

Field Study News

iCom

Significant benefits of speech intelligibility in combination with mobile phones

Summary

iCom is a new communication interface which can easily be used in combination with TV and an mp3 player or a mobile phone. With stereo quality sound presentation, Bluetooth, broadband audio streaming and optional FM connection, the device offers unlimited wireless connections for other entertainment and communication devices. During a mobile phone call, iCom receives the Bluetooth signal from the mobile and streams it continuously, wirelessly and binaurally to the hearing instruments (HI). iCom provides a binaural digital quality signal without background noise and even the possibility of hands free telephony.

Sixteen adult HI wearers participated in this study to investigate iCom and its advantages for mobile phone use. Results show that iCom significantly improved speech intelligibility while reducing noise at the phone during mobile phone use with HI. Further, subjective ratings were highly positive.

Introduction

It is often quite difficult to achieve optimum and stable positioning of the cell phone near the HI microphones (Scopek, 1998). Not only is it necessary to hold the mobile phone in a unnatural position over the microphones of a Behind-The-Ear (BTE) HI but there is also the danger of inadvertent activation or adjustment of operating elements of a custom In-The-Canal (ITC) HI when positioning the mobile phone. Because of these problems, HI wearers often use the cell phone without HI, even though speech intelligibility is very poor without amplification (Nielson et al., 1981; Van Noorden and Ekberg, 1990).

With iCom, Phonak provides a modern communication interface solution not only for mobile phones but also in combination with Bluetooth landline phones, laptops, mp3 players, television, GPS-and HiFi systems. Based on Bluetooth technology, the communication link between the mobile and the iCom is wireless. iCom supports Bluetooth to allow audio to be wirelessly received from many different audio devices and transmitted to the subject's HI. Thus, HI wearers can receive mobile phone calls directly via their HI and therefore benefit from a hearing solution and a significant increase of mobility. Subjects can wear the iCom with a neck loop with their mobile phone in a pocket while performing a handsfree phone call. When making a mobile phone call, the directional microphone built into iCom captures the speaker's voice and transmits it to the mobile phone. To examine whether iCom provides significant improvement in speech intelligibility and mobility using a cell phone, the following

study was performed at the University of Applied Science in Oldenburg, Germany.



Pic.1: iCom with HI

Goal of the Study

Two issues were examined in this study: First, the evaluation of speech intelligibility in noise via mobile phone together with HI's, secondly, spontaneous acceptance, usability and benefit of iCom in daily life.

Set-up of the Study

Sixteen experienced adult test subjects with a moderate to severe HL participated in the study. They were provided with binaural HI's fitted with the default iPGF settings. iComs were paired with a Bluetooth capable mobile phone. Once paired, the mobile phones connect automatically.

The improvements of speech intelligibility in noise were evaluated using the Göttinger sentence test in noise for mobile calls comparing the HI without and with the iCom. Adaptive measurements of the Speech-Reception-Threshold (SRT: signal to noise ratio for 50% intelligibility) were performed with subjects using the ear they normally use for telephoning. With the mobile phone, subjects had to call the computer which directly provided the speech and the speech-simulating noise via the mobile phone. For all measures, the same mobile phone was used with equal settings for loudness to avoid irregularities of the wireless mobile connection. The spontaneous acceptance and the subjective evaluation of the iCom in daily life were determined by various questionnaires which had to be completed while performing a phone call on a noisy street and in a noisy restaurant.

Results

Compared to the reference measures without accessory, the iCom achieved a significant improvement of speech intelligibility in noise with the Göttinger sentence test via mobile phone (Fig. 1).

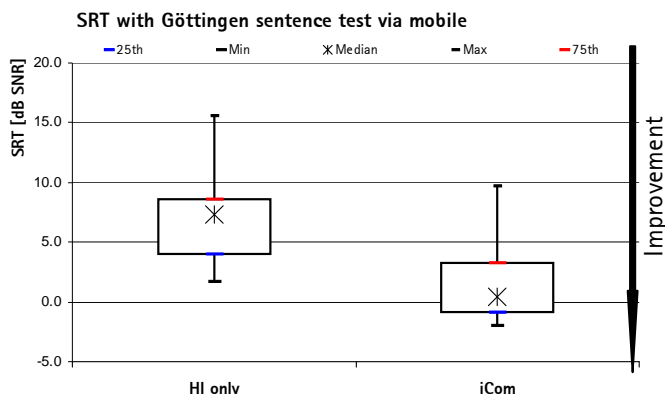


Fig. 1: Significantly improved speech intelligibility with the iCom in the Göttinger sentence test in noise compared to the measurement without accessory but HI only.. Crosses highlight medians, rectangles represent 25-75% confidence interval and lines depict non-outlier ranges. * $p < 0.01$

To subjectively evaluate speech intelligibility in noise, subjects had to perform a phone call on a noisy street and in a noisy restaurant. They were then asked to rate speech intelligibility compared to their previous mobile solution. Results showed very good spontaneous acceptance of iCom overall. The handling of iCom was rated to be very easy. 94% of test subjects rate the signal tone as very helpful. 82% reported having no interruptions during phone calls, while 1 test subject reported having interruptions during the call. This was mainly due to the use of other electrical devices. However, 69% of test subjects evaluated the iCom as being very helpful and 31% as helpful.

While performing a phone call at a noisy street, 64% of subjects rated speech intelligibility as clearly improved, 36% as improved (Fig. 2) compared to the previous phone call situation. 44% understood everything, 38% almost everything and 1 test subject understood half of the communication compared to the previous speech intelligibility. However, a recent study pointed out that when interference of the phone with the HI occur, the buzzing can lead to speech understanding difficulties (Scopek, 1998). Performing a phone call in a noisy restaurant, 62% of test subjects reported understanding clearly more than with the previous phone solution. 23% understood a little bit more, 8% equal and 8% less than before (Fig. 3). Further, 46% of test subjects understood everything, 46% mostly everything and 8% less of the conversation. However, the test subject with the negative ratings reported that the mobile phone and the iCom was disconnected due to a distance in between them of more than 10 m. This was difficult to notice. The devices were not reconnected again automatically. It therefore might be that the subject used an inactive iCom during the phone call.

Street: How much do you understand compared to the previous solution?

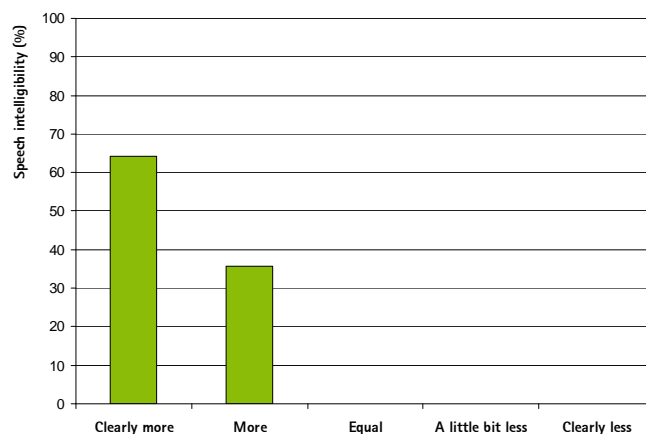


Fig. 2: High benefits of iCom during telephony on a noisy street

Restaurant: How much do you understand compared to the previous solution?

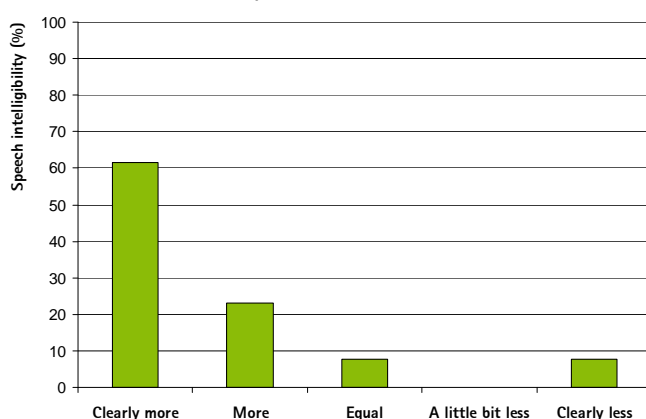


Fig. 3: Very good and good speech comprehension in a noisy restaurant while performing a cell phone call with iCom.

Conclusion

Until now, HI wearers had the options to perform phone calls either without HI, via T-coil or a special telephone program or just by placing the telephone receiver near the HI microphones. While other solutions have problems related to distance and/or humming, users now have the ability to use iCom which provides a binaural signal for significantly increased speech intelligibility in noise thanks to the stable HiBAN link between iCom and HI. iCom can be used for both CORE BTE and custom ITC HI.

References

- Nielson et al., (1981). Portable telephone communication device for the hearing impaired. *United States Patent*
- Scopek M. (1998). Hearing aid electromagnetic interference from digital wireless telephones. *IEEE Trans Rehab Engineering 6(2):235-39*
- Van Noorden L, Ekberg J. (1990). Integrated Broadband Communication (IBC) requirements of people with special needs. *Int J Rehabil Res 13(2):137-49*

For further information, please contact:

Myriel.Nyffeler@phonak.com