

SoundRecover Applications for Children: Frequently Asked Questions

SoundRecover compresses and shifts high frequency sounds to a child's audible range. It improves audibility of high-pitched sounds and fricatives such as /s/sh/f/. This helps children to develop speech and language and to better understand the voices of women, children and environmental sounds. Importantly, SoundRecover compresses only the high frequencies, while the lower frequencies remain uncompressed to avoid vowel artefacts.

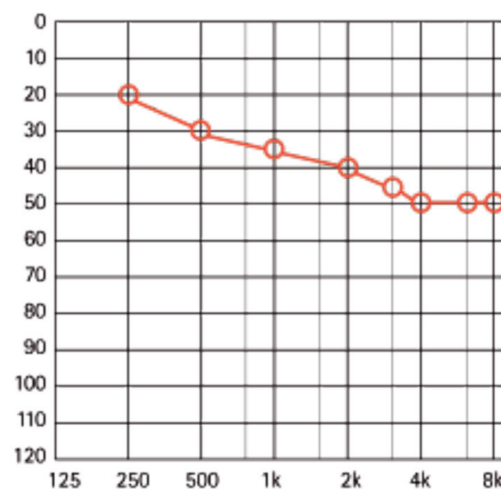
The SoundRecover algorithm was developed by Prof. Hugh McDermott from the University of Melbourne in Australia. SoundRecover has been carefully evaluated and tested on both children and adults before being brought to the market. Since its introduction, SoundRecover has been evaluated repeatedly. As a result there is a growing body of evidence (both peer and non-peer reviewed) showing the benefits of SoundRecover for users of all ages and degrees of hearing loss. For a complete bibliography please go to: www.phonak.com/soundrecover

The following pages answer some of the most frequently asked questions, and provide you with easy access to supporting research evidence.

1. Do I need SoundRecover if the hearing instrument has an extended bandwidth?

Yes. Most modern hearing instruments have a wide-band frequency response. However, due to receiver limitations, achieving audibility at frequencies above 6000Hz is very difficult even for milder hearing losses (Figures 1 and 2). SoundRecover, in addition to a conventional broadband response, ensures audibility of high frequency sounds.

Figure 1: Child's audiogram showing a mild-moderate hearing loss.



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Figure 2: Speechmap showing 3 hearing instruments with extended bandwidth from 3 different manufacturers

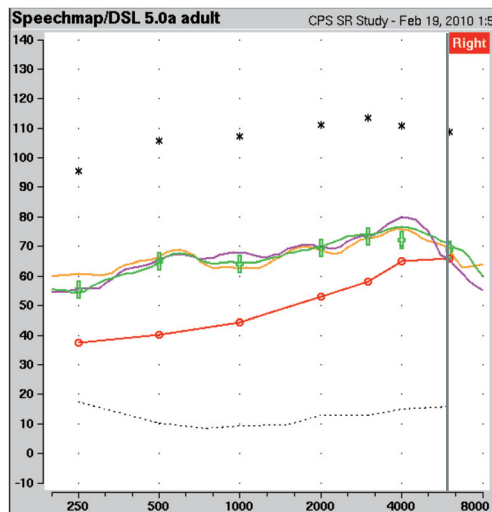


Figure 2 show that even with a mild-moderate hearing loss, it is not possible to provide usable gain above approximately 6kHz. The audiogram, converted to SPL, is shown on the Verifit Speechmap as the red curve. In order for a signal to be audible, it must be measurable above this line. Figure 2 shows the responses for 2 competitive hearing instruments claiming extended bandwidth to 10 kHz and a Phonak instrument (Nios) with SoundRecover deactivated. A broadband speech signal was presented at 65dB. The green crosses are the DSL prescription targets. All three instruments were fine-tuned to match the target. It is important to note that **all three were also set to maximum gain for the highest frequencies** in their respective fitting software programs. No further gain is available above approximately 6 kHz for any of the hearing instruments.

Figure 3: SoundRecover you can actually hear

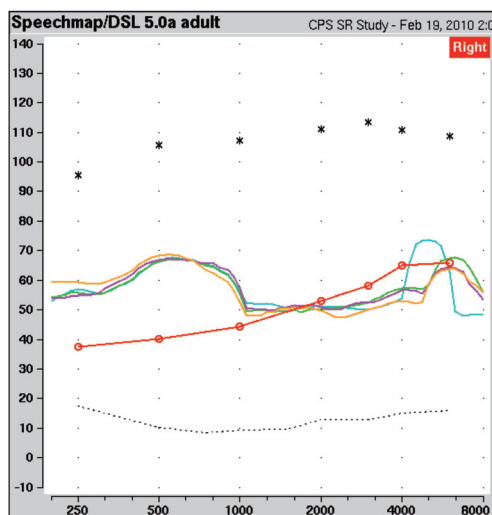


Figure 3 shows how SoundRecover can increase perceptual bandwidth. As SoundRecover compresses the high frequencies above the cut-off frequency into a lower frequency range, verification graphs will look different compared to conventional graphs.

Here, we are using a special signal that lets us focus on the high frequencies only. This signal, available from Verifit, takes a broadband speech signal and reduces the gain above 1000 Hz by 30 dB except for a one-third octave band centred on 6.3 kHz (presented again here at 65dB). Doing so creates a "notch" that allows us to view the audibility provided for a signal roughly the same as the male phoneme /s/. The low and mid frequencies can be ignored, and the section representing /s/ should be focused upon. The same audiogram from Figure 1, and the same 3 hearing instruments in Figure 2 have been used. Again, the green curve is the Phonak instrument (Nios) which, as you can see, even without SoundRecover still provides the broadest frequency response.

The blue curve shows the effect of SoundRecover. With SoundRecover, the /s/ signal is now clearly audible. This shows us that even with extended bandwidth, only SoundRecover can actually extend the perceptual bandwidth, providing audibility simply not possible otherwise.

References

- 1, 2, 3, 4, 5, 6, 7, 8, 9

2. Is there a way to verify fittings with SoundRecover?

Yes. Like all pediatric fittings, it is important to verify hearing instruments with SoundRecover in order to check that prescription targets are met and that the child has access to the important speech frequencies. We recommend you use the guidelines developed by Susan Scollie and her associates at the University of Western Ontario. This can be found on: www.phonak.com/soundrecover

References

- 10, 11

3. What research evidence is available to use SoundRecover with children?

Several peer and non-peer reviewed studies have shown benefits of using SoundRecover for both adults and children. For example, Glista, Scollie, Bagatto, Seewald, Parsa and Johnson (2009) evaluated prototype multichannel nonlinear frequency compression (SoundRecover) with 13 adults (aged 50-81 years) and 11 children (aged 6-17 years) with sloping high frequency hearing loss (ranging from moderately severe to profound). Several outcome measures were used, including speech sound detection, speech recognition and self reported preference measures. Results indicated that when SoundRecover was enabled, there was significant improvement of consonant and plural recognition (high frequency speech sounds). Importantly, vowel recognition did not change significantly, indicating that SoundRecover did not provide artefacts in the low frequencies. Glista et. al. attribute these benefits to the "increased audibility of additional high frequency energy, albeit presented in a

lower frequency range, compared to the conventional hearing aid fittings'

References

6, 7, 8, 9.

4. Can SoundRecover cause auditory deprivation?

No. The aim of SoundRecover is to provide access to important high frequency sounds for speech development, vital for infants and children. SoundRecover does not reduce the range of sounds that can be perceived. On the contrary, the range is increased, because higher-frequency components of sounds are made more audible and/or more discriminable. Without SoundRecover, those high frequency sounds are not audible at all and thus the danger of deprivation is actually more relevant when no frequency lowering techniques are used. As it is practically impossible to design ethical studies with infants, the recommendation of whether babies should be fit with this technology needs to be inferred from available data on older children.

We have asked several international leaders in the field of pediatric audiology (Prof. Richard Seewald, Prof. Susan Scollie, Dr. Patricia Roush, Andrea Bohnert, Prof. Jace Wolfe) for their opinion on the use of SoundRecover with infants. All agree that SoundRecover can be beneficial for children of all ages right from day one, with the usual monitoring and follow-up. For example,

"I have no reservations about using SoundRecover in newborns and children under one year of age...With SoundRecover we expand the audible range and provide more information. I consider it problematic to reduce information for very young children, e.g. with a noise reduction algorithm. However, I have no problem with providing more information and we are ultimately able to do that with SoundRecover".

Andrea Bohnert, MTA-F Senior Pediatric Audiologist,
University Mainz, Germany.

View all testimonials from leading pediatric experts on:
www.youtube.com/phonakpediatrics

References:

1, 4, 5, 6, 7, 8, 9

5. Do sounds appear distorted or unnatural with SoundRecover?

No. The quality for most typical settings of SoundRecover is deemed good, as can be judged by any listener with normal hearing. It is important to remember that what a person with normal hearing deems good quality will be different from a listener with hearing impairment. If the quality seems to be reduced with stronger settings of SoundRecover, then it is important to keep in mind the fact that hearing impaired listeners do not have normal hearing in those high frequencies that are affected by SoundRecover. Therefore, what needs to be compared is sound quality with SoundRecover versus sound quality with the hearing impairment. Published research evidence of improvements in speech detection, speech discrimination and speech production indicate how SoundRecover provides a high quality sound.

References

2, 3, 6, 7, 8, 9, 12

6. Are there any contra-indications to using SoundRecover?

No. SoundRecover has been thoroughly tested and poses no risk to a child's hearing. On the contrary, with appropriate verification, SoundRecover provides many significant advantages for a child's development as shown by numerous independent studies.

References

2, 3, 6, 7, 8, 9, 10, 11

7. What evidence is available to fit SoundRecover to mild hearing losses?

The benefits of SoundRecover have been found for mild through to profound hearing losses. When SoundRecover is fitted to milder losses, the cut-off frequency is set relatively high, so only the highest frequency sounds will be affected. Those sounds are otherwise not audible. This effectively widens the perceptual bandwidth of the hearing instrument. The minimal degree of compression in these cases provide additional audibility without impacting on sound quality.

"Many people with sensorineural hearing impairment cannot easily discriminate or resolve high-frequency sounds even when they are fully audible. Therefore frequency compression is applicable to a broad range of audiogram configurations, not just those showing minimal sensitivity at high frequencies."

Prof. Hugh McDermott, Deputy Director (Research), The Bionic Ear Institute, Melbourne, Australia

References

6, 12

8. How long does it take for a child to acclimatise to SoundRecover?

Experience has shown that SoundRecover enjoys a high spontaneous acceptance rate. In some cases these improvements can be measured immediately – others require an adaptation period of 4 to 8 weeks. Further improvements can also be measured even after long-term use. For example, Glista et al's 2009 clinical outcomes study (9), found that some children showed continued improvement over time. "This may be due to either maturation (the children are now older) or to true acclimatization effects, or both".

Wolfe et al (6) examined the benefits of SoundRecover on children with mild-moderately severe hearing losses aged between 5-13 years, and found positive results after just 15 minutes of use. "Initial findings from the children fitted with this type of compression yielded positive results according to subjective comments, average recognition of plural words, and individual subject evaluation. Subjective comments revealed that none of the 12 children fitted with the Nios instruments objected to the non-linear frequency compression. In fact, many reported better speech understanding."

References

6, 7, 9

9. What SoundRecover support materials are available to give to families and children?

Junior Reports, printable counselling materials, on SoundRecover are available to give to older children, parents/carers and teachers. These can be accessed in the Print icon in the top tool bar of iPFG, or on www.phonak.com/pediatric_fitting

10. Will Phonak continue to develop products with SoundRecover in the future?

Yes. The proven benefits of SoundRecover for children with mild through to profound hearing losses, means that this feature is planned for future products.

Further information:

www.phonakpro.com/soundrecover
www.phonak.com/pediatric_fitting

References

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