

Jill Mecklenburger, AuD
Principal Audiologist, GN Hearing

Abstract

Since the introduction of wireless hearing aids nearly two decades ago, numerous advancements have been made to bring improved signal to noise ratios for hearing aid users when listening to television and other audio sources in the home as well as when listening to movies, concerts and lectures in public. Despite these advancements, receiving the audio signal from a personal computer (PC) has remained a challenge for users due to the limitations of the Standard Bluetooth Classic protocol. This study evaluated the experiences of hearing aid users directly connecting their hearing aids to a PC with the more recently introduced Bluetooth Low Energy Audio (LEA) protocol

Methods

Fourteen individuals with varying degrees of hearing loss participated in the study. The test participants, who are all employees of Intel Corporation were fit with ReSound Nexia hearing aids which include Bluetooth LEA. All were experienced hearing aid users, however none had worn ReSound hearing aids previously. Participants were given laptops with the newest Bluetooth LEA drivers installed. Trial surveys included initial and final in-depth interviews, and an online survey mid-trial. The duration of the study was approximately 6 months.



Results

The study logged over 400 hours of Microsoft Teams calls and streaming from 12 participants. Over 11,000 connections to the PC with the hearing aids were documented with a 99.9% success rate. Participants reported that connecting their hearing aids to their PCs was highly valuable, and that the stability of the connection was critical to a good user experience. The main advantages included not having to wear a headset over their hearing aids, being able to hear more clearly than with a headset over the hearing aids, and the ability to walk away from the computer and still be connected to a call or meeting. The maturity of the technology at the time of the trial did not allow for a simultaneous phone and PC connection, which was a pain point for many.

| Hearing Aids to PC Connection is Highly Valued | Importance of the Phone Connection |
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| <ul style="list-style-type: none"> Stability of the hearing aid/PC connection is vital to a good experience All users would greatly benefit from an app on the PC for connecting and controlling their hearing aids | <ul style="list-style-type: none"> Hearing aid + phone connection is crucial for a good experience Switching from device-to-device (phone/PC) was a pain point for everyone |



Interviews with users revealed a common thread, which was a widespread enthusiasm for a direct connection to the PC. Most participants experienced the direct connection to the PC for the first time in this study. For some the connection was not stable, but they valued it when it worked. For others, minor issues arose because the hearing aids weren't visible and colleagues did not realize that the hearing aid user was on a call.

Reports from users:

"This has been a luxury. Having my hearing aids connected to the laptop directly and being able to see they are connected prior to the meeting, makes it so I can jump in and out of meetings without anxiety."

"I loved it when the connection worked, it was really nice. I didn't have to have a headset on. It was crisp and pretty clear. I wish there was more volume, but when it worked it was great"

"I certainly love being able to walk away from the system and still have a conversation. I don't have to wear a headset or a boom mic. It's fantastic!"

"The whole streaming audio thing, whether it's a podcast or YouTube music, all that works perfectly. This is a vast improvement over what I had before:

References

- Faulkner, S. and Elangovan, M. GN ReSound Self-Test Trial. February, 2024.

Discussion

This study enabled substantial progress in detecting and fixing reliability and stability issues with a hearing aid to PC connection. It was found that connecting hearing aids to a PC is highly valued by all, even by users who may have had failed connections. All users reported that they would benefit from an app on the PC for connecting and controlling their hearing aids and ambient sounds. This feedback contributed to a PC-based app for hearing aid volume control and presets which is scheduled to be released by Microsoft in October, 2024. Future studies are recommended for continued testing and modification of this app with a larger user group.