

The Effects of Multiple Talkers and Noise on Hearing Aid Users

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Background

- Research shows listening in the presence of **background noise** is challenging (Avivi-Reich, Jakubczyk, Daneman, & Schneider, 2015) for people with normal hearing (NH). Furthermore, when there are **multiple talkers** communicating, identifying the message becomes increasingly difficult (Kirk, Pisoni, & Miyamoto, 1997).
- We know little about how listeners with hearing loss (HL) who use hearing aid (HAs) perform when faced with listening situations similar to those mentioned above.
- Theoretical descriptions of how people with and without HL perceive speech do not typically account for everyday variability (multiple talkers and noise).

Aim

...assess the **sentence recognition skills** of listeners with HL when listening to multiple talkers in the presence of noise.

Design

For this study we used a within 2*3 within-subjects design. **Background noise** (cafeteria noise, 4-talker babble, quiet) and **talker** (single, multiple) were the independent variables. **Keyword accuracy** (percentage correct) served as the dependent variable.

Methods

Participants

13 adult native English speakers with SNHL who used HAs.

Stimuli

Talkers. 20 females recorded the multi-talker stimuli. One female recorded the single talker stimuli. All talkers reported American English as their native language.

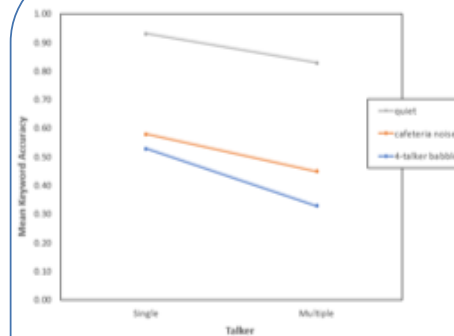
Target sentences. We randomly selected 3 sentences from the *Harvard Sentences* (IEEE, 1969) for each talker to record as stimuli for the multi-talker condition, yielding a total of 120 stimulus sentences in the multi-talker condition. 60 Harvard sentences were randomly chosen for the single talker to record as stimuli for the single talker condition.

Background noise. *Cafeteria noise, 4-talker babble and quiet.* Cafeteria noise was taken from an Auditec CD (St. Louis, MO, www.auditec.com). 4-talker babble was created using recordings from 2 females and 2 males voices. Both noise types were presented at **+3 dB SNR**. The quiet condition served as the control condition.

Procedure

1. Listener's **hearing thresholds were confirmed.**
2. Thresholds were used to program an equalizer to meet *NAL-R (Byrne & Dillon, 1986) targets.*
3. Listeners were **tested individually** at a personal computer set-up in a double-walled sound booth and equipped with circumaural headphones.
4. The researcher instructed the listener to **type the target sentences heard** while noise played simultaneously in the background.

Results



- Main effect of noise: partial $r^2 = 0.93$
- Main effect of talker: partial $r^2 = 0.87$
- **No significant interaction** between noise and talker

Discussion

- Results from the current study give **insight into how people with HL perceive speech** in challenging conditions.
- However, **these data do not provide any insight into what global and fined-grained talker-specific information** may facilitate or inhibit speech intelligibility

Future Directions

- We are currently completing an **acoustic analyses** across all the talkers' vocal recordings to explore what characteristics of the talkers' voices may correlate with intelligibility
- **Understanding the relationship between talker characteristics and the present sentence recognition data**, could contribute to improvements in aural rehabilitation. For example, we could teach patients to exploit certain talker-specific characteristics to improve speech comprehension.
- Further, additional research should also be conducted to **determine if the lack of interaction between noise and talker is robust.**

References

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