ASHA 2021

RISING UNITED

NOVEMBER 18–20 | WASHINGTON, D.C.

Performance and Preferences for Pre-configured vs Audiologist-programmed hearing aids

Presentation by:

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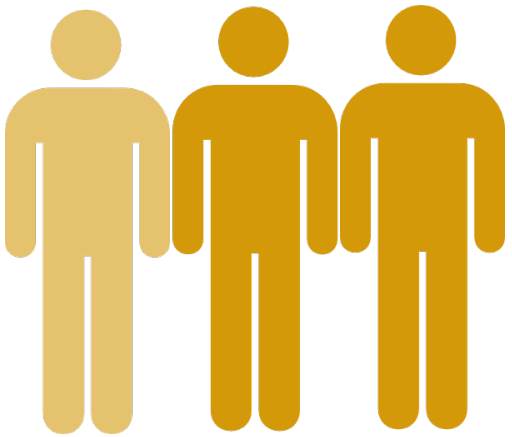
Learner outcomes

- Listeners will:
  - Discover a new method of developing evidence-based pre-configured frequency responses for individuals with mild to moderate sensorineural hearing losses.
  - Be able to compare the performance of hearing aid users with pre-configured and audiologist fit frequency responses.
  - Be able to describe possible reasons for hearing aid users' preferences for pre-configured vs audiologist-fit frequency responses.

Introduction



Introduction

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(Takahashi et al., 2007)

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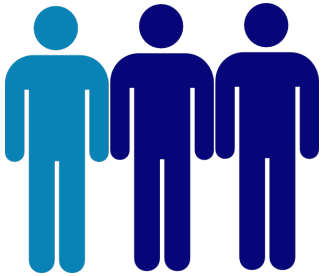
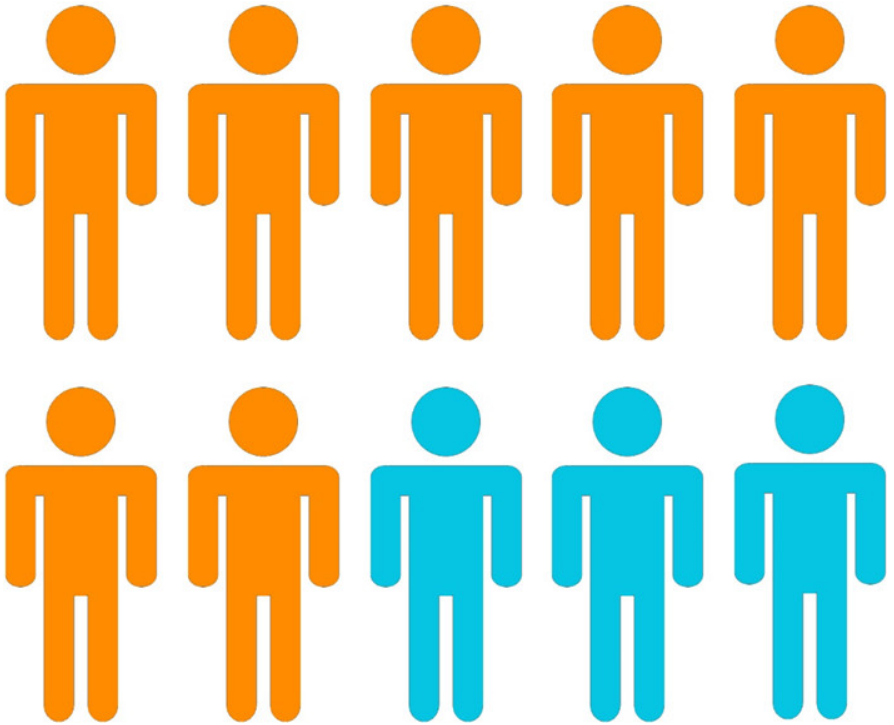
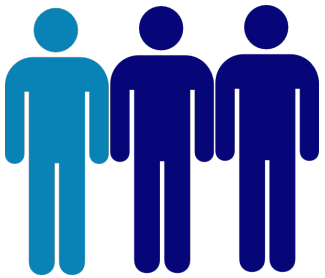
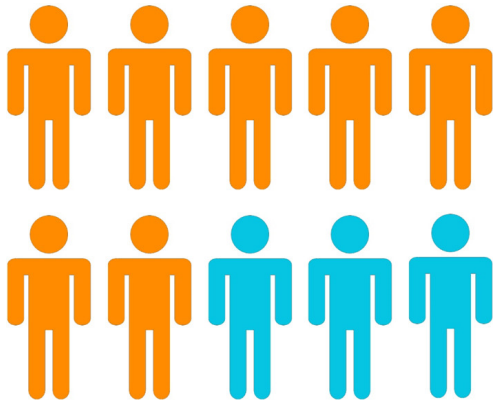




(Bainbridge & Ramachandran, 2014)

Introduction





(Kochkin, 2007; Abrams & Kihm, 2015)

II

115TH CONGRESS
1ST SESSION

S. 670

To provide for the regulation of over-the-counter hearing aids.

IN THE SENATE OF THE UNITED STATES

MARCH 21, 2017

Ms. WARREN (for herself, Mr. GRASSLEY, Ms. HASSAN, and Mr. ISAKSON) introduced the following bill; which was read twice and referred to the Committee on Health, Education, Labor, and Pensions

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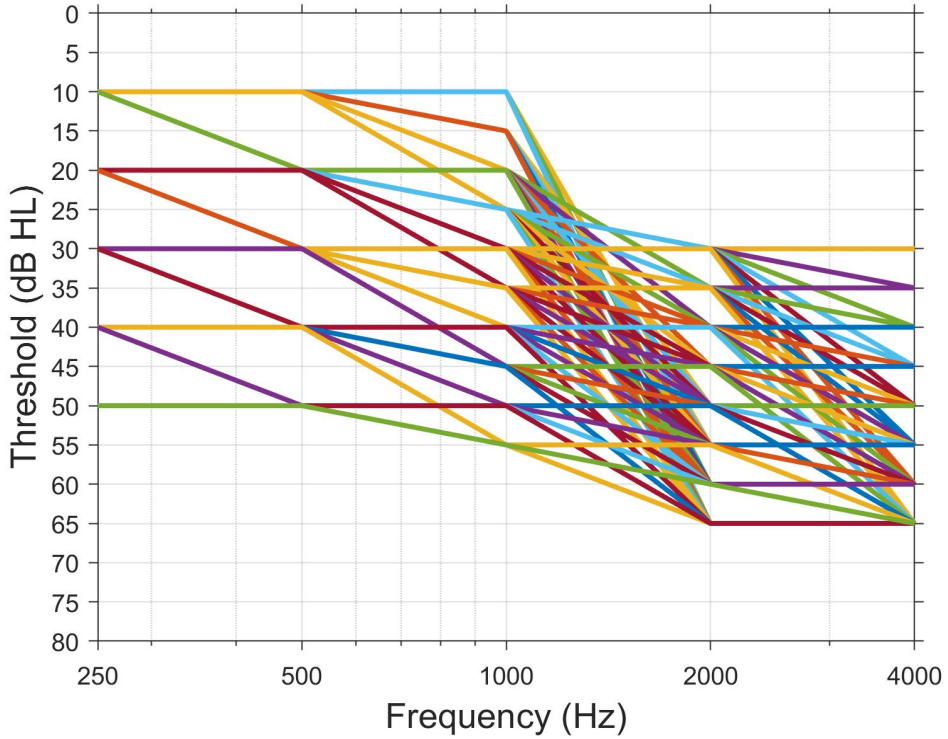
A BILL

To provide for the regulation of over-the-counter hearing aids.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Development of new presets: (Urbanski & Wu, 2020)

642 base audiograms from 534 ears from NHANES database



Development of new presets: (Urbanski & Wu, 2020)

Purpose

- To compare the outcomes of the four previously developed presets (denoted as HAAR) in the laboratory and real-world to an existing OTC hearing aid (OTC) and to traditional fittings completed by an audiologist (AUD).
- Hypothesis: The outcomes of the presets or HAAR condition will be comparable to AUD condition and will be better than the OTC condition.

Method- Participants

- 37 (18 female, mean age= 70.5 years; range= 55-85 years)
- Bilateral, mild-to-moderate SNHL.
- Passed cognitive screening to r/o dementia

Outcome measures

- Audibility: As-worn speech intelligibility index (SII), real-ear aided responses (REAR)
- Speech perception testing: Nonsense syllable test (Kuk et al., 2010)
- Real-world assessment: Abbreviated Profile of Hearing Aid Benefit.

- Subjective preferences
- Willingness to pay (WTP)

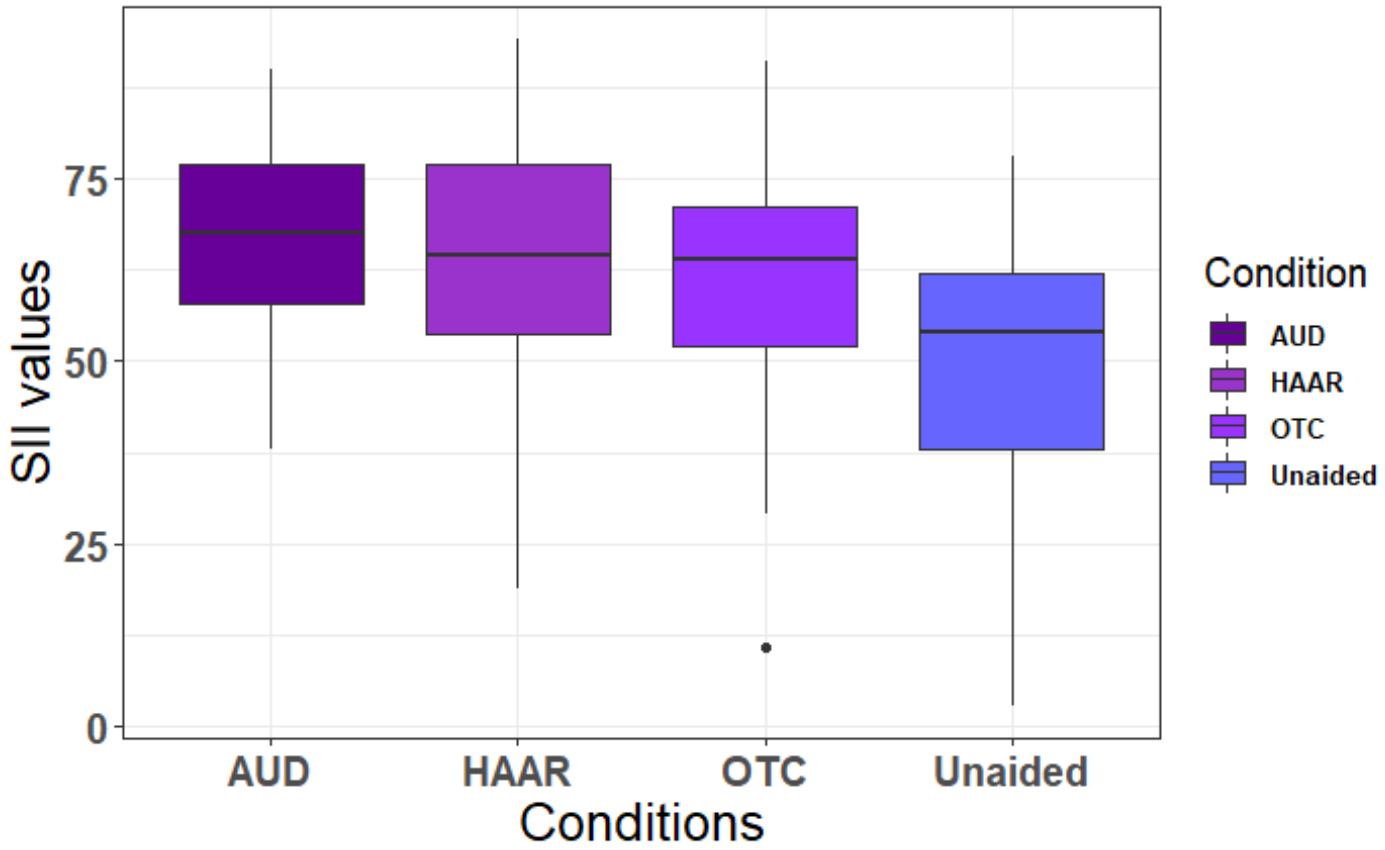
Conditions

Unaided	AUD	HAAR	OTC
• Without hearing aids	• Fit using Audiology Best Practices: NAL NL2	• Participant selected one out of the 4 presets: by listening to speech in quiet and noise with each preset.	• An OTC hearing aid: similar to ones available in the market. Mid-frequency emphasis

Analysis

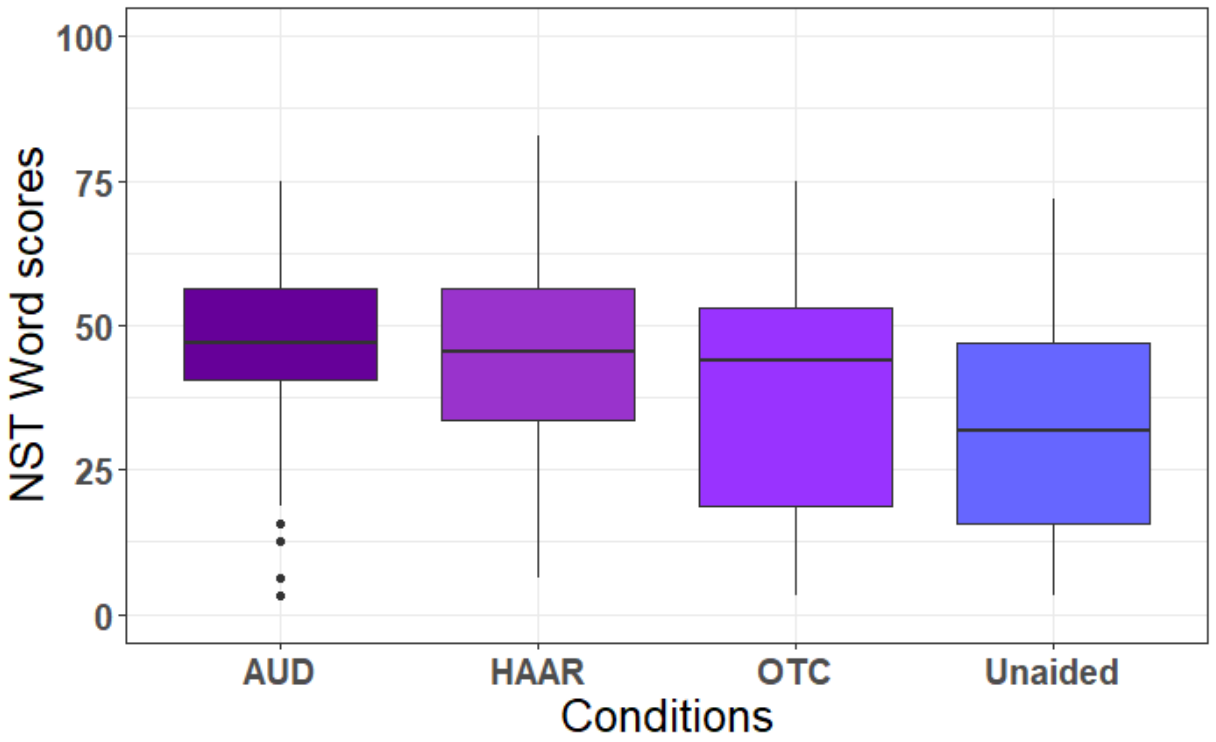
- Linear mixed effects models to analyze the difference between different conditions.
- Conditions (Unaided, AUD, HAAR, OTC): Independent variable/ fixed effect
- Subjects: random effect
- Outcome measures: Dependent variables

Results- SII



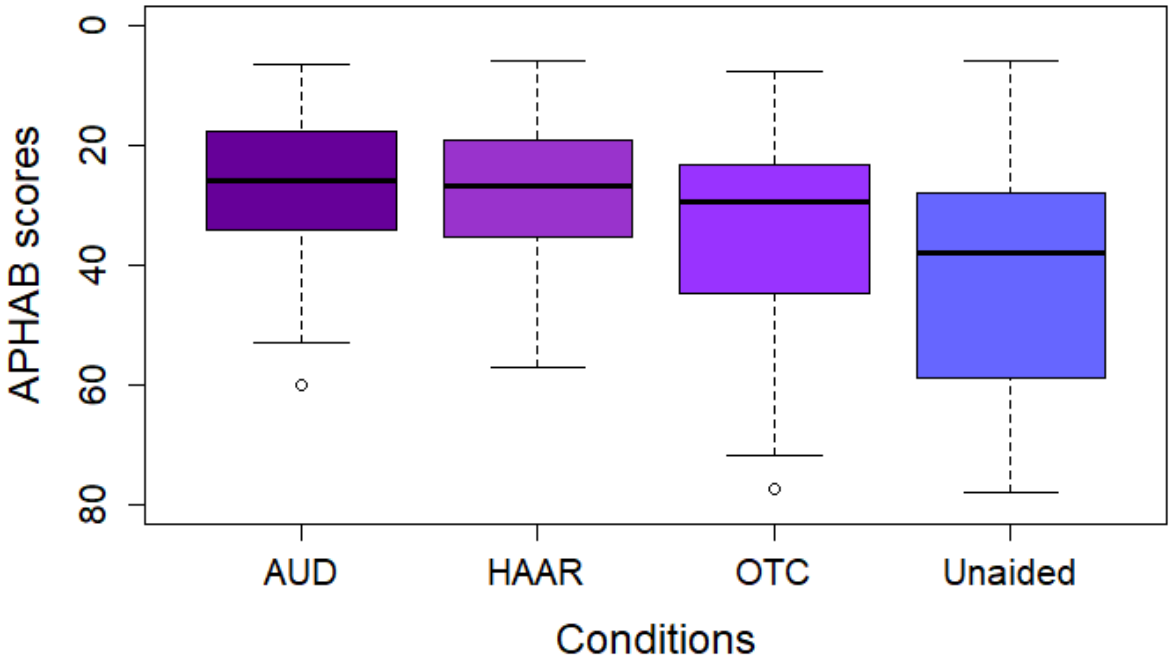
- Audibility testing using speech intelligibility index (SII) revealed that the aided SII (for AUD, HAAR and OTC) was better than the unaided SII.
- SII in the AUD condition was significantly better ($p<0.001$) than the OTC condition.

Results- Speech perception- Nonsense Syllable test (NST)



- NST word scores show that AUD ($p<0.001$), HAAR ($p<0.0001$), and OTC ($p=0.0014$) are significantly better than unaided NST scores.
- Scores for AUD are also significantly better than OTC condition ($p= 0.030$).

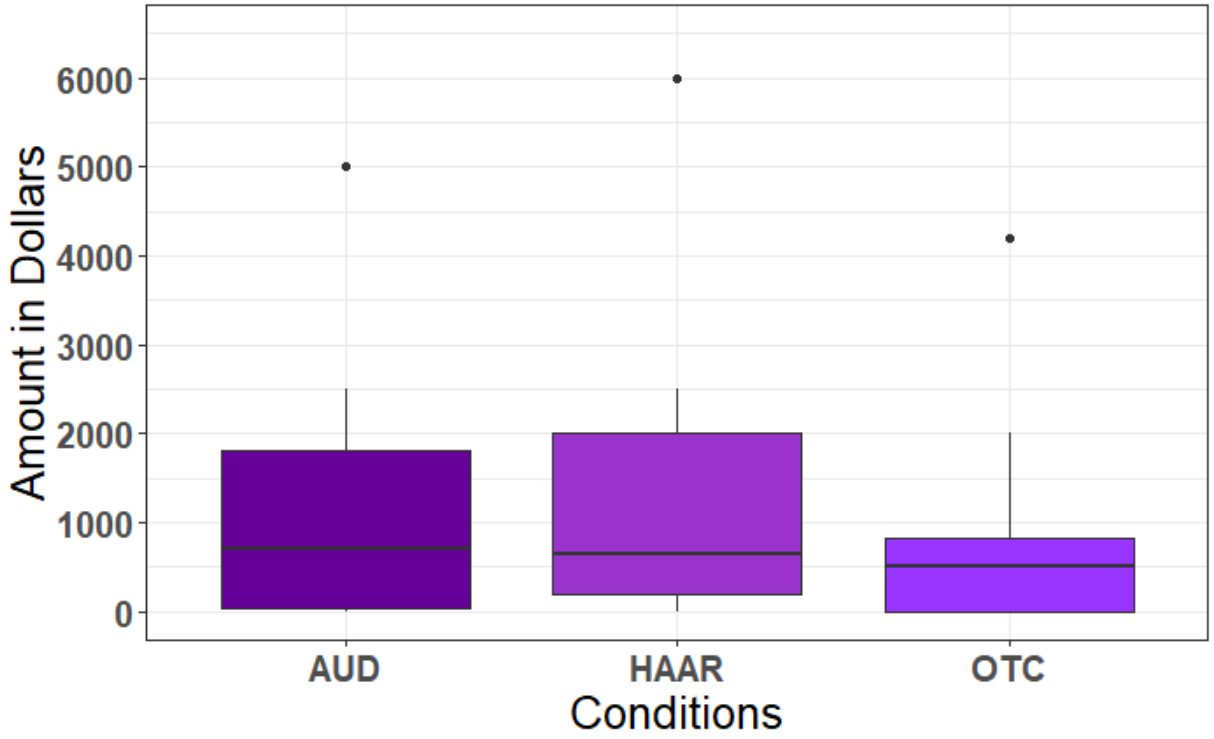
Results- Benefit in real world (Abbreviated Profile of Hearing aid benefit)



- APHAB scores indicated that all the aided conditions (AUD: $p<0.0001$, HAAR: $p<0.0001$, OTC: $p=0.0019$) showed more benefit over the unaided condition.
- Additionally, AUD condition showed significantly greater benefit than the OTC condition ($p=0.026$).

Results- Subjective preferences and willingness to pay.

- Individuals who preferred:
  - AUD: 12 (32.43%)
  - HAAR: 20 (54.05%)
  - OTC: 5 (13.51%)
  - HAAR was significantly preferred to OTC ($p<0.001$).
- Willingness to pay (mean):
  - AUD: $1050
  - HAAR: $1048.58
  - OTC: $702
  - All comparisons were NS.



Results: Comparison of REAR between AUD and HAAR conditions

- We compared the REAR targets prescribed by NAL-NL-2 targets (obtained using the participants' audiogram) and the targets of the presets selected by the participants in the HAAR condition.
- There was no significant difference between the NAL-NL2 targets and the chosen preset targets for all the frequencies investigated, i.e. 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000Hz.
- This was seen even after controlling for experience level. This could partly explain why the participants did not show strong preference for the traditional audiologist fitting.

Conclusion

- The frequency responses (HAAR) developed by our lab perform as well as a traditional audiologist gain frequency response in the lab tests and in real-world questionnaire.
- We also see that in the HAAR condition, the participants were able to choose a preset (out of the four developed by our lab) that was not significantly different than the NAL NL2 targets that would be recommended to them.

Conclusion

- Most of the participants (54.05%) indicated a preference for the HAAR hearing aids as opposed to 32.43% for the AUD hearing aids. Additionally, participants were willing to pay similar prices for the HAAR and the AUD hearing aids.
- These findings provide indication that pre-configured hearing aids that are programmed using evidence-based frequency-responses provide better outcomes and are more preferred by individuals with hearing loss over low/mid frequency-emphasis OTC hearing aids.
- Our study provides field-trial results using evidence-based frequency responses and support the use of these gain-frequency responses in pre-configured hearing aids in the future. Implementing these gain-frequency responses to pre-configured hearing aids will make hearing devices more affordable, while maintaining the quality of pre-configured hearing devices.

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