

# Field Study News

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## BroadbandBooster

### Up to 5 dB increase in broadband output for Naída V

The BroadbandBooster is a feature that increases the overall level of the broadband output of Naída V hearing aids by up to 5 dB. This study was designed to evaluate the effect of this feature on subjects with severe to profound hearing loss. The study compared the BroadbandBooster "on" and "off" in a Naída V90 SP BTE. Each participant had the chance to listen to the familiar voice of a significant other, the audiologist's voice, their own voice and music, in both conditions. After listening to each hearing aid in a single blind and counterbalanced order, participants were asked to identify their preferred amplification mode. Results showed that the Naída V90 with the BroadbandBooster "on" was ranked as the preferred hearing aid configuration by the majority of participants.

#### Introduction

It is recommended that the fitting range should be carefully considered when selecting a hearing aid. When it comes to clients with extreme amplification requirements, it is sometimes necessary to go to the output limits. This is when the new BroadbandBooster feature can help. It uses a new way of digitizing, sampling and filtering signals, to boost output for loud broadband input signals – like speech – by up to 5 dB. The expected result is that mid and loud incoming broadband signals are more audible.

The people who can benefit most from the BroadbandBooster have severe or profound hearing losses that fall just within/on the border of the fitting range of the hearing aid. This might occur in a Super/Ultra Power BTE because of the degree of hearing loss or for someone who requires the power of an xUP receiver for the Naída V RIC, but only the xS will fit in the narrow ear canal.

The BroadbandBooster works by comparing the broadband output of the hearing aid with the receiver response. When the broadband output of the hearing aid does not result in reduced amplification at the receiver, the BroadbandBooster will not boost output, even when the feature is turned on. But, if it detects that the receiver will reduce the amplification of mid to loud broadband signals, the BroadbandBooster automatically selects the correct amount of boost to compensate. It is important to note that this feature only affects broadband sounds like noise or speech and not narrowband sounds like pure tones. Therefore, datasheet information such as the gain-frequency

response and maximum power output (MPO) are not changed as they are measured with narrow band signals.

A simple way to demonstrate the difference between BroadbandBooster "on" and "off", is shown in the test box measurement below. When the hearing aid is set to its limits as shown in Table 1, a loud broadband input like speech is boosted, as shown by the yellow speechmap ("on" condition), compared to the blue speechmap ("off" condition) shown in Figure 1.

Test Setting	
Hearing aid	Naída Venture 90 RIC xUP
Test system	Audioscan Verifit
Test signal	75dB SPL loud speech ISTS
PTA	110 dBHL flat hearing loss
Program	Calm situation
Fitting formula	DSL Adult
Gain level	100%
Whistleblock	Set to lowest setting which controlled feedback
Adaptive features	off
Fine tuning	Gain manually set to maximum limits of hearing aid

Table 1. The hearing aid settings used for the measurement shown in Figure 1.

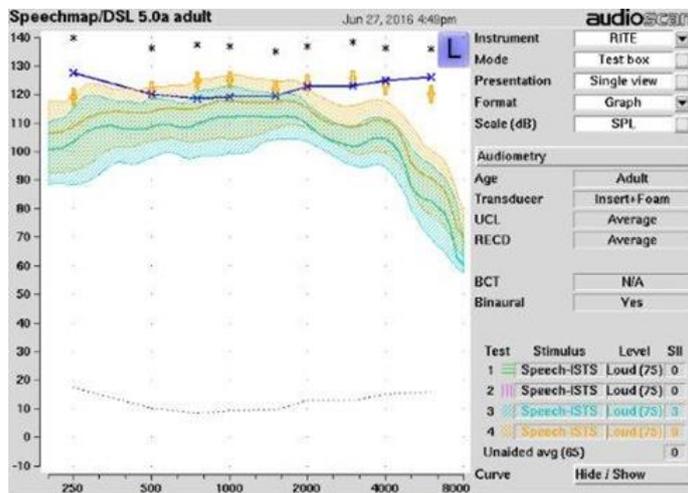


Figure 1: A speechmap from the Audioscan Verifit for the Naída V90 RIC xUP. It shows the BroadbandBooster output when the BroadbandBooster is "off" (Test 3) in blue and "on" (Test 4) in yellow.

### Study design

This study investigated whether participants with severe to profound hearing loss can notice an audible difference with the BroadbandBooster "on" and "off" for a variety of broadband signals, including speech. Participants were blind to the test conditions which were presented in a counterbalanced design.

Two different Audiology clinics in Bangalore and New Dehli, India, participated. Both clinics had hearing care professionals who were very experienced in working with adults with severe to profound hearing loss.

## Methodology

Twenty-eight participants took part in this study. Nineteen had a congenital hearing loss while the remaining nine had an acquired hearing loss.

All the participants had severe to profound hearing loss. Figure 2 shows the average hearing loss across all participants and indicates a symmetrical severe to profound hearing loss.

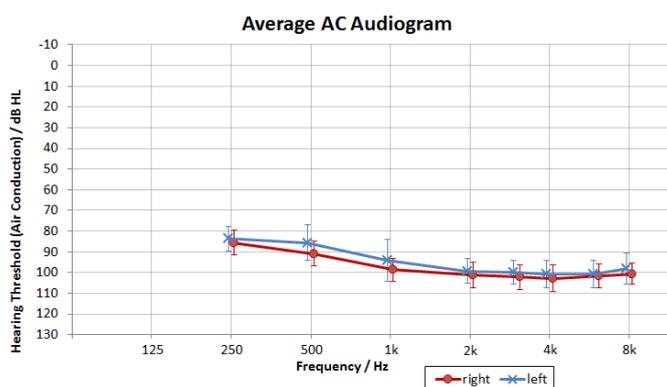


Figure 2. Average hearing loss for the 28 participants.

The hearing aids used in the study were Naída V90 SP BTEs with occluded earmolds. They were fitted using the Adaptive Phonak Digital fitting formula. A direct comparison between Naída V90 BroadbandBooster "on" vs. "off" was made.

After the fitting was completed, each participant listened to his or her own and other voices present at the fitting. They were all asked to rate their initial impressions. Each participant was also instructed to rate which setting was preferred when listening to music. Music was selected as a commonly encountered broadband sound from everyday life, which is loud enough to elicit the maximum boost.

Following the method described by Dillon (2012), the hearing aid maximum output was evaluated using very loud complex (broadband) sounds generated by the tester (page 353). Hand clapping, crunching paper, rattling keys and loud banging was used.

Listeners with severe to profound hearing loss show a large variability in auditory capabilities and for some these will be very reduced (Souza, 2009, Rosen et al 1990), therefore subjective preference is a useful measure. For the study participants, it was expected that an increase in audibility of mid and loud broadband sounds would be experienced and possibly expressed as "louder", "clearer", "fuller" or "richer".

## Results

First impressions of the initial fitting indicate that 13 participants perceived the hearing aid as too soft, regardless of whether the BroadbandBooster was "on" or "off". These 13 participants required fine tuning.

The maximum power output of the hearing aids was evaluated to determine whether this was influenced by the BroadbandBooster, in particular whether any uncomfortable listening levels (UCL) were encountered when the BroadbandBooster was turned on. For participants who reported they could hear hand clapping, crunching newspaper and rattling keys, these stimuli resulted in no difference between BroadbandBooster "on" or "off".

For loud banging, 11 out of 28 participants perceived the setting with the BroadbandBooster "on" as louder than with "off", but not uncomfortably loud. The results indicate that BroadbandBooster "on" did not influence UCLs. This finding is consistent with no change in the MPO set in the hearing aid.

Regarding their own voices, the majority of the participants (18) noted no difference between BroadbandBooster "on" or "off". Only seven perceived the audiologist's voice to be louder with the BroadbandBooster "on"; the remainder of the participants did not notice a difference. Also, when listening to their significant other's voice, 16 participants perceived no difference when the

BroadbandBooster was "on" or "off". The results indicate that voices were generally unchanged. In cases where a change was noticed for the "on" setting, the voice was perceived as louder.

For music perception, a loud 85 dB music sample of dynamic, Indian classical music was played from a loudspeaker in front of the subjects. Participants were asked to state whether the music sample was louder with the BroadbandBooster "on" than "off". They were also asked in which setting they thought the music sample was clearer and which they preferred. The results are shown in Figure 3. The results indicate that all the participants rated the music as clearer and almost all rated it louder and preferred when the BroadbandBooster was "on". These results were statistically significant ( $p < 0.0001$ ).

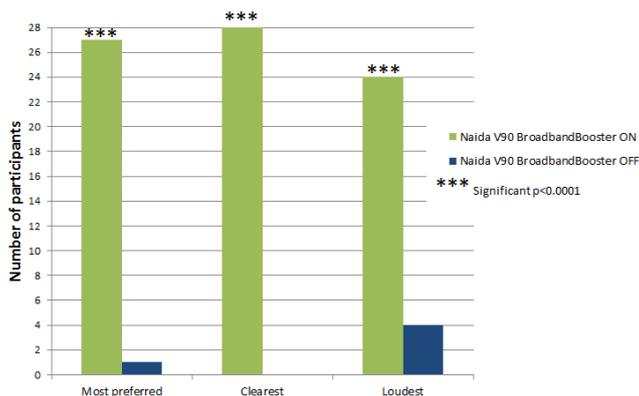


Figure 3. The number of participants who preferred BroadbandBooster "on" vs. "off" when listening to music at 85dBA using Naída V90 SP BTEs.

## Conclusion

The objective of this study was to evaluate the BroadbandBooster with subjects who have severe to profound hearing loss and could benefit from this feature.

A simple methodology for those with poor auditory abilities was to ask about preference. Although the study was single-blinded, from their first experience of the BroadbandBooster until they gave their final judgment, more people's first choice was for the BroadbandBooster "on" setting. Music was rated as louder by all participants and nearly all rated it clearer and most preferred, when the BroadbandBooster was "on".

As anticipated, we found no evidence of a change in MPO when the BroadbandBooster was turned on and no influence on uncomfortable loudness level. The study results confirm that when it comes to clients with extreme power needs, the BroadbandBooster can help to extract all the sound we possibly can from the hearing aid.

## References

- Dillon, H. (2012). *Hearing Aids* (2<sup>nd</sup> ed.). New York, USA: Thieme
- Souza, P. (2009). Severe Hearing Loss - Recommendations for Fitting Amplification. *Audiology Online*, January 19.
- Rosen, S., Faulkner, A., Smith, D.A. (1990). The psychoacoustics of profound hearing impairment. *Acta Otolaryngol Suppl.*;469:16-22.

## Authors



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Bernadette Fulton completed her training in Clinical Audiology at Melbourne University (Australia) after undertaking a BA in Linguistics at Monash University (Australia). She has extensive clinical experience in audiology, including aural rehabilitation, hearing aids and diagnostic audiology in

private and government clinics. In 2015, she joined the team dedicated to adults with severe to profound hearing loss at Phonak Communications in Murten as Audiology Manager.