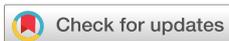


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Practical Implementation of Hearing Protector Fit Testing – Outcomes of the International Hearing Protector Fit-Testing Symposium **FREE**

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Session Summary

Practical Implementation of Hearing Protector Fit Testing – Outcomes of the International Hearing Protector Fit-Testing Symposium

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Hearing protector fit testing (HPFT) has achieved wider acceptance in civilian and military occupational hearing loss prevention programs. At the International Hearing Protector Fit Testing Symposium, various studies and efforts to implement fit testing with workers and service members were reviewed. Research indicates that HPFT identified persons who did not achieve adequate attenuation and who subsequently improved following instruction. Fit testing was reported to be an effective approach to train new employees to select and properly fit hearing protection suited to the employees' noise exposures. A forthcoming systematic review found moderate evidence that HPFT with individualized training was effective to improve the personal attenuation rating (PAR) for workers. However, simple instructions had little if any effect on PAR. Only a small number of studies provided high-quality evidence – a research need cited across presentations. Nonetheless, the evidence is sufficient such that the recently revised Department of Defense Instruction 6055.12 includes regular HPFT for select categories of noise-exposed service members and civilian workers. This paper reviews the evidence for HPFT effectiveness, proposes methods to efficiently implement HPFT, describes instructions for workers, and develops the business case for HPFT.



1. PRACTICAL IMPLEMENTATION OF FIT TESTING

Hearing protector fit testing (HPFT) has begun to achieve wider acceptance in civilian and military occupational hearing loss prevention programs. The International Hearing Protector Fit-Testing Symposium facilitated review of various efforts to evaluate and implement fit testing with workers and military Service members.

The Symposium presentations illustrated the value of HPFT. Several presentations (Federman and Karch, 2023; Gong, 2023; Hacker and Miller, 2023; Hayes, 2023; Karch, 2023; Kulinski et al., 2023; Li, 2023; Murphy, 2023; Robinette, 2023; Su et al., 2023) and posters (Huang and Su, 2023b; Zhang, 2023) support the fact that neither the Noise Reduction Rating (NRR) nor derating schemes are predictive of the level of protection obtained by individual users and that the Personal Attenuation Rating (PAR) can improve significantly after interventions. Effective interventions identified one-on-one training, demonstration of the steps for a good fit, and expert fit such that the user can experience a good fit and change hearing protector size or style when required.

Several summaries of both research (Federman and Karch, 2023; Kulinski et al., 2023; Li, 2023) and quality improvement projects conducted in the field (Hacker and Miller, 2023; Hayes, 2023; Robinette, 2023; Su et al., 2023; Vause, 2023) showed that fit testing identified persons who did not achieve adequate protection from hazardous noise. Users subsequently improved their attenuation following instruction (Federman and Karch, 2023; Hacker and Miller, 2023; Hayes, 2023; Kulinski et al., 2023; Li, 2023; Su et al., 2023; Vause, 2023). Fit testing was an effective approach to train new employees to select and properly fit hearing protection suited to the employees' noise exposures (Federman and Karch, 2023; Hacker and Miller, 2023; Hayes, 2023).

A. SUMMARY OF HEARING PROTECTOR FIT-TESTING STUDIES

Several studies supported the use and feasibility of HPFT even in industries and environments where traditional audiometric testing is a challenge (Federman and Karch, 2023; Neitzel, 2023).

Table 1 lists studies that were presented during the Symposium showing industries/settings/populations and the number of participants who were evaluated using HPFT. Whether the HPFT was conducted as part of a research study, and quality improvement project or actual implementation, the number of participants supports the feasibility of conducting HPFT across industries and populations. Using HPFT as a training tool allows flexibility in how often the tool is used. The current lack of regulatory requirements for annual or periodic HPFT provide an opportunity to explore and share the best uses of HPFT.

2. NOISE EXPOSURE LEVEL

Noise-exposure measurements simplify the complex nature of noise into exposure levels against which the hearing protection can be selected. Foremost in the process of implementing HPFT for any workplace is to have knowledge of the exposures in that workplace. Consensus standards from the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) specify methods to measure occupational noise exposure. ASA/ANSI S12.19-1996 (R2020) is one standard for determining an occupational noise exposure. ISO 9612:2009 describes a more complex engineering method to estimate a worker's noise exposure. The American Industrial Hygiene Association recently updated The Noise Manual and has practical chapters that will provide guidance for microphone selection for the wide range of noise exposures (Meinke et al., 2022). This paper can only describe an overview of several methods to assess exposure.

Table 1: HPFT studies listing the various test settings and sample sizes tested. The numbers of participants, the variety of settings, and scope (research or quality improvement) of these studies supports the feasibility of a broader implementation of HPFT.

Research Studies		
Citation	Setting	# of Subjects
Karch, Federman, and Qureshi (2023)	Military	267
Li (2023)	Metal plant	301
Huang and Su (2023a)	Textile factory	451
Zhang and Su (2023)	Auto parts, plastics, textile factories	407
Huang and Su (2023b)	4 manufacturing factories	464
Zhang (2023)	7 factories	854
Federman, Karch, and Duhon (2021)	Military basic training	821
Ullman, McCullagh, and Neitzel (2021)	10 mining sites	207
Gong, Liu, Liu, and Li (2019)	4 factories	335
Federman, Duhon, Glazer, and Hughes (2017)	Federal employees	60
Murphy, Davis, Byrne, and Franks (2007)	Automotive stamping plant	278
Murphy, Themann, and Murata (2016b)	Oil & gas sector workers	84
Implementation / Quality Improvement		
Citation	Setting	# of Subjects
Hacker and Miller (2023)	Manufacturing	>1800
Su, Liu, and Fu (2023)	3 factories	192
Kulinski et al. (2023)	Military service members	335
Federman et al. (2022)	Military accessions	60
Hayes et al. (2022)	Dept. of Defense civilian employees	278
Federman and Duhon (2016)	Military accessions	84

A. ASSESSING THE EXPOSURE

The employer's responsibility is to have information about the health and safety regulations, the work environment, and exposures that their employees experience. Determining a target PAR and selecting appropriate hearing protection depends on the noise exposures and the methods used to quantify a person's exposure over the course of a work shift or over an entire day. The needs for communication and situational awareness (hearing warning sounds) are important factors when selecting hearing protection. Figure 1 illustrates the continuum of noise exposure levels and the ranges of hearing protector attenuation. Too much attenuation (over protected) can impair communication and the ability to hear important sounds. Too little attenuation (under protected) leaves the worker at risk of developing hearing problems.

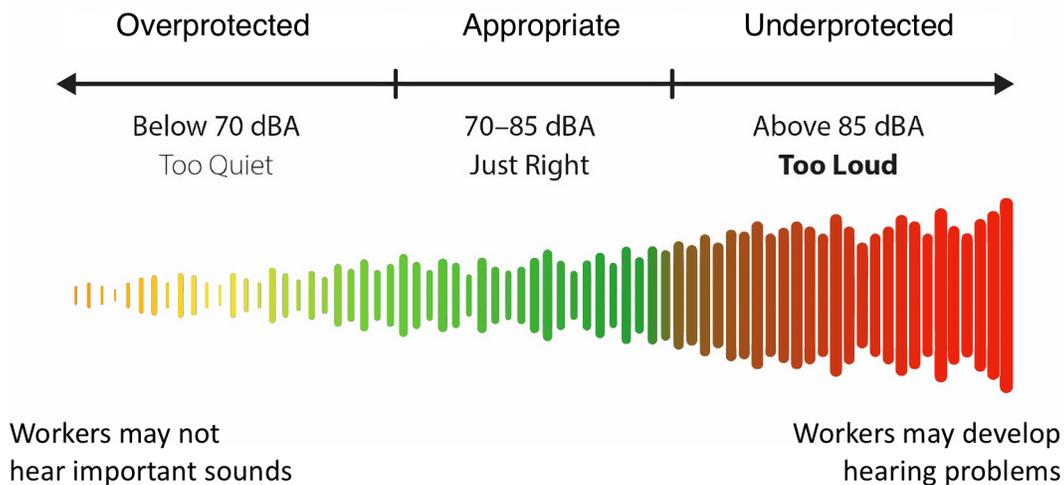


Figure 1: Noise level hazards combined with hearing protector fit testing. When hearing protection is worn, a balance must be achieved between the under protection that leads to noise-induced hearing loss and over protection which could lead to communication difficulties. The appropriate protected level is between 70 and 85 dB(A). Figure from NORA (2023).

Four approaches to estimating a worker's noise exposure are described below. Depending upon the consistency of the exposure, these methods may prove to be adequate.

i. Time-weighted Average

A worker's noise exposure can vary with the different job tasks performed during a work shift. The permissible exposure time, T_i , for any task with an exposure level, L_{Exp} , can be determined from the following equation,

$$T_i = \frac{480}{2^{(L_{Exp} - L_{Crit})/ER}}, \quad (1)$$

where L_{Crit} is the allowable noise exposure criterion and ER is the exchange rate. The time spent performing each task, C_i , is divided by associated permissible exposure time, T_i . The fractions, C_i/T_i , are summed and multiplied by 100 to estimate Dose,

$$\text{Dose} = [C_1/T_1 + C_2/T_2 + C_3/T_3 + \dots + C_n/T_n] \times 100. \quad (2)$$

Once the Dose is determined, the time-weighted average, TWA, can be estimated to represent the exposure for an entire workday. If the worker's noise exposure is constant, such as a textile weaving plant, the TWA can be extrapolated from short noise samples. The equation for determining a TWA from the American Industrial Hygiene Association Noise Manual is given below,

$$\text{TWA} = \frac{\text{ER}}{\log_{10}(2)} \times \log_{10}(\text{Dose}/100) + L_{\text{Crit}}, \quad (3)$$

where the exposure level is measured with the sound level meter, the exchange rate is typically $\text{ER} = 3 \text{ dB}$, the criteria level is typically $L_{\text{Crit}} = 85 \text{ dB(A)}$ (Meinke et al., 2022). In the United States, the Occupational Safety and Health Administration (OSHA) establishes the permissible exposure level, $L_{\text{Crit}} = 90 \text{ dB(A)}$, and exchange rate, $\text{ER} = 5 \text{ dB}$. NIOSH's recommended exposure limit is $L_{\text{Crit}} = 85 \text{ dB(A)}$ and $\text{ER} = 3 \text{ dB}$. For jobs with multiple tasks in a work day, representative levels should be sampled and the permissible exposure times calculated or found in a lookup table (NIOSH, 1998, Table 1-1).

In the NIOSH advanced hearing protector study, the facility's noise survey was used to select attenuation filters for the custom earplugs that reduced exposure levels to 85 dB(A) (Murphy et al., 2007). The TWAs for these workers ranged between 80 and 98 dB(A) measured with a traditional sound level meter and slow time constant. Because the facility used stamping presses to fabricate automotive body parts, many of the exposures were impact noises and produced peak levels far greater than the 80 to 98 dB TWAs. The workers preferred hearing protectors with higher PARs than what was predicted by the TWA exposure levels. For long periods with varied exposures, one hearing protector might be used for low noise levels and a different protector for the higher exposure levels.

ii. Estimated Maximum Exposure Level

Given that noise levels can fluctuate, workers move in and out of noisy areas, and the operations they engage in are potentially highly variable, the prudent choice might be to base the noise exposure estimates upon the tasks with the highest noise exposures. In this case, the best approach to assessing the exposure might be to sample the variety of tasks that the workers are engaged in throughout their work shifts to identify the higher exposure levels.

In Murphy et al. (2016b) the oil-rig engineers and inspectors flew in helicopters to reach the drilling rigs and then worked on the drilling rigs. According to a Department of Interior study of several helicopters and drilling rigs, the highest 10 percent of exposure levels on the oil rigs ranged between of 105 and 124 dB(A) (Radtke, 2007). Noise-exposure levels while flying in the helicopters ranged between 87 and 107 dB(A) with the highest levels experienced in the passenger compartment. Workers wore both earplugs and a flight helmet during transit to and from the oil rigs. The target PAR of 25 dB was based upon the exposures while flying in the helicopter.

iii. Peak Exposure Level

In some environments, high-level impulse noise is intermittent, but can be expected to produce levels that could produce immediate tinnitus and/or temporary or permanent hearing threshold shifts (TTS, PTS). For firearm and weapon training for military or law-enforcement personnel, the peak exposure level could be the most important measure to use when selecting a hearing protector. The expected peak levels for many small-caliber firearms is in the range of 150 to 175 dB peak sound pressure level (dB pSPL). To measure this, standard sound level meters are unlikely to provide an accurate estimate. Regardless, the peak levels can be used to determine the target PAR.

Federman and Duhon (2016) evaluated hearing protector fit with United States (U.S.) Marine Corps recruits at Parris Island during rifle training. The M-16 and M-4 rifles produce impulses of approximately

165 dB pSPL at the ear. According to the U.S. Department of Defense (DoD) guidance, peak exposure levels below 140 dB do not have restrictions on the allowable number of rounds that may be fired. Consequently, Federman et al. (2021) established a 25-dB target PAR (25 dB = 165 - 140).

Vause (2023) described lessons learned while deploying fit testing for personnel training with the AT4 shoulder-fired rocket. Peak exposures at the ear exceed 180 dB pSPL and can approach 190 dB. Soldiers used both earplugs and earmuffs to attenuate the impulses. Effectiveness was assessed through audiometric testing before and after training. When fit-testing was employed, the rate of TTS decreased significantly.

If Murphy et al. (2007) had used the peak levels of the metal stamping activities, the advanced hearing protector might have experienced greater acceptance. Many of the workers requested that the attenuation of the protectors be increased from the 4-dB to 15-dB NRR of the attenuation filters to the 17-dB NRR for the solid plug that provided maximum attenuation.

iv. Task-Based Exposure Level

The Task-Based Exposure Measurement (T-BEAM) method represents a significantly more complicated approach to determining exposure levels. The variety of tasks that a worker engages in must be measured. Hearing protection attenuation tends to be less in the low frequencies and greater in the high frequencies. The effective protection will be affected by the spectral content. In consensus standards, the variability of attenuation is included when applying the Noise Level Reduction Statistic, Graphical (NRS_G), the high/middle/low (HML) and the octave band methods from ASA/ANSI S12.68-2008 (R2020) and ISO 4869-2:2018.

Spectral Balance If the A-weighted and C-weighted exposure levels are measured, the spectral balance, $L_C - L_A$, can be determined. For fit-testing systems that measure the full range of frequencies, 125 to 8000 Hz, the spectral balance can be used to estimate the increase or decrease in the attenuation for a particular HPD. Murphy and Gallagher (2017) have reported a high correlation, $r^2 = 0.89$, between the NRS_G and the octave-band methods from ASA/ANSI S12.68-2008 (R2020).

Octave-band Exposures If the octave-band noise levels, $L_{A,f}$, and protector attenuations, $Atten_f$, are available, then the octave-band attenuation methods can be used. The octave band attenuations are subtracted from the A-weighted exposure levels and summed to determine exposure level,

$$L_A = 10 \log_{10} \sum_f^N 10^{(L_{A,f} - Awt_f - Atten_f)/10}, \quad (4)$$

where $f = 125, 250, \dots, 8000$ Hz, Awt_f are the A-weighting factors as a function of frequency.

Other Considerations If the noise is a complex interaction of impulsive and continuous content, the services of a noise consultant, acoustician, or an industrial hygienist may be needed. Current research on complex noise has developed approaches to measure kurtosis to incorporate the additional risk of noise with significant impulsive content. Hearing protectors can affect kurtosis by removing the high frequency components (Murphy and Flamme, 2023).

3. SELECTING A FIT-TESTING METHOD

Different fit-testing measurement methods are available and have been incorporated in a variety of FAES systems. Figure 2 generally illustrates the psychophysical and physical fit-testing methods elaborated upon below.

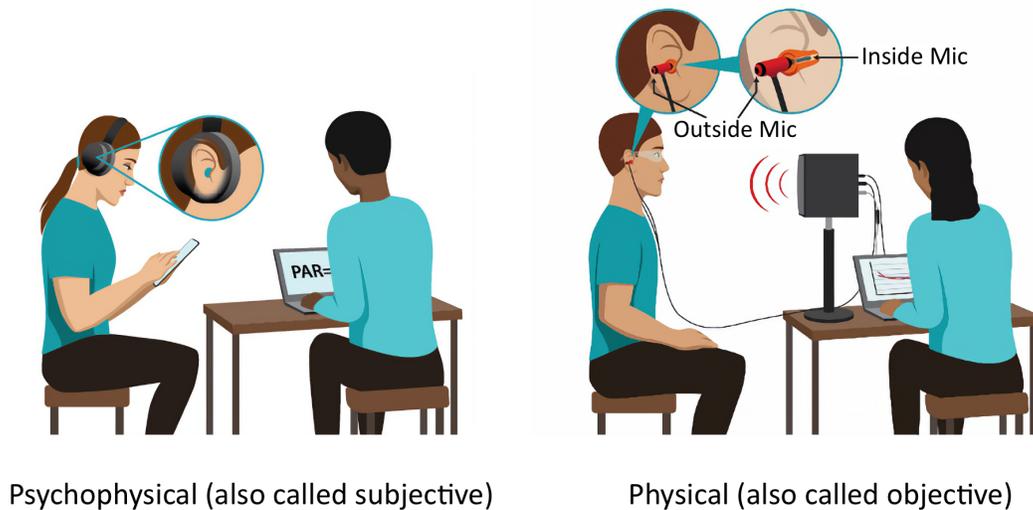


Figure 2: Psychophysical (subjective) and physical (objective) hearing protector fit-test methods. Psychophysical methods allow the subject to respond to a stimulus as a part of the fit-test process. Physical methods measure the acoustic noise reduction of the hearing protector. Figure from NORA (2023).

A. FIT-TEST METHODS

Psychophysical methods (also called subjective) rely upon the response of the person being tested. The more common methods simulate the laboratory real-ear attenuation at threshold (REAT) measurements used in laboratory tests for hearing protector ratings. In this case, a person's unoccluded and occluded hearing thresholds are measured for a one-third octave-band noise to determine attenuation as a function of frequency. These fit-testing methods can be generically referred to as "threshold-based." Workers enrolled in a hearing conservation program have experience with the signal detection, threshold-based procedures as a part of the annual audiometric test. Threshold-based methods are susceptible to background noise in the testing space and the subject's attention to the task (Murphy et al., 2016a). The time required to complete a fit test with a threshold-based methods is about 7 to 15 minutes depending upon the number of frequency bands that are tested.

Loudness balance-based fit-testing methods rely on a psychophysical procedure where the subject adjusts the presentation levels of sounds presented to each ear so that they produce the same loudness. This process is achieved by sequentially fitting the right and left ears with an earplug and adjusting the presentation levels. This method has an advantage of being conducted at supra-threshold levels thus minimizing the influence of background noise in the testing space. The presentation stimuli need to be distortion free between occluded and unoccluded levels. The loudness-balance psychophysical procedure is different from the threshold-based detection procedure and is less commonly used.

Physical (also called objective) field microphone-in-real-ear (F-MIRE) fit-test systems measure the sound pressure levels of a test signal inside and outside of a hearing protector. One method can use a miniature microphone placed to measure the levels in the ear canal with and without the protector. Another method uses a dual microphone probe that connects to a surrogate probed earplug (or earmuff) to measure the noise reduction (the difference between outside and inside) of the hearing protector. A distinct advantage of the F-MIRE systems is the relatively short time required to evaluate the fit of a protector, on the order of seconds. The subject does not have to respond to any stimuli, time can be spent focusing on selecting a suitable protector and training the subject to improve fitting techniques.

B. CONSIDERATIONS FOR SELECTING A FIT-TEST SYSTEM

Several presenters discussed considerations for selecting a fit-test system (Hacker and Miller, 2023; Hayes et al., 2022; Karch, 2023; Neitzel, 2023). These features ought to be considered when selecting a fit-test system,

- What type of hearing protectors do workers use?
- When will fit testing be done?
- Where will fit testing be conducted?
- How much background noise is in the testing area(s)?
- Does the system test all the different hearing protectors?
- How much time is needed to conduct the fit test?
- Who will conduct the tests?
- Who are the persons to be tested?
- Are there limitations to who can be tested?
- What are the calibration requirements for the fit-testing system?

The ASA/ANSI S12.71-2018 (R2022) standard addresses the performance characteristics of fit-testing systems and how they can relate the performance to the laboratory testing procedures. Fackler (2023) described the key aspects of this standard as it relates to the performance criteria, accuracy, precision, comparability of fit-test results across systems, and the breadth of field attenuation estimation systems (FAES).

4. PERSONAL ATTENUATION RATINGS (PAR)

A. HOW TO SELECT A TARGET PAR

The percentage of workers who required intervention or retraining varied widely across the studies and projects presented at the Symposium. Noise exposure levels, the target PAR(s), the selection of HPDs, population demographics, and to some degree, previous training are a few of the factors that influence the proportion of workers who demonstrate adequate protection without any intervention. Workers exposed to low levels of noise may require only about 10 to 15 dB of protection whereas workers exposed to higher levels require higher target PARs. Several of the studies and projects reveal a bi- or multi-modal distribution for PAR results (especially prior to intervention) (Murphy, 2023; Su et al., 2023) Other studies only reported the percentage who met a specified target PAR. (Hacker and Miller, 2023; Li, 2023).

The relationship between the exposure level of the noise, L_{Exposure} , and the protected exposure level, $L_{\text{Protected Exposure}}$, determines the target PAR,

$$\text{PAR}_{\text{Target}} = L_{\text{Exposure}} - L_{\text{Protected Exposure}} \quad (5)$$

If the desired protected exposure level and PAR are known, then the acceptable noise exposure level where one should be adequately protected is

$$L_{\text{Exposure}} = L_{\text{Protected Exposure}} + \text{PAR} \quad (6)$$

Conversely, if the exposure level and PAR are known, the protected exposure level can be estimated

$$L_{\text{Protected Exposure}} = L_{\text{Exposure}} - \text{PAR} \quad (7)$$

With these quantities, the hearing conservationist can determine whether workers are receiving adequate protection and whether they are at risk of over/under protection.

Although these equations are simple, several assumptions underly their use. Noise levels are not constant throughout the work shift. Rather, a total exposure consists of varying sound levels that change with job task, the proximity to noise source, the spectral nature of the sound, and duration of exposure. Unless the hearing protector attenuation is the same at every frequency, the effective PAR will change with the noise exposure.

Hearing protector fitting introduces variability. When training a worker to fit a protector, the assumption is that once they have fitted the protector, then they will fit it the same way every time it is worn. Multiple studies have demonstrated that workers fit protectors differently over time, fail to retain the fitting skill, or that protector attenuation can change during the course of a work shift (Federman et al., 2021; Gong et al., 2019, 2023; Murphy et al., 2007, 2015). In the ASA/ANSI S12.71-2018 (R2022) standard, the determination of PAR is recommended to include variability of the noise spectra, repeated fittings, and the instrumentation. Even with the uncertainties of PAR, the estimate of effective noise exposures will be more accurate than using NRR or derating schemes (Murphy et al., 2022).

i. Desired protected exposure level or exposure limit

The level to which workers should be protected is not simple either. In the U.S., for minimal compliance, OSHA's Permissible Exposure Level (PEL) is 90 dB(A) TWA unless the worker has had an Standard Threshold Shift in which case the PEL is decreased to 85 dB(A). NIOSH, the DoD, and many other jurisdictions have exposure limits set at 85 dB(A) TWA for continuous and 140 dB pSPL for impulsive noise. European Union Noise Directive sets the limits at 87 dB PEL and 200 Pa (140 dB pSPL) for impulsive noise.

ii. Target PAR

The target PAR is dependent on the factors above (i.e. how loud are the exposures and what level is desired for protected exposure). Too much attenuation can lead to over protection and result in safety hazards or the worker not using hearing protectors. One of the largest elements of uncertainty when measuring PAR is the variability of each refit. Every time a hearing protector is removed and refit, its efficacy can change. Additionally, each measurement method has inherent uncertainty and each specific fit-test system introduces some uncertainty. Therefore, PAR should be chosen based on the overall risk assessment.

B. TIPS FOR GOOD EARPLUG FIT TESTING

Based on experiences of early adopters of HPFT, the following tips were provided:

Tips for Implementation

- Load demographic information into the fit-test system database or software before meeting any subjects.
- Use 'wranglers' such as supervisors to manage the flow of people to and from the location where fit testing is being done.
- Have a good selection of hearing protectors available in a variety of sizes to ensure ability to change hearing protectors as needed.

- Require rather than ‘offer’ HPFT. Prior to its implementation, the value of hearing protector fit testing had yet to be realized, therefore, many potential users are waiting for a requirement to get them started.
- Schedule appropriate times to conduct HPFT. Possible events could be the following: onboarding or new-hire orientation, as a part of annual audiometry or respiratory fit-testing, at certain ‘office hours’, as a part of a safety education campaign, or during waiting time for other activities.
- Garner stakeholder buy-in to include the workers, supervisors, management and support personnel.
- Train and fit test new hires to select appropriate hearing protector AND ensure new users know “what right feels like.”

The implementation strategy needs to fit local needs. Flexibility about how, who and when hearing protector fit testing can be accomplished can lead to successful implementation. Figure 3 shows an example sequence of events for hearing protector fit testing.

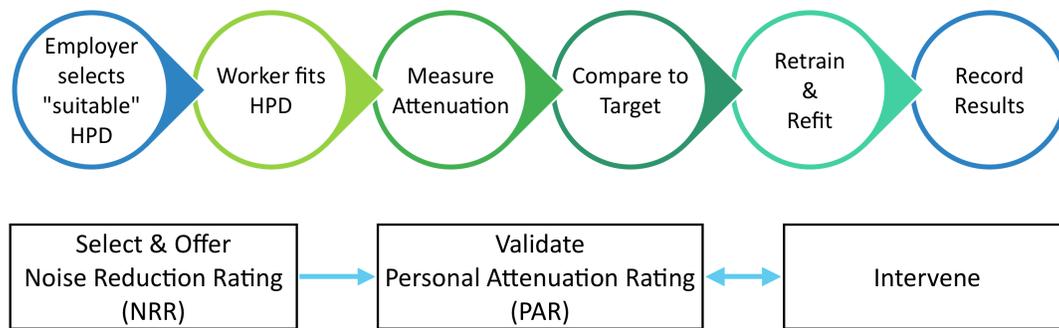


Figure 3: An example sequence of events in the fit-testing process. The essence of the process is selecting a hearing protection device, validating that the worker achieves an adequate level of noise reduction and intervention that involves retraining or refitting an HPD. Results need to be recorded as a part of the worker’s record. Figure from NORA (2023).

C. RETRAIN AND REFIT

One example of an effective intervention is called “Experiential” instruction. Several studies conducted by the Naval Submarine Medical Research Laboratory (NSMRL) (Federman and Duhon, 2016; Federman and Karch, 2023; Karch, 2023) have shown that 3 simple steps can lead to improved/adequate/appropriate protection levels.

1. Initial Self Fit (optional). This initial step, where the user fits their hearing protector as they normally would, provides a pre-intervention baseline, that is, evidence of the current effectiveness of the user’s hearing protector.
2. Expert Fit with instruction. This step demonstrates a proper fit while explaining the steps to achieve that fit.
 - (a) Explain and demonstrate roll-down technique (for foam earplugs).
 - (b) Describe how participants can best straighten and open the ear canal. Pull the pinna either up, back or out. The angle of pull varies with each person’s anatomy. Provide verbal or visual (using a phone camera) guidance. Ensure users are able to perform the most effective pinna pull for themselves.

(c) Insert the earplug into the ear canal (and let foam earplug expand).

3. Self Refit. In this step, the users demonstrate the ability to accomplish a proper fit.

The presentations by Karch and Federman included evidence that even a shortened intervention which begins with an expert fit with instruction can lead to the user's ability to demonstrate a good fit. Gong et al. (2021), Morata et al. (2021) and Murphy et al. (2022) highlight the importance of providing individualized instruction to earplug users so that they can maximize the attenuation they achieve when using earplugs.

D. COACHING TIPS

Several presentations (Hacker and Miller, 2023; Hayes, 2023; Karch, 2023) addressed the coaching tips that help earplug users obtain a good fit.

Coaching tips:

- Stand to the back/side of the participant's head for optimal view of ear canal movement.
- Rotate earplug (especially pre-molded) in circular motion during insertion for deeper fit.
- Anyone can be an expert fitting coach with experience.
- Know when to retrain with the same hearing protector vs change to another style of hearing protector.
- Practice to increase and maintain skills (both user and trainer).

5. COSTS – RETURN ON INVESTMENT (ROI)

One of the major returns on investing in HPFT that was highlighted at the Symposium is prevention of NIHL. The ability to identify workers who are not adequately protected from hazardous levels of noise is an obvious goal for HPFT. Identification of workers not well protected allows for intervention with the right population so that employers can meet their responsibility to provide a safe work environment. Hearing protector fit testing and compliance with the requirement to use hearing protectors go together. Often employees are aware of their responsibility to use PPE appropriately but if hearing protectors provide too much attenuation, a worker might adjust the hearing protector fit or remove it altogether. Fit-test results cannot be applied to a worker who chooses not to use the assigned hearing protector. Finding the right amount of protection can lead to improved compliance.

The Department of Defense Instruction 6055.12 – Change 1 requires HPD fit testing for individuals as they are enrolled in the Hearing Conservation Program when exposures are greater than or equal to 95 dB(A) TWA (Dept. of Defense, 2023; Schulz, 2023). Service members and civilian workers who experience shifts in hearing thresholds on their annual audiogram include TTS, PTS, or early warning sign shifts will also require HPFT. Efficient implementation of HPFT at a large scale will help develop a stronger business case for fit testing.

NIOSH is continuing to make hearing protector fit testing the standard of practice. NIOSH Director, Dr. John Howard, specifically called for partners to share their hearing protector fit-test data and outcomes. Dr. Howard called noise and hearing loss the perfect example for Total Worker Health, advocating the Total Hearing Health approach: [Using Total Worker Health® Concepts to Address Hearing Health | NIOSH | CDC](#)

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