Vol-4

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HAPPY NEW YEAR!

Bimonthly Newsletter

beat

Bernafon ENT Audiology Trends

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ChannelFree™ hearing aids for the management of individuals with Auditory Neuropathy Spectrum Disorder

SPECIAL FEATURE

Auditory neuropathy spectrum disorder (ANSD) is defined as a retrocochlear disorder where otoacoustic emissions (OAE) are normal and auditory brainstem responses (ABR) are abnormal/absent (Berlin et al. 2010; Berlin, Hood, et al. 2001; Berlin, Jeanfreau, et al. 2001; Starr et al. 1996). The literature on ANSD also suggests that hearing aids are of limited use in individuals with ANSD (Friesen & Cunningham 2003; Starr et al. 1996; Berlin et al. 2003; Berlin et al. 2010; Jijo & Yathiraj 2013; Narne et al. 2014). This limited benefit could be attributed to the inappropriate gain provided while fitting the hearing aid (Barman, Sinha & Prabhu, 2016). Zeng and Liu (2006) suggested that the hearing aids prescribed for individuals with ANSD should have unique speech processing abilities, which apart from amplifying and making the sounds audible should also compensate for affected spectral and temporal processing. ChannelFreeTM hearing aid technology is reported to restore spectral and temporal characteristics of the input sound. Hence, the efficacy of this technology was assessed in individuals with ANSD.

We determined the aided speech identification scores in individuals with ANSD using ChannelFreeTM hearing aids and compared it with scores obtained using conventional multi-channel hearing aids. **The results of our study showed that the aided performance was significantly better using ChannelFreeTM hearing aids compared to conventional amplification in individuals with ANSD (Prabhu & Barman, 2017).** In addition, it was more useful in individuals who had good speech identification scores in quiet (>50%). There could be several reasons mentioned below which could be the reason for better aided benefit with ChannelFreeTM hearing aids. ChannelFreeTM hearing aid technology attempts to overcome the adverse effect of multichannel compression on spectral contrasts in speech. The ChannelFreeTM hearing aid does not split the incoming speech signal into different channels, thereby ensuring that the hearing aid output retains the spectral contrasts present in the input speech. In summary, ChannelFreeTM hearing aid may reduce distortion compared to multi-channel hearing aid (Schaub, 2009).

Thus, the improved spectral, temporal cues and improved sound clarity with ChannelFreeTM hearing aids might help in improving speech perception with a ChannelFreeTM hearing aid. Thus, hearing aid trial using ChannelFreeTM hearing aids can be attempted in individuals with ANSD (especially those with good speech identification scores) since majority of them fail to benefit with conventional multi channel hearing aid strategies.

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Evaluation of Hearing Aid Algorithm to Reduce the Negative Effects of Reverberation

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Whether we are conscious of our surroundings or not, the acoustic properties of the environment affect our perception of the sound around us. Within a closed environment, such as a classroom or a concert hall, the room acoustics have a large influence on the transmission of sound between the source and the listener.
The sound perceived by the listener in a room is composed of both the direct part and the reverberant part of the signal. The exact nature of how these two sources combine depends on the room characteristics, as well as the listener's position in relation to the sound source. Boothroyd1 identified four key factors that affect the perceived acoustic signal in a room:

Distance;
Early reverberation;
Late reverberation; and
Noise.

The distance between the source and the listener influences the perceived signal. The farther away the source is from the listener, the greater the influence of the reverberant signal. The point where the energy of the direct sound is equal to the energy of the reverberant signal is called the critical distance (CD). When the listener comes closer to the signal source – within the CD – the direct signal will dominate and the effect of reverberation will be negligible. Beyond the CD, however, the reverberant part of the signal will prevail over the direct signal.2 In this condition, the listener will mostly perceive the reverberant part of the signal within a diffuse sound field, such as a large school auditorium.

The negative effects of reverberation on speech intelligibility have been observed for hearing-impaired subjects in unaided7,8 and aided9,10 test conditions. It is assumed that, in the reverberant (diffuse) sound field outside the CD, reflections arrive from all directions. Because the useful and the detrimental signals are not spatially separated, the benefit provided by directional microphones might be challenged.4

Assistive listening devices (ALDs) were developed to help hearing aid wearers in reverberant and noisy environments when conventional technology, such as directional microphones, provides limited benefit. FM receiver systems or induction loops with hearing aids can significantly improve speech reception in a classroom environment. However, their use depends on the available facilities and on the technology that the wearer has in his or her hearing aids.

A dedicated algorithm was developed that aimed to detect and reduce the amount of reverberation experienced by the hearing aid wearer.

A. With respect to Speech Naturalness

	RevRed0	RevRed1	RevRed2	RevRed3	RevRed4
RevRed0	1.000	0.625	0.362	0.474	0.400
RevRed1	1.599	1.000	1.158	0.611	0.536
RevRed2	2.760	0.864	1.000	0.776	1.221
RevRed3	2.109	1.636	1.289	1.000	1.714
RevRed4	2.498	1.864	0.819	0.583	1.000
Weights	0.099	0.172	0.223	0.282	0.223
Consistency ratio		0.026			

B. With respect to Speech Naturalness

	RevRed0	RevRed1	RevRed2	RevRed3	RevRed4
RevRed0	1.000	0.306	0.167	0.175	0.127
RevRed1	3.271	1.000	0.277	0.239	0.196
RevRed2	6.003	3.615	1.000	0.485	1.297
RevRed3	5.726	4.185	2.060	1.000	0.675
RevRed4	7.847	5.110	3.371	1.481	1.000
Weights	0.038	0.077	0.184	0.287	0.415
Consistency ratio		0.040			

C. With respect to Speech Naturalness

	RevRed0	RevRed1	RevRed2	RevRed3	RevRed4
RevRed0	1.000	0.474	0.272	0.268	0.524
RevRed1	2.108	1.000	0.575	0.553	0.245
RevRed2	3.673	1.738	1.000	0.741	0.575
RevRed3	3.725	1.808	1.349	1.000	1.864
RevRed4	1.907	1.087	1.738	0.536	1.000
Weights	0.080	0.123	0.210	0.309	0.277
Consistency ratio		0.063			

The results from the AHP in paired comparison matrices for: A) the speech naturalness scale; B) the amount of reverberation, and C) the overall preference. Values less than 1.0 favor the setting indicated in the column, whereas values greater than 1.0 favor the setting indicated in the row. Ratios closer to 1.0 indicate a smaller perceived difference, while a ratio of 1.0 reflects no perceived difference. The ranking for each scale is represented by the weights on the bottom row. Consistency ratios represent the validity of the rating scale and should be below 10%.

The AHP (ANALYTIC HIERARCHY PROCESS) can be used as a suitable tool for choosing the best setting in a specific situation, as in this case, a reverberant environment, and for answering the two research questions posed earlier:

1) Does the reverberation reduction algorithm reduce the perceived amount of reverberation?
Yes, the amount of perceived reverberation was reduced by any setting of the algorithm compared to the unprocessed condition. Increasing the strength of the reverberation reduction algorithm systematically reduced the perceived reverberation.

2) Does the reverberation reduction algorithm produce unwanted artifacts within the speech signal?
No, speech naturalness in the processed condition was always ranked to be better than in the unprocessed condition. Increasing the strength of the algorithm led to an improvement in the judgement of speech naturalness. However, it must be noted that care should be taken not to increase the effect of the algorithm too much.

A Tribute to the founder of HAC

My father Dr M P Dhir

Dr M P Dhir

Dr M P Dhir was born on 26, Nov, 1929 in Lahore to Dr Balwant Chand Dhir & Mrs. Lajwanti Dhir , they moved to India after partition. He completed his basic education at F. C. College, Lahore. After completing his BSC, he did his MBBS from, Government Medical College, Amritsar. Afterwards he completed DLO, ENT from, Lucknow Medical College.

He joined as AMO in Railways in June 1959, but resigned after a short period of 18 months giving up all the facilities and started his own practice so that he could uphold morals and values in life without any compromise. During this time he met Chief Secretory, Directorate of Industries, Punjab in a bus journey and discussed his problems in providing quality hearing aids to his patients. After a brief casual chat, on being prodded by the officer, he took it as challenge to improve upon the only existing Hearing aid available the in Indian market.

In 1965, started Hearing Aid Centre with the brand name HEARWELL and brought a new pocket model hearing aid for Indian market. In short span of time Hearing Aid Centre was Manufacturer, Importer and Exporter of Hearing aid and parts. He continued with his philanthropy endeavours all his life in the field of education & health. He was also Secretary of Arya Pratinidhi Sabha. In 1982, his elder son Alok Dhir joined HAC after finishing B.E electronics from IIT, Chennai, who took HAC to another level and HAC became the first company to introduce ITC in India.

Though being doctor and successful business man he always managed to take some time for sports as he was a sportsman to the core who used to play Cricket, Badminton and Hockey with zeal. He always had a belief of "Doing rather than Saying" and he kept true to his philosophy for family and society all his life.

He left this world for his heavenly abode on 20th October 1988, but left behind a legacy which continues to grow with his blessings.

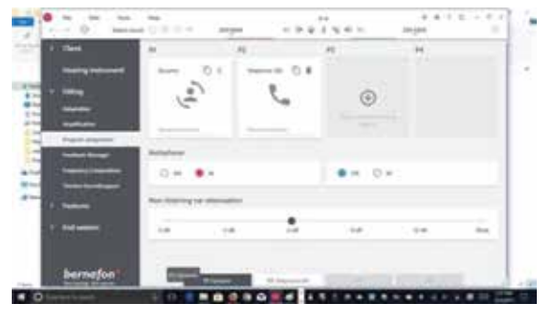
by **Amit Dhir**
CEO Hearing Aid Centre

FAQs about Bernafon's latest fitting software OASIS nxt

Q] In program assignment screen, it shows Autophone option. What is the significance of it? When we add Telephone program (M), It will ask for PHONE SIDE. Is there any relation between selection of PHONE SIDE & AUTOPHONE which is seen by default on the screen?

Ans.
The autophone and telephone programs are independent of each other.

When using autophone we can select an automatic attenuation of the non-telephone ear. When the HI is placed near the phone it will switch to Autophone which means that the phone has to be held to the ear which has the Autophone allocated to it (in this case it is the Right ear) and the other ear will drop by the amount of dB selected in the attenuation. The Autophone always uses the frequency response of the dynamic program.



When we create a Phone program then we can adjust the frequency response of the ear that the person wants to listen to the phone call on and it will attenuate the other ear by the same amount as selected in the attenuation of non-telephone ear. It doesn't use the autophone though.

Q] What is the significance of AUTOMATIC LEVEL STEERING in Tinnitus Sound Support?

Ans:
Automatic level steering controls when then Tinnitus signal is present.

Normally people will hear their tinnitus most in quiet environments. But when there is noise or speech around the tinnitus won't be as annoying or noticeable and the Tinnitus Signal might interrupt how they hear the conversation. Automatic Level Steering measures the amount of the input into the microphones. If it is < 50dB then the tinnitus sound is as loud as has been set up by the HCP. As the environment gets louder, the Tinnitus sound gets softer and eventually turns off when the environment is > 60dB.

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Your hearing • Our passion