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Bimodal hearing aid fitting: Benefits and update in Oticon Genie 2

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ABSTRACT

This paper provides a brief summary of the benefits and different fitting approaches of bimodal fitting, and highlights the new overall gain trimmer and the existing bimodal fitting flowchart in the bimodal fitting panel in Oticon Genie 2.

Bimodal fitting: Benefits and different bimodal fitting approaches

In a bimodal fitting, one ear is stimulated electrically and the other acoustically. Candidates for bimodal fitting are people with severe-to-profound hearing loss who receive cochlear implant in one ear and have residual hearing in the non-implanted ear. While cochlear implant provides good speech understanding especially in quiet listening situations, it does not give good representations of low frequency sounds. In a bimodal fitting, this shortcoming can be compensated by providing acoustic amplification of low frequency sounds in the non-implanted ear (Francart & McDermott, 2013).

Having more access to low frequency sounds can enhance auditory performance because these sounds carry phonemic and prosodic information, consonant voicing and acoustic cues, in particular the fundamental frequency (Brown & Bacon, 2009). Research studies have demonstrated that bimodal stimulation provides a wide variety of benefits over unilateral cochlear implantation such as speech recognition in noise, better music and pitch perception and perceived naturalness of sounds (e.g. Blamey et al., 2015; Ching et al., 2007, Illg et al., 2014; Morera et al., 2012) for adults.

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In addition, by making binaural cues available, bimodal stimulation also enhances spatial listening and localization (e.g. Ching et al., 2007). Further, bimodal hearing has also been shown to improve quality of life in social activities (Farinetti et al., 2015). For children, in addition to better speech recognition in noise, localization and musical perception (e.g. Ching et al., 2006; Shirvani et al., 2016), bimodal stimulation has been demonstrated to improve language acquisition and outcome (Moberly et al., 2016; Nittrouer & Chapman, 2009).

A coordinated and balanced bimodal fitting is crucial for achieving optimal benefit and listening comfort. Common bimodal hearing aid fitting approaches in clinical practice include loudness balancing, frequency lowering, and bandwidth adjustment. Vroegop and colleagues (2018) systematically reviewed 17 studies which examined the effects of different bimodal hearing aid fitting approaches on auditory performance. Most of the studies reported some bimodal benefits, and some studies reported mixed results. However, it is pointed out that based on the existing literature, it is still unclear how the use of these fitting approaches contributes to optimal bimodal outcome. Davidson (2015) reviewed the effects of frequency lowering and frequency overlap on auditory performance in children. It is concluded that bimodal benefits are mixed, which could be due to for instance variability across research methods, degree and configuration of hearing loss in the non-implanted ear and the choice of outcome measures. Owing to the inherent individual variation among the severe-to-profound population, the benefits from cochlear implant and bimodal fitting also vary greatly.

Bimodal fitting in Genie 2

Bimodal fitting generally provides greater benefits over unilateral cochlear implantation alone, but how different bimodal fitting approaches contribute to optimal benefits is still unknown. This indicates the great variability of this population, and that hearing care professionals fitting a bimodal hearing aid may need to apply individualized fitting approaches based on individual needs, preferences and performance. Currently, there is limited evidence and a lack of standardized procedures or guideline on bimodal hearing aid fitting. In light of this, Reyes (2016, Oticon whitepaper) developed bimodal hearing aid fitting guidelines featuring a bimodal flowchart, which serves as a guide to the hearing care professionals as they navigate the bimodal fitting process (Figure 1). A bimodal fitting panel is now available in Genie 2, equipped with fitting

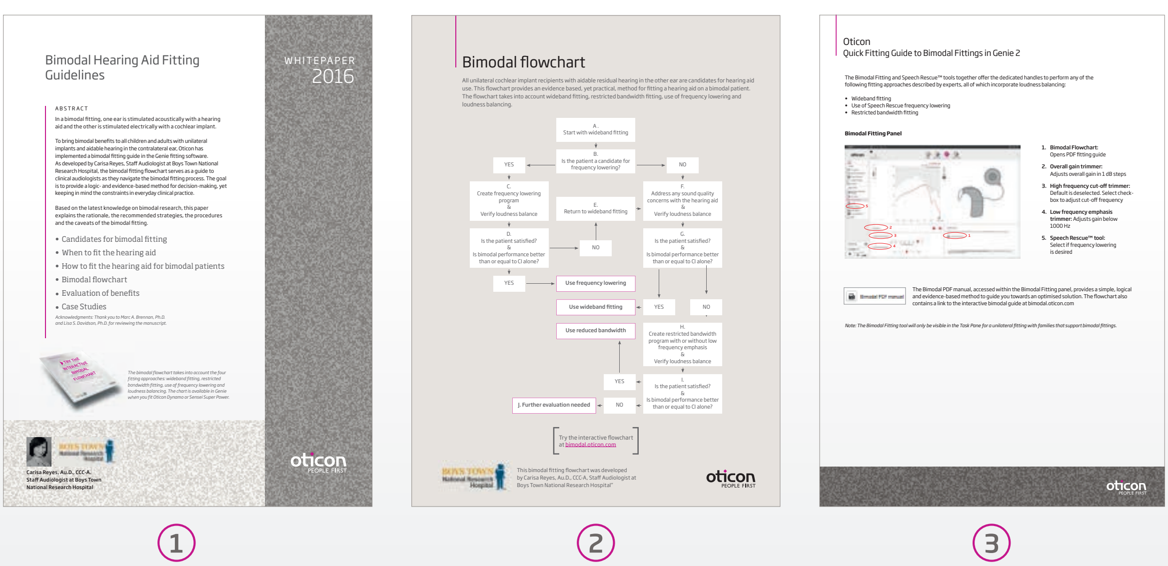

Figure 1. Materials supporting bimodal fitting with Oticon hearing aids: Bimodal hearing aid fitting guidelines, bimodal fitting flowchart and Quick fitting guide to bimodal fitting in Genie 2. (from left to right)

*Compatible with Oticon Opn S™, Oticon Opn Play™, Oticon Xceed™ and Oticon Xceed Play™

tools that allow flexible fitting approaches (Figure 2). The Quick fitting guide to bimodal fittings in Genie 2 for Oticon hearing aids* describes the steps to perform four fitting approaches: wideband fitting, restricted bandwidth, frequency lowering and loudness balancing.

Overall gain trimmer: New in bimodal fitting panel

The overall gain trimmer replaces the overall loudness trimmer in the bimodal fitting panel in Genie 2 (Figure 2). Balancing loudness across the cochlear implant and the bimodal hearing aid is very often needed because of binaural loudness summation. People with severe-to-profound hearing loss typically have a greatly reduced dynamic range and therefore a very steep loudness growth function. This means that a small change in sound level would make a larger change in their loudness perception compared to normal hearing people. To accommodate this, the step size of this new overall gain trimmer is now 1 dB (formerly 2 dB). This allows a finer adjustment and loudness balancing between the cochlear implant and hearing aid. Moreover, adjustment using this gain trimmer does not alter the maximum power output (MPO), which prevents any unintended change in the MPO settings. The overall gain trimmer, together with the other existing bimodal fitting tools in Genie 2, including the high frequency bands trimmer, low frequency bands trimmer and Speech Rescue frequency lowering, allow more accurate and flexible fittings. Any adjustments made using these tools in Genie 2 will apply to the hearing aid only.

Concluding remarks

There are well-documented benefits of bimodal fitting over unilateral cochlear implant alone for adults and children, even though there is no standardized procedures on bimodal fitting for optimal benefit. The bimodal hearing aid fitting guidelines and flowchart developed by Reyes (2016) provide a good basis for use of different fitting approaches and decision-making in the bimodal fitting process. The updated bimodal fitting tools in Genie 2 allow finer adjustments, which support hearing care professionals to fit optimally the hearing aid to complement the implanted ear.

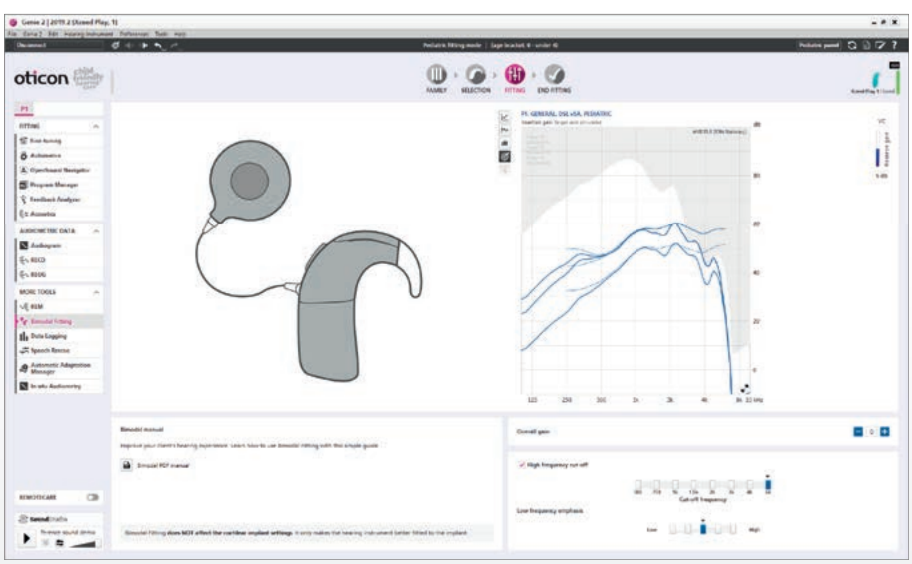

Figure 2. Bimodal fitting panel in Genie 2. Cochlear Implant on the right ear, hearing aid fitted to the left ear. Hearing aid settings can be sound balanced to the cochlear implant.

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