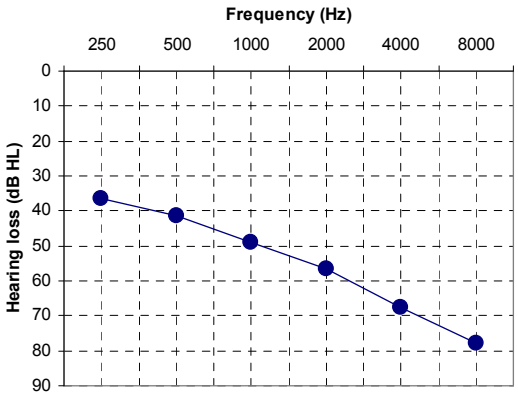
MicroLink: Maximum support in demanding environments

Summary
The improvement of speech perception in noise with Phonak FM technology has been investigated in a range of listening conditions. The results show that utilizing FM provides major improvements in understanding speech in noise. There is also a clear advantage compared to directional microphones. The FM benefit could further be increased by using bilateral FM receivers instead of only one. Thus, bilateral use of FM systems provides maximum support in noise, which still is the major need of people with hearing loss.

Introduction
The major complaint of individuals with sensorineural hearing loss is communicative difficulty, especially in situations where background noise is present. Fortunately, personal frequency modulation (FM) technology has shown to be an effective strategy for improving speech perception in noise for these individuals. A FM system is basically comprised of two parts: an FM transmitter and an FM receiver. The FM transmitter has a microphone which captures the talker's voice, which is then transmitted via an FM signal to a receiver tuned to the same frequency. The received signal is then amplified and converted back to an acoustical waveform. A recent advancement in FM technology allows a personal FM receiver to be added via an audio shoe, which is a small device that attaches to the bottom of a regular BTE hearing aid. This technology allows a user to convert his personal hearing instrument into a FM system simply by attaching the audio shoe. The Phonak MicroLink FM receiver (right) is an example of this type of technology.

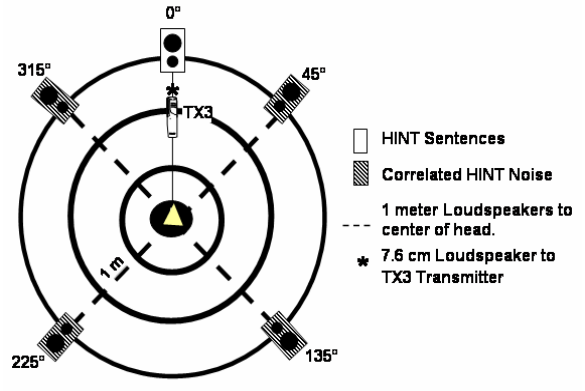
The improvement of speech perception in noise with Phonak FM technology (MicroLink and HandyMic transmitter) has been investigated in a range of listening conditions. In particular, the effect of using bilateral FM systems compared to unilateral FM usage has been explored, as well as the performance difference compared to using hearing aids alone. The study has been conducted at two sites*.

Setup of the study
In total, 46 adult subjects with slight to severe sensorineural hearing losses participated in the trial. The average pure-tune thresholds are shown below.



Average pure-tone threshold of all subjects

PHONAK
hearing systems



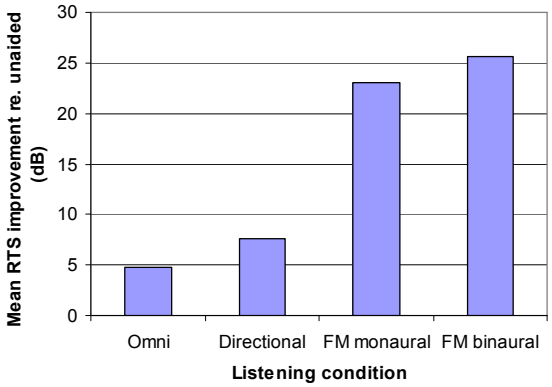
Setup for the speech tests

Speech perception in noise was assessed using the Hearing in Noise Test (HINT) with correlated diffuse noise presented from four loudspeakers positioned at 45°, 135°, 225°, and 315° azimuths located one meter from the subject. The HINT sentences were presented, using an adaptive procedure, from a loudspeaker positioned at 0° azimuth and located one meter from the subject (see Figure above). The FM transmitter was placed on a microphone stand located 3 inches from this loudspeaker at a height of 0.5 meters to simulate an ideal-user position.

Reception thresholds for sentences (RTS) were obtained for five different listening conditions:

1. unaided
2. two BTEs in omnidirectional microphone mode
3. two BTEs in adaptive directional microphone mode
4. one BTE utilized with FM receiver in FM-only mode and one BTE in omnidirectional microphone mode worn on the opposite ear
5. two BTEs utilized with binaural FM receivers in the FM-only mode.

The used hearing instruments were Claro 311 dAZ. They were fit according to DSL[i/o], which was verified via real-ear measures.



Results

The mean results for each listening condition are presented in the Figure above. It shows the benefit in each situation, compared to the unaided condition. Results are shown as RTS differences in dB. It can be seen that directional microphones provide better performance than omnidirectional microphones, even in diffuse background noise. The increase is statistically significant. A major improvement was provided by using FM. Compared to directional microphones, the additional RTS benefit was about 15 dB, and clearly over 20 dB compared to the unaided condition.

Additional binaural advantage

The benefit from FM could further be increased by using two instead of only one FM system. This resulted in an additional improvement of 2.3 dB, which equates to about a 23% improvement in sentence perception. Hence, in adverse listening environments bilateral utilization of FM systems further improves speech understanding in noise, which still is the major need of people with hearing loss.

*The study was conducted by M. Valente[1], C. Crandell[2], J. Enrietto[2], and S. Lewis[1]
[1] University of Florida in Gainesville, FL, USA
[2] Washington University School of Medicine in St. Louis, MO, USA

For further information, please contact info@phonak.ch