



Putting consumers in control of their hearing experience

How do you offer a personalized hearing solution to a person who has some trouble hearing, but who doesn't want to take a hearing test or an appointment with a hearing care professional (HCP)? This was the type of questions we faced when developing the new All-Day Clear Hearing Aids for our over-the-counter (OTC) category. Without having an audiogram to use as a baseline, we knew the aid had to be developed in such a way that the consumer could easily and simply personalize settings to achieve a level of amplification that feels and sounds "right" to them.

Simple and effective customization

We accepted the task and pulled up our sleeves. We're proud to say that we were able to engineer a self-fitting process that is simple, yet precise and that can be completed in less than 4 minutes. The personalized sound profile of All-Day Clear is achieved while listening to a streamed audio passage through the hearing aids using the All-Day Clear App and consists of 3 simple steps:

1. Adjustment of the volume
2. Adjustment of the sound quality (bass / treble tilt)
3. Adjustment of the balance between ears

Fortunately, for individuals with milder hearing loss it is easy to judge what sounds good. There is evidence that the outcome of our self-fitting process is often as good as if they had gone through a conventional hearing test and fitting process.

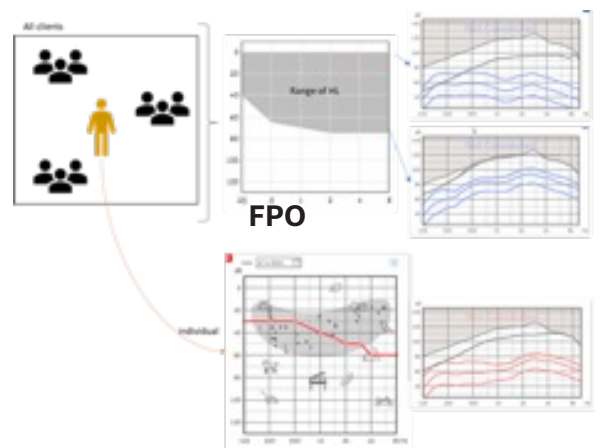
A highly configurable and flexible system

Our system design process began with the knowledge that, as hearing loss progresses, it impacts the amplification required. People with milder loss need only a little bit of gain. They also need a lower compression ratio (CR) and lower maximum power output (MPO). However, while there is a relationship between hearing loss gain, compression ratio and MPO, it's not a one-to-one relationship. A 10 dB increase in hearing loss doesn't mean you need 10 dB more gain. Nor does it mean that as the compression ratio doubles you need 10 dB more MPO.

To accommodate a range of different types, shapes and configurations of hearing loss while systematically varying the gain, compression ratio and MPO required that a highly configurable and flexible system be embedded within the aid. We named this system 'X Space'.

In X Space the interdependence between gain, compression ratio and MPO is embedded in a single calculation engine. A vector of X Space values (one for each frequency) defines the complete hearing loss compensation model. Since each value in the X Space vector can vary an infinite variety of hearing loss combinations can be achieved (constrained only by the physical limits of the amplification system). To facilitate the selection of a sound profile, a predefined subset of X Space vectors was derived to cover a large range of the possible variability.

The Sound Profile personalization selection involved making adjustments along two perceptual dimensions: volume and sound quality. Specifically, a set of 7 pre-sets to cover a range of adjustment along the dimension of loudness (volume), and a second set of 6 pre-sets to cover a range of adjustment along the dimension of tilt or slope of loss (sound quality). Together, these two dimensions create 42 different sound profiles to choose from.



Providing flexibility and control

After completing the sound profile selection, the users maintain control of the optimization of sound to their personal hearing preferences. At any time, and as frequently as desired, they can adjust their sound preference for things like volume or frequency response with an equalizer. This puts control in the consumer's hands to tweak their hearing aids in-the-moment.

While it has some highly sophisticated and innovative technology inside it and a wealth of hearing experience behind it, the All-Day Clear solution offers simplicity and control. It may just give consumers the sense of confidence and flexibility they are seeking in order to embark earlier on their hearing care journey.

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