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# Why Is It Crucial To Measure Bone Conduction Hearing Thresholds Directly with the User's Specific Device and Connection In Place?

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Bill Hodgetts, R.Aud, PhD

Measuring bone conduction hearing thresholds in-situ with the device and connection that the user is wearing is critical for several key reasons, particularly when it comes to the prescription of amplification targets and ensuring that the hearing aid is properly calibrated to meet the user's specific needs.

## 1. Accuracy in Real-World Conditions:

In-situ measurements capture the actual conditions under which the bone conduction device (BCD) will be used. This includes the specific attachment method (e.g., abutment, softband, magnet under skin) and individual anatomical factors, such as skull density, skin thickness, and vibrator location, which can significantly influence sound transmission. Accurate threshold measurements under these conditions are essential to ensure that the device provides the correct level of amplification for the user's everyday listening environments (Gascon & Hodgetts, 2022).

## 2. Prescription of Amplification Targets:

Bone conduction thresholds measured in-situ are vital for setting precise amplification targets. These thresholds calculate the device's output to compensate for the user's hearing loss. The prescription process often involves fitting formulas, such as DSL-BCD (Desired Sensation Level), which are specifically designed for bone-anchored devices (BADs). These fitting formulas consider the unique acoustics of bone conduction and ensure that the amplification is optimized for the individual user's hearing needs. The prescribed targets might be inaccurate without in-situ measurements, leading to suboptimal hearing aid performance (Bagatto, 2018; Pumford, 2018).

## 3. Personalization of Device Settings:

In-situ threshold measurements allow clinicians to tailor the device's settings to the individual user's needs, providing a more personalized hearing experience. This ensures that the amplification is neither too weak nor too strong, optimizing speech understanding and comfort for the user. Personalization is especially important for users with unique anatomical features or specific hearing needs, as generic settings may not provide the best outcomes (Persson, 2024).

## 4. Development of Pediatric Fitting Protocols:

The importance of in-situ measurements is also highlighted in developing pediatric fitting protocols. Children's skulls and auditory systems are still developing, making accurate in-situ measurements crucial for ensuring that bone conduction hearing devices (BCHDs) provide appropriate amplification. These protocols help set safe and effective output levels for pediatric patients, ensuring that the devices support speech and language development effectively (Bagatto, 2018).

## 5. Verification of Device Performance:

In-situ measurements also serve as a verification tool to ensure the device functions correctly. By comparing the measured thresholds with the expected performance, clinicians can identify any discrepancies that may indicate issues with the device or its fitting. This step is crucial for confirming that the BCD is delivering the appropriate level of amplification and that the user is receiving the intended auditory benefits (Gascon & Hodgetts, 2022).

## 6. Reducing Judgment Noise:

Conducting measurements in-situ reduces the variability caused by external factors, often called "judgment noise." This leads to more consistent and reliable assessments, ensuring the device is optimally set for the user's hearing needs. Inconsistent measurements can result in inappropriate amplification levels, negatively impacting the user's hearing experience (Gascon, 2022).

In summary, in-situ measurements are essential for ensuring accurate and personalized amplification and verifying device performance, supporting the development of pediatric fitting protocols, and reducing variability in clinical assessments. These measurements directly influence the prescription of amplification targets, making them a critical component of effective bone conduction device fitting.

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