Audéo with CrystalSound

Breaking the rules of amplification

Summary

The present Field Study News focuses on the user-benefits provided by **Audéo**, the new Personal Communication Assistant by Phonak. Audéo includes the new feature **CrystalSound**, especially designed to improve speech intelligibility and sound quality for users with mild-to-moderate hearing loss. 27 volunteers took part in a field trial and were fitted with Audéo for several lab tests as well as a real-life testing period. Results indicate that participants could communicate easier and more efficiently in noisy environments. Apart from communication in noisy environments, Audéo also helped in other listening situations, in particular when listening to music.

Introduction

Audéo was specifically designed for users with mild to moderate hearing loss who experience listening difficulties, particularly in the presence of concurrent noise, with a special emphasis on first-time hearing instrument users.

In order to fulfil their specific hearing needs, the new feature **CrystalSound** was introduced. Compared to traditional gain models used in other hearing instruments, CrystalSound provides less gain in the mid-frequencies (below 3 kHz) and significantly more gain in the very high frequencies, above 4 kHz (see **Fig. 1**). For users with mild to moderate hearing loss, this stress on high-frequency gain results in a more natural sound, with less hollowness of own voice, better clarity and therefore higher spontaneous acceptance. CrystalSound is incorporated into the existing adaptive fitting formula structure, which means that the actual effect of it depends on hearing loss degree and configuration. Ricketts et al., (2007) showed that subjects with an average hearing loss of less than 50 dB HL preferred a wider frequency range (cut-off frequency 9 kHz) while subjects with an average of more than 70 dB HL preferred a narrower frequency range (cut-off frequency 5.5 kHz). Hence, as the average hearing loss exceeds the moderate range, the effects of CrystalSound are, by design, negligible compared to the Phonak Adaptive Digital fitting formula. However, for mild to moderate hearing loss, CrystalSound can provide a great sound-quality improvement.

Goal of the Field Trial

The study was set-up to evaluate the spontaneous acceptance and speech intelligibility with first-time users. Apart from the lab-tests, all subjects received Audéos to wear in their familiar surroundings and gain long-term experience.

Setup of the Study

The tests were conducted in Stäfa, Switzerland, and in Auckland, New-Zealand. Objective and subjective measures were performed. Speech intelligibility in noise was evaluated using the HINT (English) and the OLSA (German), comparing performances with Audéo and CrystalSound to those obtained with either the standard gain model Phonak Adaptive Digital and a competitor's gain model as benchmark.

Spontaneous acceptance of Audéo was also evaluated using questionnaires evaluating different subjective sound-dimensions during a "Sound Parcours", a series of examples of real-life listening environments.

Subjects and Devices

For the field study, 27 participants with mild to moderate hearing loss were recruited (16 in Switzerland, 11 in New Zealand). They were all fitted binaurally with Audéo IX. Volunteers had a mean age of 64.7 years with a range from 28 to 81 years (S.D. = 10.9 years). They were all first-time users and not owners of hearing instruments. The devices were used for at least 6 weeks and all subjects were seen during several visits at the test sites to conduct all objective tests. They were asked to use the devices as often as possible. Because of the high acceptance of Audéo, most subjects actually wore them all day long.

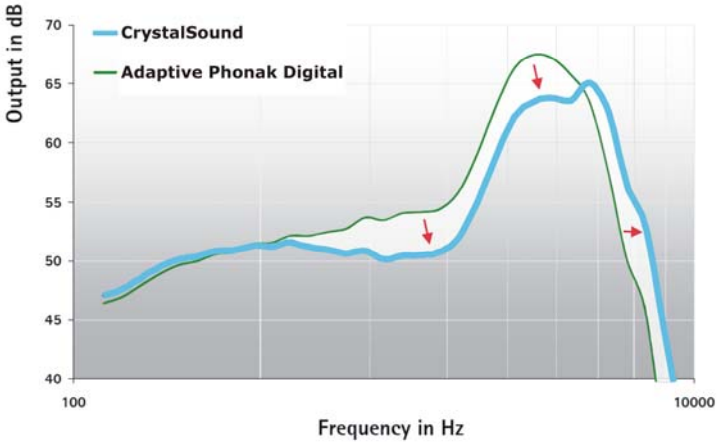

Fig. 1: CrystalSound vs. Adaptive Phonak Digital frequency response for a typical mild to moderate hearing loss. CrystalSound offers less amplification in the mid frequencies and more in the high frequencies over a wider frequency range, for improved sound clarity.

Results and Discussion

Please note that the results shown are from the OLSA-test conducted in Switzerland only, as it was not possible to combine results from the different speech tests of the different sites in one graph, because of language and experimental setup differences. However, results from the NZ study confirmed these observations.

With Audéo, speech intelligibility was best compared to benchmark devices, see **Fig. 2**. Thanks to CrystalSound, the results are better than for a Phonak benchmark device. The competitor's device that was also tested proved to be least helpful for speech intelligibility in background noise.

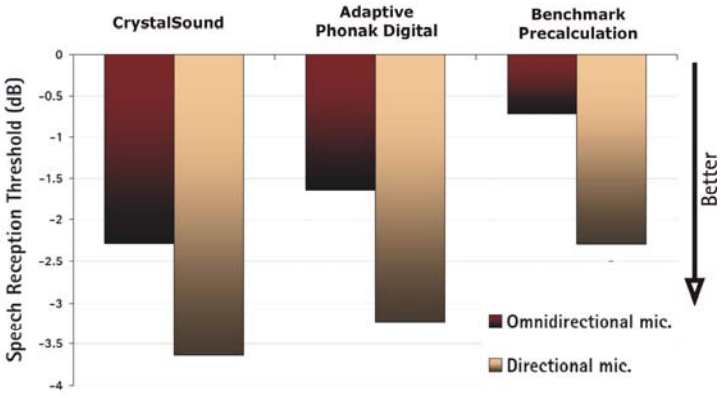

Fig. 2: Results of speech in noise test (OLSA) – for participants with a mild to moderate loss, CrystalSound was associated to improved speech intelligibility in noisy environments in both omni and directional microphone settings.

Performances both in the omnidirectional microphone mode and in the directional microphone mode showed an improvement with CrystalSound.

In addition to objective testing, Audéo was also evaluated subjectively by the volunteers. Questionnaires were used to collect their opinions during the take-home periods with Audéo. **Fig.3** shows the results obtained for a question evaluating the subjective ease to listen in noisy environments.

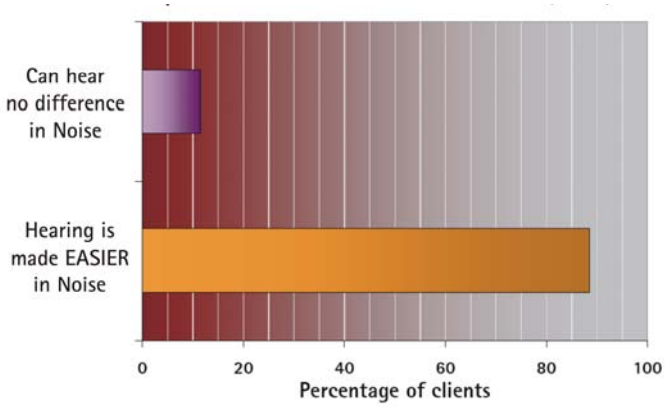

Fig. 3: Experienced improvement with Audéo in noise: for almost 90% of participants (N=27), hearing in noise was made easier.

Subjective responses correspond well with objective measures indicating significant improvement in understanding in difficult listening situations. Thanks to the combined effect of the new gain formula CrystalSound and Phonak's adaptive directional microphone technology: digital SurroundZoom (dSZ), almost 90% of the subjects reported alleviations and significant benefits experienced in situations they often tried to avoid because of problems with understanding speech in background noise.

But CrystalSound not only improves speech intelligibility, it also makes the sound of music more enjoyable. Due to the mild to moderate hearing losses, the benefit in quiet situations was not as pronounced as in noisy situations. However, when listening to music, a majority of the subjects reported a better sound quality due to the high-frequency amplification and increased frequency range provided by CrystalSound. The pie-chart in **Fig. 4** confirms that three out of four subjects do like the sound of music better when wearing Audéo. One subject who gave a negative rating, claimed music to be too loud in general and therefore uncomfortable. He was however satisfied with the performances of Audéo in all other listening situations.

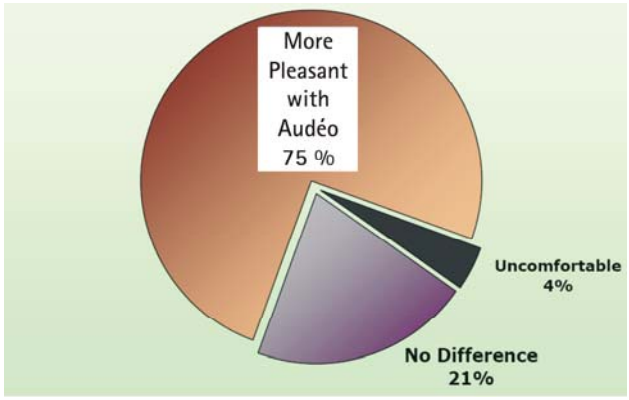

Fig. 4: Perceived sound quality of music with Audéo (N=24), rated after a 2 weeks acclimatization period, CrystalSound is responsible for increased music pleasantness.

During the trial, subjects also found Audéo easy to place in the ear and comfortable to wear. This led to high levels of initial acceptance. 80% of the subjects took Audéo home with the precalculated settings at first-fit, 20% required minor fine-tuning. Overall, sound was experienced as being very pleasant with CrystalSound in particular own voice sounding was rated very positively.

Conclusions

Audéo with CrystalSound proved to be beneficial for users with mild-to moderate hearing loss by improving the intelligibility of speech sounds in noisy environments as well as increasing the global ease of listening in acoustically challenging surroundings. Moreover, Audéo and CrystalSound provide a very good high-frequency definition that increases the pleasantness of music sound compared to other gain formulas or hearing devices. Finally, Audéo offers a high level of acceptance with very satisfying own voice quality and an almost instant and extremely comfortable fit.

References

Ricketts TA, Dittberner AB, Johnson EE (2007) High frequency amplification and sound quality in listeners with normal through moderate hearing loss, *JSLHR - in press.*

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