A Field Study

Wearer benefit of Directional Microphones and Open Fit BTEs in Noise

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Introduction

This field trial was established with the goal of surveying current and new hearing aid wearers' perception of speech understanding in various noisy situations while wearing an open fit BTE hearing aid with directional microphones.

The Hearing Aid

Manufactured by Magnatone, the Monet Shadow Z is a fully digital, open fit behind the ear hearing instrument with four memories and manually selected directional or omni-directional microphones. Developed for people with mild to moderate hearing losses, this aid was designed to target the predominant hearing aid wearer objective of improving speech clarity, especially in the presence of background noise. The Shadow Z employs a 6.5 mm microphone separation and predominately a horizontal plane of approximately 13 degrees between microphone ports when positioned on the ear. This hearing aid incorporates a Tri-Mode Layered Noise Reduction algorithm. Random noise, steady state noise, and a quick recovery layer are used to address different noise sources.

Subjects and Procedures

For the field study, 215 participants with mild to moderate hearing loss were recruited by Gardner Audiology through newspaper advertising in the Tampa Bay area. Participants were mostly fitted binaurally and a few were fitted monaurally simply because they only had hearing loss in one ear. The age of participants was from 55 and up. Participants included 160 first time hearing aid wearers and 55 current wearers of custom in the ear hearing aids or behind the ear aids without the benefit of directional microphones. No money was requested or received from participants during the trial period.

Following determination of hearing thresholds and speech recognition ability, each participant completed a pre-fitting survey in which they rated their current ability to understand speech in various levels of background noise.

The Shadow Z hearing aids were fit to an optimal NAL-NL1 real ear response using live speech mapping available through MedRx. During the initial fitting only one memory was activated with full time directional microphones (cardioid pattern). The Tri-Mode Noise Reduction remained "on" for all fittings. During a follow up visit some participants requested a second memory for more comfort in very noisy situations. For

the majority of these patients a second memory was simply a gain reduction without modifications to the frequency response.

The hearing aids were trialed in participants' familiar surroundings for four weeks and all were seen for several visits during the study trial period. Participants were asked to use their hearing aids all day long and most reported doing so. Following the trial period, participants completed a post-fitting survey.

Results and Discussion

The overall results of pre and post-fit comparison for new hearing aid users are presented in Figure 1. As would be expected by any dispenser, the entire group of new hearing aid users experienced improvement in speech understanding in most situations with the use of the Shadow Z hearing aid as compared to their unaided speech understanding.

More interesting is the fact that participants who had previously used other hearing instruments without directional microphones or without open ear designs demonstrated overall improvement of speech understanding in most all acoustical environments. These results are represented in Figure 2.

Figure 3 displays the entire groups' assessment of their improved speech understanding ability with the Shadow Z in the most difficult listening situations like noisy restaurants and parties. No complaints (or complements) were received from patients that they could recognize when the device was entering Noise Reduction Mode or turning off the Noise Reduction Mode. Effectively, the algorithm was seemingly transparent to the wearer.

Conclusion

When wearing the Shadow Z hearing aid in the full time directional microphone mode both new hearing aid users and previous hearing aid users with mild moderate losses reported significant improvement in speech understanding in quiet and noisy situations. Some wearers required a second memory to reduce gain in very noisy situations.

This data reveals the need for more empirical analyses of the acoustic benefits of directional microphones in open fit behind the ear hearing aids.

Although this field study documented the benefit of open ear BTE fitting with full time directional microphones we are left wondering about the value of this benefit for patients with mild moderate hearing losses. Most of the prior hearing aid users purchased their field study instrument but only about 65% of the new users purchased the aid. Most of the non committed participants had marginal hearing loss or a lifestyle that did not motivate them for better hearing at today's hearing aid prices. Sometimes it was just a matter of affordability. At what price point will these consumers embrace a quality hearing aid? We think that question requires another field study.

Figure 1. Subjective speech understanding ratings improve with Shadow Z for new users.

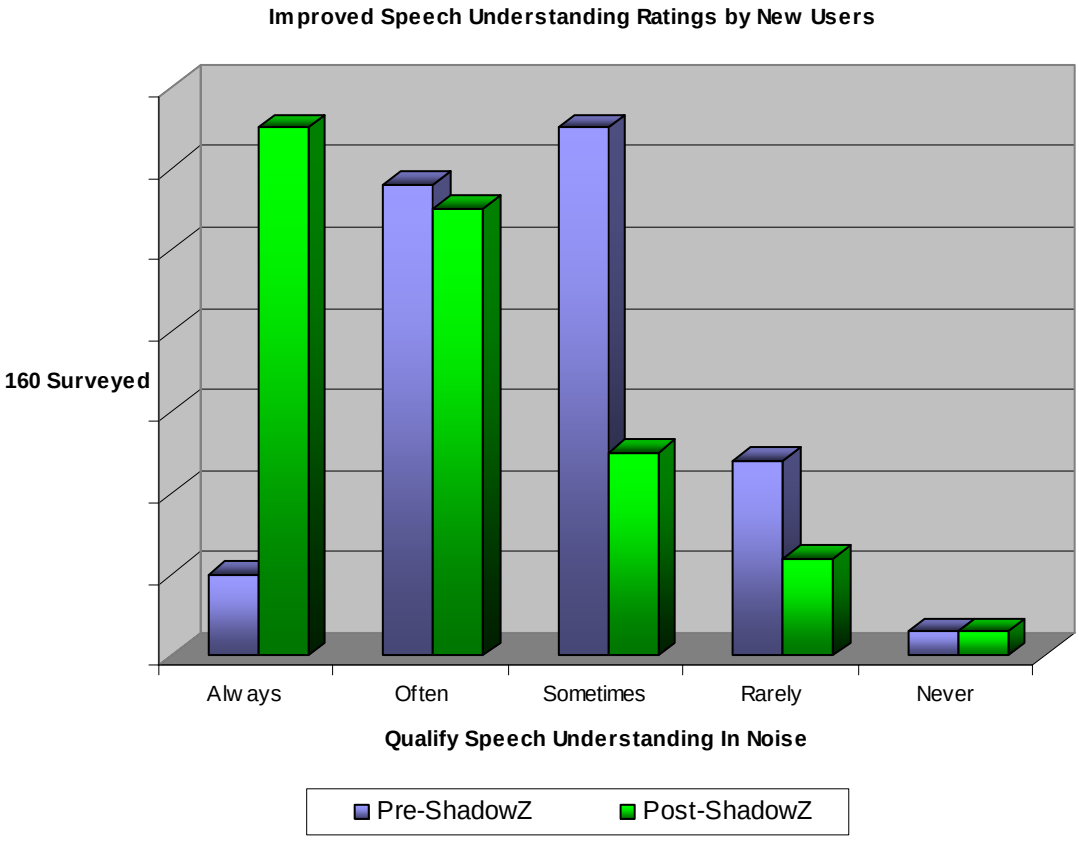

Figure 2. Speech understanding improves with ShadowZ compared to previous hearing aid.

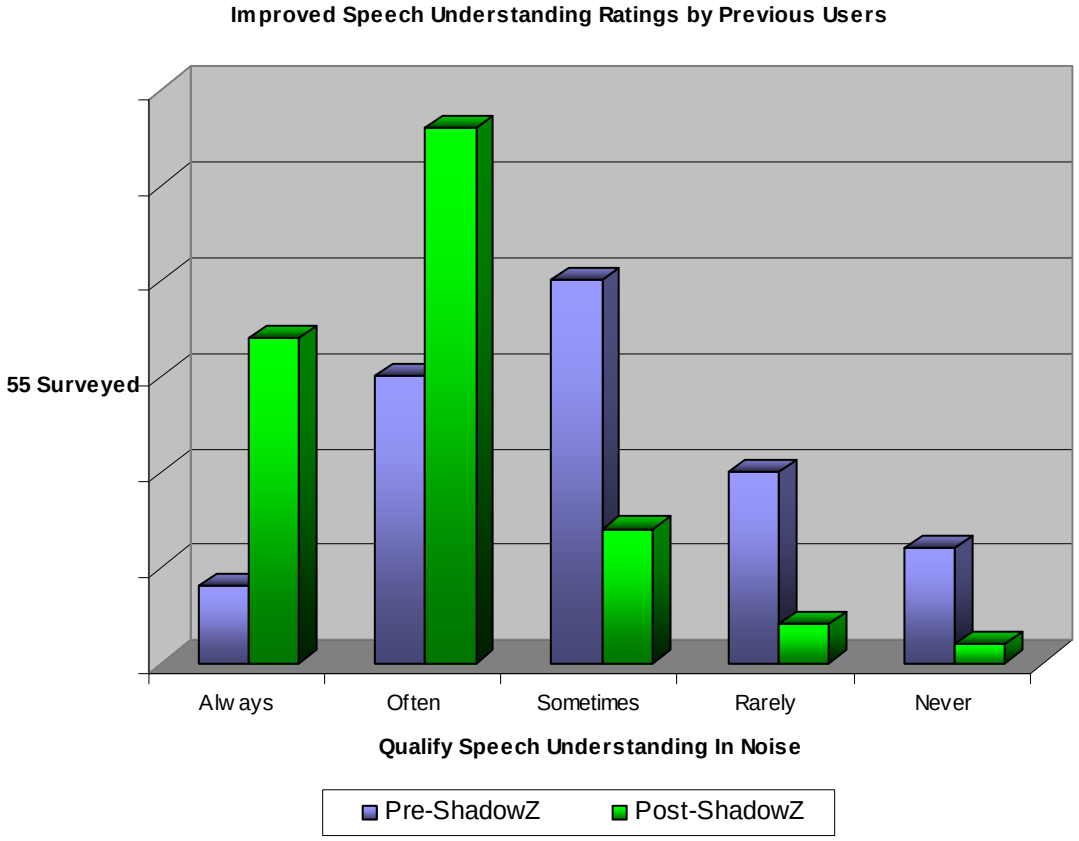

Figure 3. All participants summarized their improved speech discrimination ability in the noisiest situations like restaurants and parties.