

Personal Hearing Instruments

Fitting hearing instruments to both ears is the preferred arrangement unless there are specific contra-indications; binaural fitting facilitates localization of sound and improves listening in noise.

Type of Hearing Instruments

Air Conduction: Amplified sound delivered into the ear canal

Advantages: Maximizes sound quality, Multiple signal processing strategies available

Limitations: Limited use with external ear malformation, Limited use with chronic ear drainage

Bone Conduction: Amplified sound delivered directly into the inner ear (cochlea) by way of vibration of skull from transducer placed on bone behind the ear.

Advantages: By-passes external and middle ear when there is an external ear malformation and/or chronic ear drainage

Limitations: Limited available signal processing options. Required headband to hold firmly in place on mastoid.

Cochlear Implant: Surgically implanted device with externally worn processor that converts acoustic energy into electrical energy, stimulating the auditory nerve.

Advantages: Improved audibility of sound for individuals with limited benefit from hearing aids. Positive language outcomes with appropriate intervention. Hybrid model combine features of hearing aid and CI to amplify low frequencies and electronically stimulate high frequencies

Limitations: FDA approved for 12 months of age and older. Only for severe and profound hearing loss. Requires surgical procedure. Requires programming, close follow-up and auditory habilitation by CI specialists.

Bone Anchored: Amplification device surgically implanted; Baha most common.

Advantages: Baha is FDA approved for age 5 and up. Prevents need for headband.

Limitations: Requires surgical procedure. Baha has external component .

Style of Hearing Instruments

Behind-the-Ear: (BTE) Sits behind the ear, coupled directly to the ear canal via a tube and a custom fit ear mold.

Advantages: Flexible as child grows. Durable, some models are water resistant. Available in a variety of colors and designs to match hair or express oneself

Limitations: Retention may be an issue on very small ears

BTE Open Fit: Amplified sound is delivered into ear canal from BTE via slim tubing typically without a custom ear mold.

Advantages: Cosmetically appealing. Best for high frequency losses - low frequency sounds are not amplified

Limitations: Retention may be an issue on very small ears. May have more feedback

Receiver-In-Canal: (RIC) Amplified sound is delivered from the BTE to a receiver placed in the ear canal.

Advantages: Cosmetically appealing. Best for mild to severe hearing losses. Feedback problems are reduced because microphone and receiver are separated

Limitations: Retention may be an issue on very small ears. Wax problems are more common. May not be appropriate during very aggressive athletic activities.

All Custom (ITE): All components of the instruments are in the ear

Advantages: Inconspicuous (completely in the canal model) Effective for mild to severe hearing losses

Limitations: Not appropriate for young children due to feedback from ear growth. Wax problems are more common. Remote microphone use is via streamer only.. May not be appropriate during very aggressive athletic activities

Amplification Features

Multiple Programs: Can be accessed through push button or remote control; some models automatically switch programs/features based on environmental conditions or listening situations.

Advantages: Added flexibility, good for fluctuating hearing loss. Can access multiple processing strategies or microphones. Improved understanding across a broad range of environments (phone, groups, music)

Limitations: Some models may require physical manipulation to change programs. Programs usually changed on personal preference. May not be practical for young children.

Multiple Mics: The capability of the hearing aid's microphones to reduce incoming signals from the back and sides of the listener.

Advantages: Enhanced signal-to-noise ratio in noisy environments. Some models permit the listener to choose the speaker or event on which they want to focus.

Limitations: May reduce input of surrounding sounds.

Roger: Allows the signal from a remote microphone/transmitter to be sent directly to the ear of the listener; either design integrated or interfaced to hearing aid or cochlear implant/BAHA via adapter (i.e., audio shoe).

Advantages: Enhanced signal-to-noise ratio in all environments. Direct input from the primary speaker/language model.

Limitations: Requires compatible Roger microphones and receivers to be used.

Digital Signal Processing

Non-Linear Frequency Compression:

Shifts high frequencies to range of audibility for the listener.

Advantages: Improves access to high-pitched sounds that may be outside the range of audibility

Wide Dynamic Range Compression (WDRC):

Automatically adjusts the gain for different input loudness levels.

Advantages: Automatically adjusts gain for all input intensities. Increased audibility of soft speech sounds. Less gain at high intensities may help limit over amplification.

Limitations: Less gain at high intensities may be perceived as less powerful to experienced users.

Output Limiting:

The general term used to describe the control of the maximum loudness level a hearing aid will provide.

Advantages: Limits loudness level to avoid additional hearing damage.

Multiple Channels:

Frequency shaping capabilities of the hearing aid permits better matching of different pitches to individual hearing loss.

Advantages: Ensures audibility and avoids loudness discomfort for conversation inputs

Feedback Control:

Digital processing reduces acoustic feedback (whistling).

Advantages: Automatically detects and reduces excessive feedback (whistling). More advanced methods allow cancellation of feedback without any reduction in audibility

Limitations: Some methods may reduce gain which can cause loss of audibility for soft speech signals.

Noise Reduction/Speech Enhancement:

The use of digital processing to reduce non-speech background noise and enhance speech inputs.

Advantages: Allows access to audibility of speech signals in the presence of some background noise. Enhances sound quality.

Limitations: Too much reduction may limit important information, including speech.