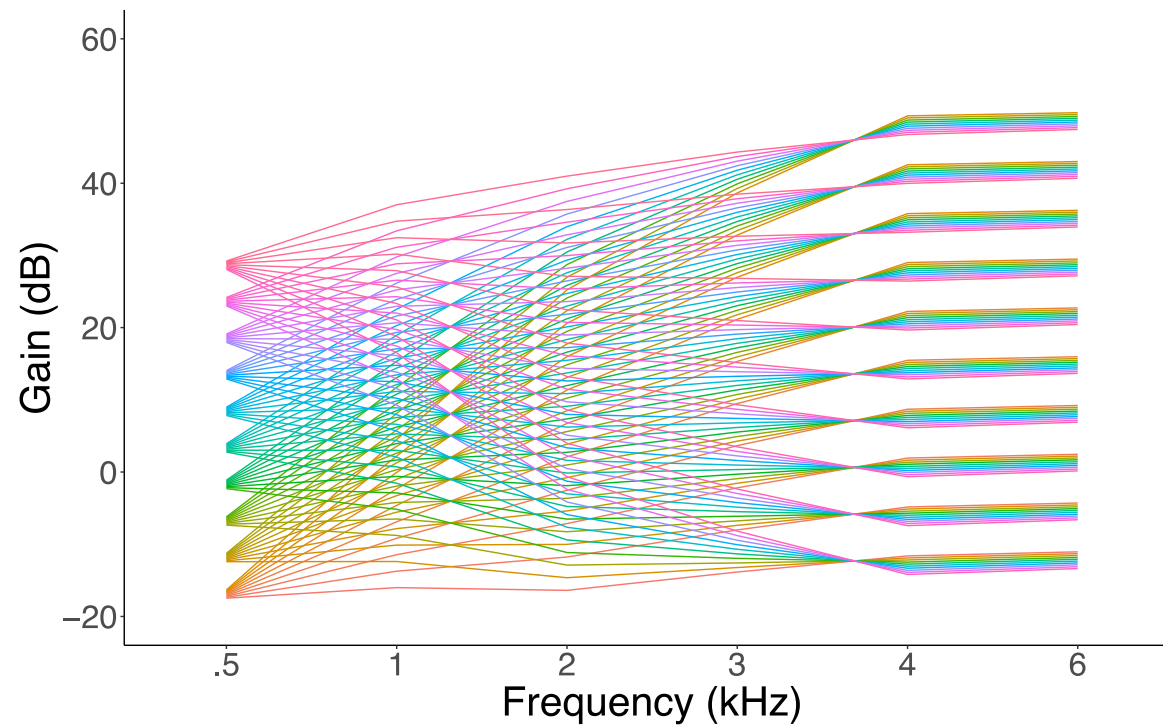
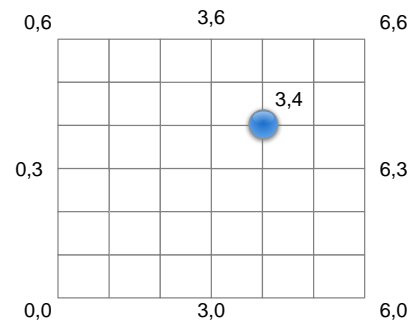
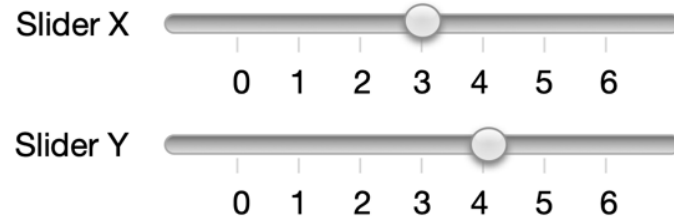
Step 4. Incorporate preference variations.



Step 3 Again:







Do more settings actually make a difference to users?

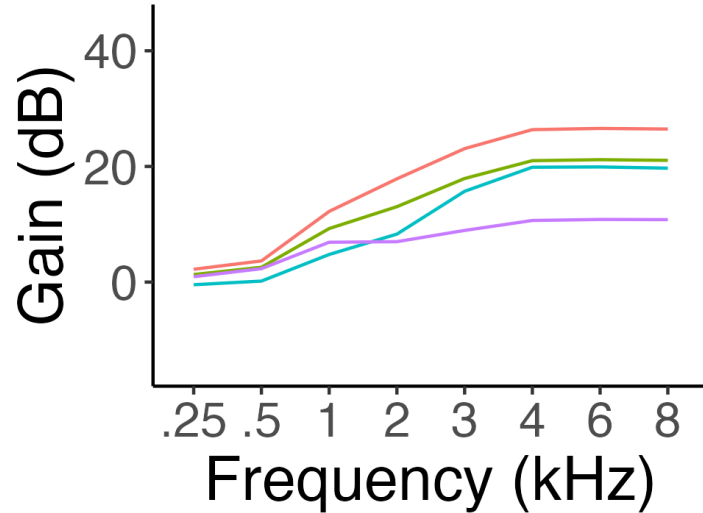


Testing Settings Collections of Different Sizes



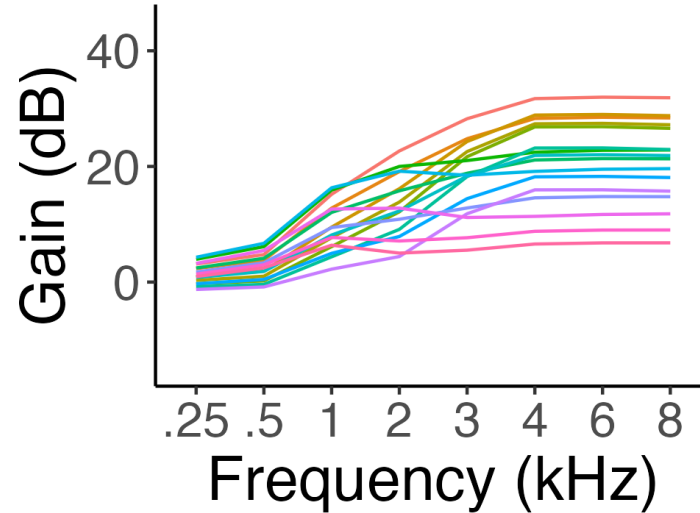
82% Coverage
(no preference variations)

4 Settings



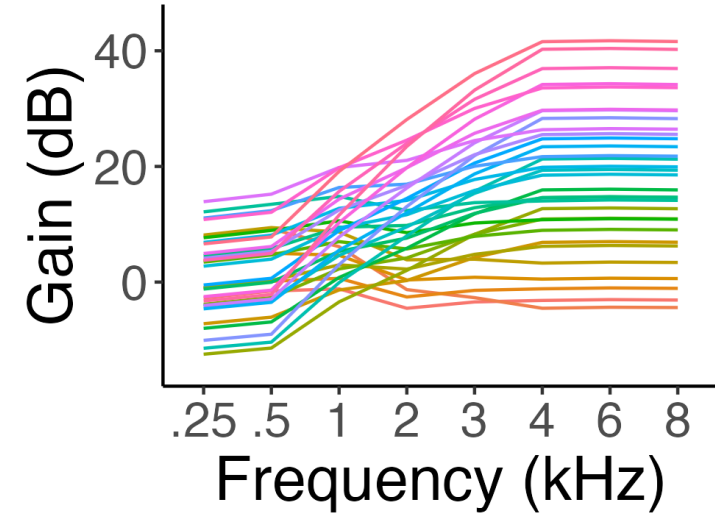
97% Coverage
(no preference variations)

16 Settings

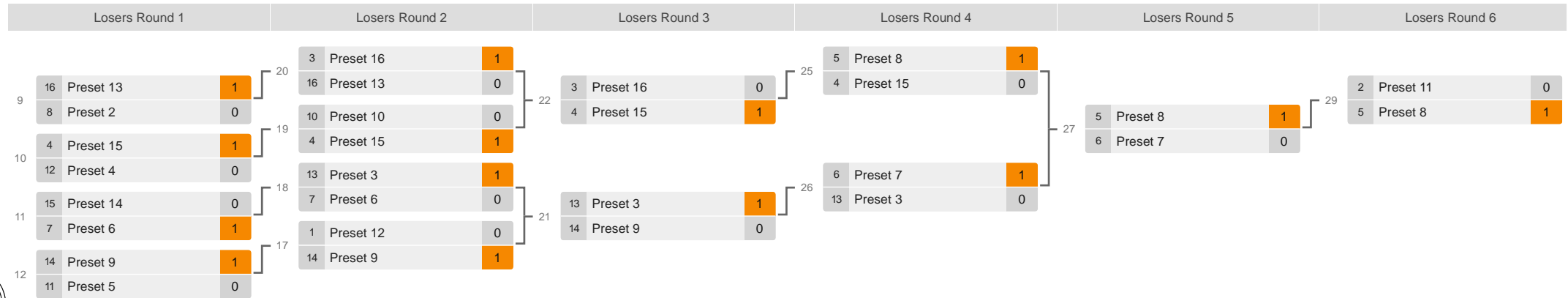
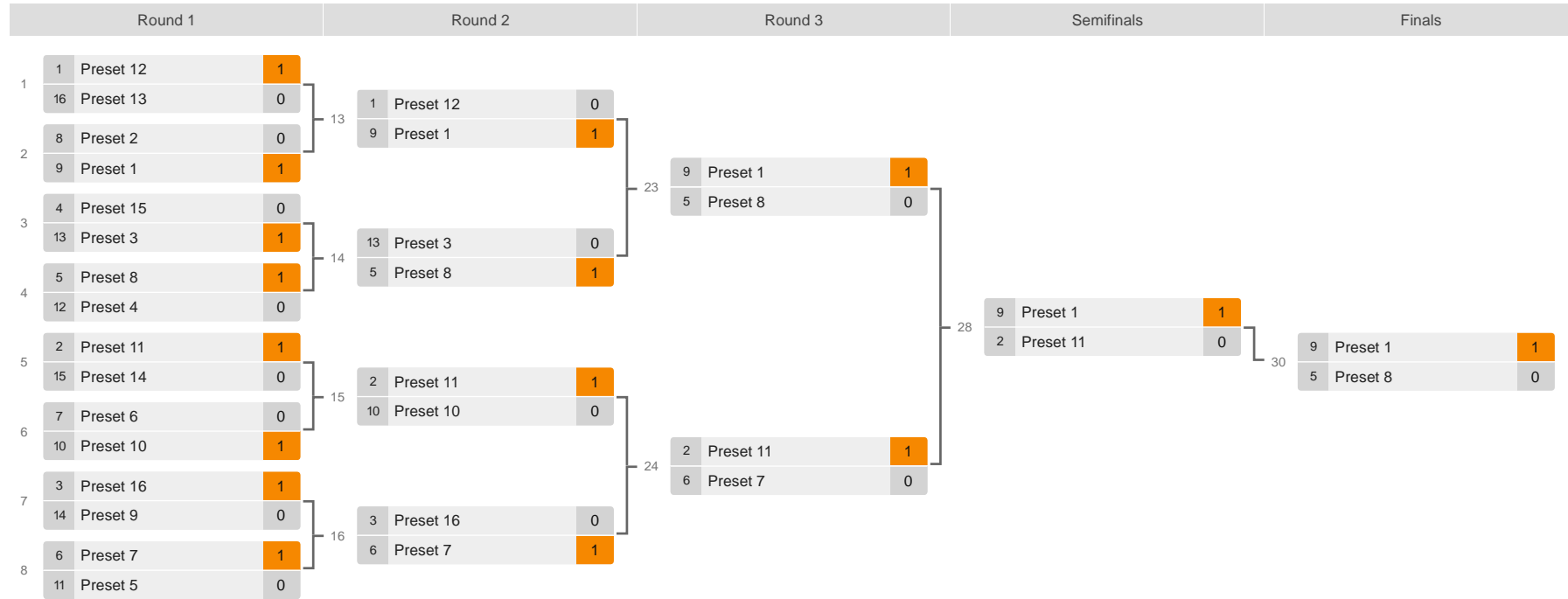


81% Coverage
(with preference variations)

32 Settings

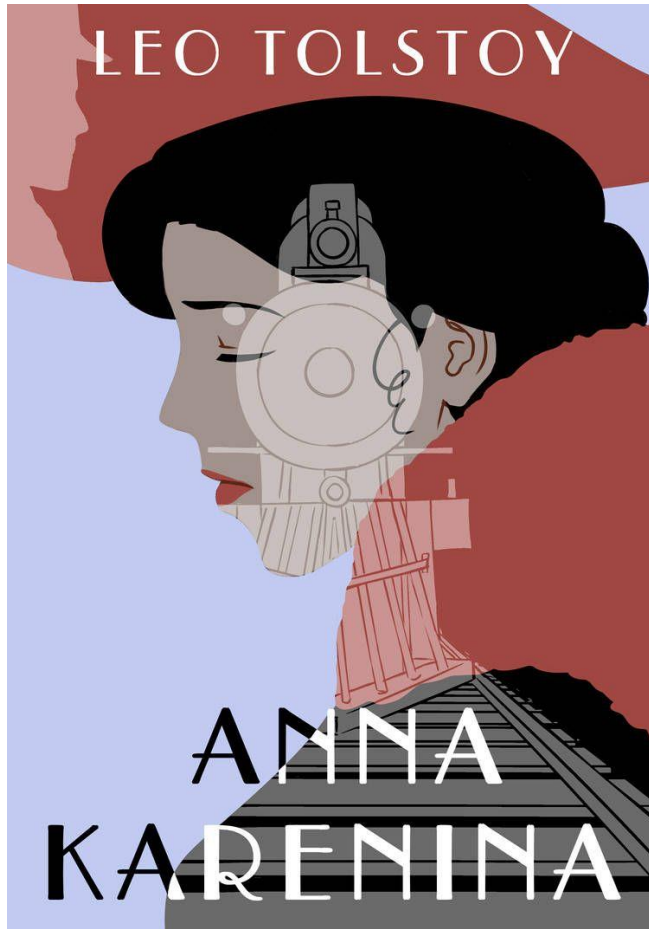


Preset Tournament



The Portable Hearing Aid Lab





Select A or B as your HA settings

Comparison: 1/98

A

B

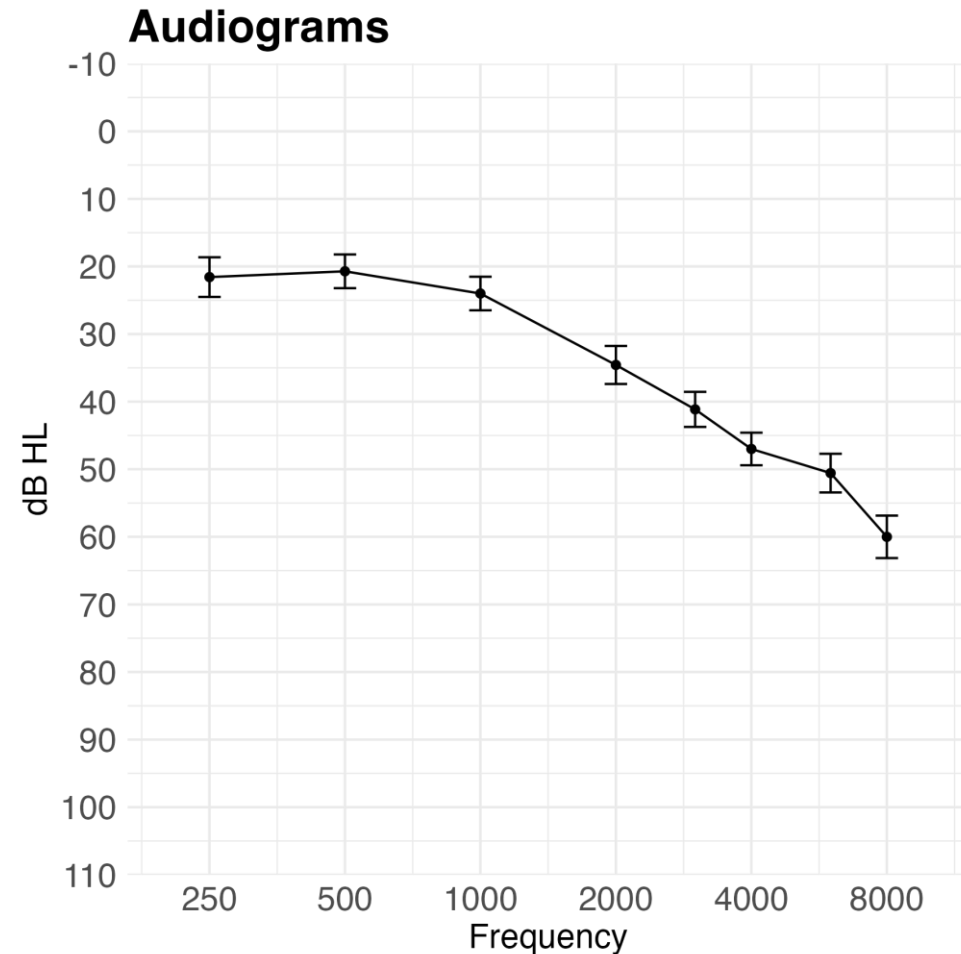
BACK

SELECT A >>



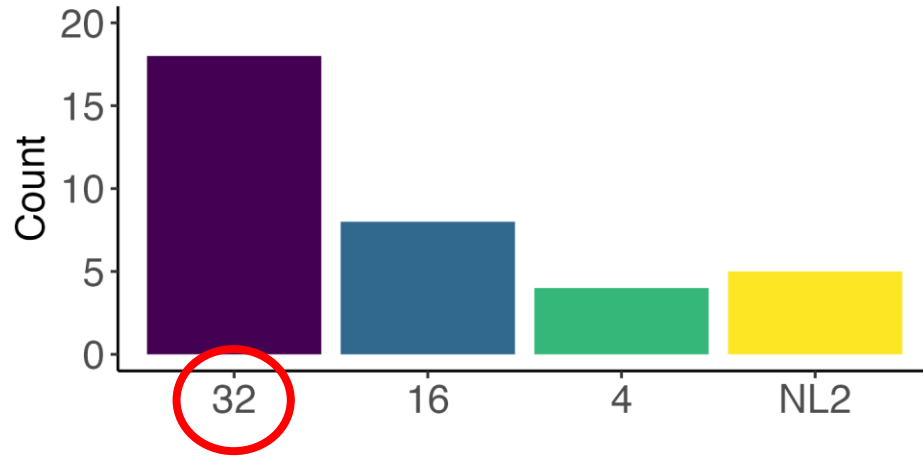
Data collection so far:

- 35 adults with acquired, mild-to-moderate, sensorineural hearing loss
 - “Difficulty hearing”
 - Mostly retired or semi-retired older adults in their 60s and 70s
 - Mix of hearing aid users and non-hearing aid users

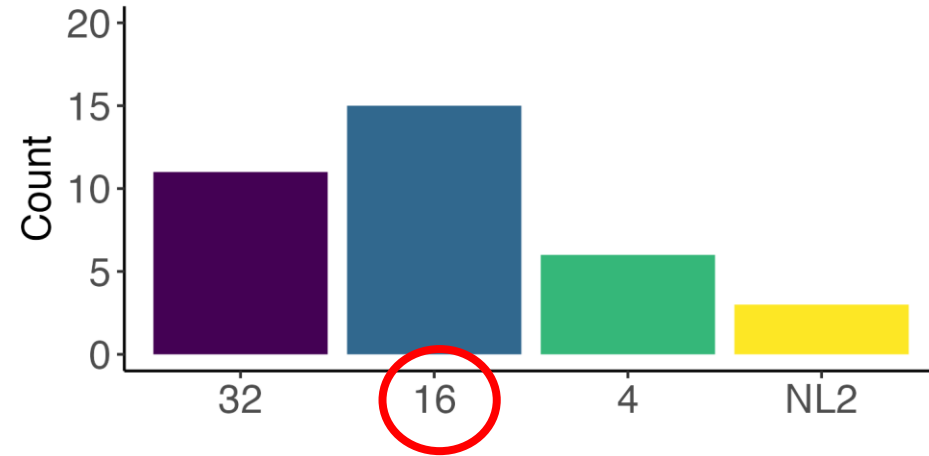


Speech in Quiet

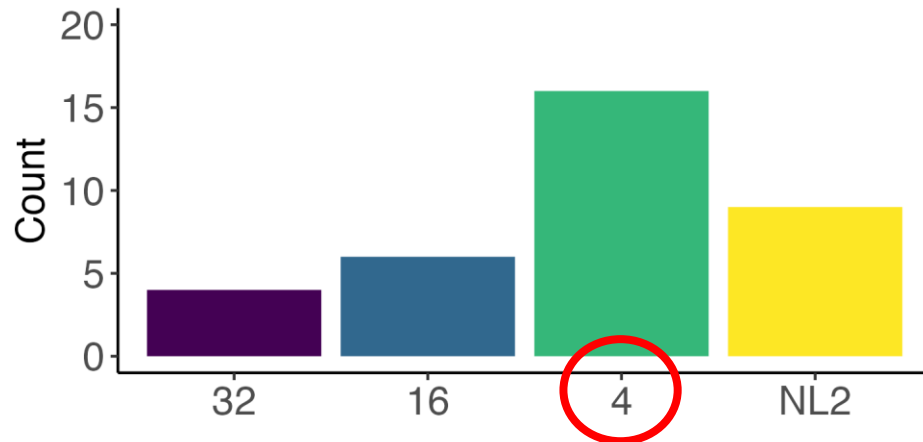
1st Choice



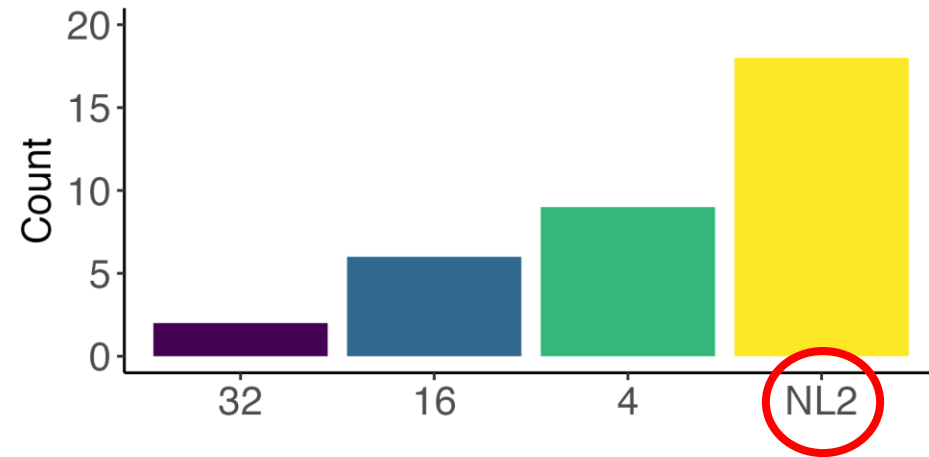
2nd Choice



3rd Choice



4th Choice

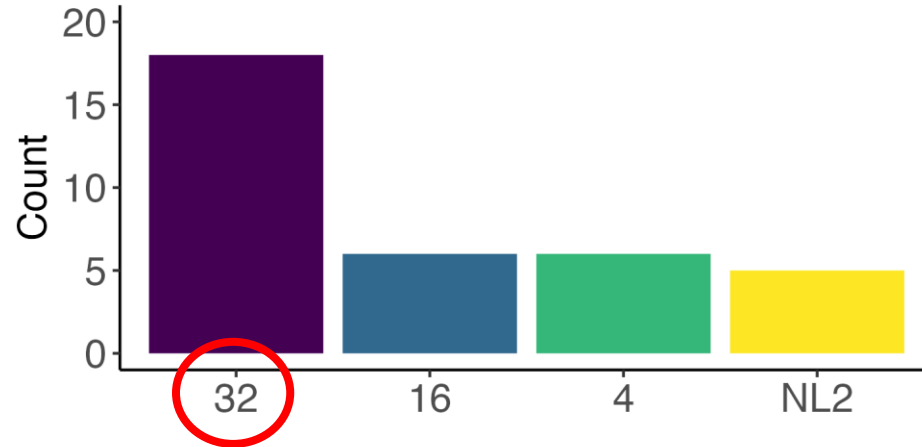


Friedman
 $p = < 0.001$

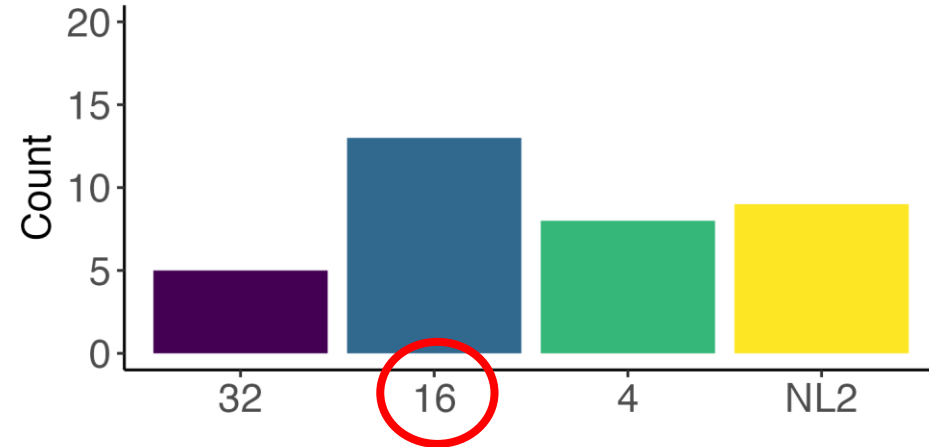


Speech in Noise

1st Choice

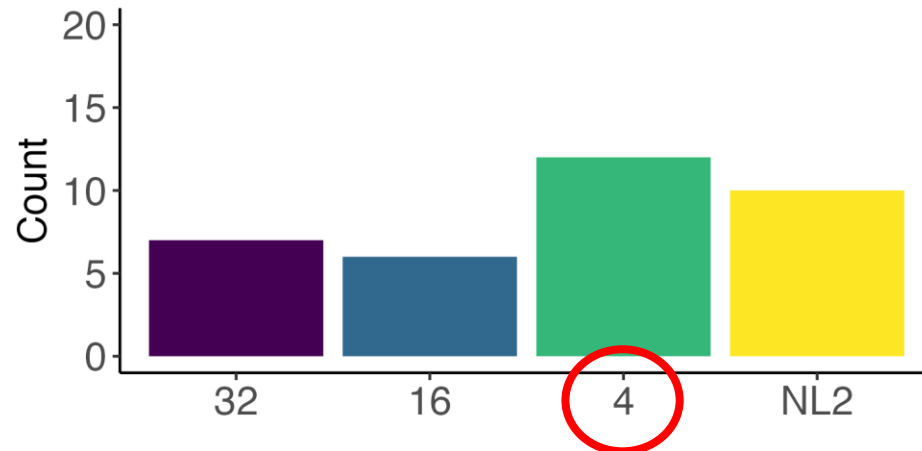


2nd Choice

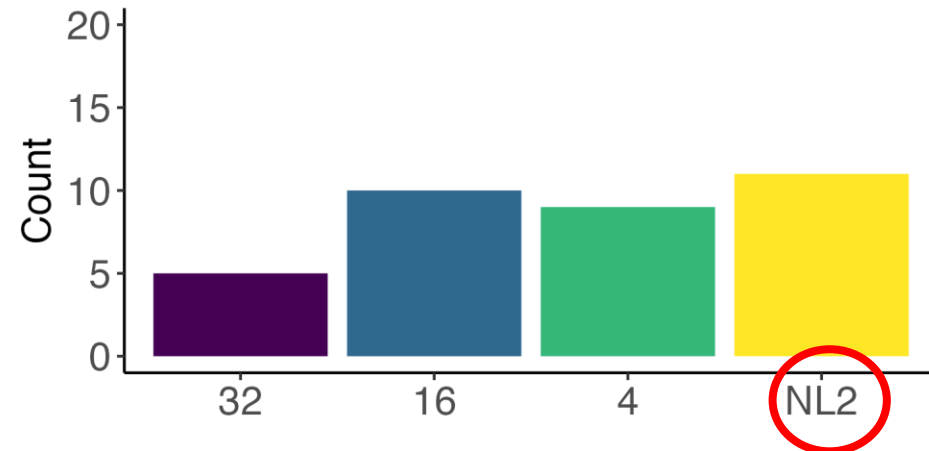


Friedman
p = 0.03

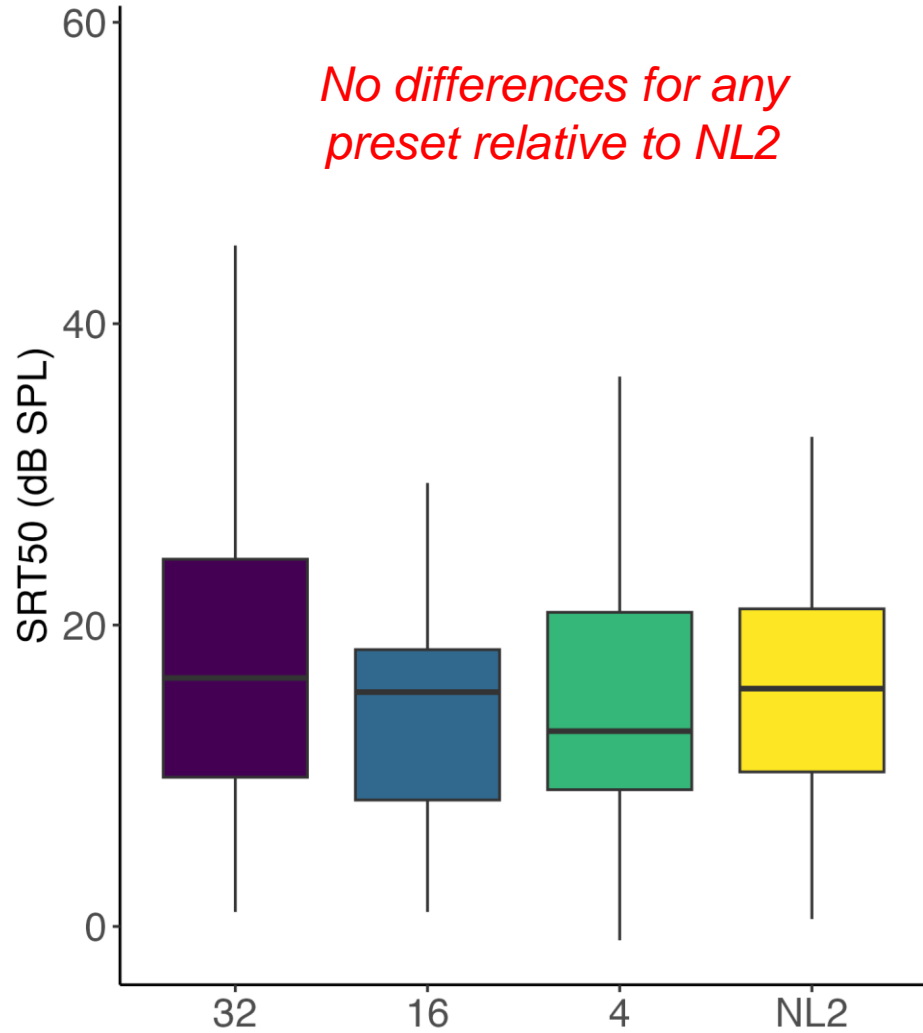
3rd Choice



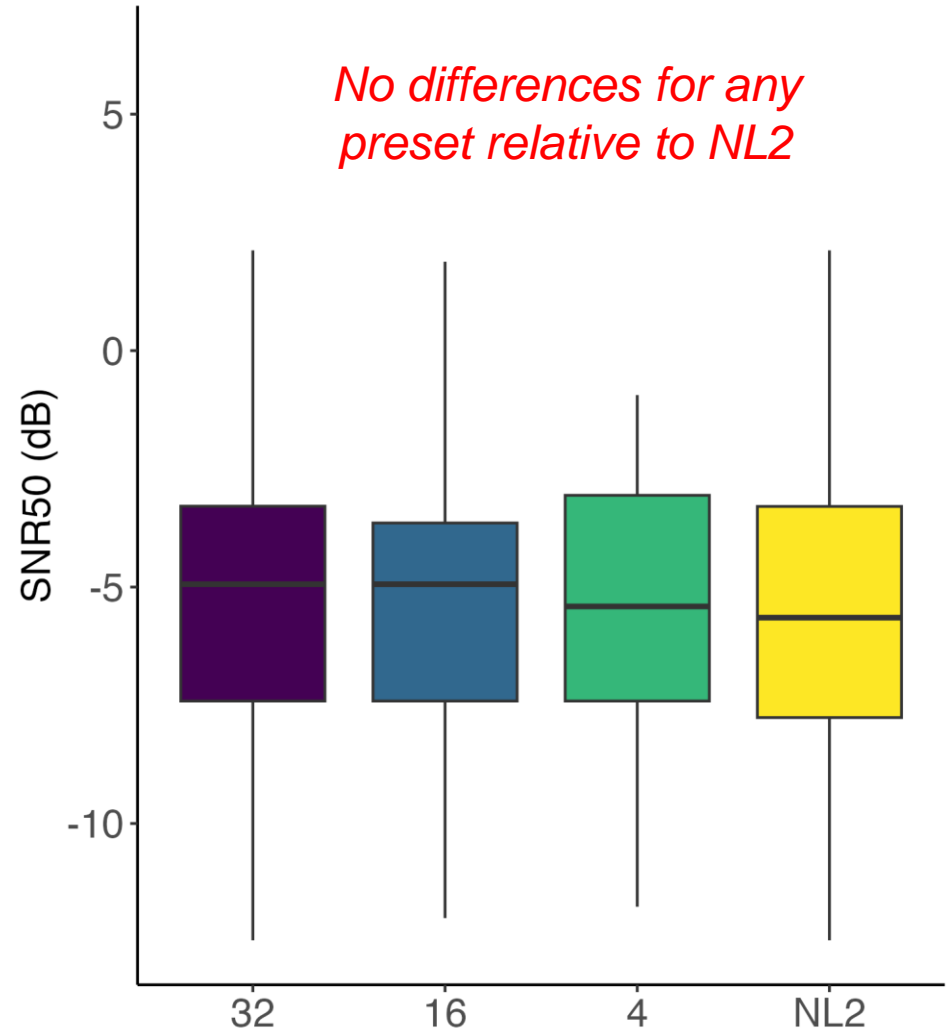
4th Choice



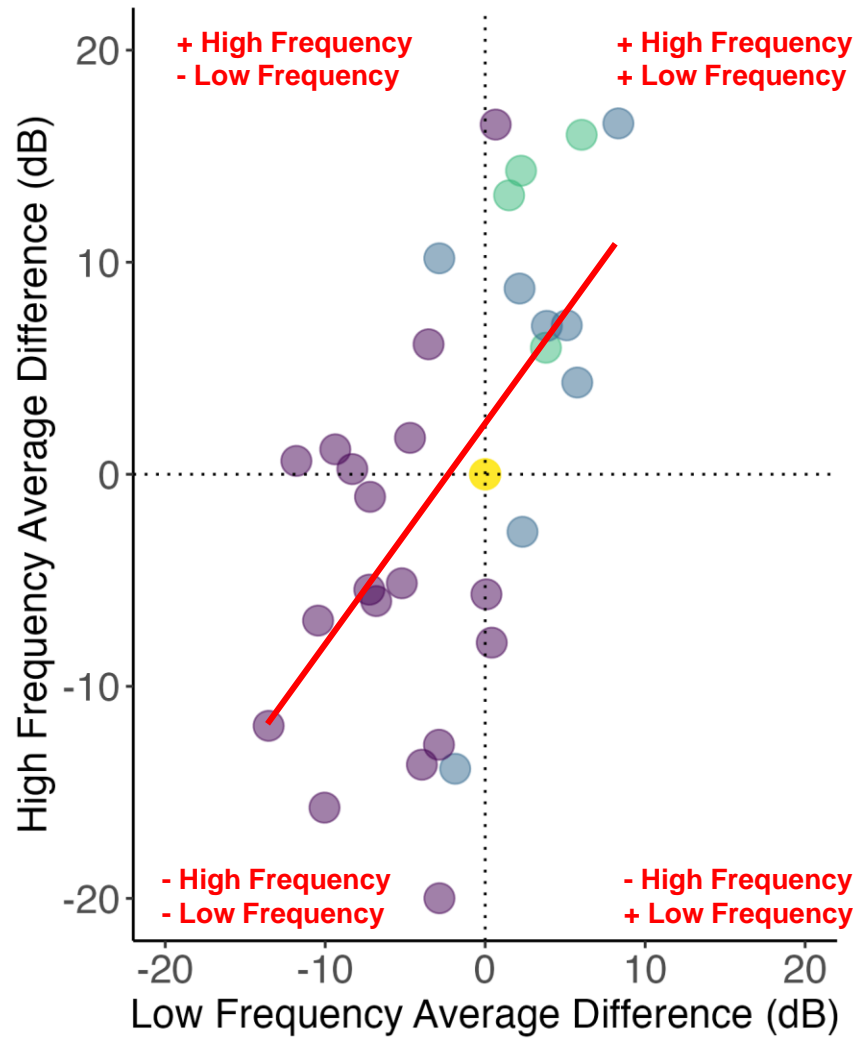
SRT50 (Quiet)



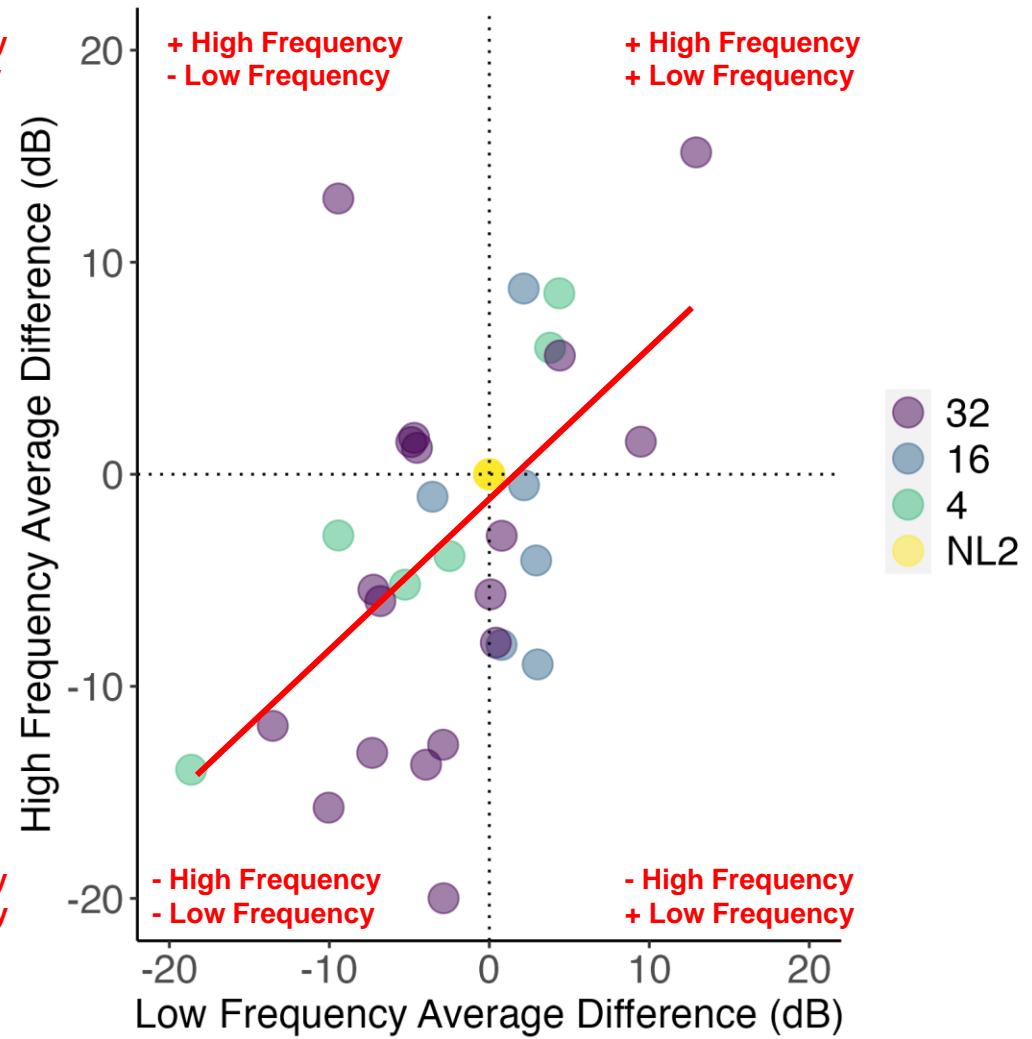
SNR50 (Noise)



Deviation from NL2: Quiet



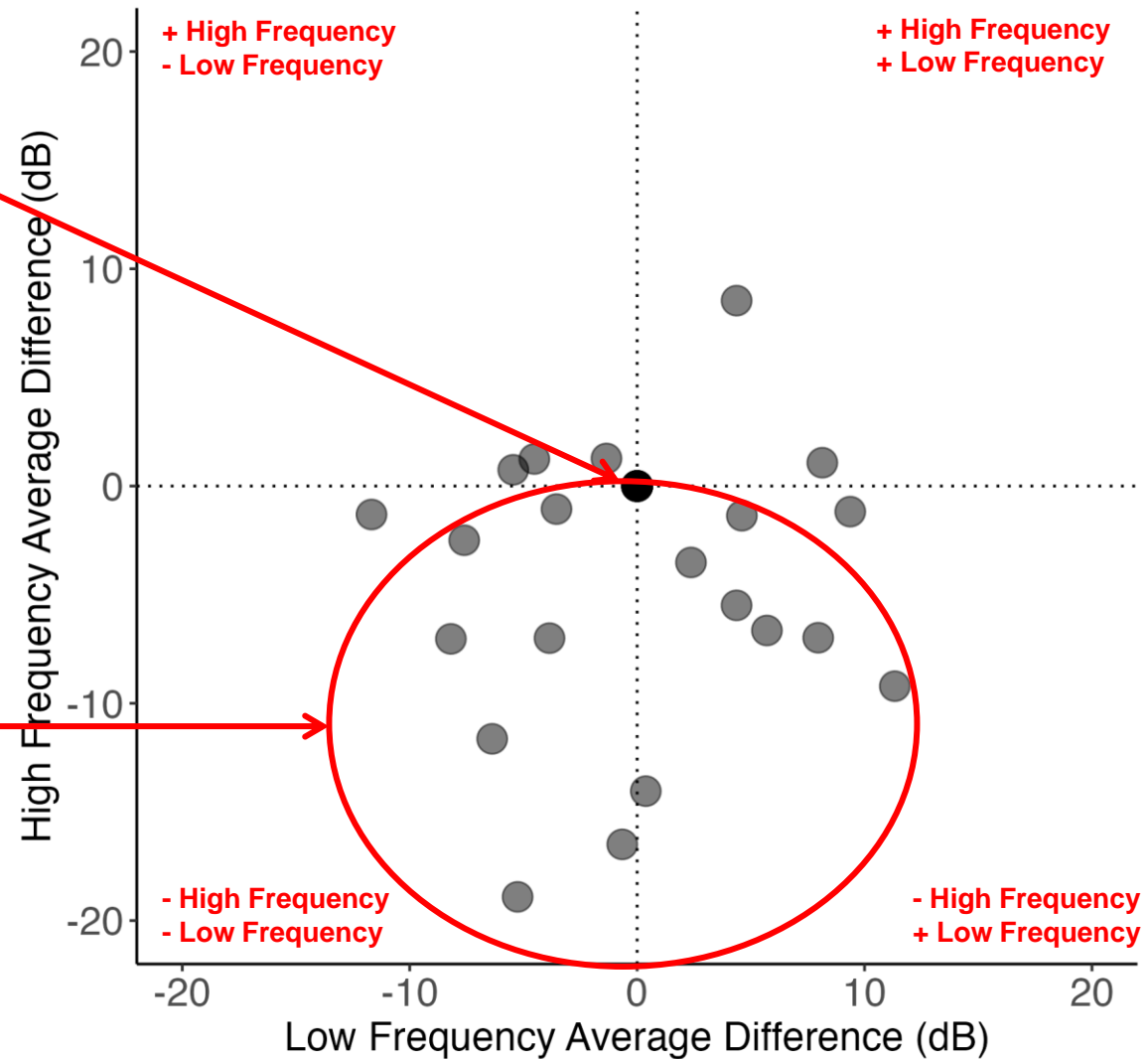
Deviation from NL2: Noise



40% had the same preference for speech in quiet and speech in noise

Most others preferred less high frequency gain in noise—but split on more or less low frequency gain

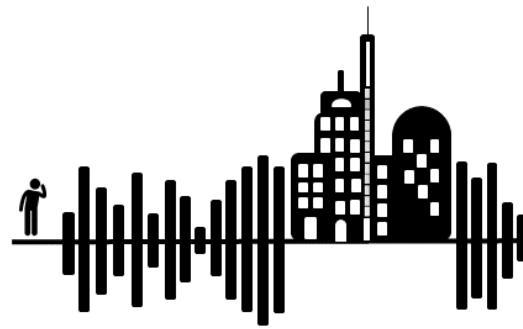
Preference for Noise vs Quiet



Conclusions

- Listeners show a clear preference for the 32-setting collection.
 - $32 > 16 > 4 > \text{NL2}$
 - Evidence supporting more personalization on an OTC
 - Also some evidence that a volume control might be good enough
 - Caveat: Just because someone prefers one setting over another doesn't mean they wouldn't *accept* a less preferred setting.
- Speech perception testing is not sensitive to preference differences.
- A/B comparisons in a tournament is a useful method to determine ranked preference for hearing aid settings.





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