

Speech mapping and the benefits of using in clinical practice

BY NICOLE DA ROCHA

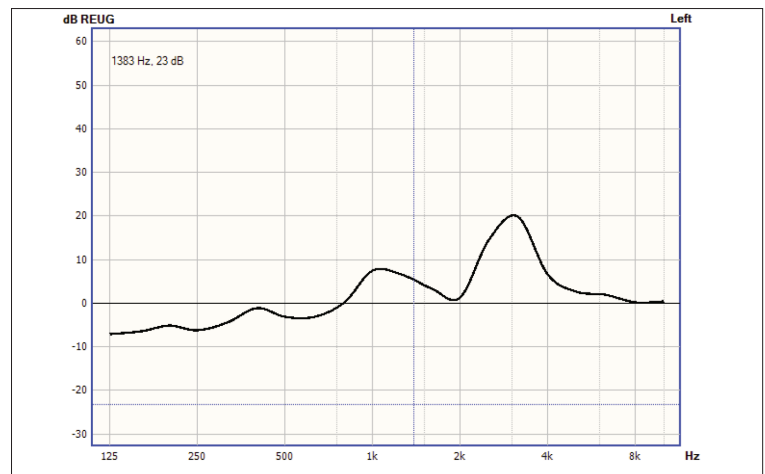
Fitting hearing aids is not simply a case of one size fits all. **Nicole da Rocha** discusses the benefits of using speech mapping as a verification tool.

The verification of hearing aids has become quintessential for best practice. Using either the real ear aided response (REAR) or the real ear insertion gain (REIG) is indispensable for verification of prescriptive targets and determining appropriate audibility of the amplified signals. The external meatus of the human ear has a unique /S/ shaped bend. These bends assist with the resonate amplification of the frequencies 2-3kHz, (which are the most important for speech).

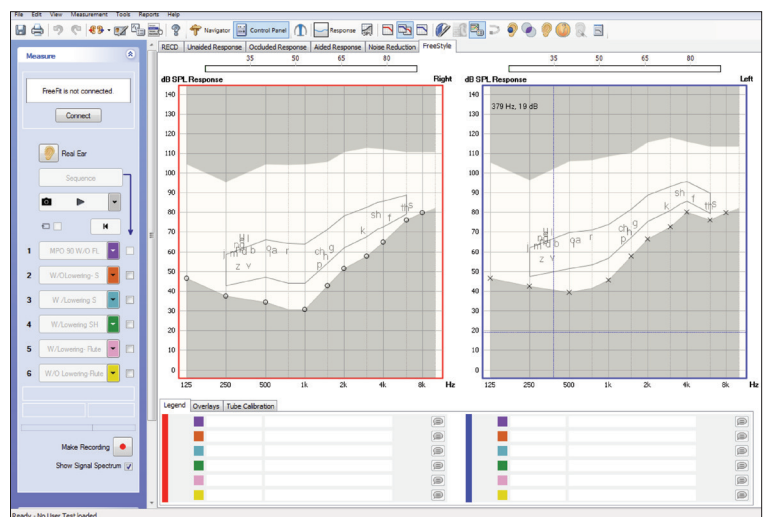
Due to the distinctive resonate characteristics of the ear canal, only by doing real ear measurements (REMs) can we truly know what is being received at the ear drum, thus allowing choices to be made based on data rather than speculation, instinct, or clinical intuition. The new 'Practice Guidance on the verification of hearing devices using probe microphone measurements' from the British Society of Audiology, reiterated the importance of verification: "Evidence suggests that fitting to prescriptive target levels will lead to more comfortable listening, and significantly improved speech quality and intelligibility than fittings that deviate significantly from target." [1]

The new recommendation places emphasis on REAR replacing the more commonly used REIG. The REAR measured with a modulated speech-based input signal provides a better view of amplification from a given device because it can display the interactions of the input signal with the compression across multiple channels. Measuring REAR is the only way to quickly and easily see the precise inter-relationship between dynamic range of hearing and the audibility of speech before and after amplification (and maximum output). This is where the term 'speech mapping' originates. Speech-shaped signals, or real-speech inputs, have become routine. The use of these signals against the view of the patients' dynamic range in SPL has prompted audiologists to refer to the measurement as speech mapping. In a nutshell, performing REAR is performing speech mapping.

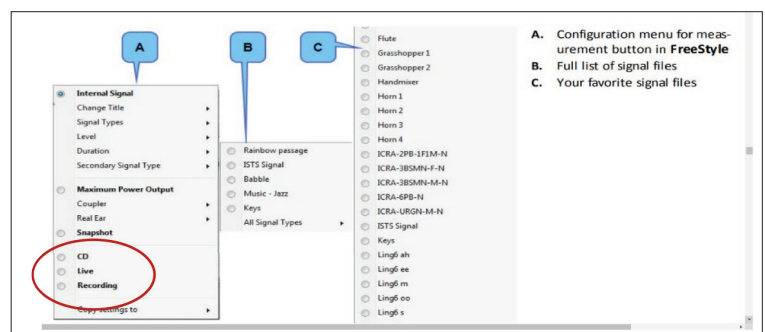
"Verification does not get more patient centred than using a loved one's voice"



Measure of the natural resonance of the open ear canal- REUG. Peak of approximately 12-22dB between 2-3kHz.



Utilise overlays to show: dynamic range, customised speech banana and the reference audiogram.



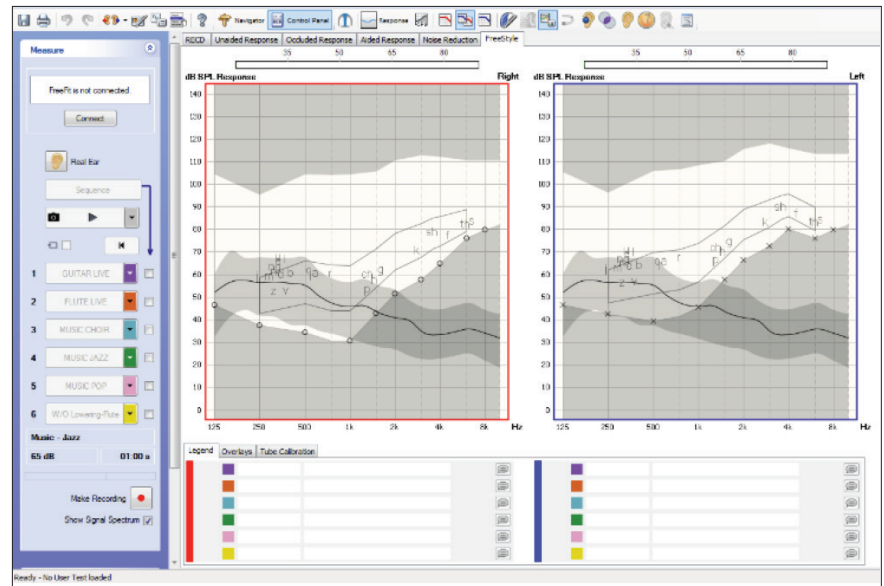
Change from internal signal to CD, live or recording in the drop down options.

The term 'speech mapping' was first used in the 1990s when Bill Cole and his associates introduced this feature, trademarked as Speechmap™ on the Audioscan coupler/probe microphone unit. Speech mapping displays the output of a hearing instrument in a patient's ear canal in response to an acoustic input, and can be a useful tool in both verification and counselling [2,3]. With the age of over-the-counter hearing aids coming into practice, more and more audiologists are looking for ways to make the practice of hearing aid fitting more individualised and patient-centred. When you utilise the FREESTYLE option in otosuite software, you will see that the screen displays a REAR. However, unlike the standard aided response screen, you may now utilise a full array of internal signals. For example, if you have a patient that complains specifically of the noise of a vacuum cleaner, you can play this specific sound file and adjust their noise program accordingly.

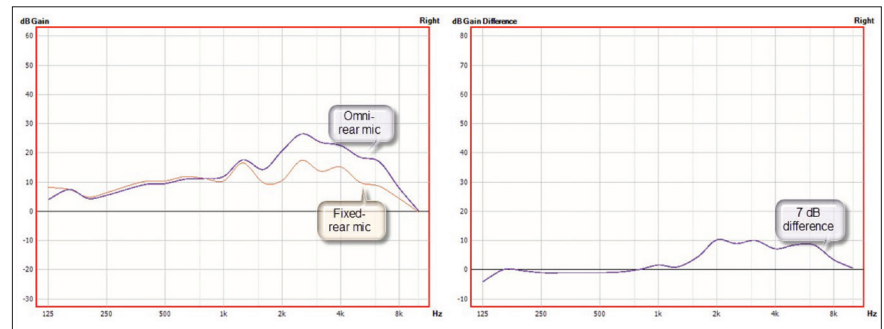
Verification does not get more patient centred than using a loved one's voice. A common complaint regularly heard in practice is: 'I can hear most people's voices well, but for some reason my wife/husband's voice is not clear'. The live voice option can be used to create a program custom made to a significant other's voice, utilising the REAR and LIVE voice stimulus option. The 'target' is the dynamic range of the patient and the customised speech banana. Speech not only provides a real-world verification signal, but it is also effective in demonstrating the effects of hearing loss and validating the benefits of hearing instruments with patients and significant others.

Another useful clinical utility of the LIVE function is to assist with programming the hearing aid's music program for musicians and sound engineers. For musicians, patients should bring in their musical instrument and, utilising the LIVE/RECORD stimulus option, get the patient to play the chorus of one of their songs. The target is to remain within the dynamic range and adjust the hearing aid compression to remain within audible area, while under uncomfortable levels. For sound engineers, using a CD of their own sound mix, allows the clinician to adjust their music program accordingly.

The utility of these different



Utilise overlays to create the 'target' within patient's dynamic range.



Measurement of live voice difference with directional microphone, within freestyle screen, in Gain View.

stimulus tools is endless, and allows for individualised complaints to be addressed. These procedures are also helpful in assessing and adjusting several hearing aid features, and in troubleshooting post-fitting problems. Moreover, conducting these measures can be interesting and informative, and sharing the results with the patient is a very effective counselling procedure.

When we have verification of a validated prescriptive method, we have good clinical judgement of the trade-offs between audibility, speech audibility, sound compression, comfort, and other factors involved in the fitting of the typical patient. This may not be the conclusion for all patients, and further gain adjustments may be necessary.

FreeStyle offers you a number of flexible features that allow you to create your own tests for demonstrating and verifying hearing instruments, features

and fitting. FreeStyle enables you to make measurements using a variety of different sound sources. It allows for two signals to be played simultaneously, either from a front speaker and a rear speaker, or from a single speaker. Two measurements can be made which then allows for a view of a curve that illustrates the difference between the two measurements.

Other tips for using freestyle with digital hearing aids include:

- The clinician can observe the effects of different noise reduction strategies.
- Acoustic feedback can be observed, if it is not heard by the clinician.
- With a surround-sound system and a sound library, the clinician can observe and assess the effectiveness of directional programs, adaptive directionality, noise reduction, and other features of digital technology.
- Increasing patient confidence. By making the patient a part of the verification process, the patient and family can 'see' the effects of treatment and gain confidence in what the technology is actually accomplishing for them. Reducing (or eliminating) returns for credit.
- Enhancing counselling. When specific voices or sounds are important to the

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patient, the system allows both the patient and family to 'see' what is being heard relative to the patient's hearing loss.

This article has placed much emphasis on verification. However, validation is imperative in order to know what needs further addressing and whether your verification has been successful.

Although behavioural measures can be helpful, they are complementary and not a substitute for the objective assessment of hearing aid output in the ear canal. It is important to understand that a prescriptive fitting is ultimately based on the desired amplified signal level in the ear canal, not a 2cc-coupler measure (at least not without correcting for differences between the ear and the coupler).

The process is not one test or technique, but a series of events that include accurate

measurement, listening to the patient, identification of the patient's unique needs and desires, counselling, and selection of technology that can meet the patient's needs. This will result in best quality of life for the patient's hearing and satisfaction as well as importantly giving the audiologist the best job gratification and satisfaction. Happy patients equal happy clinicians.

References

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3. Moore BCJ. Speech mapping is a valuable tool for fitting and counselling patients. *The Hearing Journal* 2006;**59**(8):26-30.

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FURTHER READING

Mueller HG, Ricketts TA, Bentler R. *Speech Mapping and Probe Microphone Measurements*. San Diego, USA; Plural Publishing; 2017.