

Field Study News

FlexControl

Individualizing automatic performance

Abstract

Volume Controls (VC) have been important to hearing instrument wearers for as long as hearing instruments have been available (Cox and Alexander, 1991). But often, "louder" does not necessarily always mean "clearer". With the innovative FlexControl Phonak allows the user to personalize the automatic performance of SoundFlow. SoundFlow continuously analyzes the current listening environment and adjusts the hearing instrument parameters accordingly. FlexControl adjustments made by the wearer teach SoundFlow his personal preferences in each situation and with User Preference Learning, these preferred adjustments are automatically applied when a similar listening environment is encountered.

Nine experienced hearing instrument wearers with a moderate to moderately-severe hearing loss participated in a validation study and 9 test subjects participated in an independent study to evaluate the benefits of FlexControl in different listening situations and while listening to music. Results show that FlexControl performs better in all sounds conditions compared to a conventional VC.

Introduction

One of the main challenges of using a VC in different listening situations is that "louder" does not necessarily always mean "clearer". Therefore, optimal hearing in specific situations is not usually achieved solely through volume adjustment. Rather, this is accomplished by adjusting the settings of the situational program. The original loud/soft function of a VC has now evolved into a unique new opportunity to precision-tune digital hearing instruments much more effectively. This new type of intelligent, adaptive user control, known as FlexControl, is available for the first time in Phonak Spice Generation hearing instruments. With FlexControl, Phonak has developed a completely new combined method which not only uses frequency selective volume control, tuned to the unique configuration of the hearing loss, but also incorporates other sophisticated sound cleaning functions to optimize settings. FlexControl is able to respond to the wearer's desires in all the different listening situations, thereby providing more hearing comfort, increased listening pleasure or enhanced speech intelligibility. Instead of just making sound louder or softer, real time classification of the soundscape enables the system

to actively respond to the wearer's needs by adjusting and personalizing the SoundFlow automatic system. Further, FlexControl learns end user preferences and can provide a more enjoyable hearing experience that ensures improved speech clarity in many different situations without the need to switch out of the automatic program. FlexControl, together with User Preference Learning, ensures that adjustments made by the end user are automatically applied in future similar listening environments. The system gradually adjusts itself, to a new, optimized setting, seamlessly and automatically. In this way, the settings become optimized over time and on-the-spot adjustments become less necessary. FlexControl provides an integrated concept for adjusting not just volume but also hearing preferences in hearing instruments. It is an intelligent VC which takes into account the hearing loss configuration, desired frequency response and gain levels. FlexControl also adapts sound cleaning functions of the Spice platform into the control, including microphone mode, WindBlock, NoiseBlock and EchoBlock. The goal of this study was the evaluation of the benefits of FlexControl.

Test subjects and devices

First evaluations with nine subjects were done in the Phonak Hearing Center in Stäfa, Switzerland. FlexControl was compared to a conventional VC by determining whether the specific needs of the hearing instrument wearer were met in different listening environments, investigating user preferences. Data was collected in two test-retest setups and additionally, for closed and open fittings for the same subjects. Field evaluations were then performed at the University of Giessen, Germany. So far, nine adult experienced hearing instrument wearers with moderate to moderate-severe hearing loss have participated in the field study. More will follow. Test subjects were fitted with Phonak Ambra microP hearing instruments. Hearing instruments were fitted based on the pre calculation of Phonak Target and fine tuning was performed only if necessary. In a blinded study, subjects compared the preference of FlexControl to a conventional VC. A cross-over design was used where half of the test subjects first started with the evaluation of FlexControl and the other half with VC. This condition was changed after 2 weeks. During presentation of different sound examples (speech in noise, music, calm situation), test

subjects had to choose their preferred settings of either FlexControl or traditional VC. Preferred settings were manually collected and documented by reading out the steps done with the aid of the myPilot, where each step represents a 2 dB change. After setting optimization by the test subject, myPilot was reset to the start condition. Subjective data was collected while the test subject went on a walk with an audiologist, thereby evaluating the different FlexControl or VC settings in four different listening environments: talking to a person in a restaurant; news on TV, listening to music and listening to loud commercials on TV. For the daily life test, hearing instruments offered only the SoundFlow program but no manual programs and without the preference learning algorithm. Retest of the lab measures and the walks with the audiologist of test subjects was done after one week of daily life use and group conditions were changed for a second daily life trial of one week as described above.

Results

In the validation trial, FlexControl was compared to a conventional VC. Test subjects were able to rate their preference on a scale from 0 to 100. Since ratings were performed four times in different test environments during the study, the preference scaling was transformed in order to have data which are independent of the reference system. Transformation was done by subtracting the means of a test subject from the original value in the respective test condition. Transformed values (y-axis) were between -1 and +1. The obtained value was then divided through the standard deviation over all conditions. Averaged results over all sound classes showed that FlexControl was rated as being significantly preferred compared to the conventional VC (Fig. 1).

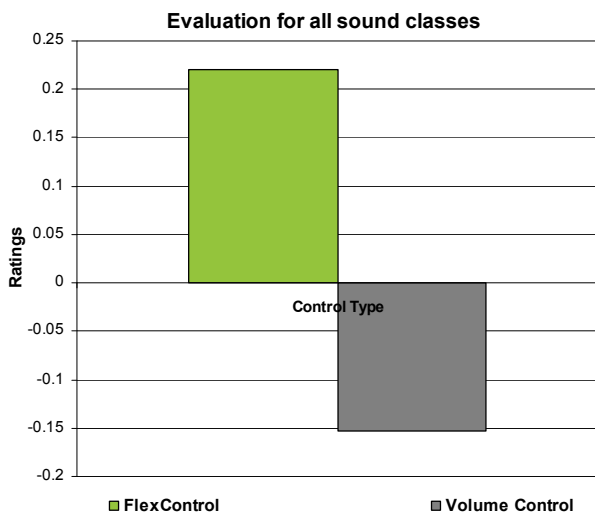


Fig. 1: FlexControl (green) is preferred over all sound classes compared to a conventional VC (grey). Data are transformed in order to make them independently of reference systems. Ratings are from -1 to +1.

In the independent field trial, the preference of FlexControl compared to a conventional VC in a blinded setup in different listening situations (calm situation, speech in noise, noise and music) were rated. Here, preliminary data of nine subjects are presented. Results of preference rating revealed that FlexControl (green) was rated as being equal, better and much better in these situations compared to the VC (grey; Fig. 2). These results indicate that the sound cleaning features which

are active in the SoundFlow automatic are advantageous for hearing instrument wearers and that with FlexControl a personalized setting of "more speech intelligibility" or "more comfort" can easily be determined by each individual.

Evaluation of the daily life test where test subjects had to rate the performance of FlexControl and VC for either speech intelligibility and/or sound quality revealed that with FlexControl speech intelligibility was clearer and sound quality was perceived as being more comfortable.

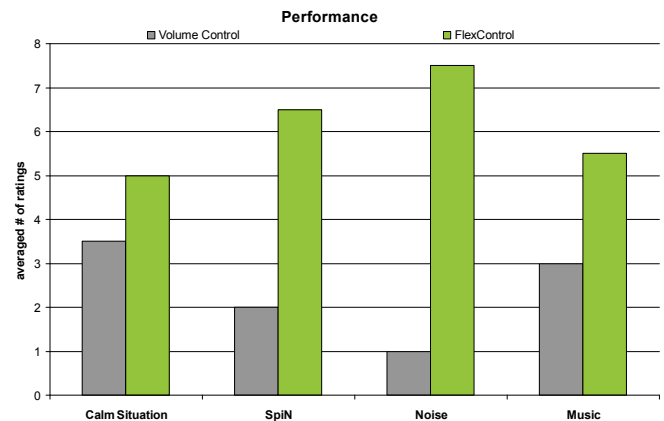


Fig. 2: Averaged preference ratings of benefits over two assessments of either FlexControl (green) or the conventional VC (grey) in different listening environments. FlexControl was rated as being equal, better and much better than the VC.

Conclusion

Building on the basis of current fitting practices, Phonak has developed a new type of interactive adjustment tool, FlexControl. Adjusting overall loudness is not always sufficient, and an integrated, intelligent system which takes into account the nonlinearities of the impaired ear and the effects of different environments is preferable. FlexControl within the automatic program SoundFlow continuously analyzes the current listening environment. FlexControl meets all these requirements. It is far more than just an intelligent VC, because it can:

- Recognize the preferences of the end user and respond to his adjustments
- Combine the fitting information contained in the hearing instrument with integral learning ability – a foundation on which the hearing instruments can continue to maximize end user benefit.

References

Cox RM, and Alexander GC. 1991. Preferred hearing aid gain in everyday environments. *Ear Hear* 12(2):123-6

For more information, please contact:
Myriel.Nyffeler@phonak.com