

Use of LENA to quantify hearing aid outcomes in older adults

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INTRODUCTION

- Information about hearing aid outcomes can be gathered in many different ways, including clinical tests of speech perception and self-reported measures of satisfaction, benefit, etc.
- These traditional methods have been challenged as either 1) not representing real-world performance, or 2) relying too heavily on memory recall of success in various communication situations.
- The Language Environment Analysis (LENA) system holds the potential of combining the real-world relevance of survey data with the objectivity of clinical measures; this tool has been used extensively to study the language and auditory environments of children.
- In this study, the LENA system was used as a novel approach to better understand the effect of hearing aids on the real-world auditory environments of older adults.
- Study questions: What is a typical auditory environment for older adults, and how does the auditory environment change with the use of hearing aids?

METHODS

- Participants
 - Twenty-two hearing aid users aged 64 to 82 ($M = 72.4$), nine females and 13 males
 - Bilateral sensorineural hearing loss
 - Sixteen new hearing aid users, six experienced users ($M = 2.3$ years of experience)
- LENA digital language processor was worn 6-8 days while not wearing hearing aids (unaided condition) and for 6-8 days while wearing hearing aids (aided condition)
 - For the aided condition, subjects wore hearing aids for 4 weeks before the LENA-recorded week
 - For the unaided condition, experienced hearing aid users agreed not to use hearing aids for 4 weeks before the LENA-recorded week
 - The order of the unaided and aided conditions were randomized for the experienced hearing aid users
 - All but one of the new hearing aid users completed the unaided condition before the aided condition
- LENA variables examined in unaided and aided conditions:
 - Adult Word Count (AWC) per hour
 - Total AWC divided by participant's total recording time
 - Percentage of total recording time spent in meaningful speech, distant speech, TV/electronic sounds, noise, silence

RESULTS

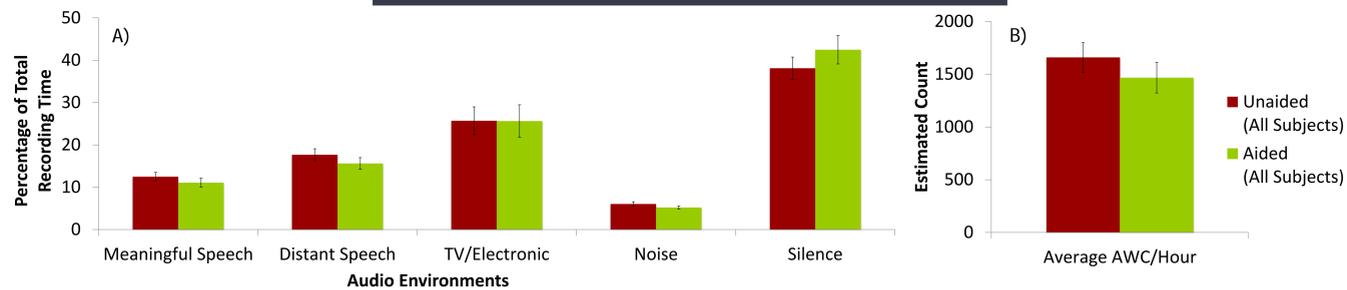


Figure 1. A) Mean percentage of LENA (Language Environment Analysis) recordings spent in different audio environments. B) Estimated mean Adult Word Count (AWC) per hour. Mean recording times were 79.1 hours ($SD = 8.6$) in the unaided condition and 78.3 hours ($SD = 10.4$) in the aided condition. $N = 22$. Error bars represent +/- standard error of the mean. No significant differences were found between the conditions for any variable.

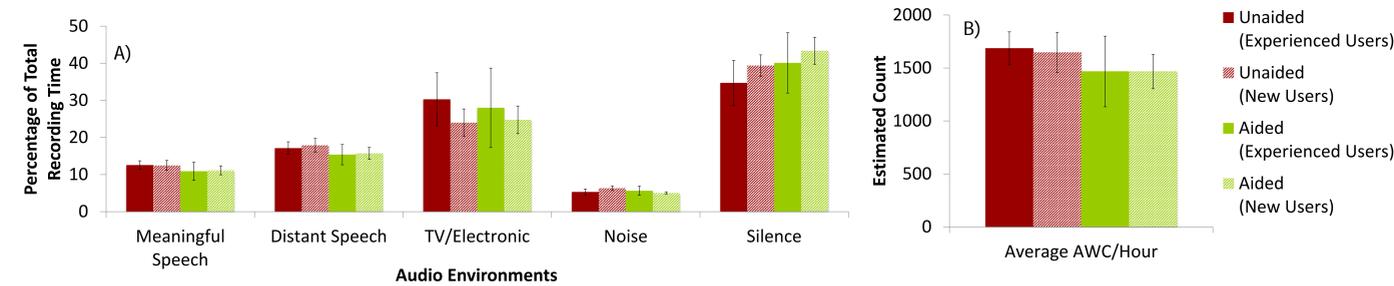


Figure 2. Comparison between new and experienced hearing aid users' A) audio environments and B) average Adult Word Count (AWC) per hour. Experienced users $N = 6$, new users $N = 16$. Error bars represent +/- standard error of the mean. No significant differences were found between the conditions or between new and experienced users for any variable.

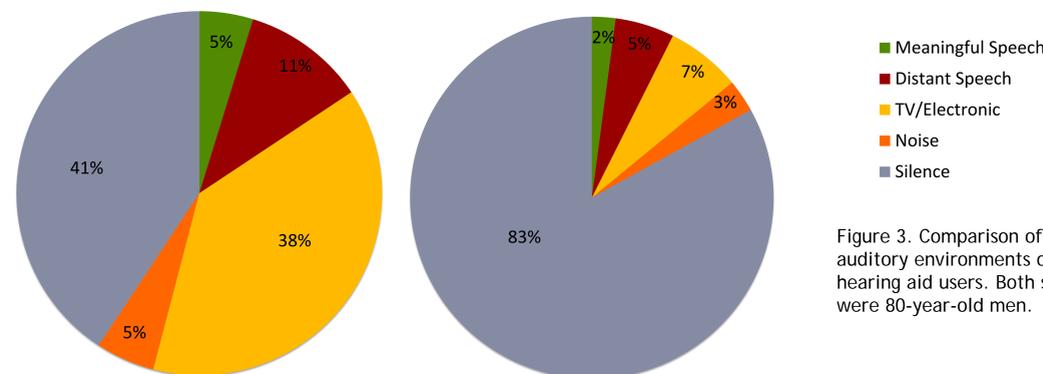


Figure 3. Comparison of the aided auditory environments of two new hearing aid users. Both subjects were 80-year-old men.

DISCUSSION

- Wide variation was found between individuals' auditory environments in both the unaided and aided conditions.
- No differences were found between the unaided and aided conditions for any of the five audio categories or AWC per hour.
 - In the aided condition, participants may have listened more and talked less than in the unaided condition, resulting in a "balancing out" of the total amount of speech detected by digital language processor.
 - Since the LENA system cannot distinguish between words spoken by the key adult and other adults in the environment, it is unclear if the hearing aid user was talking more or less.
 - Older adults may not choose to seek out new social situations or emotional connections, even if hearing aids could be beneficial in such situations.
 - The particular variables examined in this study may not be sensitive to the effects of hearing aids on the lives of older adults.

CONCLUSIONS

- Based on the current data, the usefulness of LENA as a measure of hearing aid outcomes for older adults is unclear.
- Clinicians must consider the auditory needs and experiences of clients on an individualized basis.
- An examination of alternative variables available through the LENA software—such as average TV level, average conversation level, and number of conversational turns—may reveal subtler differences between the auditory environments of older adults with and without hearing aids.

ACKNOWLEDGEMENTS

This project is supported by the National Institute on Deafness and Other Communication Disorders - NIH (1R03DC012551-01 and R01DC012769-01).

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