Auditory Reality - Impact of hearing status

Florian Wolters, Petra Herrlin, Karolina Smeds · ORCA Europe, WS Audiology
firstname.lastname@orca-eu.info

Introduction

In previous studies[1, 2], the **auditory reality** (AR) for older individuals with impaired hearing was investigated. AR was mapped using ecological momentary assessments (**EMA**) and listening situation classification based on the Common Sound Scenario (**CoSS**) framework[3]. Results (Fig 1) indicated that test participants (TP) spent almost half of their everyday life in situations without communication or focused listening.

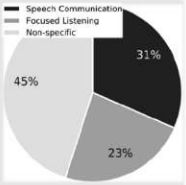


Fig 1 Distribution of listening intentions (CoSS)

To date, it is unknown if these findings are specific to the study population and potentially reflect patterns of listening situation **avoidance**. Consequently, the presented study explores the impact of **hearing status** on aspects of people's auditory reality.

Method and Analysis

Participants · 65-79 years old

Group	Group size	Hearing status
Hearing-impaired (**OHI**)	**20** (8 M, 12 F)	PTA4: 41-60 dB HL
Normal-hearing (**ONH**)	**17** (3 M, 14 F)	0.25-4kHz: ≤25 dB HL, 6 kHz: ≤50 dB HL

Method ·

- 1-week **EMA** using study mobile phone and 7 prompts/day
- Report **location**, **listening task**, **difficulty to hear**, and **noise presence/annoyance**
- External microphone attached to the phone continuously logging **sound levels** during EMA hours (8am-8pm)
- Semi-structured **exit interview** focusing on **avoidance** of listening situations. Question: "Do you recognize that you avoid listening situations in your everyday life (due to hearing difficulties)?"

Analysis ·

A publicly available tool for Bayesian analysis of EMA data[4] was used to investigate AR group differences. Results are visualized in terms of **situation probabilities** (Fig 2-3) for location/CoSS categories or **logit units** (Fig 4-5) for ordinal rating categories. **Credibility** of group differences is also presented. Red areas in the figures mark differences with credibility values above 0.8.

Conclusions and Outlook

Conclusions ·

EMA data: Similar **listening tasks**, **noisiness,** and **sound levels**, but **OHI** TPs perceived hearing in these situations as **more difficult**.

Retrospective assessments: **OHI** TPs report significantly **more avoidance** of loud (e.g., concert) or noisy (e.g., multiple talker) situations.

Outlook ·

Data for **young normal-hearing** TPs have been collected as part of this study, and age effects will be analyzed.

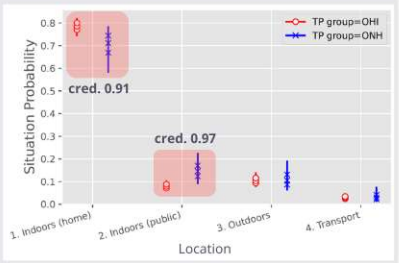
More research needed to find **outcome dimensions** that may indicate avoidance patterns and other important group differences in AR.

Additional research needed to understand the **impact of avoidance** of certain listening situations.

Results

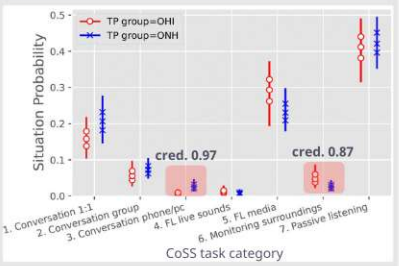
Location (Fig 2)

- Most reports made indoors at home (both groups)
- OHI higher probability of being indoors at home and lower probability of being indoors in public
- No difference for outdoors and transport situations



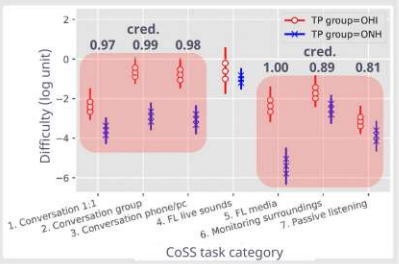
Listening task (Fig 3)

- Everyday listening tasks similar both groups
- ONH higher probability of having "Conversation via phone"
- OHI higher probability of being in "Monitoring surroundings" situations



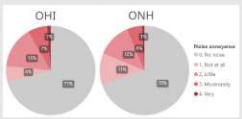
Difficulty to hear (Fig 4)

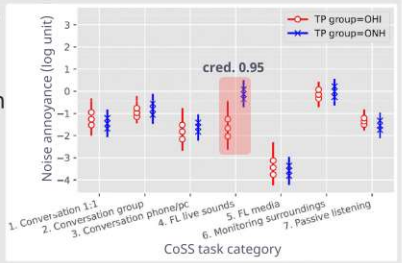
- OHI report higher listening difficulty for all CoSS categories except "Focused listening (FL) to live sounds"
- High credibility (>0.8) for all differences



Noise annoyance (Fig 5)

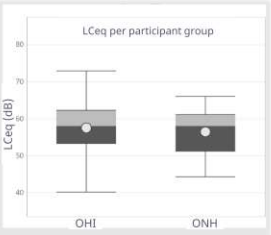
- ~ 80% reports in quiet or "not at all" annoying noise
- OHI more annoyed by noise in "FL to live sounds"





Sound levels (Fig 6)

- Long-term average C-weighted sound levels
- Median sound level: 58 dB(C)
- No significant difference between groups (p>0.05)



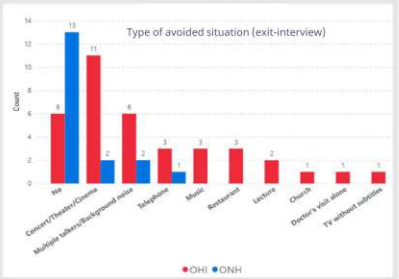
Avoidance (Fig 7)

Both groups reported avoidance

- 70% of OHI participants
- 24% of ONH participants

Most commonly reported avoided situations

- Focused listening to live sounds (concert etc.)
- Multiple talker / noisy situations



[1] **Jensen, Hau, Lelic, Herrlin, Wolters, Smeds, (2019).** Evaluation of auditory reality and hearing aids using an Ecological Momentary Assessment (EMA) approach. *23rd International Congress on Acoustics (ICA),* Aachen, Germany.
[2] **Smeds, Gotowiec, Wolters, Herrlin, Larsson, Dahlquist (2020).** Selecting scenarios for hearing-related laboratory testing. *Ear Hear*, *41*, 20S-30S.
[3] **Wolters, Smeds, Schmidt, Christensen, Norup (2016).** Common sound scenarios: A context-driven categorization of everyday sound environments for application in hearing-device research. *J Am Acad Aud*, 27(07), 527-540.
[4] **Leijon, von Gablenz, Holube, Taghia, Smeds (2023).** Bayesian analysis of Ecological Momentary Assessment (EMA) data collected in adults before and after hearing rehabilitation. *Front Digit Health*, 5, 16.

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