Assistive Technology Validation (ATV) Protocol: Audiology Outside the Soundbooth

Alexander Morris, B.A. & Linda Thibodeau, Ph.D.

The University of Texas at Dallas

INTRODUCTION

Hearing aids and cochlear implants are well-established options for individuals with hearing loss; however, in some cases assistive listening devices (ALDs) are necessary to help such individuals communicate in real-world environments.[1] Specifically, the use of wireless microphone technology has been shown to provide additional speech recognition in noise benefit when compared to hearing aids alone.[2] Audiologists are responsible for dispensing appropriate amplification as well as recommending ALDs based on the patient's lifestyle and communication needs. Per the American Academy of Audiology's practice guidelines on hearing assistive technology, validation should always be performed to ensure such technology is meeting the patient's communication goals.[3] Recent research suggests that validation using real-ear measurements can increase the patient's perception of a provider's competence and even willingness to pay for services;[4] however, not all situations allow for validation of ALDs using traditional methods in the soundbooth. The 2016 ASHA Audiology Survey indicates that 67% of audiologists surveyed are currently dispensing, fitting, or recommending ALDs; however, only 32% of those surveyed report validating this technology using speech-in-noise testing.[5]

Audiologists—both in the clinic and in educational settings—are in need of a protocol that shows wireless microphone benefit functionally, reliably, and quickly. A protocol developed by Dr. Linda Thibodeau utilizes readily-available tools such as a Bluetooth speaker and smart tablet to show relative benefit in a timely manner. Recorded multi-talker babble from the BKB-SIN [6] test and live-voice BKB sentences are presented. This protocol has been named the Assistive Technology Validation (ATV) Protocol, as it can be used on a wide array of assistive devices and doesn't require testing in a soundbooth.

EQUIPMENT AND STIMULI

Figure 1. Equipment and stimuli used for the Assistive Technology Validation Protocol.

TEST ARRANGEMENT

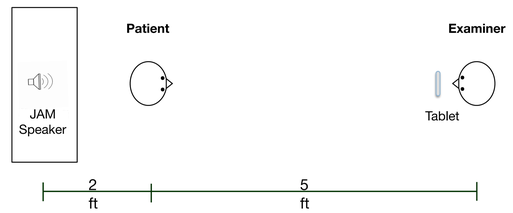

Figure 2. Testing arrangement.

PROCEDURES

ENVIRONMENT/EQUIPMENT

- Test room had ambient level less than 60 dBA and was 10'x12' foot
- Examiner seated five feet in front of patient, holding iPad/tablet
- Sound level meter used to monitor own voice (goal of 65 dBA presentation)
- JAM Bluetooth Speaker set at full volume on a table/desk two feet behind the patient
- iPad (or other tablet) connected to JAM speaker and adjusted so starting noise level was 65 dB SPL at the patient's location

STIMULI

- BKB noise and eight-sentence lists were recorded into a movie file on the iPad
- Noise file increased in intensity in 3-dB steps that coincided with the sentence presentation cued by the movie file

INSTRUCTIONS AND SCORING

- Listeners were instructed to repeat the sentences and to guess if necessary
- The number of key words correct was calculated as as percent correct score

POSSIBLE MODIFICATIONS IF NEEDED

Trials can be completed under various conditions to show benefit:

- Hearing aids or cochlear implants alone vs with wireless microphone technology
- Visual cues allowed vs denied
- Examiner reading sentences vs communication partner reading sentences

SUBJECTS

The ATV protocol was administered to four subjects to demonstrate wireless microphone benefit: two individuals with hearing loss (ages 22 and 92) and two individuals with normal hearing (ages 21 and 22). A Phonak Roger Pen was used as the wireless microphone.

Of the two individuals with hearing loss, one wore bilateral behind-the-ear hearing aids compatible with Roger Receivers. The two individuals with normal hearing were given access to the Roger Pen signal through the use of bilateral Phonak Roger Focus, ear-level receivers coupled to the ear with slim-tubes.

The ATV protocol was administered to all four participants under two conditions: without the Roger Pen and with the Roger Pen. Each trial was scored as a percent correct.

RESULTS

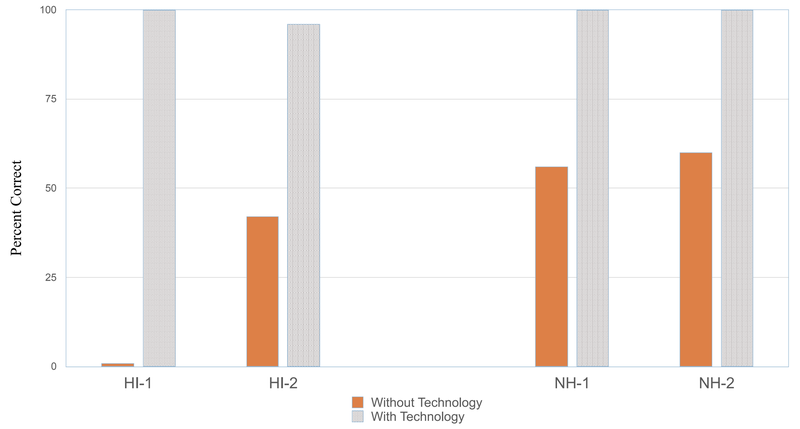

Figure 3. Percent correct scores without (solid bars) and with (dotted bars) technology for hearing impaired (HI) and normal-hearing (NH) listeners.

SUMMARY AND DISCUSSION

All four participants in this study showed improvement on the BKB-SIN test regardless of the presence or absence of hearing loss. The group with hearing loss showed an average of 77% improvement while the group with normal hearing showed an average improvement of 42%.

The benefits of assistive listening devices in noisy environments are well-documented[1,1,2] and it should not be inferred that the ATV protocol is a replacement for established speech-in-noise measures completed in an audiologically-favorable environment. Rather, this protocol is a way to quickly, objectively, and functionally demonstrate the benefit of wireless microphone technology to our patients when pressed for time or access to a soundbooth. Possible applications for this protocol include educational audiology, private practice settings, ENT offices, and home visits.

REFERENCES

1. Atcherson, S. R., Franklin, C. A., & Smith-Olinde, L. (2015). Hearing assistive and access technology. Plural Publishing.
2. Thibodeau, Linda. (2014). Comparison of speech recognition with adaptive digital and FM remote microphone hearing assistance technology by listeners who use hearing aids. *American Journal of Audiology, 23*(2), 201-211.
3. American Academy of Audiology (2011) Clinical Practice Guidelines: Remote microphone hearing assistive technologies for children and youth birth-21 years and supplement A.
4. Amlani, A.M., Pumford J., Gessling E (2016). Improved Patient Perception of Clinical Services through Real-ear Measurements. *Hearing Review.* 2016; 23 (12):12.
5. American Speech-Language Hearing Association (2016). *2016 Audiology Survey. Survey summary report: Number and type of responses.* Available from www.asha.org.
6. BKB-SIN: Bamford-Kowal-Bench speech in noise test (2005). Elk Grove, IL: Etymotic Research.