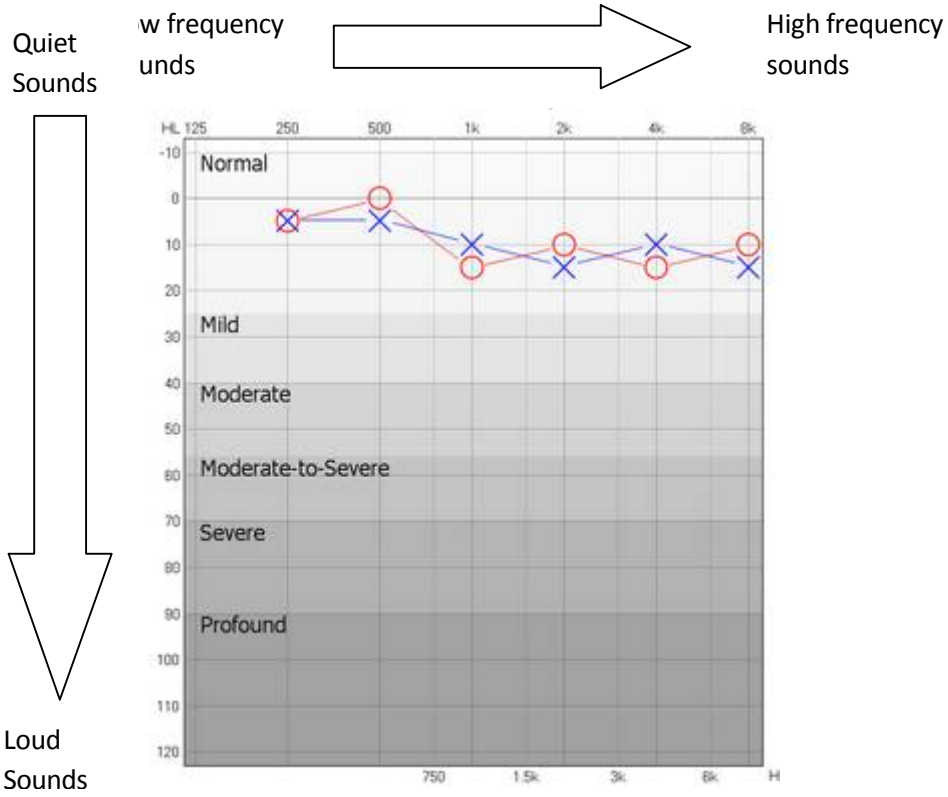
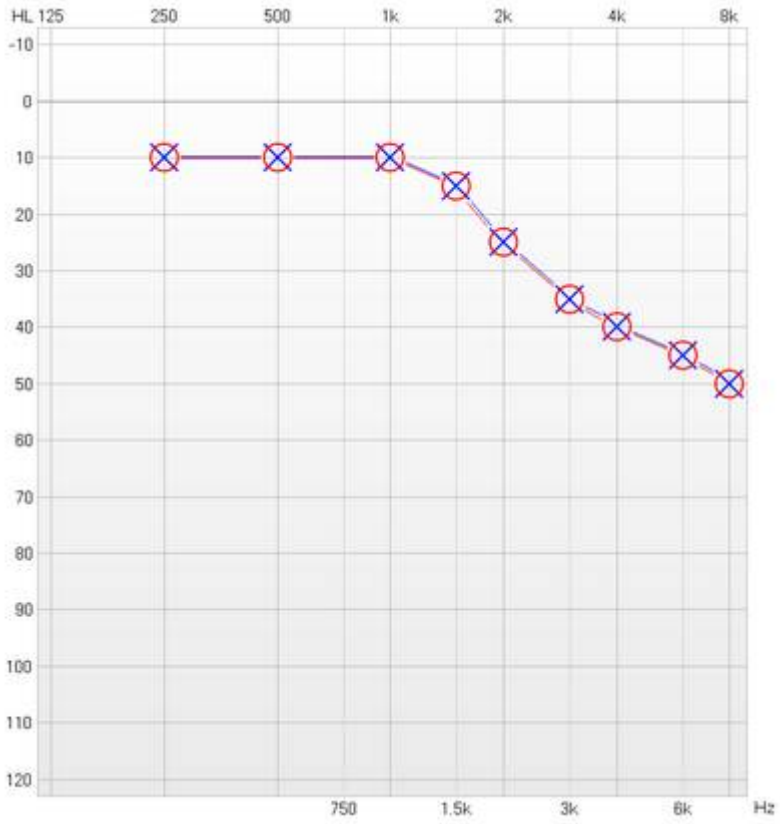
Audiometry and Hearing Loss Examples

An audiogram shows the quietest sounds you can just hear. The red circles represent the right ear and the blue crosses represent the left ear. Across the top, there is a measure of frequency (pitch) from the lower pitched sounds on the left going to higher pitched sounds on the right. Each red circle and blue cross represents the individual frequencies of sound that have been presented. These sounds are measured in Hertz.
Down the side of the audiogram, there is a measure of loudness. At the top of the graph are the very quiet sounds, going down to moderate, and then very loud sounds. The points (red circles and blue crosses) marked on the graph represent the quietest sound which can be just heard. This loudness is measured in a scale called decibels (dB). Any points that are heard at 20dB or quieter are considered to be within the normal range.

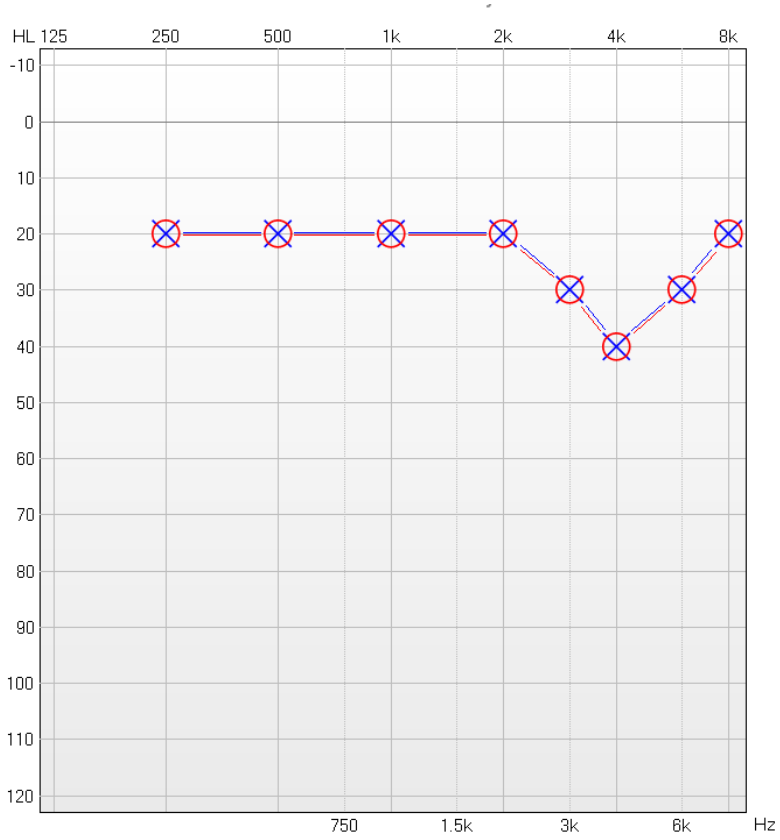


The lower down the graph the points are plotted, the worse the hearing. The different shaded areas indicate the different classifications of hearing loss. For example, if an individual's thresholds were all between 40 and 60 dB we would say they have a moderate hearing loss.
The most common way of helping someone with a hearing loss is to fit hearing aids. However the worse a hearing loss is, the more difficult it is to fit hearing aids. When thresholds are above 100dB, the hearing loss may be difficult to aid as the sound quality the patient gets from the aid is likely to be poor. This is because the louder the hearing aid has to make the sound the more distortion it creates.

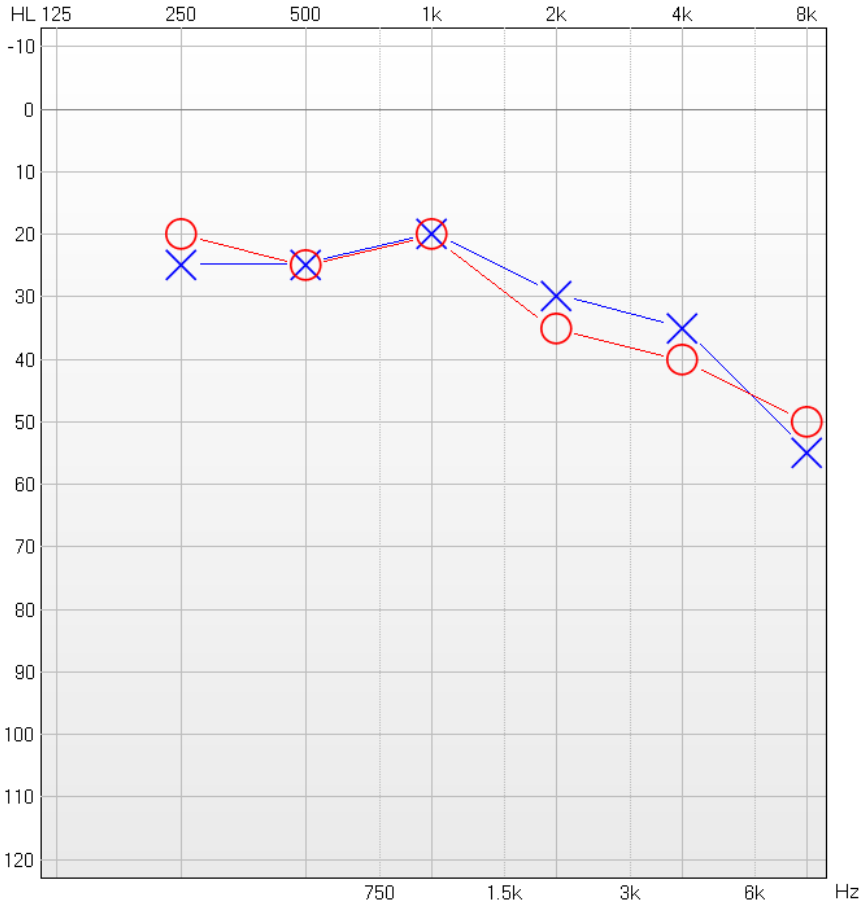
P**resbyacusis** is an age related hearing loss. It usually affects the high frequencies more than the low frequencies. The audiogram below shows the sounds have to be made louder before they are heard in the high frequencies (the right side of the audiogram), leading to a slope on the audiogram as seen below. This audiogram shows normal hearing up to 1KHz (mid frequency) and a mild hearing loss in the mid to high frequencies. Depending on the degree of the hearing loss, the sounds may have to be made louder before they were heard than shown below, but the general pattern is likely to be similar for all presbyacusis hearing losses. A right hand sloping hearing loss with the left and right ear usually deteriorating at equal rates.



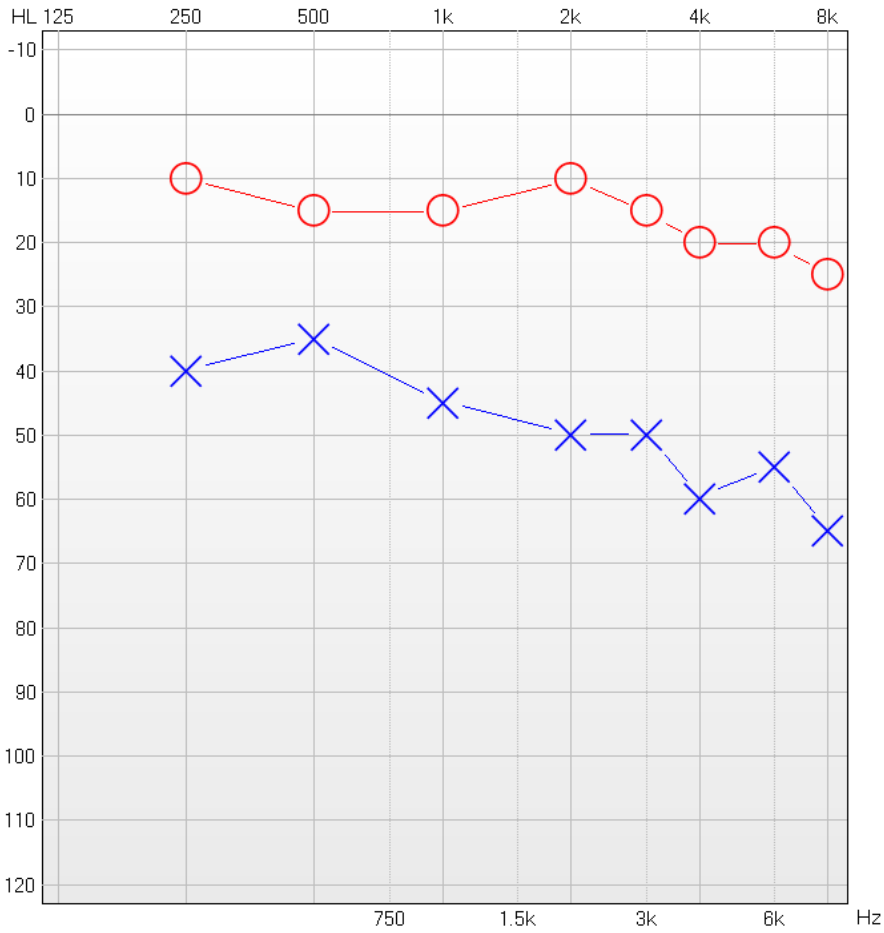
Noise induced hearing loss is where loud noise has caused damage to the hearing organ, the cochlea. This most commonly occurs at 4KHz. Therefore if a hearing loss is noise induced you would expect that the sounds have to be made louder before they are heard at 4KHz than at any other frequency. This leads to a dip in the graph as seen below. The frequencies around 4KHz will also be affected.



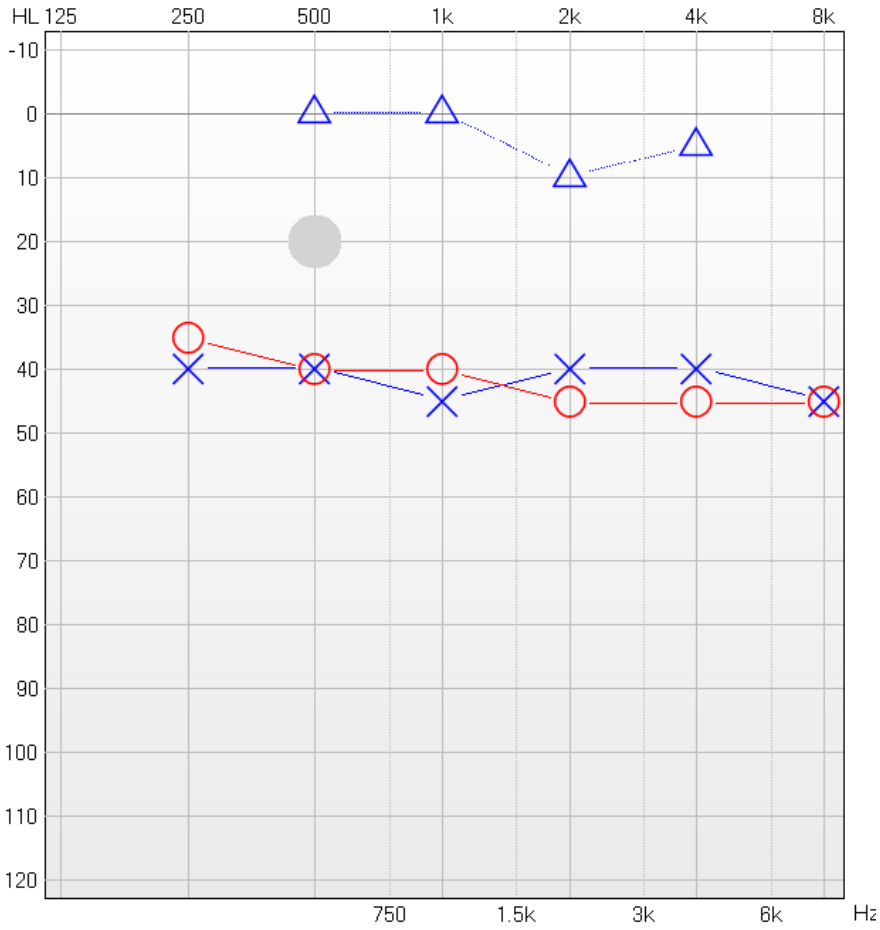
Symmetrical hearing loss is one where the hearing loss is roughly the same in both ears. We consider a hearing loss to be symmetrical if the points for each ear occur within 10dB of each other. The red circles show the thresholds for the right ear, whilst the blue crosses show the thresholds for the left ear. When there is a decline in hearing it commonly occurs at equal rates.



This audiogram shows an **asymmetrical hearing loss**. This means that the hearing is different in each ear. On the audiogram below the right ear is mostly within normal limits, whilst the left ear has a mild to moderate hearing loss across the frequencies.

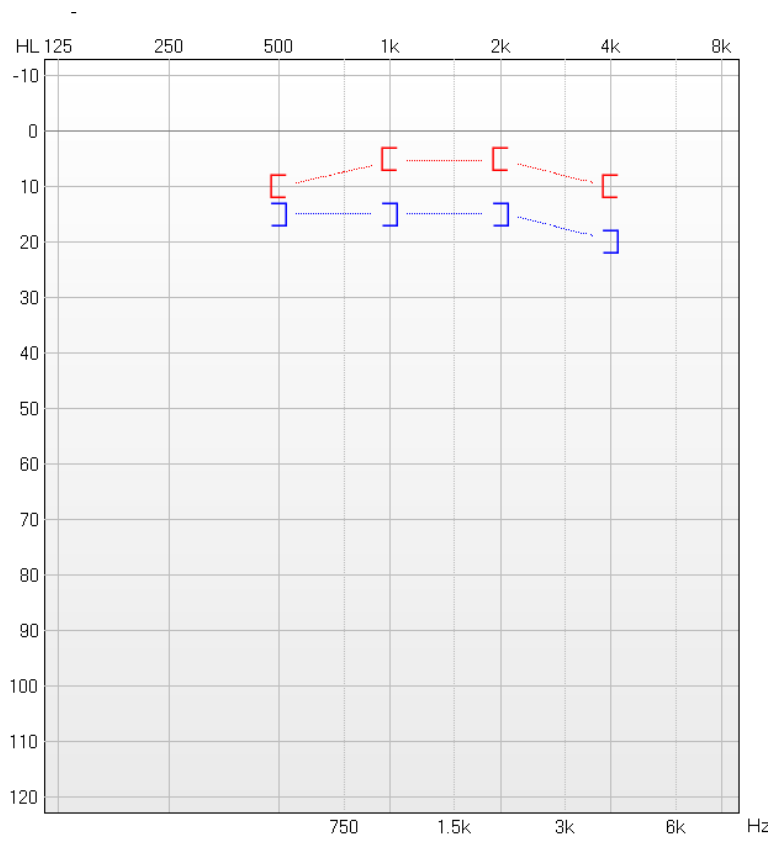


The triangles on this audiogram indicate the **bone conduction thresholds**. This is tested by placing a headband behind the ear, which stimulates the cochlear directly without going through the middle ear. If there is a gap between the bone conduction thresholds, which are within normal limits, and the air conduction thresholds (tested using the headphones) it indicates there may be a problem in the middle ear (the area between the ear drum and cochlear). This is called a conductive hearing loss. Middle ear problems have a verity of causes. In children this is most commonly cause by fluid in the middle ear which is often referred to as glue ear.

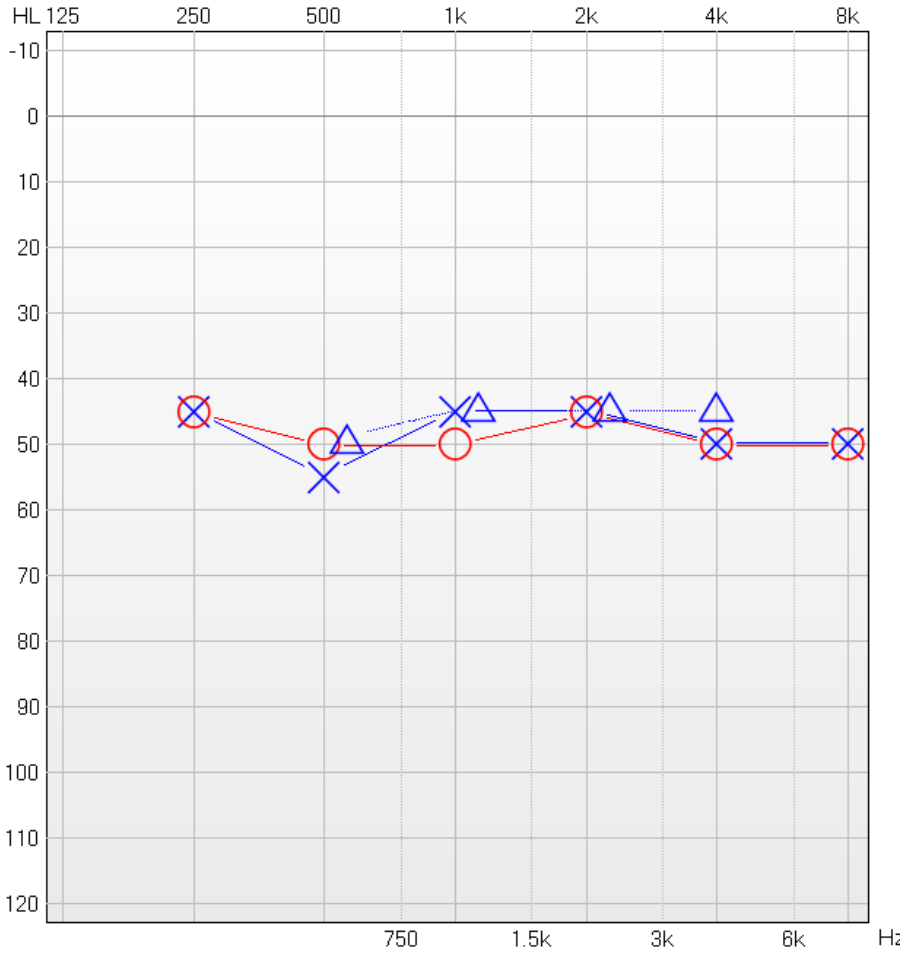


When we test via bone conduction the sound will be heard by the better ear regardless of which ear the bone conductor is placed behind. In order to find the thresholds for the other ear (worse ear) we play a rushing sound in to the non test ear (the better ear) to distract it. This means the sounds made by the bone conductor are heard by test ear (the worse ear). This is known as masking.

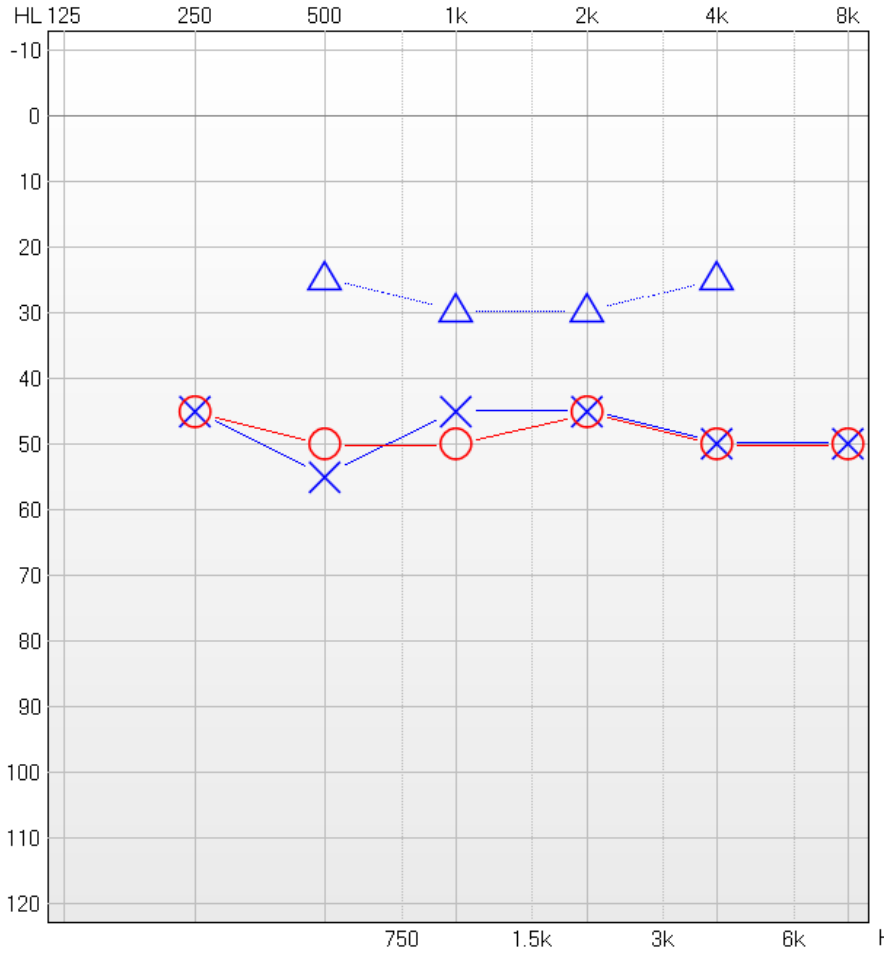
The audiogram below shows the symbols used when bone conduction masking has been performed. The blue symbols indicate the thresholds of the left ear and the red symbols for the right ear.



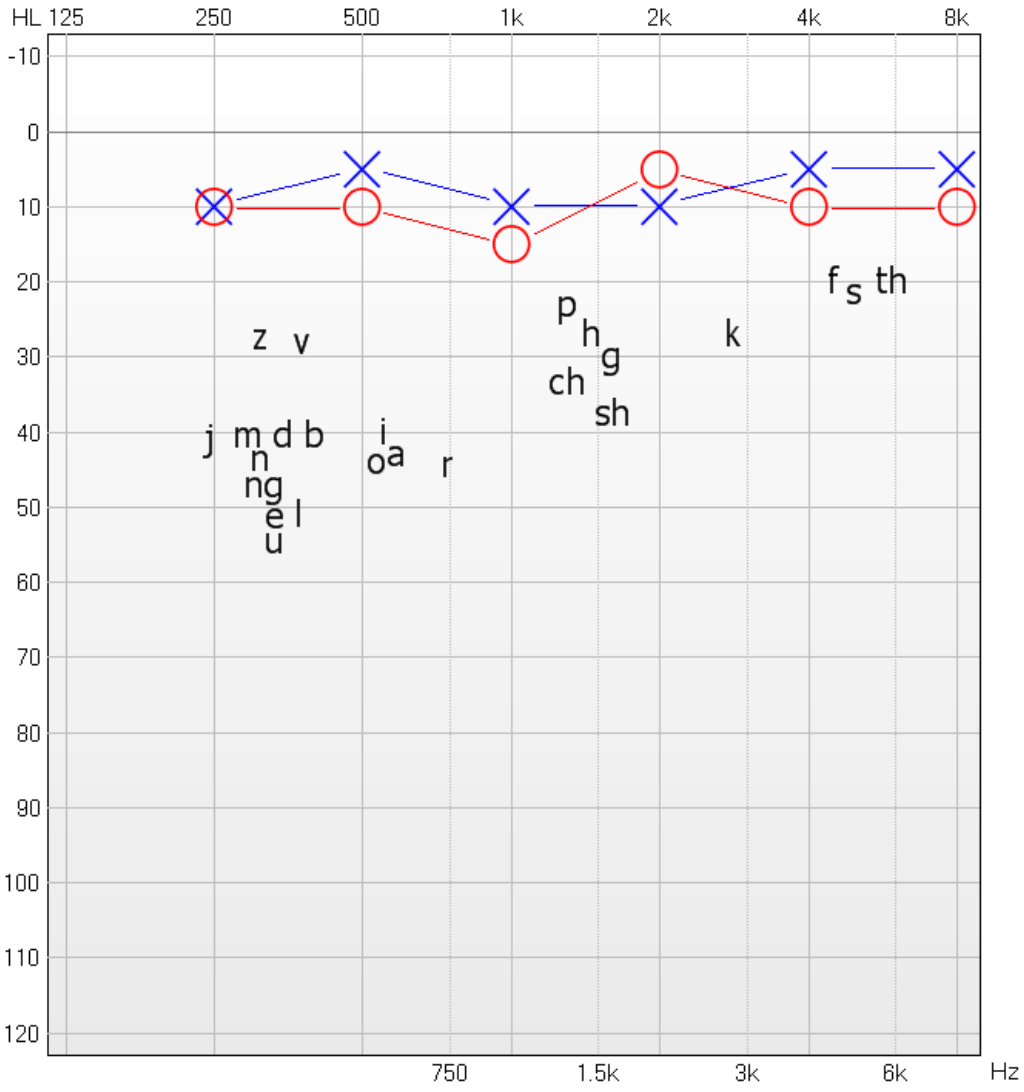
When there is no difference between the air conduction and the bone conduction thresholds it indicates that the hearing loss is due to a problem in the cochlea. This is the most common type of hearing loss in adults and is known as a **sensorineural hearing loss**.



This audiogram shows a gap between the air conduction and the bone conduction thresholds, however the bone conduction thresholds still indicate a hearing loss as they are not within normal limits. This would suggest that there is a problem in both the cochlear and the middle ear, and is what is known as a **mixed hearing loss**.

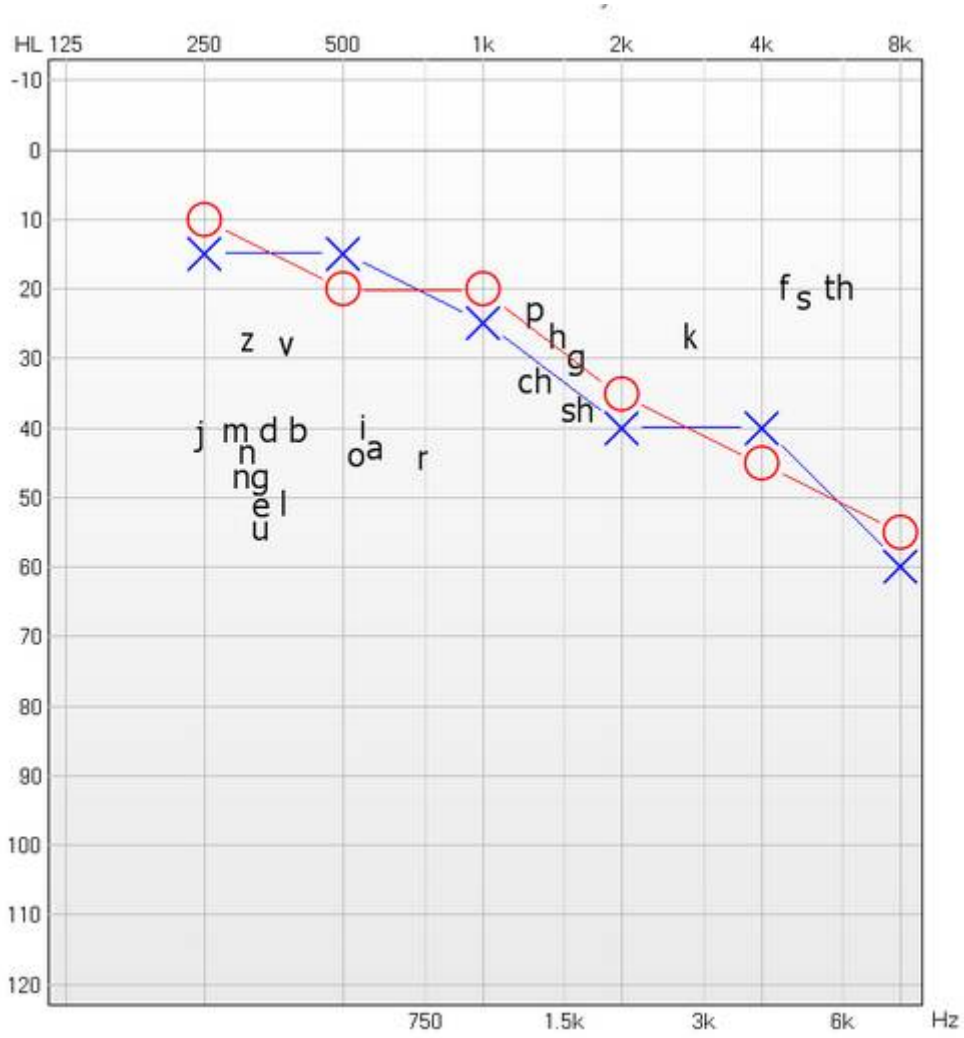


This audiogram shows hearing within normal thresholds along with the levels and frequencies at which **speech sounds** are made. As the thresholds are above the speech sounds, we know the patient can hear all the speech sounds as they are louder than the quietest sound the patient is able to hear.



In the audiogram below, some of the hearing thresholds are below the levels at which speech sounds are made. This means the individual will be unable to hear the speech sounds above their thresholds, and as a result may feel speech sounds muffled or complain that others are mumbling. By aiding these frequencies, we aim to make these speech sounds audible, and therefore make it easier for the patient to hear and understand speech.

Women's and children's voices tend to be of a higher frequency compared to men and thus harder to hear with a high frequency hearing loss.



This audiogram also shows the loudness and pitch at which environmental sounds are made.