

Field Study News

SoundRecover

The benefits of SoundRecover for mild hearing loss

Summary

It has already been proven that SoundRecover is very beneficial for people with a severe to profound hearing loss who have obvious challenges identifying and differentiating important, high-frequency spoken sounds such as the consonants /f/, /s/ and /sh/. Difficulties perceiving and distinguishing these sounds which are crucial for speech intelligibility are also common for people with mild to moderate hearing losses, so SoundRecover offers potential benefits for this population, as well.

The benefit of SoundRecover was examined in a trial involving test subjects with a mild hearing loss after adjustment and fine-tuning to optimize hearing instrument gain. A Logatom test was used to evaluate the increase in speech intelligibility in a quiet environment. Recognition of high-frequency consonants was found to be significantly improved with SoundRecover.

Introduction

Improved audibility of high-frequency signals provided by SoundRecover makes identification and differentiation of consonants such as /s/, /f/ and /sh/ possible. Nonlinear frequency compression was developed and extensively examined in the field of hearing instrument technology with the goal of restoring high-frequency hearing in cases where conventional gain is not enough (Simpson et al., 2005, Scollie et al., submitted for publication). The audible range is expanded by compressing and shifting high frequencies that are otherwise not heard into an adjacent lower frequency range. The SoundRecover nonlinear frequency compression algorithm integrated in hearing instruments based on the CORE platform avoids problems with acoustic feedback and issues related to the excessive loudness caused by very high levels of high-frequency gain (Simpson et al., 2005). As a result, the audible range is increased without creating any disruptive artifacts and while retaining good sound quality. All frequencies below the cutoff frequency are not affected. External studies have found that SoundRecover benefits people with moderate to profound hearing impairments. To date, there is no supporting data for use of frequency compression in cases of mild hearing loss.

Trial objectives

People with mild hearing loss typically notice their diminished hearing in noisy environments or with quiet high-frequency sounds. This study addresses the question of whether SoundRecover can increase the audibility of high-frequency consonants, especially /s/, for people with mild hearing loss, after all conventional gain setting adjustments have been exhausted.

Trial structure

To measure consonant recognition, an adaptive Logatom test was used (an application developed by Phonak). The basic test format is to present the statement "My name is Asa" varying the consonant in the last word. The test adapts the presentation level and determines the recognition threshold for each consonant in the test set.

The following process was followed with all subjects: 1. Hearing instrument adjustment; 2. Two-week acclimatization; 3. Logatom test; 4. Repeat Logatom test and compare clarity and comfort using sound samples.

Hearing instrument adjustment: Gain adjustment focused on achieving sufficient audibility of quiet, high-frequency sounds. The quietly spoken /s/ had a sound level of approximately 30 dB. Channel by channel, the researchers determined that corresponding narrow-band noise was audible but without the /s/ sounding sharp when spoken at moderate volume (50 dB). Current systems were found able to make the necessary fine manual adjustments. Nevertheless, it is a very difficult task as the effects of the gain control selectors are differentiated for 40 dB and 60 dB input levels.

Next, a clear and pleasant SoundRecover setting was determined and set. Three manual programs were stored in the instruments: SoundRecover ON, SoundRecover OFF and mute, so the user could make the appropriate comparisons.

Acclimatization phase: Subjects were asked to compare a series of sounds with SoundRecover OFF versus ON and to record the results in a daily log.

Logatom test: With the adaptive Logatom test, consonant recognition thresholds were recorded

under the following three auditory conditions: SoundRecover ON, SoundRecover OFF, no hearing aid. Two test variations were used. Variation 1 contained the stimuli /d/, /s/ at 6 kHz and /s/ at 9 kHz. Variation 2 contained the additional sounds /f/, /k/, /sh/ and /t/.

Logatom re-testing, sound samples: Logatom tests were repeated to check the reliability of the data. Furthermore, sound samples from everyday life were presented (soft speech in a quiet environment; moderately loud speech in a quiet environment; moderately loud speech in a noisy environment; loud music; moderately loud music). Subjects compared clarity and comfort with SoundRecover ON and OFF.

Test subjects and hearing instruments

Ranging from first-time to experienced users, all test subjects had a mild hearing loss. Variation 1 of the Logatom test was used for **12 test subjects**; variation 2, with **10 test subjects**. All subjects wore Exélia Art hearing instruments coupled with standard sound tubes and open canal fitting.

Results

Figure 1 shows the results from variation 1 of the Logatom test. SoundRecover clearly improved the recognition threshold of 6 kHz-/s/ and 9 kHz-/s/. There was little effect for the /d/ sound with SoundRecover.

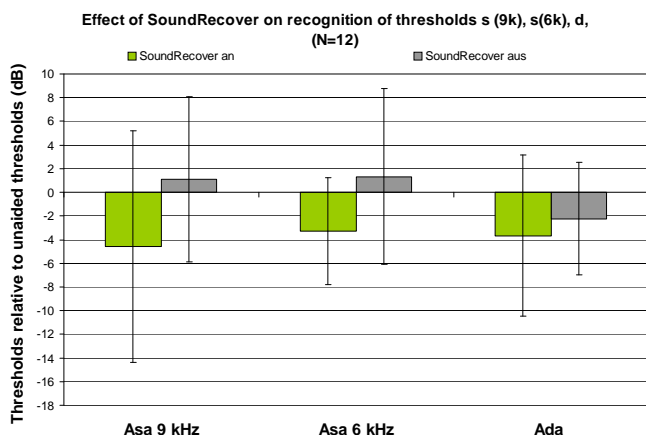


Figure 1: Recognition thresholds with and without SoundRecover for /s/-6 kHz, /s/-9 kHz and /d/.

Figure 2 shows the results from variation 2 of the Logatom test. Clear improvement was shown with both /s/ sounds, as also shown with variation 1. Additionally, improvements also occurred with /d/, /f/, /sh/ and /t/.

In addition to the positive effects of amplification with SoundRecover, results also suggest good validity and usefulness of the Logatom test. However, the considerable scattering shown among the intra-individual test/retest results (at 9 dB) require further optimization of the Logatom test. When comparing SoundRecover ON versus OFF during a series of everyday sound samples, there was no subjective perception of difference in hearing clarity. For hearing

comfort, SoundRecover was perceived to have a slight advantage.

The daily logs kept by the test subjects did not reveal any systematic differences between the hearing programs. One methodical weakness of the daily log was that it did not require use of quiet or faraway speech to assess perception of benefit with SoundRecover.

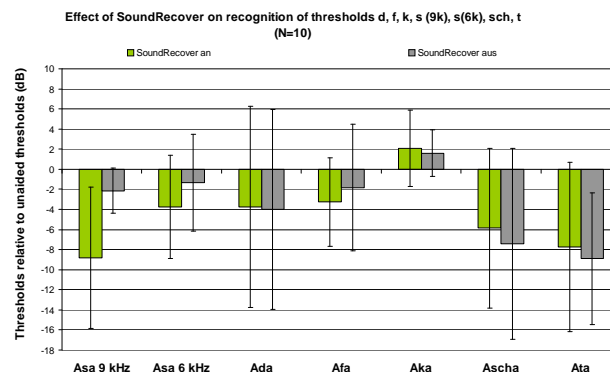


Figure 2: Intelligibility thresholds with and without SoundRecover for /s/-6 kHz, /s/-9 kHz, /d/, /f/, /k/, /sh/ and /t/.

Conclusion

Recognition of /s/ sounds can be clearly improved with SoundRecover in cases of mild hearing loss, even with optimization of conventional gain settings.

Test subjects perceived hearing with SoundRecover as more pleasant than without.

The Logatom test is one important step in finding appropriate methods to evaluate the benefits of hearing instrument benefit in cases of mild hearing loss. In these cases, standard speech tests are limited in their conclusiveness.

References

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