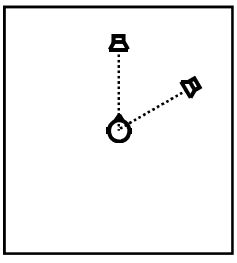
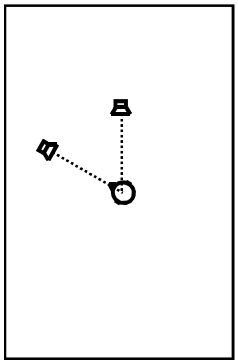
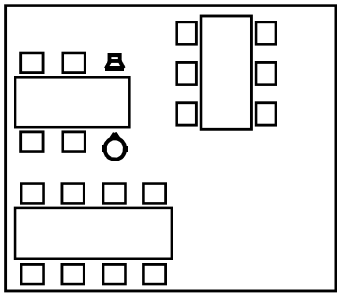
Why do hearing impaired people suffer poor speech perception in noisy environments?

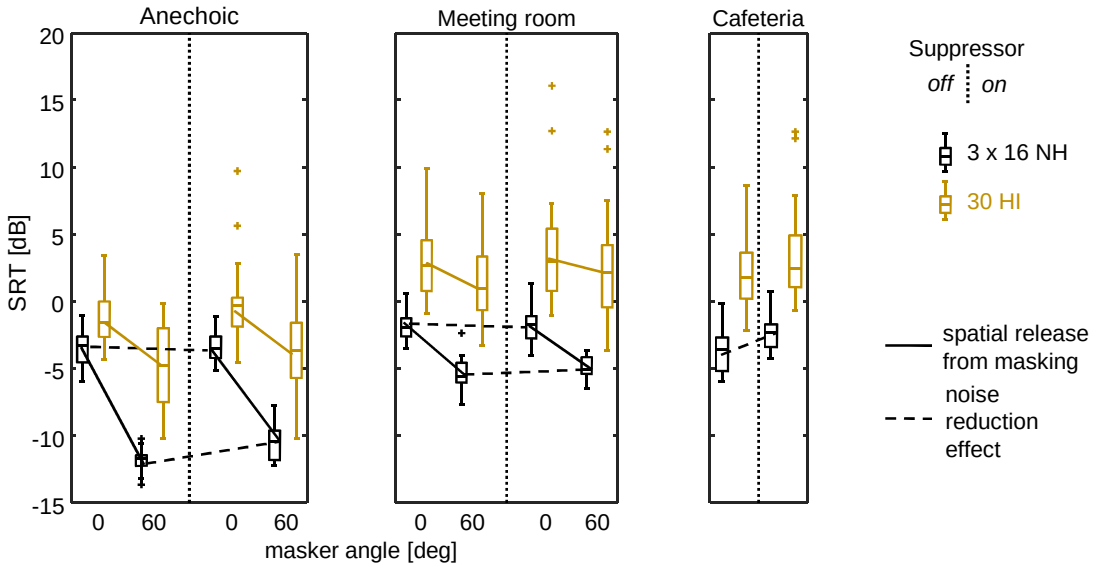
An intelligibility metrics approach.

Gaston Hilkhuysen, Tim Green, Stuart Rosen & Mark Huckvale

Environments

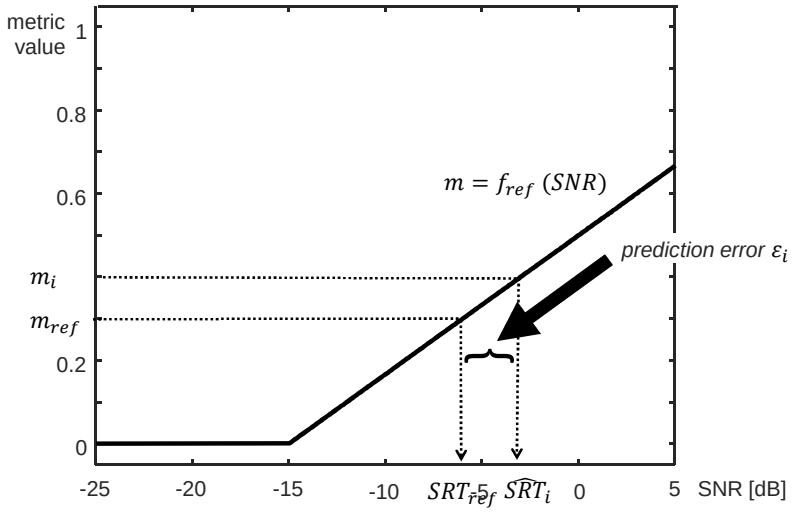
Anechoic	Meeting room	Cafeteria
		
$RT_{60} \approx 0.00$ s V = 29 m^3 LTASS	$RT_{60} \approx 0.70$ s V = 61m^3 LTASS	$RT_{60} \approx 1.25$ s V = ??m^3 Ambient

Observed intelligibilities



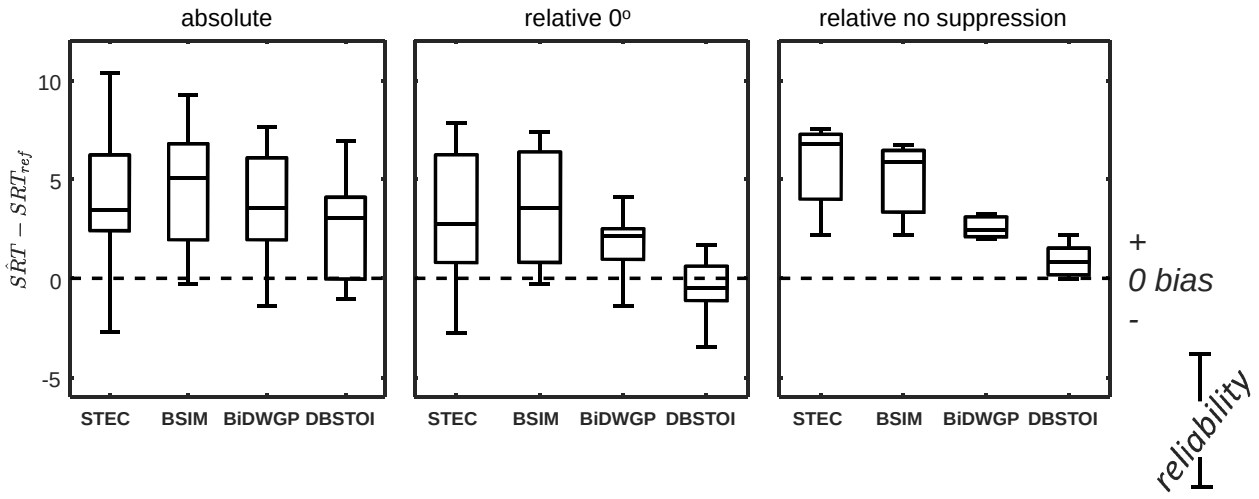
Evaluating metrics

- calculate metric values m_i for all i experimental conditions
- determine $m = f_{ref}(SNR)$
- $\widehat{SRT}_i = f_{ref}^{inv}(m_i)$
- $\varepsilon_i = \widehat{SRT}_i - SRT_{ref}$



fictive data

Evaluating metrics: NH

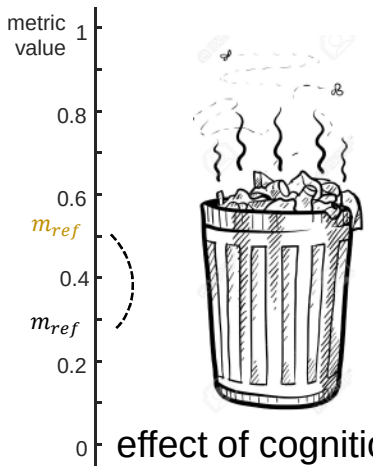


Evaluating metrics: HI

SRTs for HI are higher than SRTs for NH

⇔

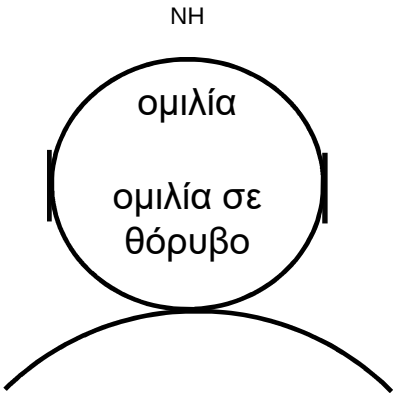
HI require higher metric values than NH



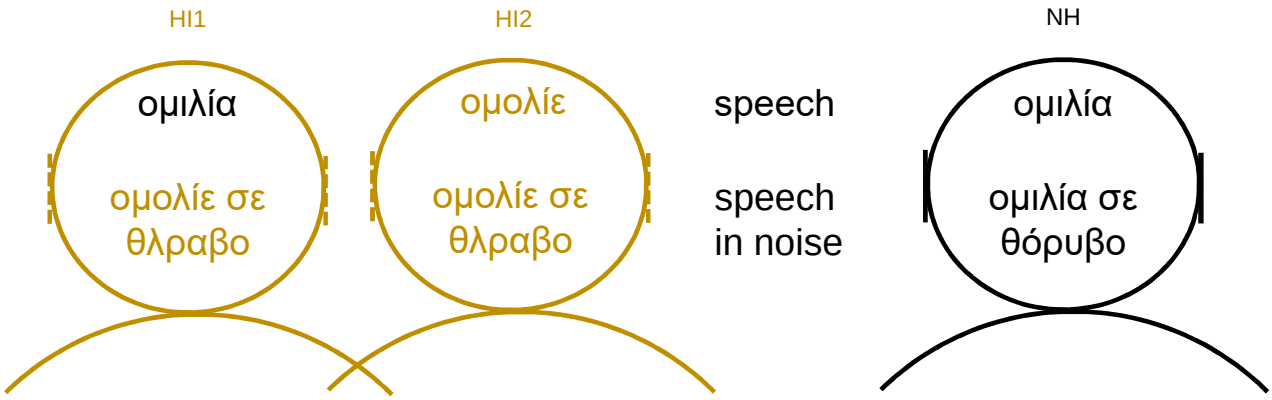
effect of cognition ?

speech

speech in noise

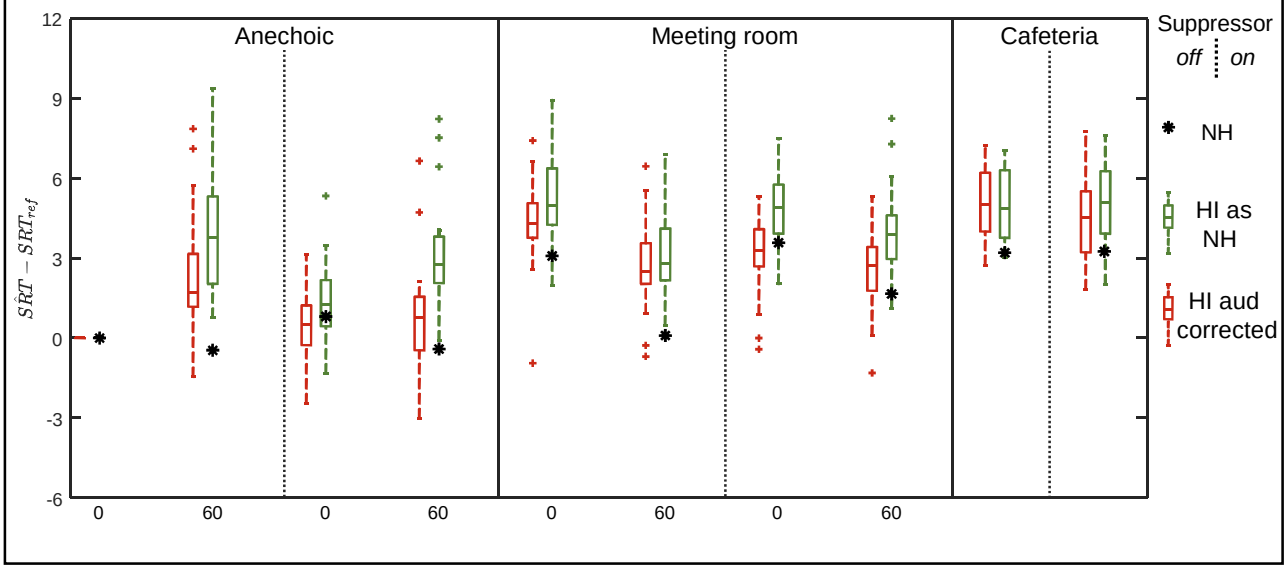


Evaluating metrics: HI

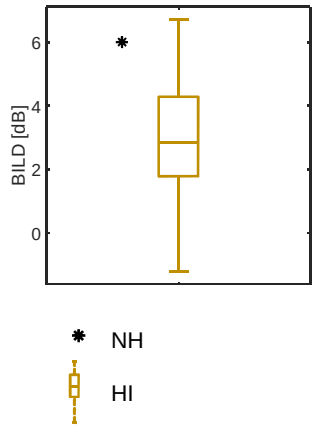


Which representation of unprocessed speech to use for HI listeners?

Predicting intelligibility: HI

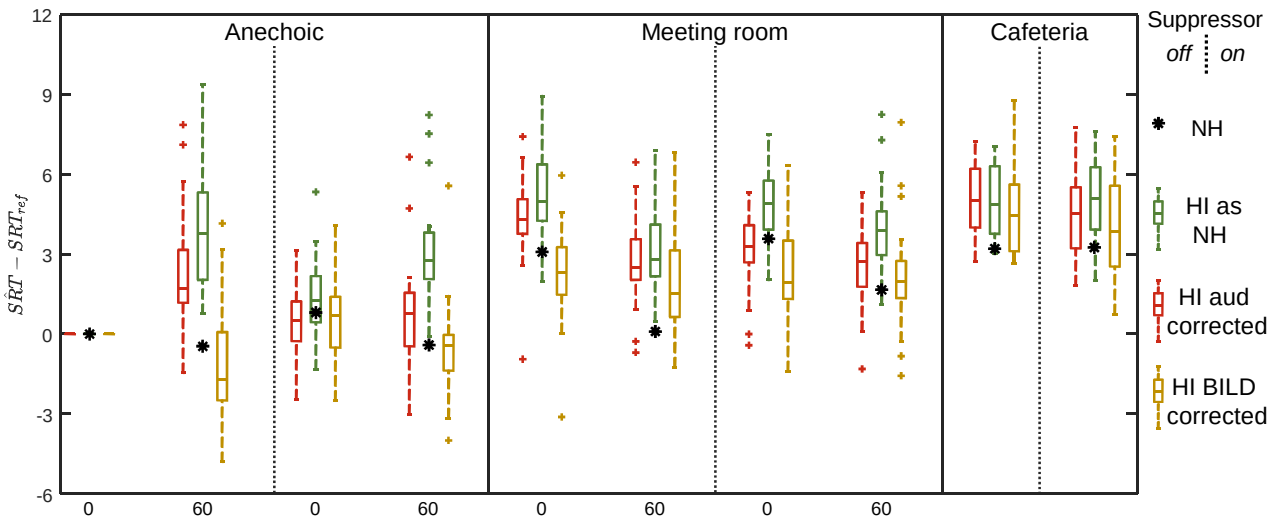


Predicting intelligibility: HI



- Augment time and amplitude jitter in equalisation-cancelation stage such that metric fits the BILD data.
- Use adjusted parameters in intelligibility predictions.

Predicting intelligibility: HI



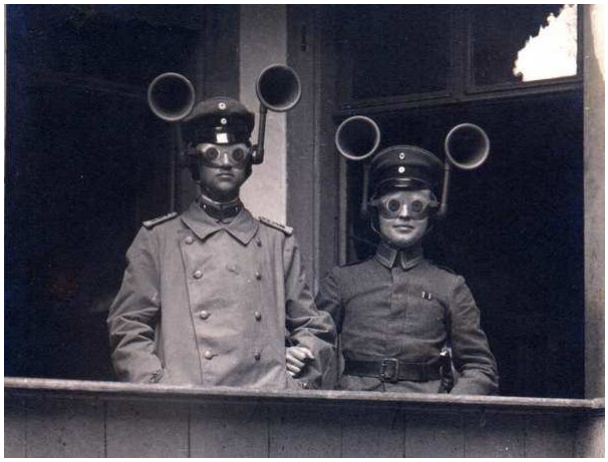
Conclusions

HYPOTHESES

1. HI with similar audiograms have different intelligibilities of noisy speech due to differences in their mental representations of speech signals
2. Audibility plays a role in the lack of spatial release of masking experienced by HI listeners
3. Due to a poorer amplitude and time representations of noisy speech, HI listeners experience less spatial release of masking than NH listeners

Future directions

- include broader auditory filters
- determine effects of measurement error
- add additional metrics
  - similar or supplemental information



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