

microPower:

The new heights of Power instrumentation.

Summary

Speech intelligibility in noise performances and directional power of the digital AudioZoom of **microPower** were assessed and compared to results obtained on the same tests by a benchmark external receiver device as well as a highly performing 311 BTE hearing instrument in a series of field trials. Results showed that **microPower** produced as good outcomes as a standard 311 BTE device but did better than the benchmark external receiver hearing instrument. **microPower** thus successfully broke the size barrier while keeping outstanding gain and sound quality characteristics.

Introduction

Designing hearing solutions for people with moderate-to-severe hearing loss (HL) traditionally faces the difficulty of achieving sufficient amplification in an instrument that is also perceived as having cosmetic appeal and that offers important comfort and ease of use. This is the challenge that Phonak decided to take



when designing microPower, the first canal receiver technology (CRT) instrument for patients with moderate-to-severe HL.

microPower uses an external receiver, mounted on a custom shell and inserted in the ear canal. The CRT design offers numerous advantages. First, on a cosmetic

point of view, it allowed Phonak to propose the first power instrument that fits in a micro behind-the-ear (BTE) housing weighing less than 2 grams and virtually disappearing behind the ear, thus offering all the cosmetic advantages of micro-instruments to patients with moderate-to-severe HL. Second, on a more technical point of view, the use of an external receiver has many benefits as, amongst others, a naturally increased resistance to feedback effects, because of i) the spatial separation between the external receiver and microphone and ii) the connection between the core of the hearing aid (HA) and the receiver is done via a very slim tube containing wires and not via an

air-filled tube that potentially allows for sound leakage and introduces resonance peaks in the frequency response. Occlusion effects can also be reduced, either by deeply inserting the shell and/or using vents with diameters up to 2 mm. Indeed, the high amplification performance of microPower makes it possible to use larger vents without compromising on gain levels. Using a 16 channels chip, microPower offers a very smooth frequency response in an exceptionally broad band (Fig.1), providing outstanding sound quality, especially in the high frequencies.

dB SPL

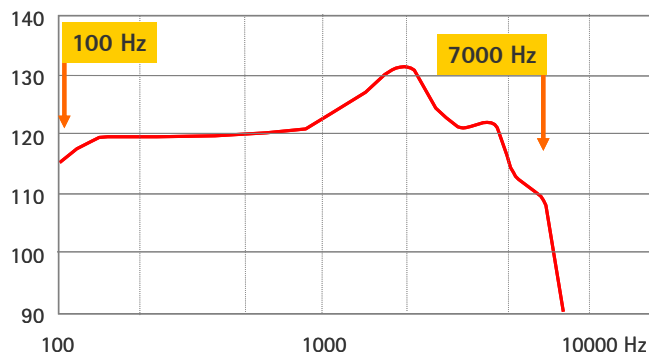


Fig. 1: microPower's exceptional broad band smooth frequency response.

Goal of the Field Trial

In the present series of trials, microPower was compared both to a standard 311 BTE device as well as to another concurrent external receiver instrument in order to demonstrate i) that increasing comfort and cosmetics in a power device can be done without compromising on sound quality compared to a classical power BTE device and ii) that the broadband frequency response of microPower ensures outstanding speech comprehension results compared to existing devices with external receiver.

Setup of the study

Subjects and Hearing Aids

18 participants aged 39 to 80 years (mean = 65.2 years), with moderate-to-severe HL entered the study (Fig. 2). Compared devices were the Phonak Eleva 311, microPower fit with custom shells and another commercially available hearing instrument also using an external receiver design (hereinafter called benchmark

x-Device) selected to reach potential gain levels comparable to the ones of microPower. All three devices were tested by all subjects in a random order and in omnidirectional and directional mode.

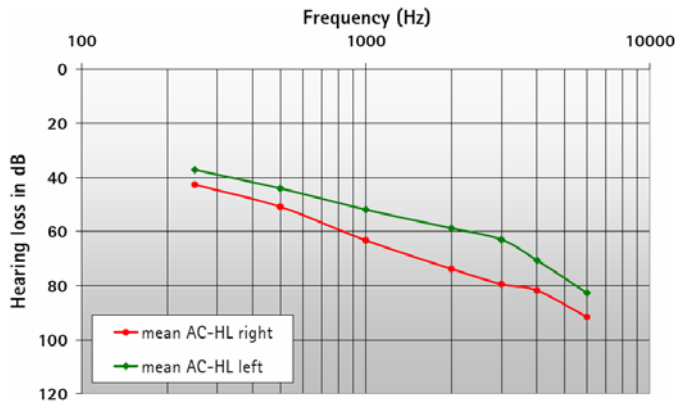


Fig. 2: Averaged left and right pure tone audiogram for the 18 included subjects

Speech intelligibility tests

Speech intelligibility was evaluated using an adaptive threshold test: the OLSA. Scores are expressed in dB as the Signal-to-Noise Ratio (SNR) measured for 50% speech recognition.

Results

Comparing microPower to a high performance BTE

Subjects included in this study were able to understand half of the words in the sentences presented against concurrent background noise at a SNR of +3.11 dB, a score that is quite consistent with the moderate-to-severe hearing loss pattern they showed. When fitted with Eleva 311 subjects reached the same comprehension level for SNRs of -0.7 and -4.6 dB, in the omnidirectional and directional mode respectively, important improvements compared to the unaided condition. When using microPower, subjects reached the 50% comprehension level at SNRs of -0.7 and -4.3 dB in the omni- and directional modes respectively.

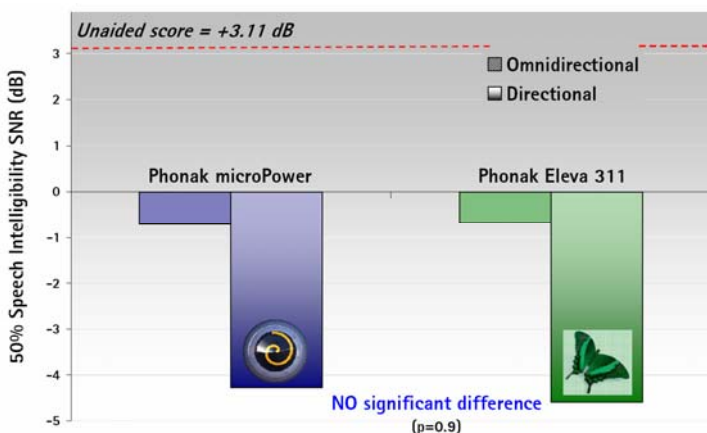


Fig. 3: Olsa test results for the Phonak Eleva311 and microPower devices.

Again, the difference between the unaided and all aided as well as the difference between omni and directional modes were highly significant (ANOVA, $p < 0.001$). However, the 0.3 dB difference in the directional mode remained statistically non significant (ANOVA, $p = 0.9$), demonstrating that microPower could reach the same level of performance in a speech in noise test as a technologically advanced but still classically designed BTE.

Comparing microPower to a concurrent x-device

The picture was slightly different however when comparing microPower to the benchmark x-Device. The benchmark aid performed worst than microPower, reaching only SNRs of 0 and -3.3 dB in the omni- and directional modes respectively, all differences being statistically significant (ANOVA, main effect of device type at $p = 0.001$).

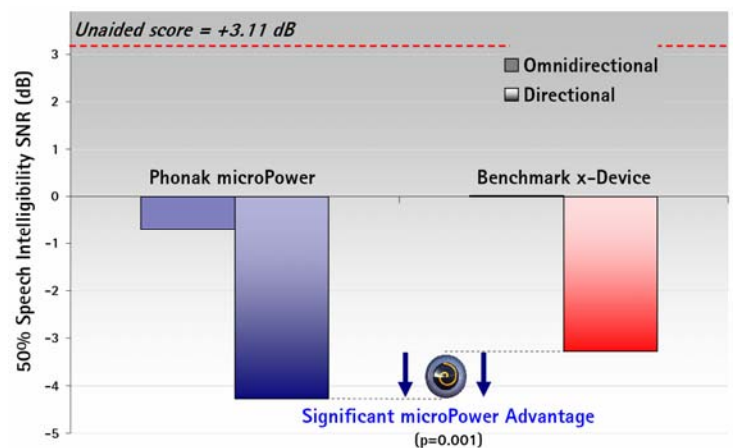


Fig. 4: Olsa test results for the benchmark x-Device and microPower. Significant difference ($p = 0.001$).

This difference being close to equivalent in the omni- and directional mode, these results must be explainable by the overall difference of sound quality and speech cues restitution existing between the two devices.

Conclusions

This series of tests demonstrates that microPower has successfully broken the size barrier, offering the first micro-instrument using the canal receiver technology for moderate-to-severe HL, while also providing these clients with outstanding sound quality and speech cues restitution. Now we can offer power users both perfect romance and performance.

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