

Microphone directionality in hearing aids

This is the beginning of a series of articles “getting to know your hearing instruments – inside and out”. Today we focus on directionality – the next issue will cover signal processing.

A microphone is an essential component in all hearing aids. It picks up sound from within the environment and converts it to an electrical signal which can then be processed by the hearing aid. You may have heard that it is best to have directional hearing aids, and this article aims to explain what directionality is, and why it will benefit you.

What are directional microphones?

While audiologists often refer to hearing aids as being omnidirectional or directional, this generally refers not to the microphones themselves, but to the method in which the hearing aid is able to process sound.

The fact is that almost all modern hearing aids have only omnidirectional microphones (omnidirectional means that the microphone is able to receive signals equally from every direction), but it is whether there is one microphone or two that dictates whether a hearing aid is considered directional.

In a hearing aid with two omnidirectional microphones, the microphones are lined up a very precise distance apart, and the hearing aid is able to detect which direction a sound is coming from by the timing differences of a particular sound reaching each of the two microphones. So, a sound that is behind a person will be received by the back microphone before it is detected by the front microphone. In this way the two microphones can work together to ‘beam form’. That is, based on a set of criteria, they can minimise the impact of sounds coming predominantly behind (the ‘null point’), while preferentially amplifying sounds coming from in front of the wearer.

Sounds simple? Well, now we’re ready to deal with the type of directionality – fixed or adaptive. A fixed directional hearing instrument will have a beam which has a fixed shape and size. When this hearing aid is working directionally, all sounds within the beam will be amplified, while all sounds outside the beam will be damped. On the other hand, an adaptive directional hearing instrument has a beam that changes the location of the null point (and therefore the shape of the directional response) depending upon the location of the dominant noise source around the head. This added level of sophistication has the advantage of greater effectiveness

at reducing annoying and disruptive noise sources compared with a static of fixed null point.

Then we need to consider channels. A fixed directional hearing instrument will damp sounds outside its beam in all channels (for all pitches of sound).

On the other hand, an adaptive directional hearing aid will not only have a 'roving' null point, it can have a number of channels (from three to 33), and in each channel the null point is directed at the loudest intruding sound to be damped down.

Finally, when does the hearing aid work in directional mode? Some hearing aids work in directional mode only when you tell them to (mostly with a button on the aid or a remote control), while more sophisticated instruments will automatically switch from omnidirectional mode to automatic mode when the presence of background noise is detected.

In what ways does directionality benefit me?

Directionality in a hearing instrument will have no benefit in quiet situations, where the presence of background noise is not an issue.

In noisy situations the directional hearing instrument comes into its own by providing benefits in speech intelligibility, and of

listening comfort, over an omnidirectional hearing aid. In fact, studies have shown that some people wearing two directional hearing instruments in a noisy situation will hear almost as well as a normal hearing person!*

It is important, however, to remember that a hearing aid cannot determine what you consider to be relevant, and what you consider to be noise - especially if both are speech! Instead, the hearing aid assumes that the signal in front of you is the signal you wish to hear. For this reason, when using hearing aids in directional mode, you will hear much better if you face the person you are listening to and keep as much of the background noise behind you.

In general, the hearing aid with the best signal processing and automatic operation and most channels with adaptive directionality will allow you to hear best in the presence of background noise. But ask your audiologist which one is the best match to your typical listening situations.

**Markides, A. (1977). Binaural Hearing Aids. Academic Press, N.Y.*

If you would like to book in for a hearing aid review please call **Debbie** on **264 0405** to make an appointment.