

## Solutions for Home Defense

While the most important thing in a defense situation is to stop the threat, you also want to avoid hearing damage and tinnitus (for yourself and your loved ones) after the incident.

One option is to use electronic hearing protection. These are ear muffs that allow normal sound to pass through but block sounds above 85 dB. You can still hear what's happening and maintain situational awareness, but when you fire your gun the sound will be partially blocked by the earmuff.

Another option is to purchase a suppressor (aka silencer). Though expensive, they dramatically reduce the noise from the gun. Suppressors are regulated by the NFA, but it is mostly a matter of paperwork for law abiding citizens to purchase one. Do note that some firearms may still not be hearing safe even with a suppressor.<sup>6</sup>

The best solution, of course, is to combine these. Using electronic hearing protection and a suppressed firearm will allow you to defend your home while providing the largest amount of protection for your ears.

### References

- 1 – <https://www.looper.com/624990/the-action-movie-that-almost-ruined-bruce-willis-career/>
- 2 – [https://www.niehs.nih.gov/health/assets/docs\\_f\\_o/hearing\\_protection\\_508.pdf](https://www.niehs.nih.gov/health/assets/docs_f_o/hearing_protection_508.pdf)
- 3 – [https://www.cdc.gov/nceh/hearing\\_loss/what\\_noises\\_cause\\_hearing\\_loss.html](https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html)
- 4 – <https://www.mossberg.com/hearing-protection/>
- 5 – <https://www.northwestern.edu/environmental-health-safety/docs/health-docs/hearing-protection-information.pdf>
- 6 – <https://leader.pubs.asha.org/doi/10.1044/leader.AEA.23032018.18>

Please visit [hearing.education](http://hearing.education) for more info!

## Firearms

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## Hearing

Shooting is a fun sport, and the ability to defend yourself is an important freedom we enjoy in America. I am pro-2<sup>nd</sup> Amendment, but I believe there are a few major gaps in the education of gun owners.

Most important, the potential for hearing damage and concurrent health effects from shooting are rarely discussed.

Exposure to a single gunshot without hearing protection can result in both hearing damage and permanent tinnitus.

This pamphlet is meant to inform shooters about these issues so they can make good decisions about shooting for fun and for defense **and** maintaining their hearing health.

I believe a **Fourth Rule of Gun Safety** should be added to the usual curriculum: Always wear hearing protection when someone is handling a loaded firearm.

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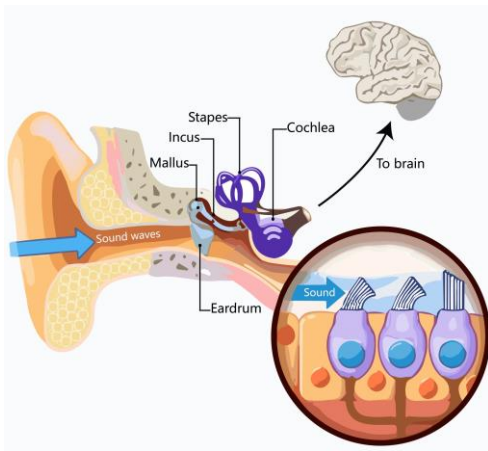
## Human Biology: The Ear

TV shows and movies are quite inaccurate in their portrayal of firearms. People generally cannot be exposed to noise from multiple gunshots in close quarters without suffering ill effects.

Consider the case of Bruce Willis. When he actually fired a gun close to his ear on the set of Die Hard, he suffered two-thirds partial hearing loss in his left ear.<sup>1</sup>

The human ear is one of the only body parts that cannot heal if damaged. There are tiny hairlike cells inside the ear that respond to sound and transmit that signal to the brain. Loud noises can permanently bend the hairlike structures. This has two effects:

- 1) Those cells can no longer respond properly to sound (hearing damage)
- 2) Those cells may spontaneously transmit signals to the brain when no noise is present (tinnitus)



## Decibels

To get an idea of how powerful the noise from firearms is, let's look at the decibel scale. Decibels (dB) are how sound is measured. Larger numbers mean the sound is louder.

But the scale is "logarithmic." This just means that small increases in the scale result in very large increases in sound. For example, an increase of only 3 dB means the sound pressure is doubled.<sup>2</sup>

Noises over 120 dB can cause immediate damage to the ear.<sup>3</sup>

Here are some common noise levels:

Normal conversation: 60 dB

Washing Machine: 70 dB

Motorcycle: 95 dB

Jet Engine: 120 dB

Firearms are far louder than the items above:<sup>4</sup>

**.22 Rifle: 134 dB**

**12 Gauge Shotgun: 160 dB**

**.357 Magnum: 165 dB**

## Solutions for the Shooting Range

One way to reduce your noise exposure at the range is to double up. Use earplugs inside your ear canal, **and** then put earmuffs over these.

Note that the effect is not linearly cumulative. Combining earplugs with an NRR\* of 20 with earmuffs with an NRR of 22 does **not** result in a 42 dB reduction.<sup>5</sup> Doubling up adds an additional 5 dB reduction in sound. Again, keep in mind that a change of only 3 dB means double the sound pressure, so a 5 dB reduction is significant!

Another advantage of using ear muffs in addition to ear plugs is that ear muffs obviously cover the entire ear. Why is that so important? There are tiny, sensitive bones in your ear that are unprotected when only using earplugs and thus can still be damaged.

\*NRR, or Noise Reduction Rating, is a unit of measurement used to determine the effectiveness of hearing protection devices.