

Head and gaze orientation behavior during conversations is influenced by hearing difficulty and talker position

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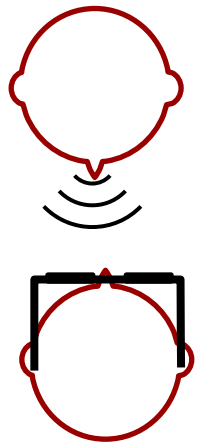
**orca**labs
The Scientific Institute of WS Audiology



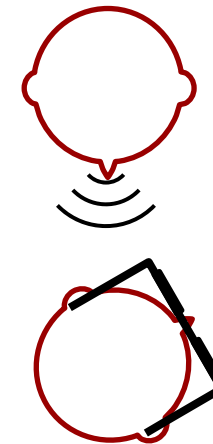


Communication Strategies

Visual cues



Signal-to-noise ratio



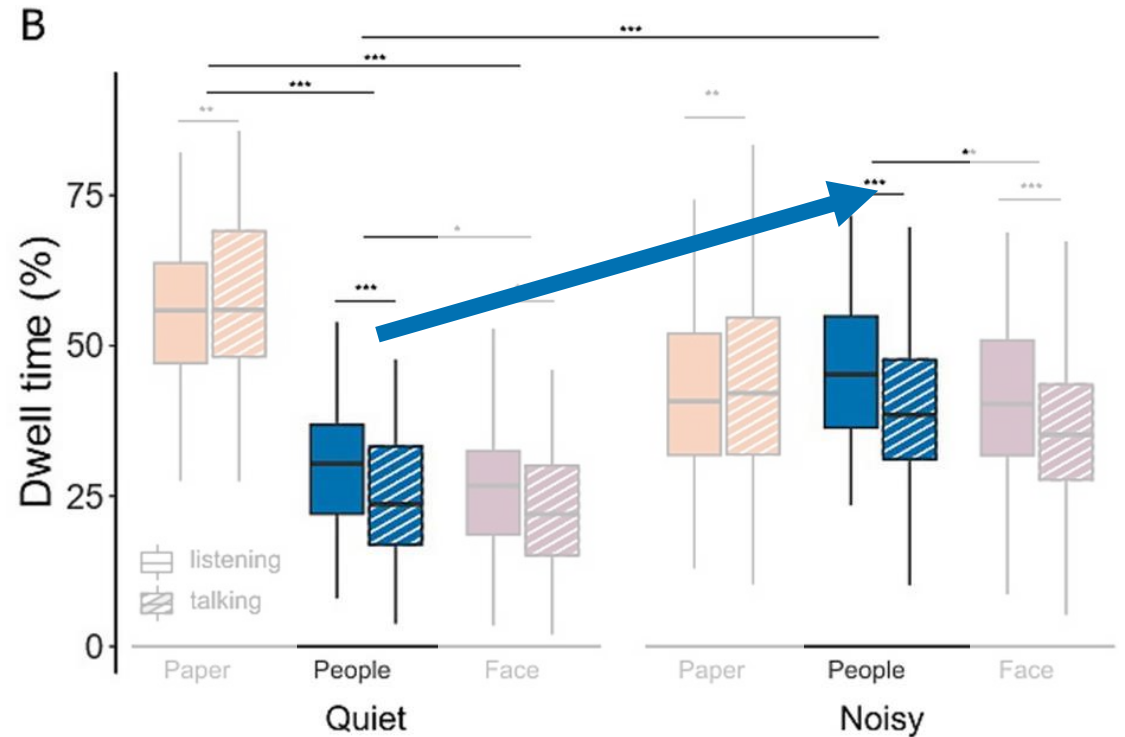
Effects of HI and noise on orientation behavior during conversation

Findings from face-to-face conversations:



- Increased gaze at talkers when listening to speech in noise

(Slomianka et al., 2025; Lu et al., 2021)



Slomianka et al., 2025

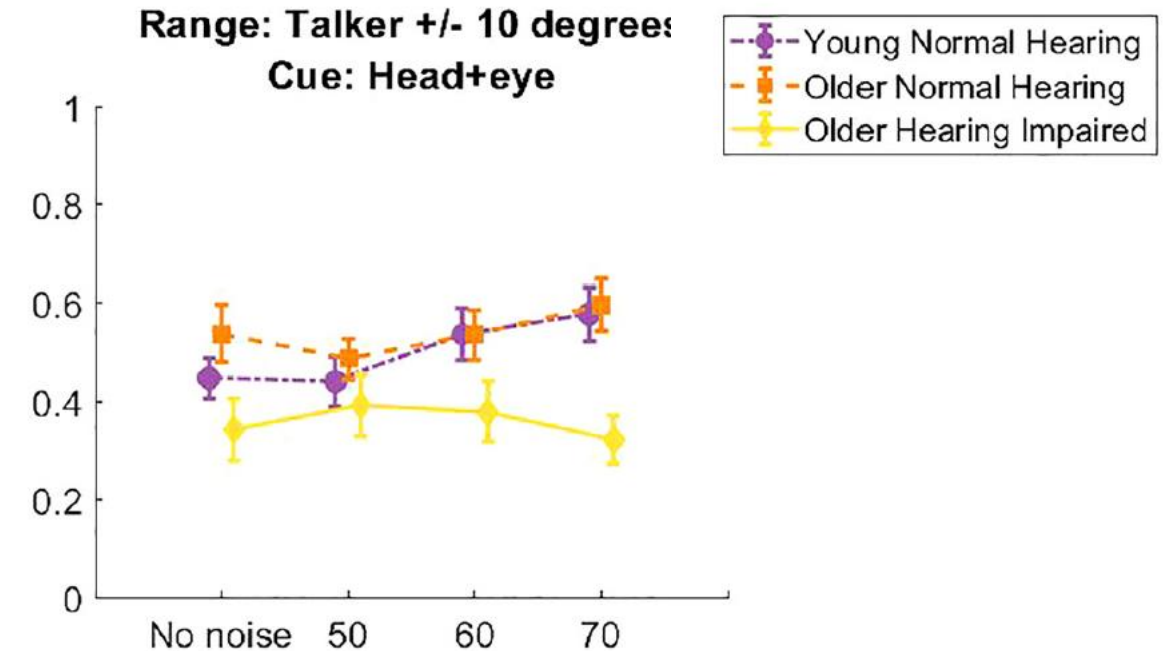
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- Increased gaze at talkers when listening to speech in noise – but only for **YNH**

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Lu et al., 2021

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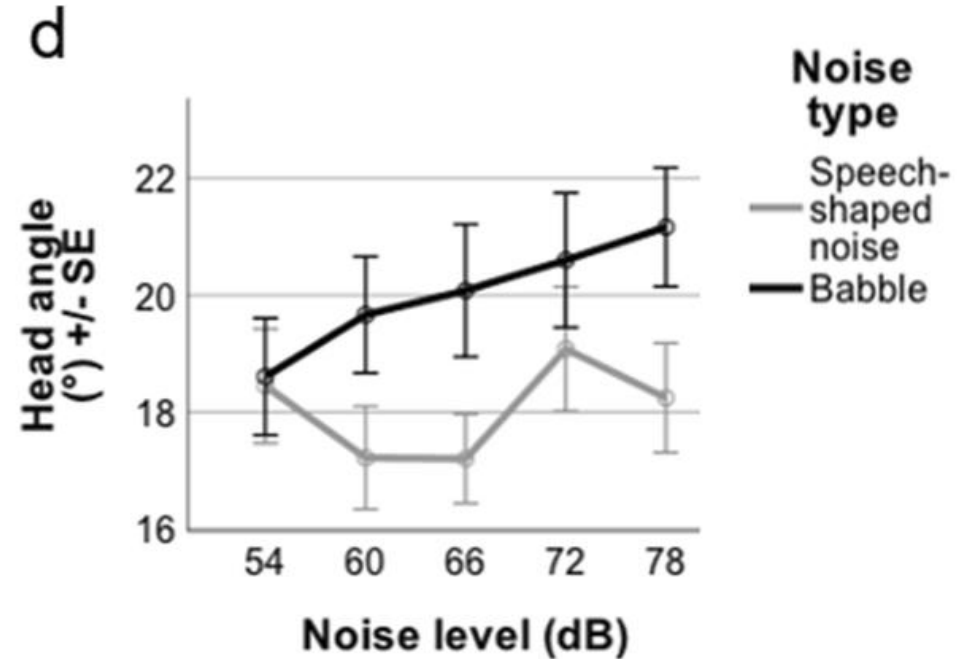
- Increased gaze at talkers when listening to speech in noise – but only for YNH

(Slomianka et al., 2025; Lu et al., 2021)



- Less direct head orientation in noise – but only for babble noise. Not in conversations.

(Lab: Hadley et al., 2021, Conversation: Lu et al. 2021)



Hadley et al., 2021

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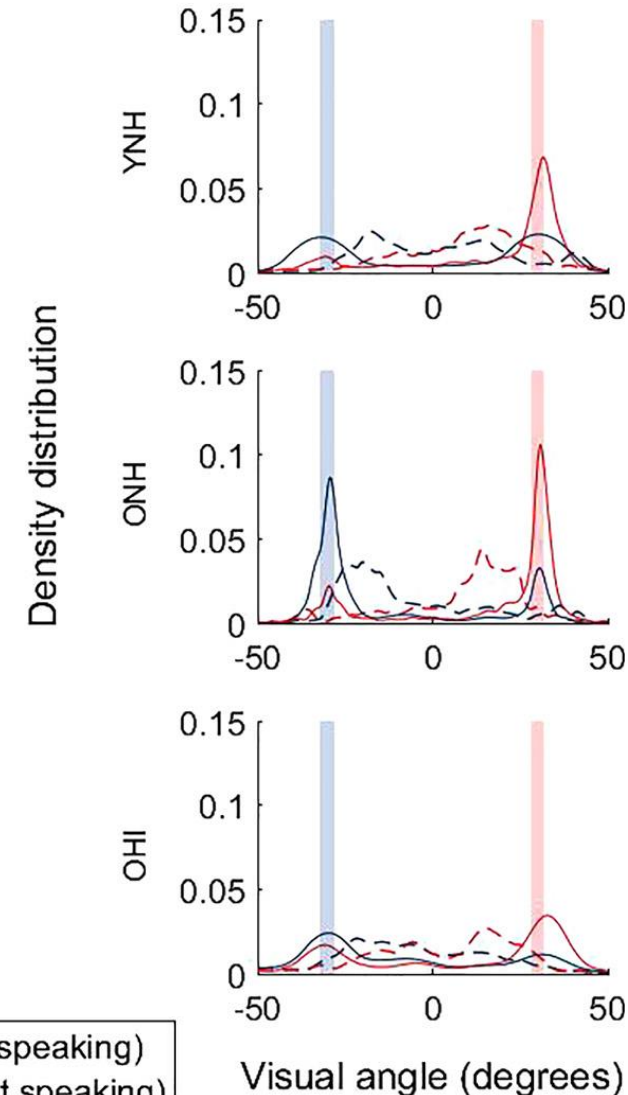
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- HI move their gaze more

(Lu et al., 2021)



— Head+eye (Left speaking) --- Head (Left speaking)
— Head+eye (Right speaking) --- Head (Right speaking)

Lu et al., 2021

Effects of HI and noise on orientation behavior during conversation

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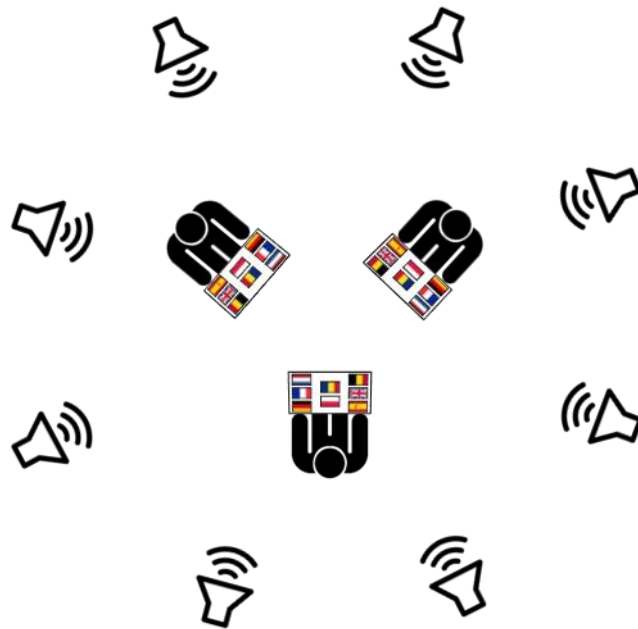
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(Lu et al., 2021)

Take away:

- passive listening ≠ conversations
- Behavior is often averaged over whole conversation
- Ecological validity is often limited by
 - Unfamiliar interlocutors
 - Laboratory environments
 - Conversational tasks

Effects of HI and noise on orientation behavior during conversation



Take away:

- passive listening $\neq$ conversations
- Behavior is often averaged over whole conversation
- Ecological validity is often limited by
 - Unfamiliar interlocutors
 - Laboratory environments
 - Conversational tasks
 - Symmetric seating

Research Question

How do hearing difficulty, noise and seating position affect head and gaze orientation behavior during conversation?

Hypotheses:

- Increased gaze at talker while listening during noise and with HI
- Noise and HI reduce direct orientation towards talker while listening
- Increased eye movement while talking to scan for visual backchannels during noise and with HI

Experimental setup

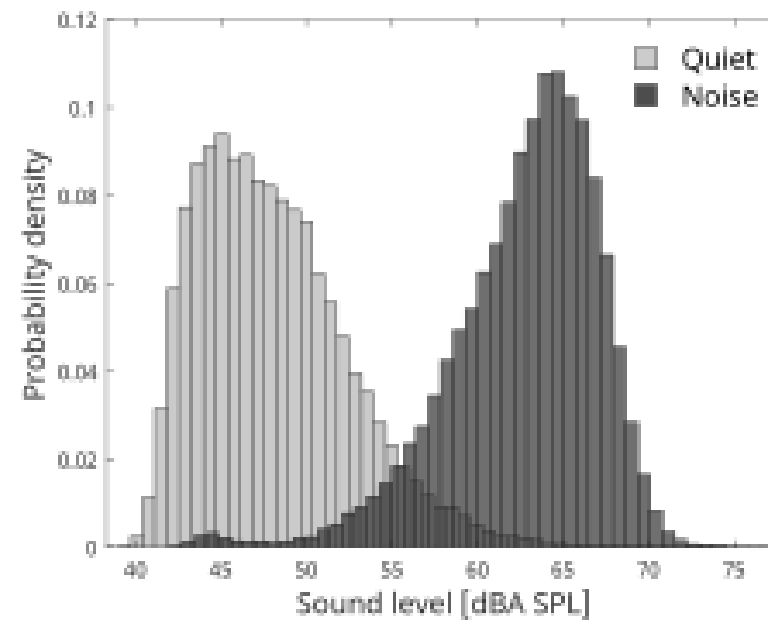
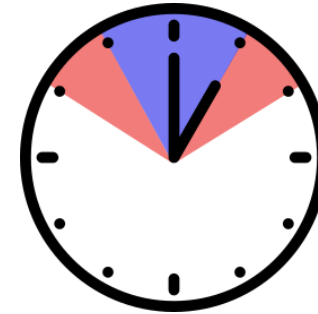
Participants

12 triads: 1 HI + 2 NH



Conditions

2 noise conditions



Experimental setup

Conditions

2 noise conditions

- Quiet or Noise

2 seating conditions

- Across or Side

2 glasses wearer

- NH or HI

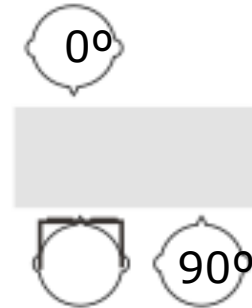
2 runs =

16 conversations per group

Across



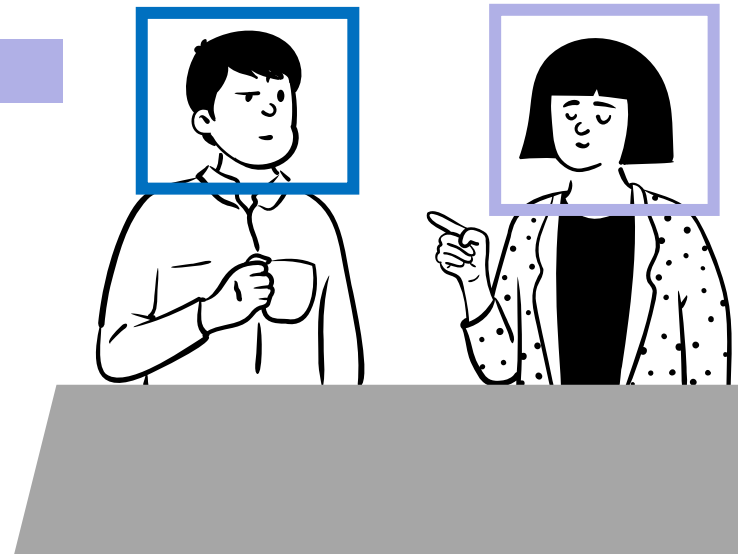
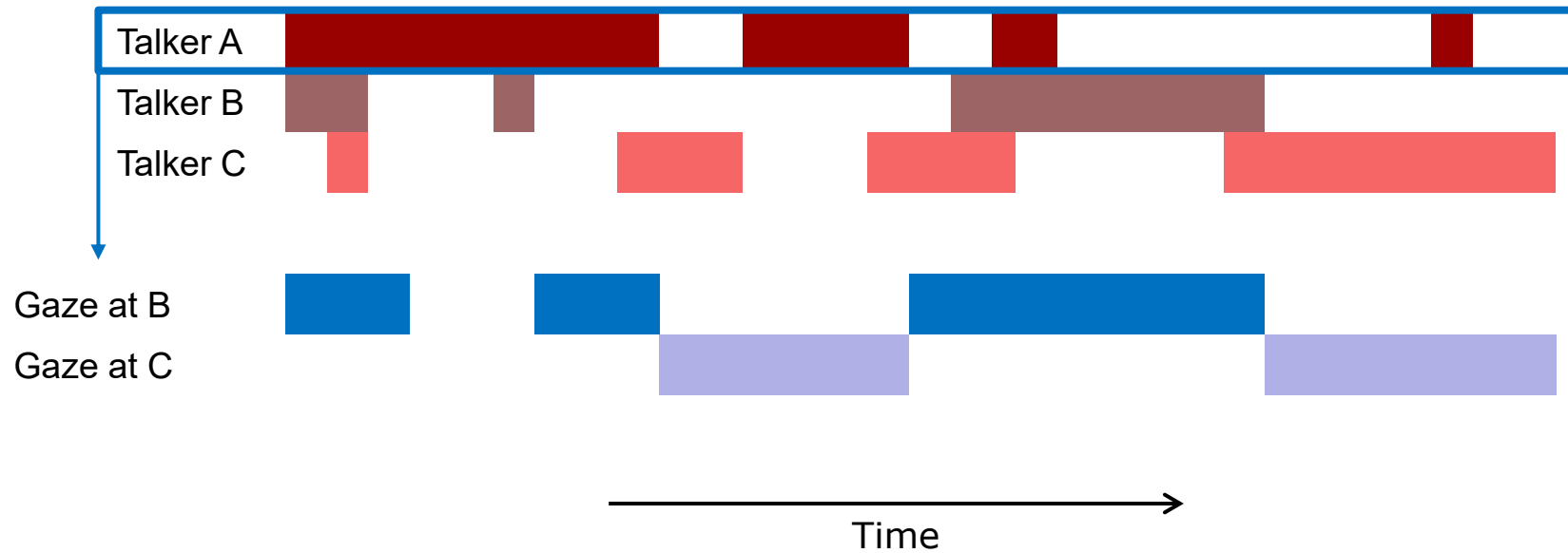
Side



Data recorded:

- Speech
- Eye tracking

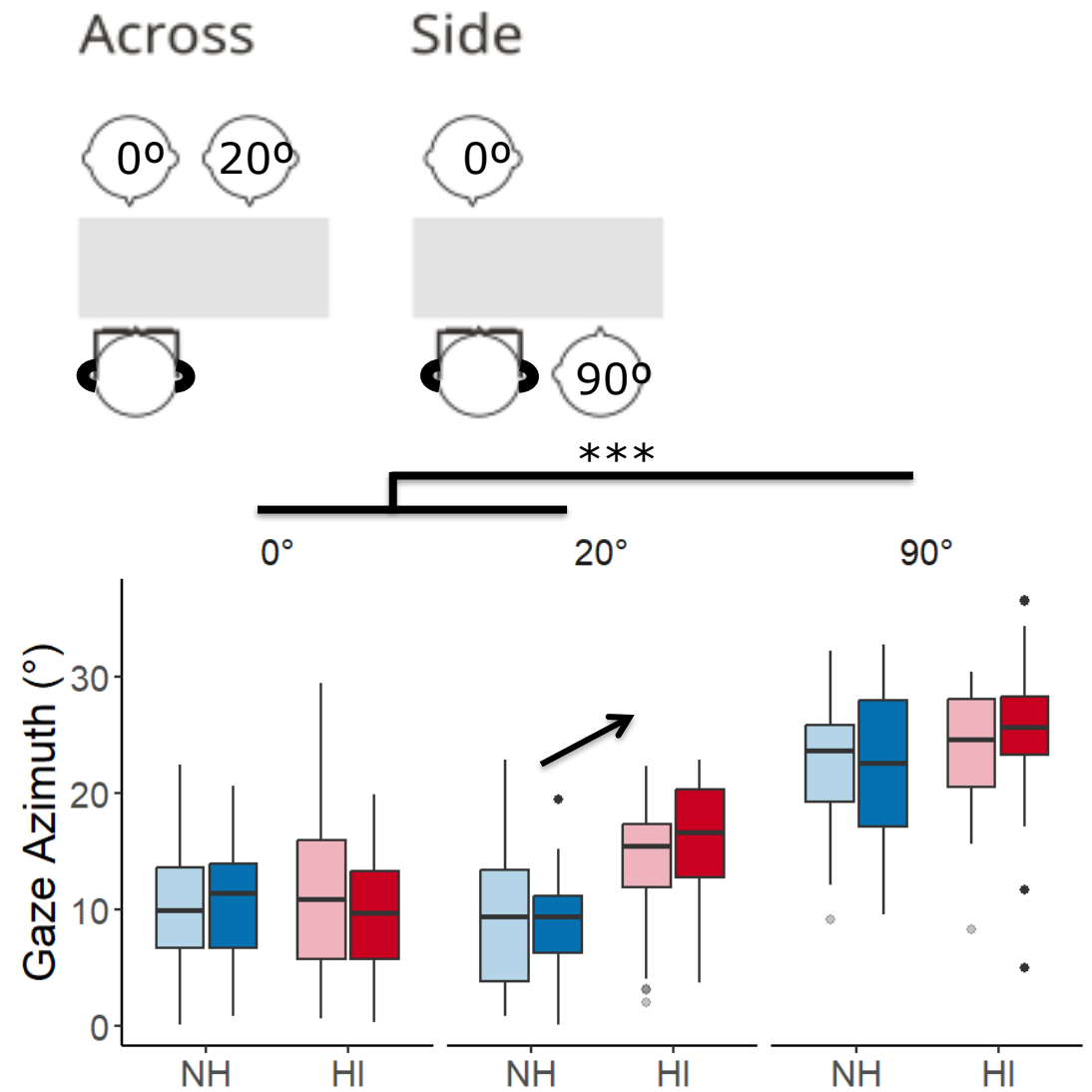
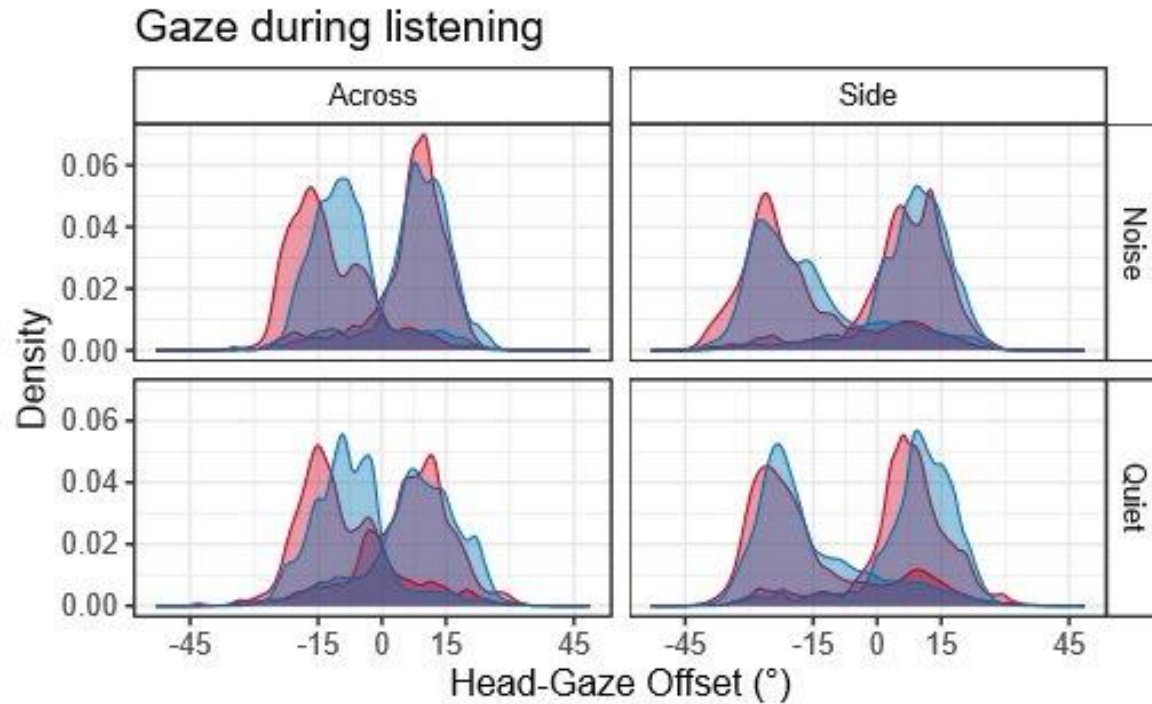
Relating turn-taking with eye movement



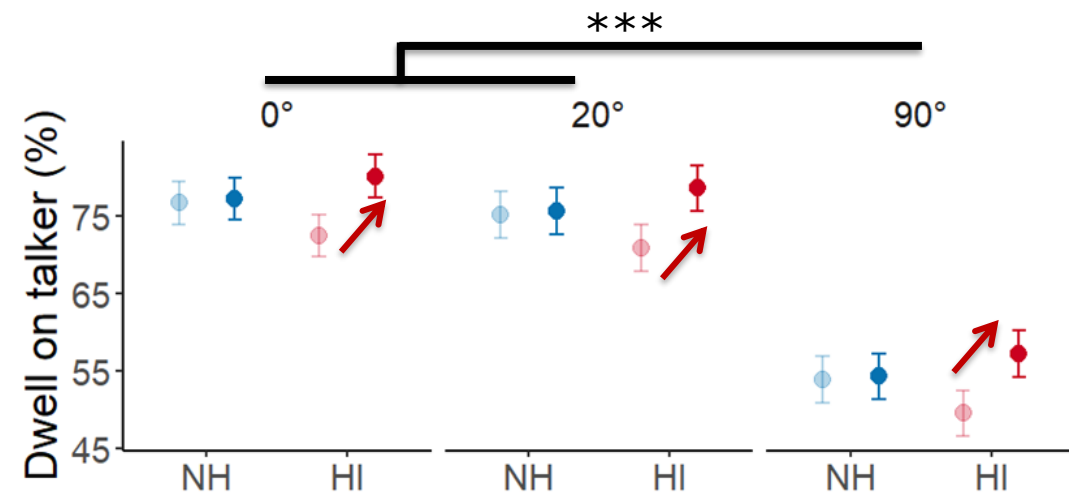
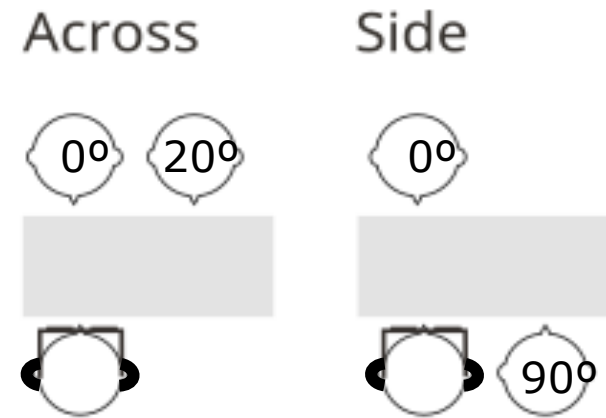
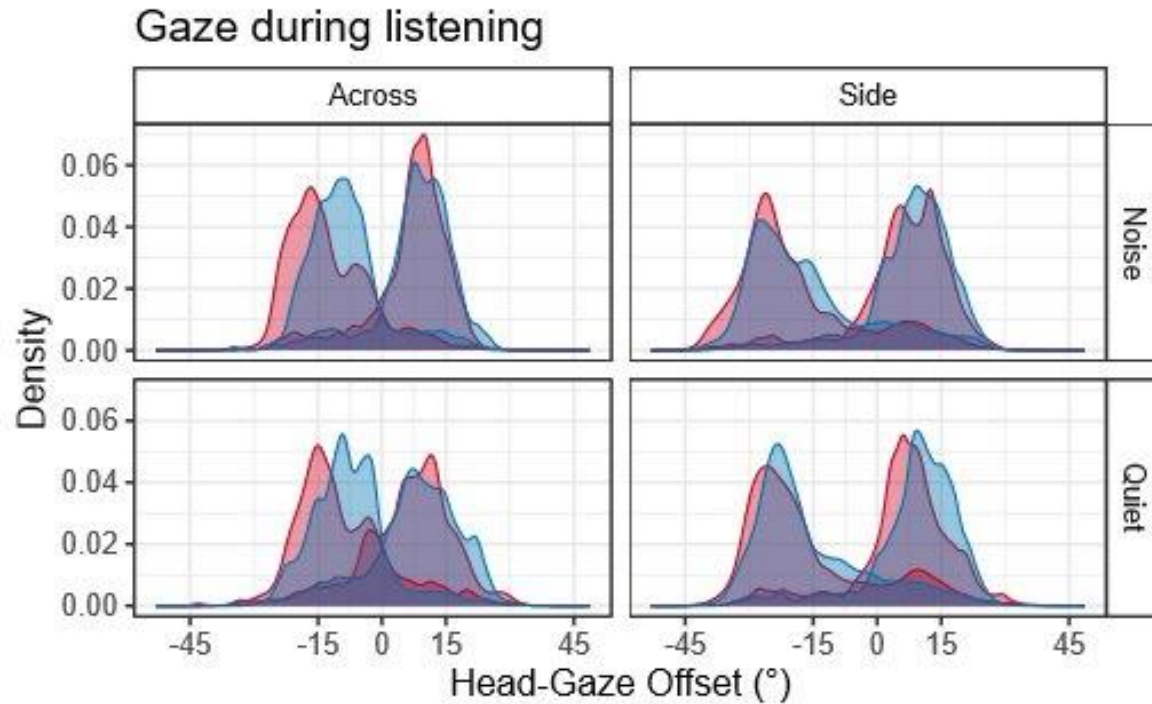
Orientation behavior during listening



Gaze during listening



Gaze during listening



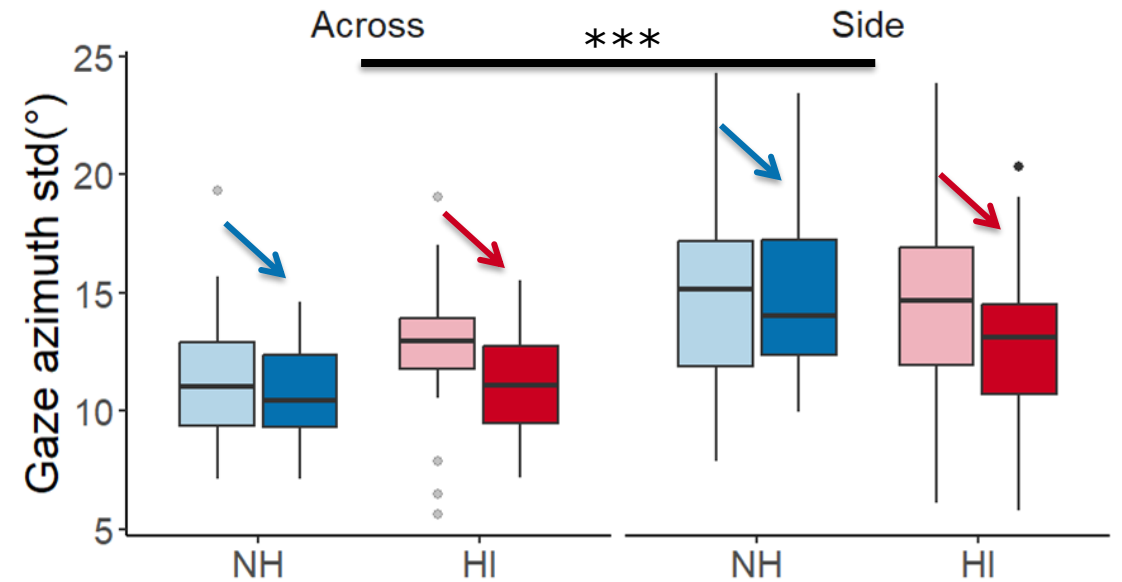
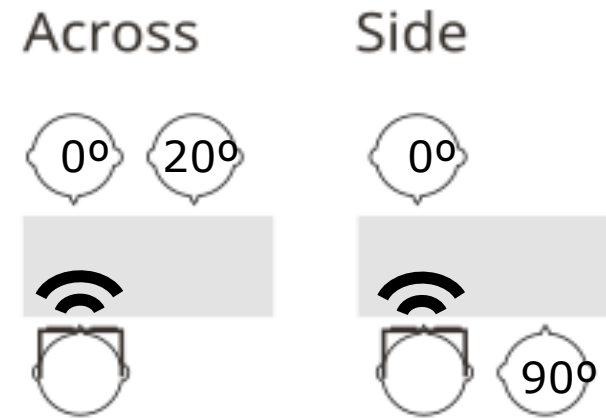
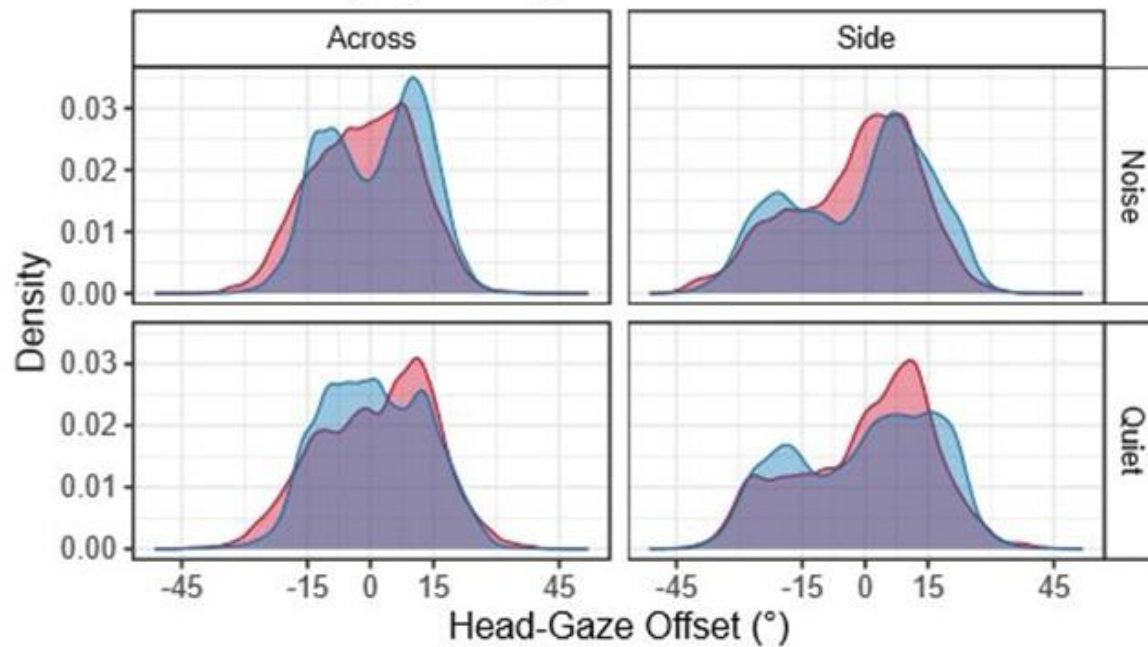
Orientation behavior during talking



Gaze during talking



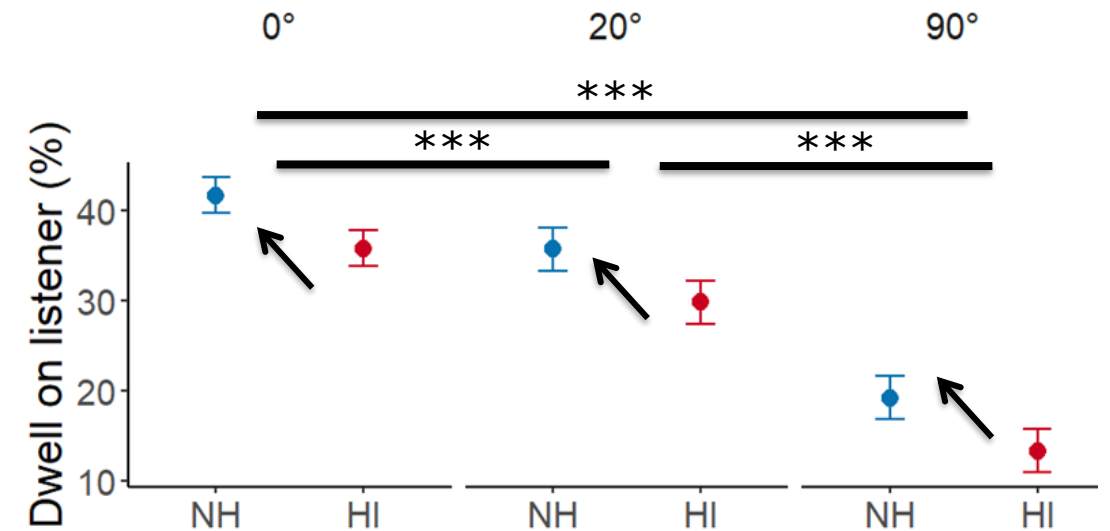
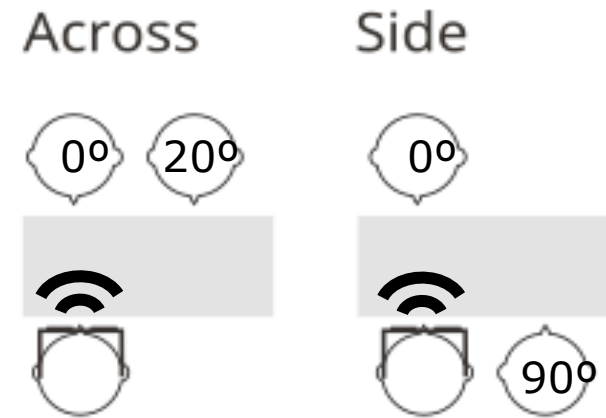
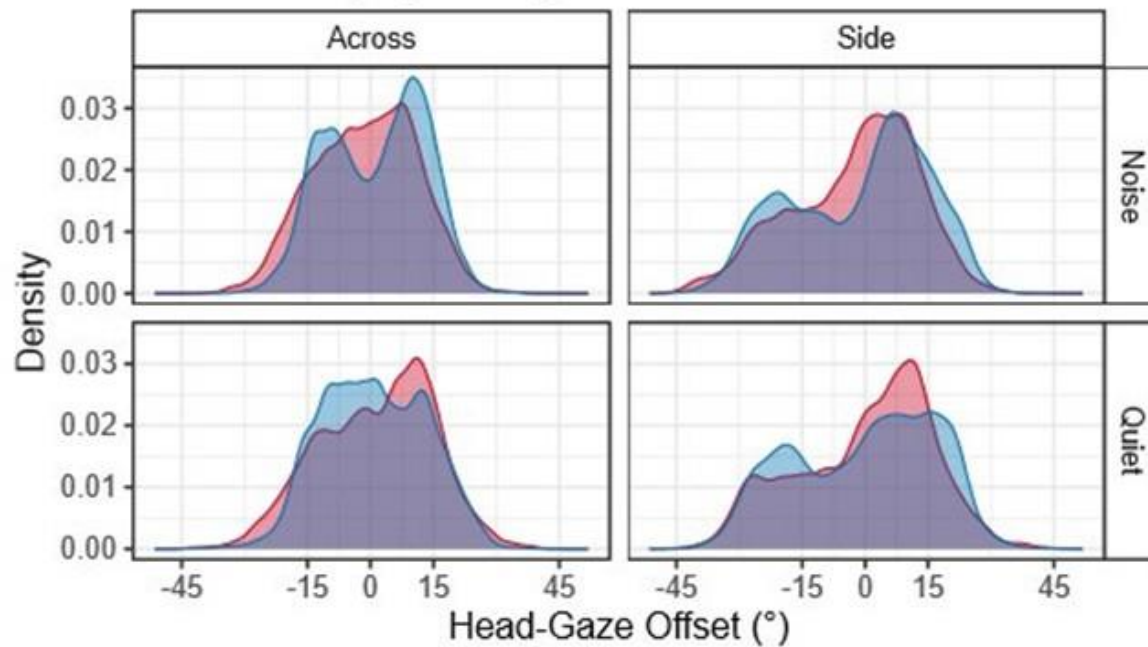
Gaze during speaking



Gaze during talking



Gaze during speaking



Summary

How do hearing difficulty, noise and seating position affect head and gaze orientation behavior during conversation?

Large effects of seating position on gaze to talker while listening and interlocutor while talking

Hypotheses:

- Increased gaze at talker during noise and HI: *only for HI* ✓
- Noise and HI reduce direct orientation (turn better ear) towards talker ✗
 - HI orient less directly at 20 degree
- Increased eye movement while talking during ~~noise~~ **quiet** and with ~~HI~~ **NH** look more at listeners

Read our preprint:



Conclusions



Gaze behavior is strongly affected by seating arrangement, with peripheral talkers receiving less visual attention

- Gaze behavior does not reliably indicate the active talker which is a limitation for gaze steered beamforming
- Implication for rehabilitation: Conversational partners should be positioned frontally to allow the use of visual cues



Effects of HI and noise are smaller than those typically observed in passive listening tasks. However, orientation behavior resembles patterns in sound localization tasks

- Highlights the importance of studying behavior during natural conversations

Thank you all for your attention



Valeska Slomianka



Florence Mazzetti



Torsten Dau



Tobias May

