



Of our five senses, hearing is the easiest sense to lose. Noisy work can significantly damage your hearing if done without protective equipment or ear plugs. This damage is irreversible as no technology currently exists to restore hearing.

According to the Center for Disease Control, more than 10% of the workforce has difficulty hearing and one out of every four hearing difficulty cases is due to work exposures. These work related exposures are typically from loud noise but can also include chemicals that damage the inner ear. [1]

This week, we'll talk about how noise affects our hearing, how to measure dangerous noise levels, how hearing is tested, and how to protect your ears in different ways depending upon the situation.

Monday – Hearing and Noise

Ears transform vibrating soundwaves into electrical signals that the brain can understand. Sound travels from the outer ear to the eardrum creating vibrations. These vibrations are sent behind the eardrum where they meet the bones that connect the eardrum to the inner ear. Vibrations cause movement of the fluid in the ear which changes the structure of the hairs in the ear. **These hairs translate the vibration induced movements into electric signals that the brain can interpret into sound.** [2]

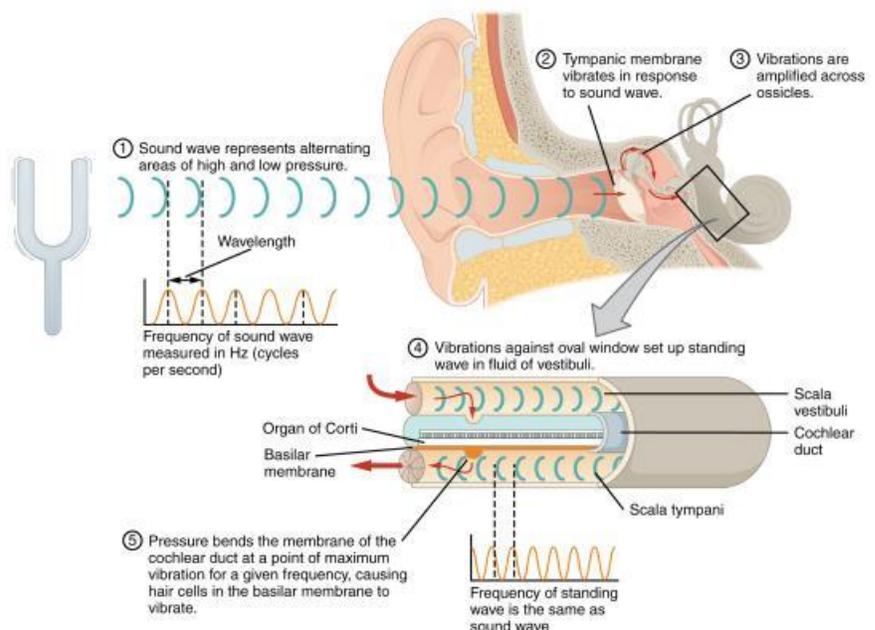
Sometimes, daily work tasks or social events expose us to loud noise. This is not typically a hearing issue; however, **noise above 85 dB causes the destruction of the conductive hair cells.** While this destruction is not immediately noticeable, hearing ability will decrease over time. Years and years of noise exposure leads to significant irreversible hearing impairment.

Tuesday – Noise characteristics

Physical noise is organized in different levels of pressure that form sound waves. The different levels of pressure determine whether or not surrounding noise can potentially damage your hearing.

Important sound characteristics you must keep in mind are:

- **Pressure:** Pressure determines noise level. The higher the pressure, the louder the noise, and the more likely it is to damage your hearing.





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- **Sound wave frequency and amplitude:** Sound either has a high or low pitch. High pitches are associated with higher frequency sounds, while low pitches are associated with lower frequency sounds. The amplitude of the sound wave determines the volume. Large amplitudes make louder noises and small amplitudes make quieter sounds. [3]
- **Ear sensitivity:** Our ears are more sensitive in some areas than others which determines the volume at which we will hear a sound. If the frequency of a sound falls into a sensitive region of the ear and has a large amplitude, we will hear that sound at a high volume. On the other hand, if the frequency falls into a less sensitive region and has smaller amplitude, we will hear it at a lower volume. [3]



Two types of noise in the workplace:

- **Excessive noise** is noise commonly found in workspaces and facility floors from machines, tools, vehicles, etc. Excessive noise can be measured for long periods of time with average limits on the decibel (dB) scale.
- **Impact noises** are noises that arrive suddenly with an extreme high level caused by objects coming in contact and generating loud sounds. In industrial work, impact noise combined with excessive noise poses even more hearing risks. [4]

Now there are digital signs that can measure and report the dB levels in your work area, to warn you when to use hearing protection. Let's talk about the types of noise in your work area. Is it considered excessive? What are some impact noises that consistently occur? Does your hearing protection adequately protect you from impact noise?

True or False: The noise difference of 80 to 83 dB: Only 3 dB more could not have a major impact on my hearing.

False: The decibel measure is a **logarithmic** scale: 3dB more is equal to double the sound power you receive on the ear.

Wednesday – Dangerous Noise Levels

Occupational safety standards define a maximum daily noise level that is allowable for employee exposure. This level is expressed in dBA, which stands for A-weighted decibels and express the loudness of sounds in relation to the human ear. The OSHA standard in the United States is 90 dBA for all workers for an 8-hour day. In Europe, this level is set to 85 dBA per 8-hour work day. This level is also recommended by NIOSH, which goes further to limit less than 15 minutes per day of exposure to 100 dBA. The [NIOSH Sound Level Meter App](#) is a tool to measure sound levels in the workplace and provide noise exposure parameters to help reduce occupational noise-induced hearing loss. [5]



Generally speaking, noise levels above 85 dBA are harmful to hearing and work in these environments should be limited. Regardless of noise levels, personal protective equipment (PPE) should always be worn.

European regulations define levels with specific recommendations:

- Levels less than 80 dB: Associate can be exposed during 8 hours without any long term issues. [6]
- Levels between 80dB and 85dB: Provide associate with earplugs. The noise will fatigue hearing but will not cause permanent impairment as long as associate is not exposed to these levels frequently. [6]
- Levels between 85dB and 92dB: Reinforce safety rules and ensure associate is wearing ear plugs while working. Levels above 85dB will impact hearing and damage is irreversible. Always wear protective equipment when working in these levels. [6]

Taking care of your hearing is just as much your employer's responsibility as it is your own. Employers should put equipment in place to decrease the impact of the noise you may encounter. Some good equipment examples are:

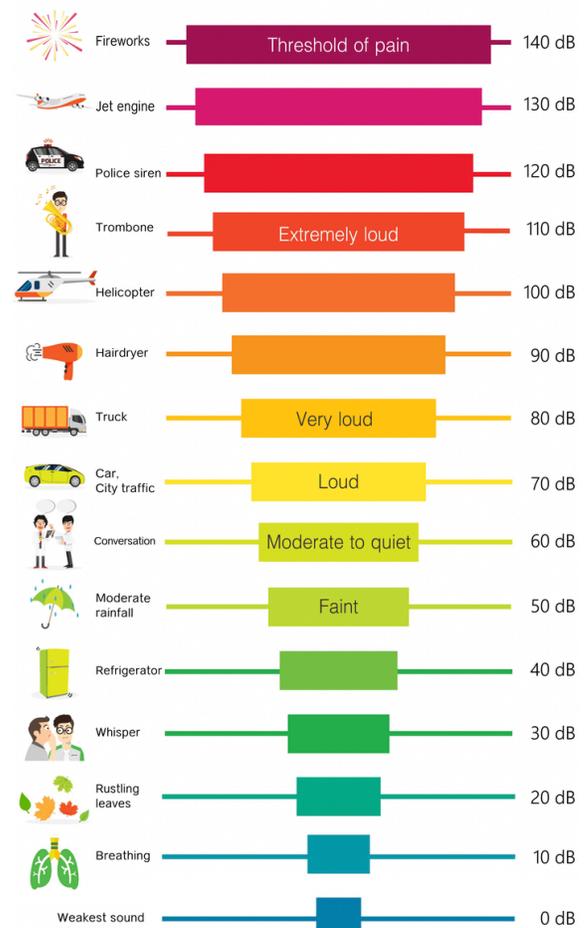
- **Collective protection: silencer on air exit and noise housing.** Take care of this equipment and make sure they are in place for all other noise producing tasks. If this equipment is damaged, notify someone immediately that a replacement is needed. In the case of noise housing with a door, wear your ear plugs **before** entering the housing and close the door as you enter and exit.
- **Personal Protective Equipment:** Most of the time, you will receive protective equipment such as ear muffs or plugs to protect against noise levels. Pay attention to the instructions and make sure the equipment provides adequate protection. There should be no space between your ear and the protective equipment.

True or False: Wearing ear plugs for half the task is enough to provide protection.

False: Think of noise protection like rain protection. If you stand outside in the rain for 1 hour but only use an umbrella for 50 minutes, you will be soaked in less than 10 minutes. For noise, it's similar. Working in a loud environment for 8 hours but only wearing your equipment for 7 hours, leaves you open to an entire hour of

Decibel Scale (dB)

An explanation of the decibel scale and related units for measuring sound and loudness.





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damaging noise. Not wearing your protective hearing equipment when it is needed makes you susceptible to hearing impairment. [8]

Thursday – Wearing Ear Plugs

Remembering to wear ear plugs in a noisy area is good, but correctly wearing them is better. Imagine your ear is a hole in a wall of your home. You want to protect your house from cold weather by putting in protective insulation. Spaces without insulation allow the cold to enter your home. For ears, it's the same thing. Your ears are entrance points for noise and leaving unprotected in loud environments can cause problems down the line.

When wearing custom protective ear plugs, make sure they fit your ear properly. Try to find models that lock the ear plug in place to provide better protection as the ear plug will not move around or become loose.



Typically, your organization will provide you with standard ear plugs. For these, press the plug together as tightly as possible, insert it into your ear, and allow time to let it grow back to its original size. In order to achieve proper protection, the plug should completely close the ear canal allowing very little to no sound in. If your ear plugs come with directions, read and understand them before starting work.

Hearing protection should reduce the noise level by more than 10 dBA. When used properly, most ear plugs and ear muffs will reduce sound levels by 20 – 30 dB. If you are working in an environment with more than 100 dBA sound levels (like jackhammers or chainsaws) you should wear ear muffs AND ear plugs. However, this only adds 5 dB more of protection (you can't double the dB reduction number). [7]

Friday – Home Protection

The importance of hearing protection does not take a break when we leave work for the day. The social activities you partake in or even work you do at home can significantly impact your hearing health. If you are constantly exposed to high noise levels at work, your ears need time to rest and recover.

Listening to music in the car over 80 dB is just one of the many personal activities you do that can affect your hearing. Yard work or home improvement projects that use mechanical equipment and power tools can generate noise levels higher than 80 dB, just as they would in the workplace. Sports stadiums with thousands of people cheering and loudspeakers can reach noise levels higher than 100 dB. NASCAR and Formula 1 races, as well as rock music concerts, can have a sustained noise level over 100 dB for more than 3 hours. For these activities, make sure you are wearing ear plugs and/or ear muffs. Check the equipment you are using for noise level signs, like the one shown here, and protect yourself as needed.

Has anyone found themselves affected by the high noise levels they encounter on the job? Do you feel that your protective equipment provides you with adequate protection against these noises? What can we implement to make the workplace safer with regards to noise? What noise protection do you need away from work?



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Sources:

- [1]: <https://www.cdc.gov/features/worker-hearing-loss/index.html>
- [2]: <https://www.soundrelief.com/hearing-loss/how-hearing-works/>
- [3]: <https://www.siyavula.com/read/science/grade-10/sound/10-sound-03>
- [4]: https://www.ccohs.ca/oshanswers/phys_agents/noise_measurement.html
- [5]: <https://whatis.techtarget.com/definition/A-weighted-decibels-dBA-or-dBa-or-dBa>
- [6]: <http://www.cochlea.org/en/noise>
- [7]: <https://blogs.cdc.gov/niosh-science-blog/2018/10/24/hearing-protection/>
- [8]: <http://explorecuriosity.org/Explore/ArticleId/6673/noise-on-earth-and-on-the-iss.aspx>