

Masking

Cross Hearing

Interaural Attenuation

Types of Noise

- Narrowband Noise
- White Noise
- Speech Noise

Absolute Threshold

Cross over is when the signal crosses over to the opposite cochlea and it becomes a clinical issue when cross hearing occurs. Cross hearing occurs when the intensity of a sound is loud enough so that the sound crosses from one side of the head and it is heard in the other ear. Cross over occurs through bone conduction to the cochlea of the opposite ear because the bone conduction vibrator stimulates both ears equally so there is no interaural attenuation for bone conduction. We mask when there is a chance of cross hearing.

Cross hearing is the result of interaural attenuation, which is the reduction of energy between ears. Interaural attenuation is the difference between the signal going into the test ear and the signal reaching the non-test ear and is dependent on the (1) transducer type, (2) frequency spectrum and the (3) individual subject. It can be measured by obtaining the unmasked air conduction thresholds in a “dead ear” and then calculating the difference between the normal and impaired ear. Normative values exist so that clinics can account for interaural attenuation. For supra-aural headphones, IA is 40dB and for inserts the IA is 75dB from 250-1000 Hz and 50dB for 2000-8000 Hz. In the clinic, 40dB for headphones and 70dB for inserts is generally used.

There are many types of noises that are used in clinic to mask sounds. Narrowband noise is centered around a specific frequency and is the most effective masker for pure tone stimuli. White noise is normally not used because it contains noise components that are outside of the pure tone’s critical band, this difference adds to the overall level of noise that is not ideal for masking. Speech spectrum noise is comprised of white noise that has been filtered to simulate the long-term average spectrum of speech (LTASS) with the greatest energy in the low frequencies – so the spectrum level decreases a function of increasing frequency, this type of speech noise has a more limited bandwidth than white noise and is used to mask for speech stimuli.

The absolute threshold of a sound is the minimum detectable level of that sound in the absence of any other external sounds. Absolute threshold is dependent on the properties of the stimulus (frequency, duration, wave purity) and delivery of stimulus (headphones vs free sound field). The absolute threshold in young adults is around 0dB SPL for sounds around 2-3kHz. In the clinic, audiologists measure and plot a patient’s absolute threshold on an audiogram at different frequencies relative to 0dB HL.