

# Reducing the Risk of Noise-Induced Hearing Loss through Earplug Fit-Testing

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**Objective:** Hearing loss compensation has been escalating for the U.S. Veterans Administration over the past several years. Efforts continue to reduce the risk of noise-induced hearing loss (NIHL). Installation Hearing Program Managers are using every tool to reduce the risk of NIHL. One of those tools is fit-testing earplugs to determine the real-world protection that soldiers and civilians get from their hearing protection device (HPD) and then train them to get proper attenuation.

**Methods:** Soldiers with pre-existing hearing loss who were referred for audiologic evaluation received an earplug fit-test using the VeriPRO® system from Howard Leight®. Soldiers fit one of the three pre-approved earplugs (Triple flange – 3 sizes; Single flange – 5 sizes; E-A-R Combat Arms earplug – 3 sizes; Quattro – 1 size). A technician performs a visual assessment of the fit and instructs the soldier regarding subjective assessment of fit to select the first earplug. The VeriPRO Quick Check is then performed to determine if a change in earplug size or style is needed.



Soldier completing VeriPRO® QuickCheck earplug fit-test.

**Results:** Data from an Army Hearing Program clinic showed an improvement of protection levels from initial attenuation and final attenuation of soldiers who were evaluated with a VeriPRO Quick Check. Twenty-four (24) soldiers showed appropriate attenuation averaging 24 dB on their fit, and required no further instruction. Twenty-nine (29) soldiers achieved less than appropriate protection and required an intervention which included additional fitting instruction and / or the selection of a different earplug, and an additional VeriPRO Quick Check. Seven (7) soldiers were unable to achieve the target Protected Exposure Level (PrEL) with VeriPRO and were testing using a threshold based fit-test procedure in the audiometric test booth.

Figure 1a. Personal Attenuation Levels (PAR) before and after a change of HPD style.

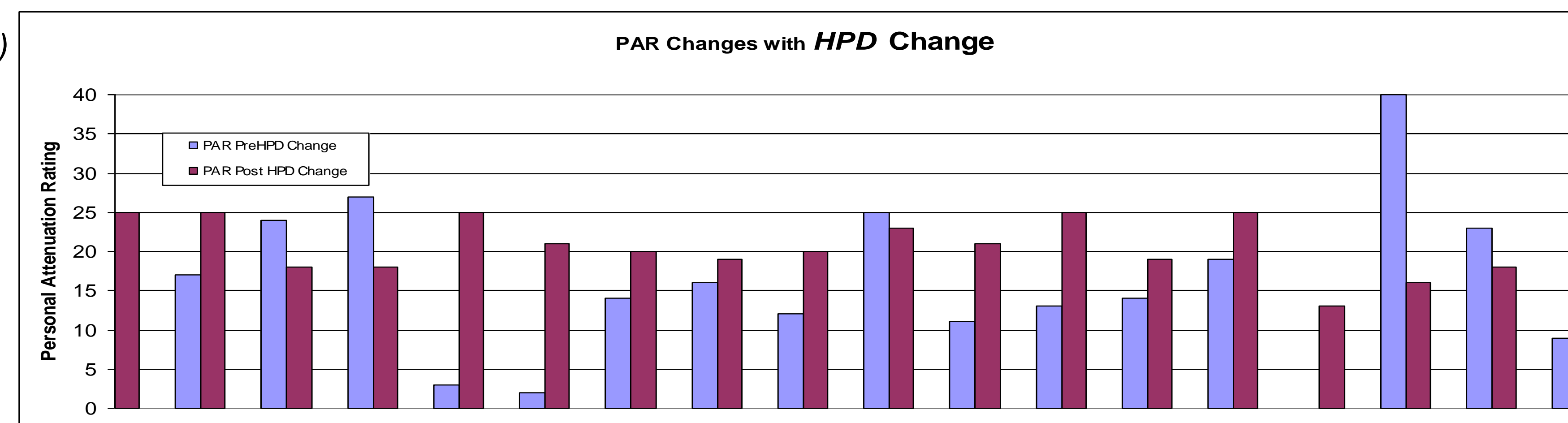
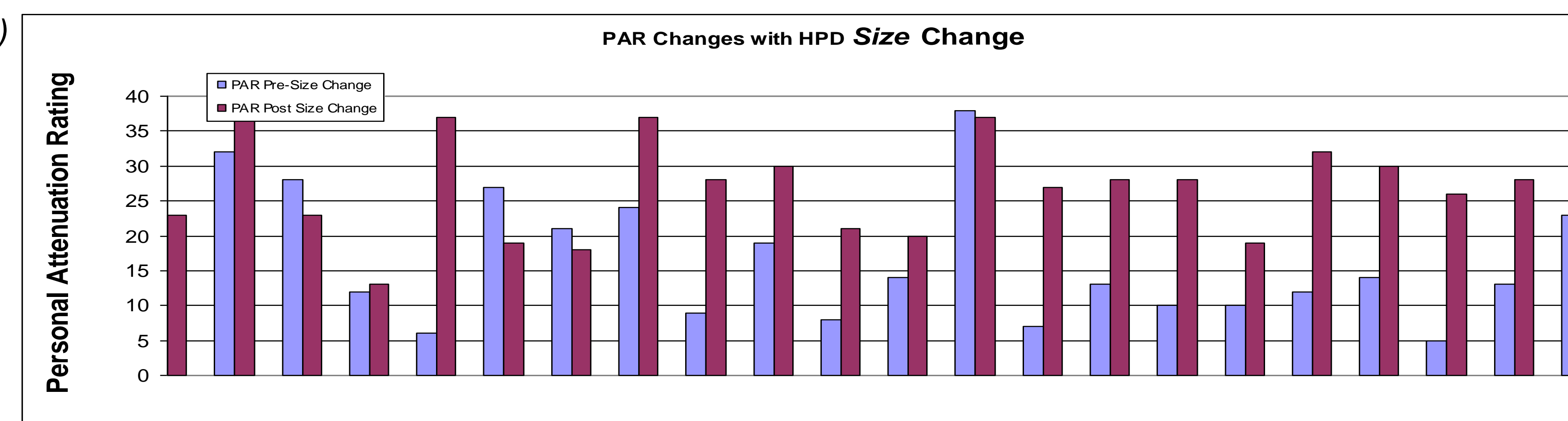


Figure 1b. Personal Attenuation Levels (PAR) before and after a change of HPD size.



Those 29 soldiers who required intervention were then administered additional multiple fit-tests, which led to adequate protection levels. The average initial attenuation level for these soldiers was about 11 dB. Comparing the initial and final PAR for the ears with the lowest PAR, a 13 dB average improvement is noted. [For example first PAR: L=8, R=23 and final PAR: L=21; R=32]. The range for lowest PAR improvement was 1-39 dB.

Looking at the 29 soldiers who changed size or style of HPD, 6 had decreased PAR for one ear but none had a decreased PAR for the less protected ear. This means every soldier left with better protection after making the appropriate change. Eleven of the 29 changed size of HPD, 10 of the 29 changed style of HPD, and 8 left with the original HPD but training enabled them to use it correctly.

The Protected Exposure Level (PrEL) was estimated using 100 dB as the exposure level. PrEL is calculated by subtracting the PAR of the less protected ear from the individual's exposure level. The PrEL is shown in Figure 2a and 2b. Figure 2a shows the PrEL for those soldiers who achieved good fit on the first test. The PrELs for soldiers that needed some intervention is shown in Figure 2b. Recall that intervention can be training alone, change in size of HPD, or change in style of HPD.

Figure 2a. Protected Exposure Levels (PrEL) for soldiers who achieved a good fit on the first fit-test.

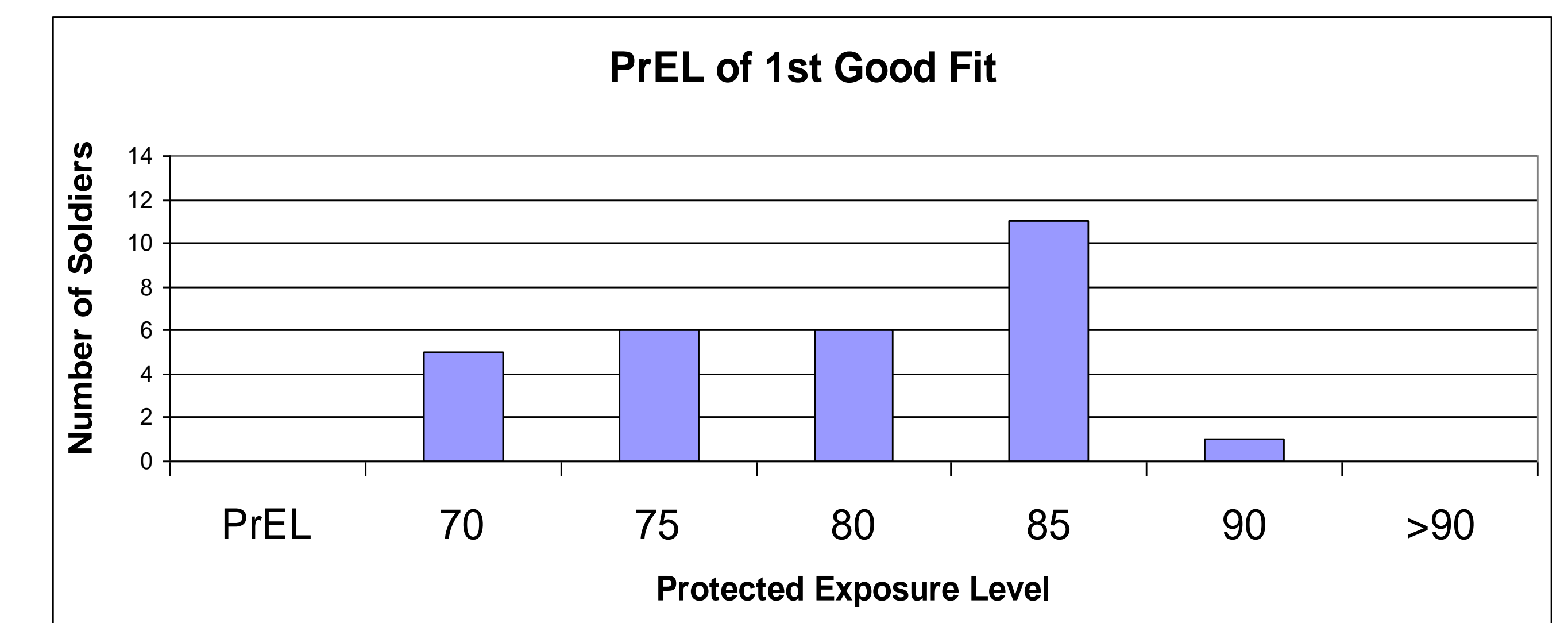
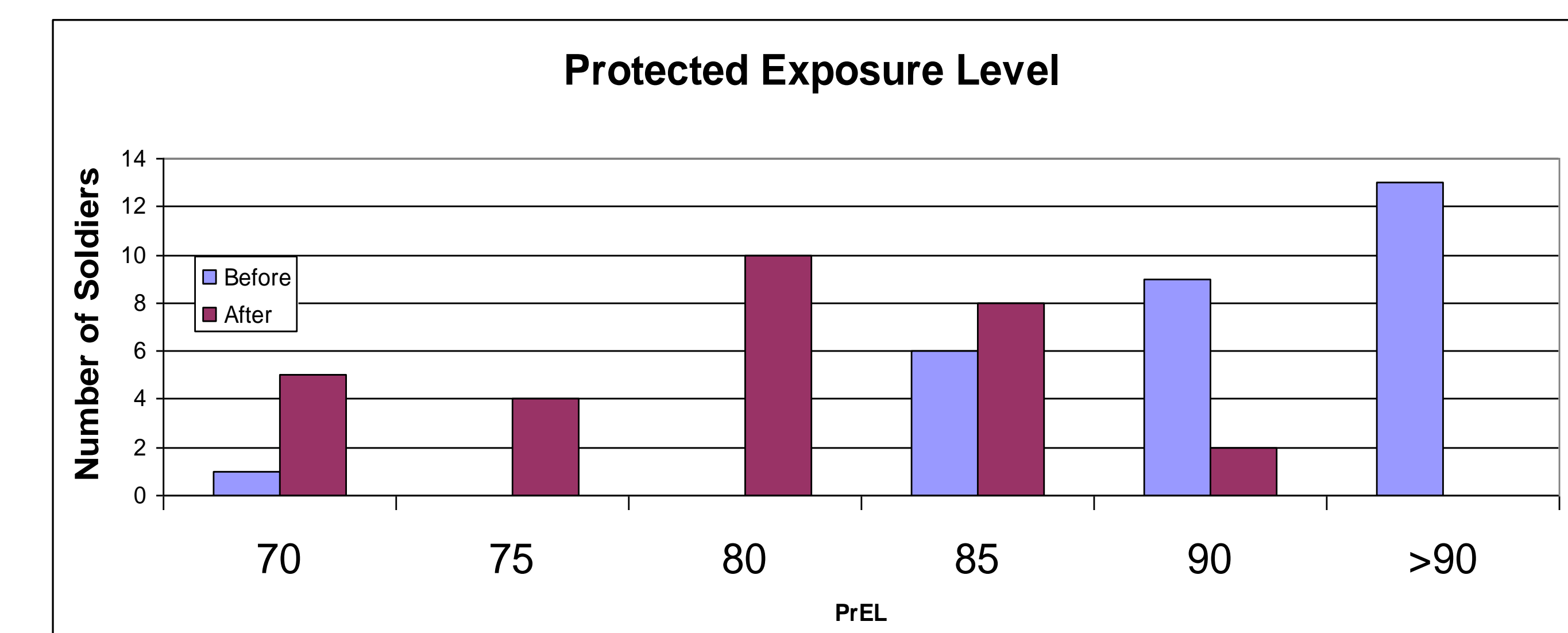


Figure 2b. Protected Exposure Levels (PrEL) on initial fit and after training, re-sizing or changing style of HPD.



**Limitations:** Soldiers with asymmetric hearing loss greater than about 45 dB cannot be tested. Fatigue is a factor in the ability to achieve a good fit since the fit-test is conducted on the first day of basic training. Some soldiers need extra instruction to encourage them to focus on the task to achieve reliable results.

**Conclusion:** Fit-testing is a valuable training tool to ensure appropriate protection from hazardous noise. This provides important reassurance for soldiers with pre-existing hearing loss.

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