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Is The Inter-Aural Attenuation By Bone Conduction Actually 0 dB?

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For the past 21 years, I have fitted only bone-conduction hearing aids. One of the most common questions I get from audiologists who do not routinely fit bone conduction devices is “how can you fit bilateral bone conduction devices when the inter-aural attenuation by bone conduction is 0 dB?” And, “won’t there be confusion as the two signals compete at the cochlear level?

These questions stem from the fact that we are all taught and adhere to the notion that, during audiometry, we assume that the vibratory energy we deliver is arriving equally at both cochleae, regardless of where the bone vibrator is placed. This assumption ensures we accurately set the minimum masking levels to ensure confidence that the ear under test is responding and not the non-test ear.

We know that binaural hearing allows us to localize where a sound originates, suppress environmental noise, and release us from masking. This is why it is usually recommended to wear two hearing aids when the loss demands it (also this is why we don’t walk around wearing monocles for bilateral vision problems). But, if bone conduction signals reach the cochleae at equal levels (0 dB inter-aural attenuation), how, for example, could a bilateral bone conduction user localize sounds? Wouldn’t the inter-aural level and timing cues just be 0?

In reality, the inter-aural attenuation varies widely across individuals (as much as 40 dB) and varies widely across frequencies even within the same individual (Stenfelt, 2012, Nolan and Lyon, 1981, Snyder, 1973). For example, at frequencies up to 0.5 kHz the difference is around 3 to 5 dB. The 0.5 kHz to 1.8 kHz is actually close to zero (on average), where it rises to around 10 dB in the higher frequencies (Stenfeldt, 2012). These differences are more subtle than the inter-aural differences we are

accustomed to in air conduction hearing. Still, they are enough for many bilateral bone conduction users to localize to some degree (when the cochleae are sufficiently symmetrical–within 10 dB), to hear better in noisy environments, and to get a release from masking. Finally, bilateral bone conduction hearing aids give people a better awareness of sound from both sides of the head, even if they aren't helping as much with binaural hearing. So the next time you see someone with binaural conductive/mixed loss wearing only one bone conduction device, perhaps a new conversation with them would be beneficial.

References

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