

# Supporting the benefits of bimodal hearing:

## ReSound ENZO Q™ and the Smart Hearing Alliance

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### Abstract

Adults with moderate sloping-to-profound hearing loss may be candidates for or users of a cochlear implant. Increasingly, cochlear implant users use a hearing aid on the opposite ear. This paper reviews the benefits of this bimodal fitting strategy, and how the unique collaboration between Cochlear and ReSound – the Smart Hearing Alliance – makes it easy to provide a smart bimodal solution.

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### What is bimodal hearing – and why are we seeing it more today?

A cochlear implant is an implantable hearing treatment for people who do not hear well enough only using hearing aids. When cochlear implants were first introduced in the 1980s, they were only intended for individuals with profound hearing loss who did not receive any benefit from hearing aids<sup>1</sup>. Over time, as improvements in technology and user outcomes were observed, candidacy criteria changed. Thus people with more residual hearing are now considered as a candidate for a cochlear implant. Today, adults with moderate sloping-to-profound hearing loss can be evaluated for a cochlear implant<sup>2</sup>.

As candidacy criteria for cochlear implants has evolved, cochlear implant users with residual hearing may be able to achieve further benefits from continuing to wear a hearing aid in the non-implanted ear. This approach to amplification provides electrical (cochlear implant) and acoustic (hearing aid) stimulation to each ear separately and is referred to as bimodal hearing. A range of cochlear implant users can be fitted bimodally.

One question that emerged as bimodal fittings became more common was: will patients using a hearing aid in the contralateral ear receive additional benefits over using their cochlear implant alone? Evidence strongly suggests they can. The purpose of this white paper is to summarize the evidence for bimodal hearing and to introduce the ReSound Enzo Q hearing aid.

### Benefits of bimodal hearing

Two ears are (typically) better than one, that includes cochlear implant users. Researched evidence supporting bimodal stimulation includes improvements in many aspects of auditory performance and daily functioning over using a cochlear implant alone. Some individuals may not receive sufficient benefit from bimodal hearing. Bilateral cochlear implants could be an appropriate option in these cases<sup>3,4</sup>.

For adults who wear unilateral cochlear implants, however, bimodal stimulation is recommended<sup>5,6</sup>. Bimodal hearing is also a cost-effective management of cochlear implant patients from a public health perspective<sup>7</sup>.

#### Speech understanding

Speech understanding typically improves with the addition of the hearing aid when compared to using a cochlear implant alone in both quiet<sup>5</sup> and noisy environments<sup>6,8</sup>. In one study, unilateral cochlear implant users obtained a 14% average improvement in word recognition in a quiet environment with the addition of a hearing aid on the non-implanted ear<sup>5</sup>. In noisy environments, similar improvements have been measured in studies of adult bimodal users, likely due to the combined effects of binaural hearing advantages and the addition of low-frequency acoustic information<sup>6,8,9</sup>. Both listeners who were experienced with bimodal hearing and those relatively new to using a hearing aid with their cochlear implant show improved speech understanding in noise<sup>6</sup>.



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## Sound localization

While sound localization can be challenging for bimodal listeners because of the difference in signals (electric vs. acoustic)<sup>5</sup>, studies show that bimodal hearing can offer significantly improved sound localization compared with using a hearing aid or cochlear implant alone<sup>5,6</sup>. Bimodal users are better able to detect the direction of speech or pink noise compared to using a cochlear implant alone<sup>5,6</sup> and improvements in localizing speech from an array of loudspeakers in Ching et al. were associated with better speech perception<sup>6</sup>.

## Bimodal benefits in everyday environments

Bimodal users report real-world improvements in speech perception compared to using a cochlear implant alone<sup>6,9</sup>. They also report a preference for bimodal stimulation when listening in quiet or noisy environments, for environmental awareness and when listening to music<sup>6,9</sup>. Bimodal listeners can experience several benefits, such as easier listening in noise, better localization of a speaker in a crowd, a more natural hearing experience, and finding music to be more pleasurable<sup>6,9</sup>. Listeners who showed bigger improvements in speech understanding and localization tasks with bimodal hearing also tended to report greater satisfaction with sound quality and spatial perception in their everyday life<sup>5</sup>. Bimodal users report other benefits related to real-life functioning and quality of life, such as feeling more confident and greater ease of listening<sup>6,9</sup>.

## Maximizing bimodal hearing benefits

While many patients fitted bimodally can expect to see at least some benefits from bimodal hearing compared to using a cochlear implant alone, the amount of benefit will vary from person to person. A period of adjusting to the new sound sensations will likely be needed in the early stages of bimodal stimulation. Adults who continue wearing their hearing aid for at least three months after receiving a cochlear implant are more likely to become successful bimodal users<sup>9</sup>. However, consistent fitting of a contralateral hearing aid following implantation does not occur for all unilateral cochlear implant users. In 2015, a study of US-based cochlear implant clinics reported just over 40% of adult unilateral cochlear implant users were also using a hearing aid on the opposite ear<sup>10</sup>. Of those patients using a hearing aid, less than 20% used their hearing aid within two months of receiving the cochlear implant, and close to 20% never had their hearing aid reprogrammed for the opposite ear at all<sup>10</sup>.

It appears that people who receive less benefits from hearing aid amplification may also see less overall bimodal benefit<sup>5</sup>. In one study of bimodal users, 15% discontinued use of their hearing aid after attempting bimodal listening for at least three months post-implantation<sup>9</sup>. The participants who discontinued hearing aid use tended to have poorer mid-to high-frequency hearing in the con-

tralateral ear and no significant improvement in speech understanding with the addition of the hearing aid, as compared to more successful bimodal users<sup>9</sup>. In another study, cochlear implant users reported discontinuation of their contralateral hearing aid due to poorer sound quality and no perceived additional benefits<sup>11</sup>. When both ears are better able to work together – specifically when speech recognition is symmetrical between the ears – a greater likelihood of bimodal success is observed<sup>12</sup>. Note that a relationship between residual hearing thresholds, speech recognition abilities and bimodal benefit or preference is not observed in all studies<sup>6,9</sup>. This variability across cochlear implant users means predicting bimodal benefit is not straightforward.

One way to increase the likelihood for success from bimodal hearing is for the hearing care professional (HCP) to ensure an optimal fitting of the contralateral hearing aid and to balance perception of sound between the ears. Unfortunately, there is a lack of consistent bimodal fitting guidelines for HCPs to reference. Best practices for bimodal fittings continue to be investigated. This means that HCPs may not feel entirely confident in how to approach a bimodal fit, especially considering the variation in cochlear implant patients. HCPs who work with cochlear implant patients tend to specialize in cochlear implants and may not have much hearing aid fitting experience. Bimodal patients may end up seeing two different HCPs for the fitting of their devices<sup>9,10</sup>.

## ReSound ENZO Q perfectly complements Cochlear™ implants

The synergies of the Smart Hearing Alliance, a unique collaboration between Cochlear and ReSound, make bimodal fitting with a cochlear implant and a hearing aid an appealing solution for both patients and HCPs. Patients benefit from bimodal, as well as bilateral wireless streaming capabilities and smartphone apps that improve convenience and user experience. HCPs benefit from a streamlined fitting process that provides guidance on fitting patients bimodally and reduces time and effort needed to fit two separate devices. The current product offerings from both companies – Cochlear Nucleus 7 Sound Processor and ReSound ENZO Q - offers all the benefits of the Smart Hearing Alliance.

### Benefits of the Smart Hearing Alliance

Cochlear and ReSound have created a bimodal fitting flow<sup>13</sup> for a step-by-step fitting that supports best outcomes. The hearing aid fitting flow maximizes the audible bandwidth<sup>14</sup> and helps ensure loudness balance between the two devices. For fitting the hearing aid, the HCP can select from peer-reviewed fitting rationales as well as the proprietary Audiogram+. Both a validated prescriptive rule and a manufacturer proprietary fitting rule have been shown to provide a good starting point for a bimodal fitting<sup>15</sup>. Currently, Cochlear recommends setting up two listening programs in both the cochlear implant and the

hearing aid<sup>13</sup>. Additional programs or adjustments can be made based on individual patient needs. The bimodal fitting flow aligns the acoustic indicators in the hearing aid with those in the cochlear implant. The fitting software also instructs the HCP on settings that enable direct wireless streaming and ensure wireless accessories are set up optimally.

The Smart Hearing Alliance provides unique connectivity solutions that work with both the hearing aid and the cochlear implant. ReSound and Cochlear share wireless technology, so your patients can stream directly to their Cochlear™ Nucleus 7 implant and hearing aid simultaneously from a compatible iOS or Android™ device, or from a range of wireless accessories\*. There is no intermediary device required for either the Cochlear Nucleus 7 Sound Processor or ReSound ENZO Q to connect and stream in unison.

The user can access smartphone apps for real-time adjustments or program changes to optimize listening for specific environments. Independent studies strongly support the benefit of using wireless accessories bimodally. The ability to understand speech when using a mobile phone has also been shown to improve with use of wireless streaming from a Phone Clip\*\* device to both the cochlear implant and hearing aid, with 25% and 23% word recognition improvement noted in quiet and noisy environments, respectively<sup>16</sup>. A separate study of bimodal speech recognition in noise using a Mini Mic\*\*\* device demonstrated an average 6.3 dB improvement in signal to noise ratio compared to performance without the Mini Mic<sup>17</sup>. This large improvement in SNR could mean the difference between understanding and not understanding speech in a noisy environment.

### Introducing the ReSound ENZO Q

The ReSound ENZO Q super power behind-the-ear hearing aid (BTE) offers an upgraded chip and additional features for optimizing patient outcomes<sup>18</sup>. First, ReSound ENZO Q has an IP rating of 68 that indicates high resistance to moisture and supports long-term durability. The super power ENZO Q (98 model) offers the same 145 dB

SPL peak maximum gain as its predecessor with the addition of an increased input dynamic range of up to 113 dB. This means louder sounds are less degraded as they are detected by the hearing aid microphone, which may be especially beneficial for users with more severe-to-profound hearing loss. The addition of impulse noise reduction allows for greater control over comfort for loud sounds. HCPs can adjust the noise reduction settings for fast, very loud environmental sounds without increasing NoiseTracker II settings. This is especially important for users with severe-to-profound hearing loss, as increasing digital noise reduction can have negative effects on audibility of speech and other wanted sounds.

ReSound ENZO Q includes live synchronous support from the HCP with the use of ReSound Assist Live. This allows the user to communicate directly with their HCP during a remote fine tuning session via a video chat through the ReSound Smart 3D™ app. Texting in the app during the video call is available in case the user is in a situation where they are unable to hear their HCP well enough to communicate their needs. Remote fine-tuning requests can still be made via the asynchronous ReSound Assist feature if real-time support from the HCP is not necessary.

## Summary

There are many potential benefits to bimodal hearing for unilateral cochlear implant users, including better speech understanding in quiet and in noisy environments, better sound localization and improvements in daily life in terms of sound quality and perception of sound. The Smart Hearing Alliance aims to maximize the benefits of bimodal hearing by coordinating wireless streaming for both hearing devices and streamlining the bimodal fitting process. Patients using both a Cochlear Nucleus 7 Sound Processor and a ReSound ENZO Q hearing aid can benefit from the newest technology and all that the Smart Hearing Alliance has to offer.



\* For compatibility information and devices visit [cochlear.com/compatibility](https://cochlear.com/compatibility) or [resound.com/compatibility](https://resound.com/compatibility)

\*\* ReSound Phone Clip+ or Cochlear Phone Clip

\*\*\* ReSound Micro / Multi Mic or Cochlear Mini Microphone 2/2+

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## Cochlear and ReSound collaborate in the Smart Hearing Alliance to develop the world's smartest bimodal hearing solutions.



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