Technical Paper

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Interpreting audiograms

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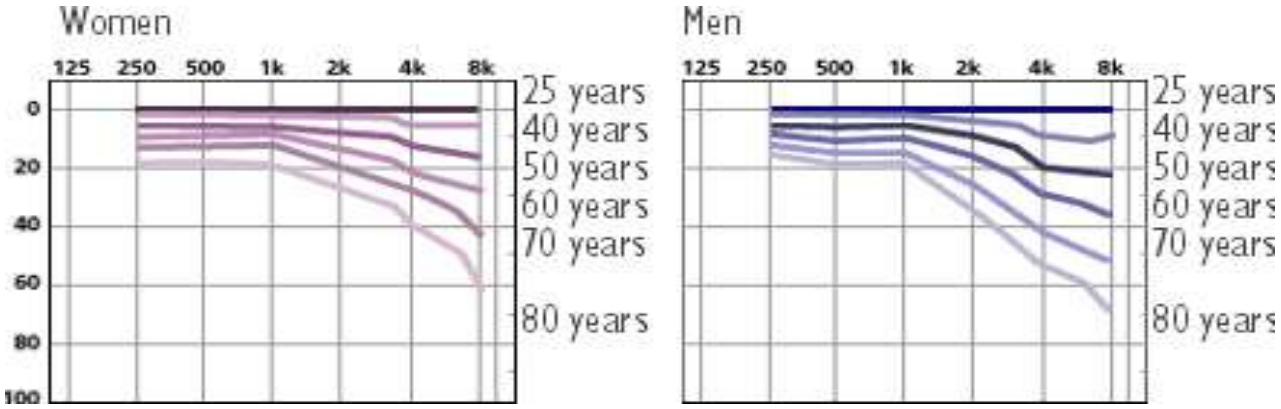
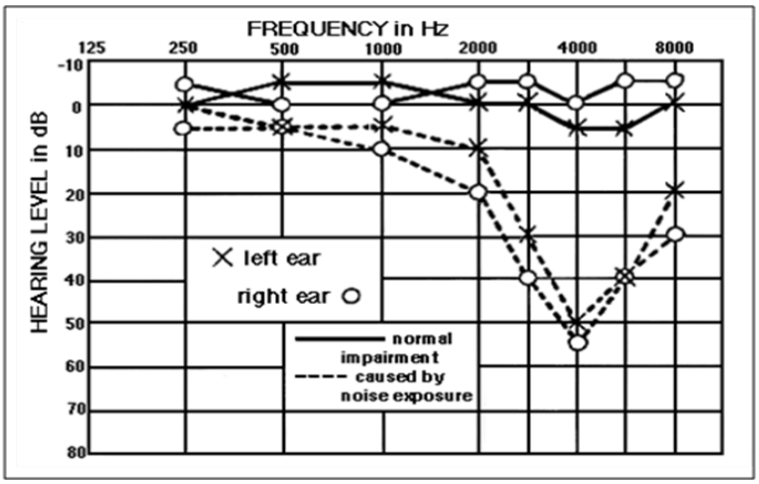
As part of a health surveillance programme where people could potentially be exposed to high levels of noise, hearing tests are often carried out. The outcome of such tests are audiograms with attenuation in dB on the Y axis and frequency on the X axis. The latter is normally in x2 increments. In order to fully assess the outcomes of such tests, it is essential that the audiograms are analysed.

There is a normal deterioration of hearing with age. This varies from person to person and with gender, but generally, the hearing loss with age would be as shown below.

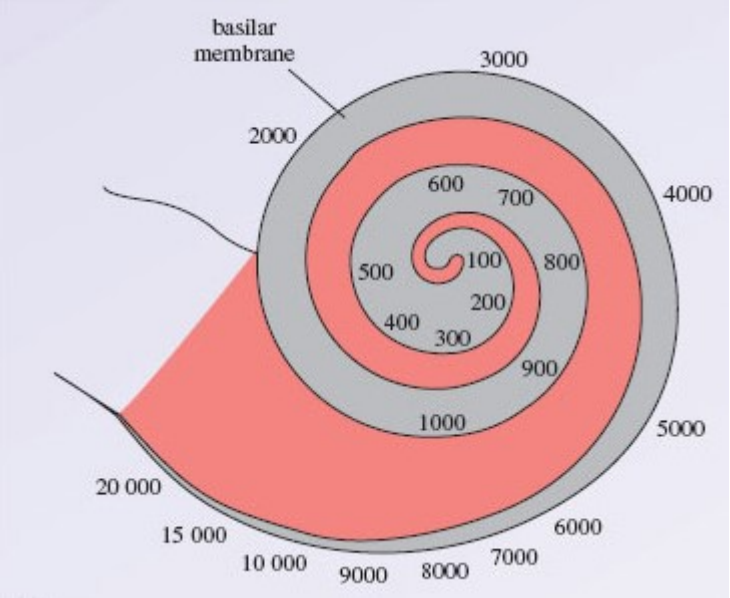


What is not commonly known is that a dip at 4 kHz and then rising back up again, as shown below, is an indicator of noise-induced hearing loss. Therefore, in trying to distinguish between noise induced hearing loss and hearing loss due to other causes, it is necessary to examine the audiograms.



The reason for this becomes clear when we look at the structure of the cochlear duct which is the inner part of the ear which process sound and its lining, the basilar membrane.
The basilar membrane responds to different frequencies at different positions along it.. Note that the duct and membrane are curved. In the view shown below, sound is travelling from the area at the left of the 20 kHz region.

High volume sound waves travel in a straight line but then hit the "bend" at in the 4 kHz to 6 kHz region. Therefore, it is this region which is prone to damage. Because audiograms are in 2x stages, the next higher frequency measured after 4 kHz is 8 kHz; 6 kHz is not registered. Therefore only the damage at 4 kHz is recorded. As the sound wave progresses further round the duct, its energy has been reduced by this impact. Hence, the sound is less likely to damage the lower frequency sections further round the bend.



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