miniTek, Tek Connect and e2e wireless 2.0

improve speech understanding for telephone listening

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Dr. Josef Chalupper

The wireless audio transmission technology "e2e wireless 2.0" provides the capability to digitally transmit signals from the telephone via the miniTek or Tek Connect into the hearing instrument – bypassing the telephone receiver and the hearing instrument's microphone. As a consequence, reverberation and ambient noise cannot degrade the telephone signal. Moreover, as e2e wireless 2.0 allows for bilateral transmission, speech understanding may benefit from the binaural redundancy effect. And additional benefit is that when asymmetric hearing loss is present, the listener always will be using the better ear, regardless of whether the phone is place to the right or left ear. Thus it was hypothesized that e2e wireless 2.0 would improve speech understanding on the telephone for hearing instrument wearers.

Problems understanding on the telephone in particular occur for listeners with moderately severe hearing loss. Therefore, a study with 10 subjects with moderately severe (PTA > 50 dB HL) and 10 participants with severe (PTA > 65 dB HL) hearing loss was designed, and conducted at Vanderbilt University (Ricketts & Picou 2010). Participants were fitted bilaterally with Siemens Motion P or Nitro BTE according to NAL-NL1 prescriptive targets. As telephones are often used in noisy environments, the listener was surrounded with a background noise of two different levels: 55 dB and 65 dB SPL. To measure speech intelligibility, the Connected Speech Test (CST) was used with an SNR of about + 15 dB to avoid ceiling effects. The speech material was delivered through a telephone using four different coupling methods for the telephone and hearing instrument:

- "Microphone": Coupling via the hearing instrument's microphone. Subjects were instructed to find the optimum position of the telephone receiver before testing

- "T-Coil": coupling via the hearing instrument's telephone coil. Again, subjects were instructed to find the optimum position of the telephone receiver before testing

- "e2e wireless 2.0 (unilateral)": Telephone signal was routed via e2e wireless 2.0 to one ear only

- "e2e wireless 2.0 (bilateral)": Telephone signal was routed via e2e wireless 2.0 to both ears

The results for 55 dB and 65 dB SPL background noise conditions resulted in a very similar pattern, hence, only data for the 55 dB SPL condition are shown in Figure 1. For the "microphone" condition – which is the typical use case today – subjects on average understood less than 20% correct. This is not enough to follow a conversation. Usage of the T-coil resulted in significantly better speech intelligibility, but was still clearly worse than both conditions with e2e wireless 2.0. Observe that with the bilateral e2e, mean performance was 30% better than the t-coil findings, and at a level where it would be possible to follow a telephone conversation. Examination of individual performance revealed improvements of 19 to 70%. Further investigations indicated that subjects were not able to maintain the optimum position for the T-coil throughout testing, whereas e2e wireless 2.0 is robust against changes of the telephone receiver position and thus, results in improved understanding compared to T-coil.

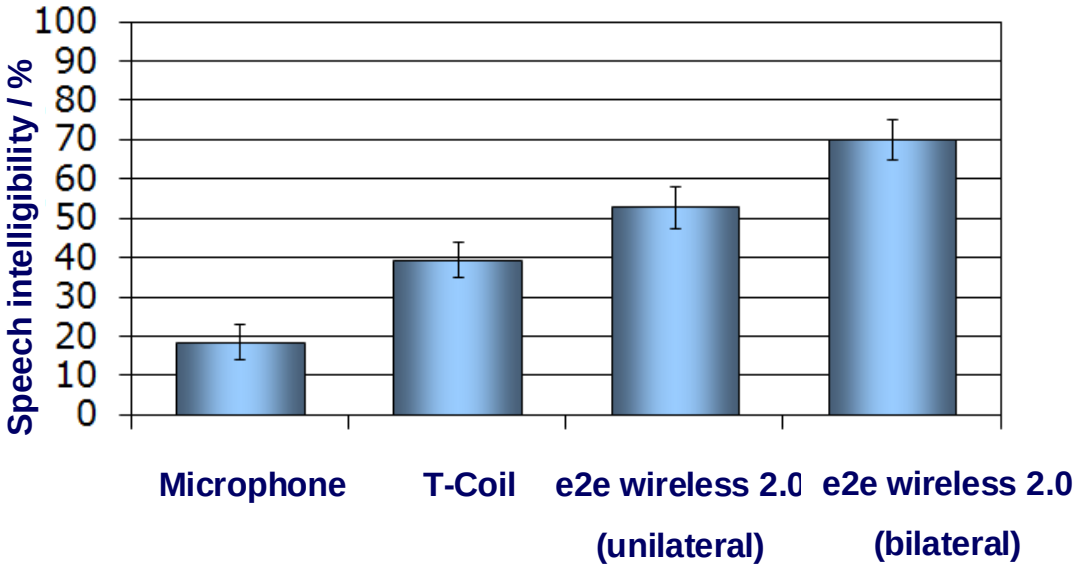

Figure 1: Speech intelligibility in percent correct (CST) for different methods used to deliver speech to hearing instruments.

Summary

Coupling the telephone via the microphone to the hearing instrument results in poor speech intelligibility and thus, is usually not satisfactory for listeners with moderate and severe hearing loss. Routing the telephone via e2e wireless 2.0 (e.g. with miniTek or Tek Connect) directly into both hearing instruments significantly improves speech intelligibility, and therefore helps to overcome one of the biggest issues of hearing instrument wearers – conversation on the telephone.

References

Ricketts, TA & Picou, E. (2010): Comparison of Hearing Aid-Based Telephone Routing Strategies. Paper presented at the 2010 annual meeting of the American Academy of Audiology, April, 2010, San Diego.