
User Efficacy in Fitting Hearing Protection

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Noise-induced hearing loss is the most common permanent and preventable occupational injury in the world.

World Health Organization

Worker's Compensation

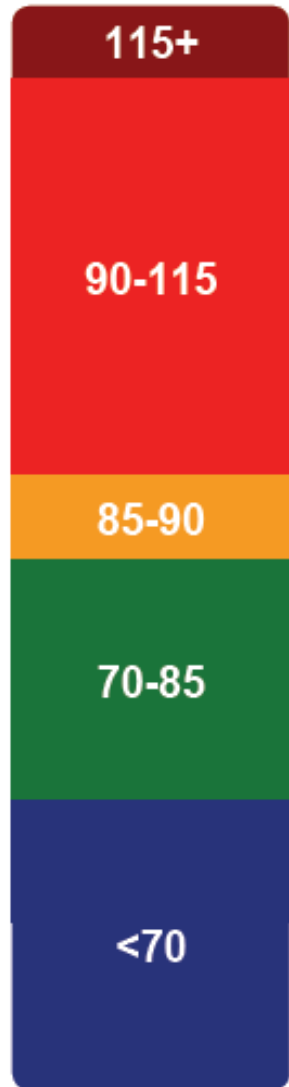
In many countries, excessive noise is the **biggest compensable occupational hazard**. Cost of NIHL to developed countries ranges from **0.2 to 2% of its GDP**. NIHL is **on the rise** globally. (Source: WHO)

United States Statistics

Most common occupational injury in the United States. **22 million US workers** are exposed to hazardous noise at work on a daily basis.

Approx. **8 million Americans** suffer from NIHL. (Source: NIOSH, 2009)

Hearing Protection Selection



In the United States, **76%** of noise-exposed workers need no more than **10 dB** of protection. **90%** need no more than **15 dB** of protection.

Noise Reduction Rating (NRR)

Noise Reduction Rating



Noise Level = **100 dB**

Noise Reduction Rating = **30 dB**

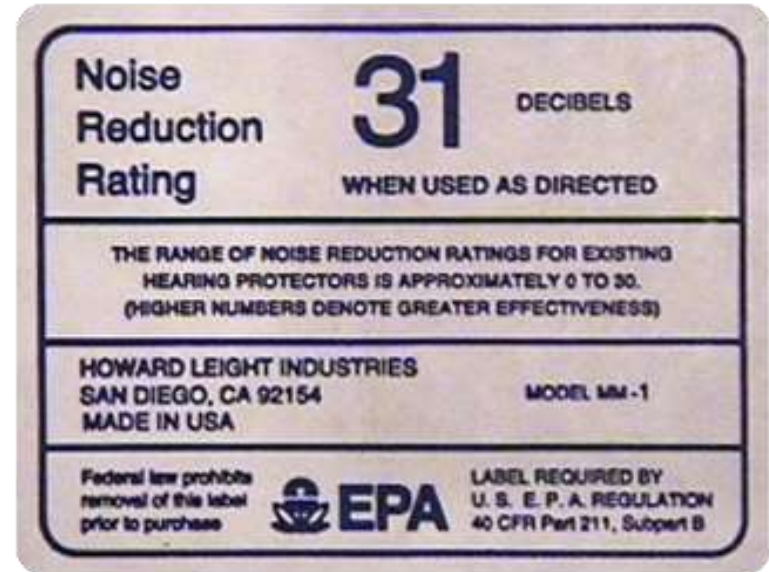
***How much noise is
reaching the ear of
the worker ?***

That is completely unknown ...

(55 – 104 dB)

Noise Reduction Rating

- A laboratory estimate of the amount of attenuation achievable by 98% of users when properly fit
- A population-based rating — some users will get more attenuation, some will get less

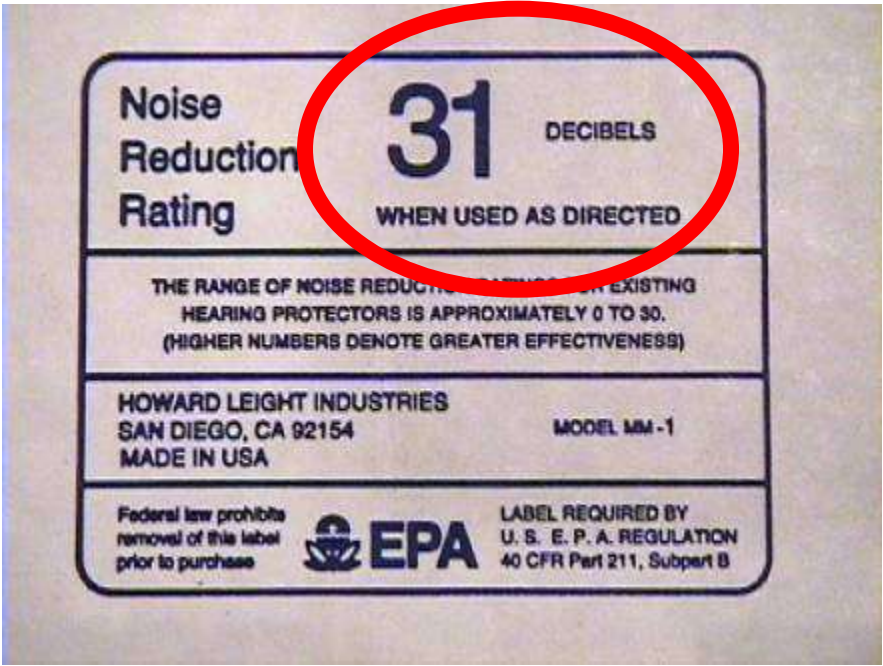


The NRR is only a population estimate, not a predictor of individual attenuation.

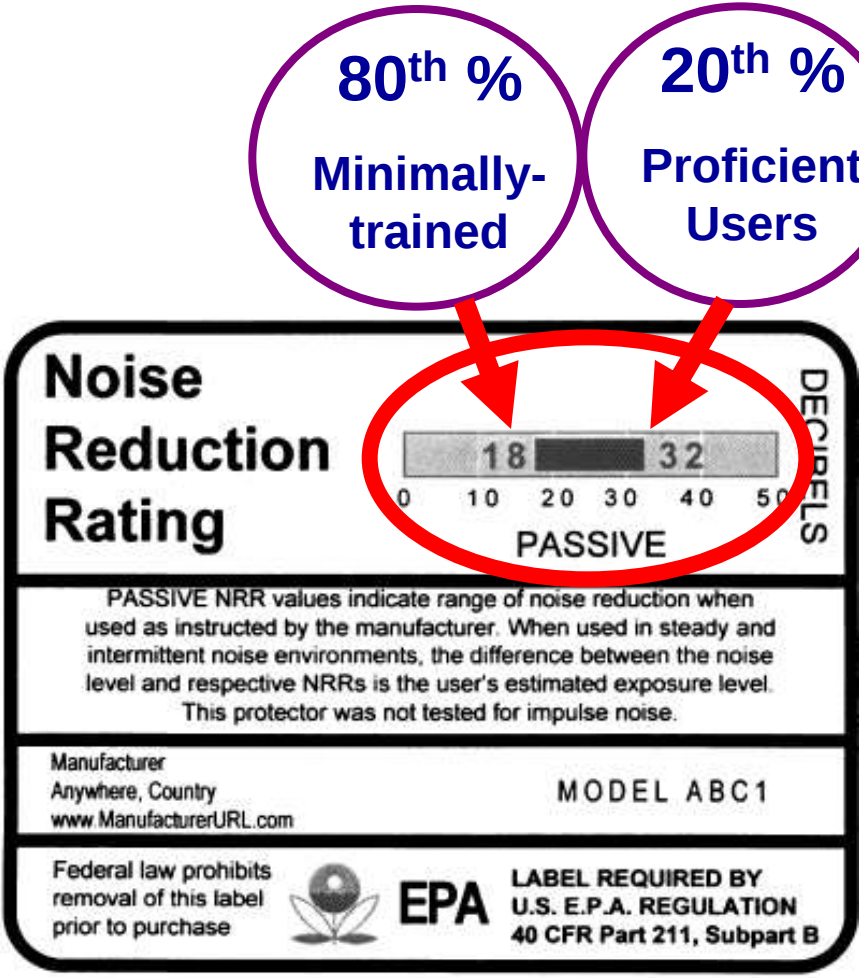
Noise Reduction Rating

- The EPA recently made an announcement about a proposed change to the Noise Reduction Rating [NRR]
- This is the first change in hearing protector regulation in nearly 30 years

Noise Reduction Rating



Current NRR Label

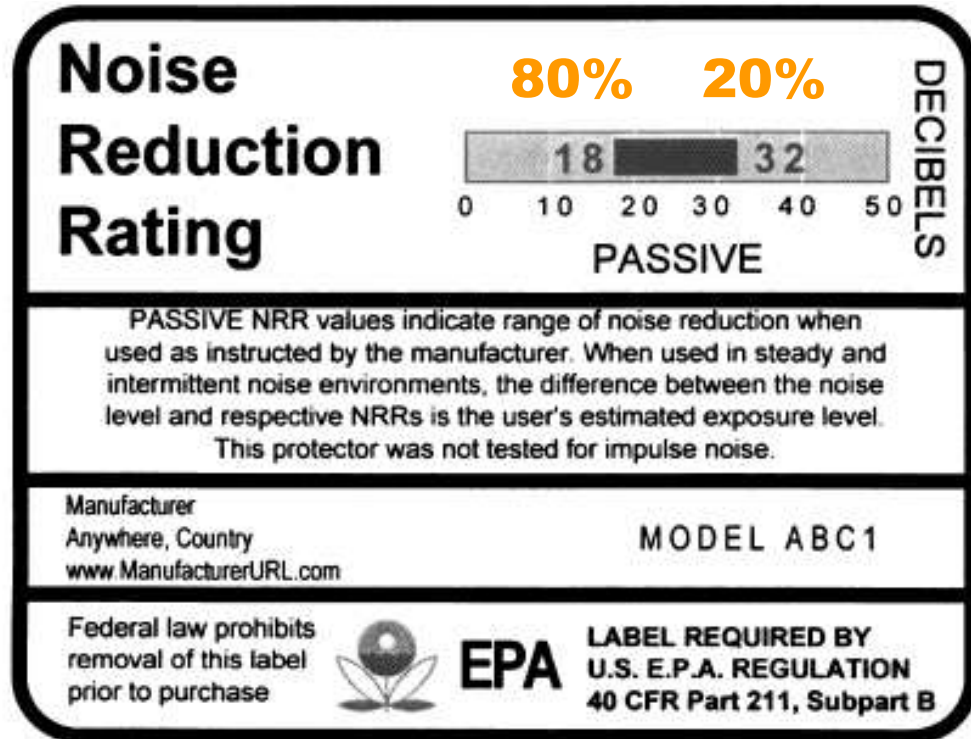


Mock-up of New Label

Noise Reduction Rating

How to Apply the New Label

Two-number range displays the estimated protection achievable by minimally-trained users [80%] versus proficient users [20%].



A wider range indicates greater variability in the fit of that HPD. Smaller ranges indicate more consistency of fit. For example, earmuffs will usually have a tighter fitting range than earplugs, and may have a smaller NRR range.

Earplug Fit Testing

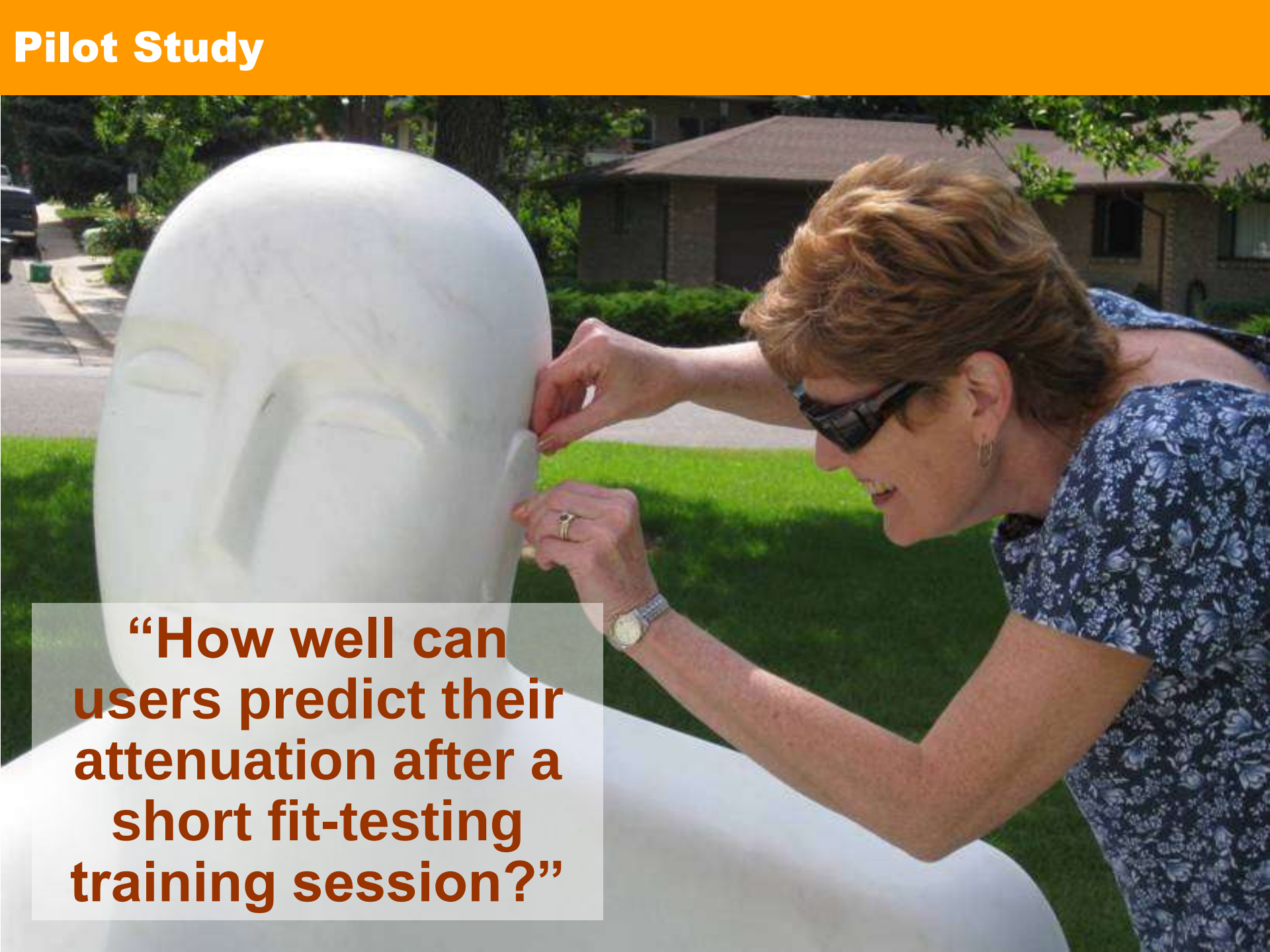
Provides an *accurate, real-world* picture of your employees' hearing protector effectiveness.



Identify if your employees are:

- Receiving optimal protection
- Require additional training
- Need to try a different earplug style

Pilot Study

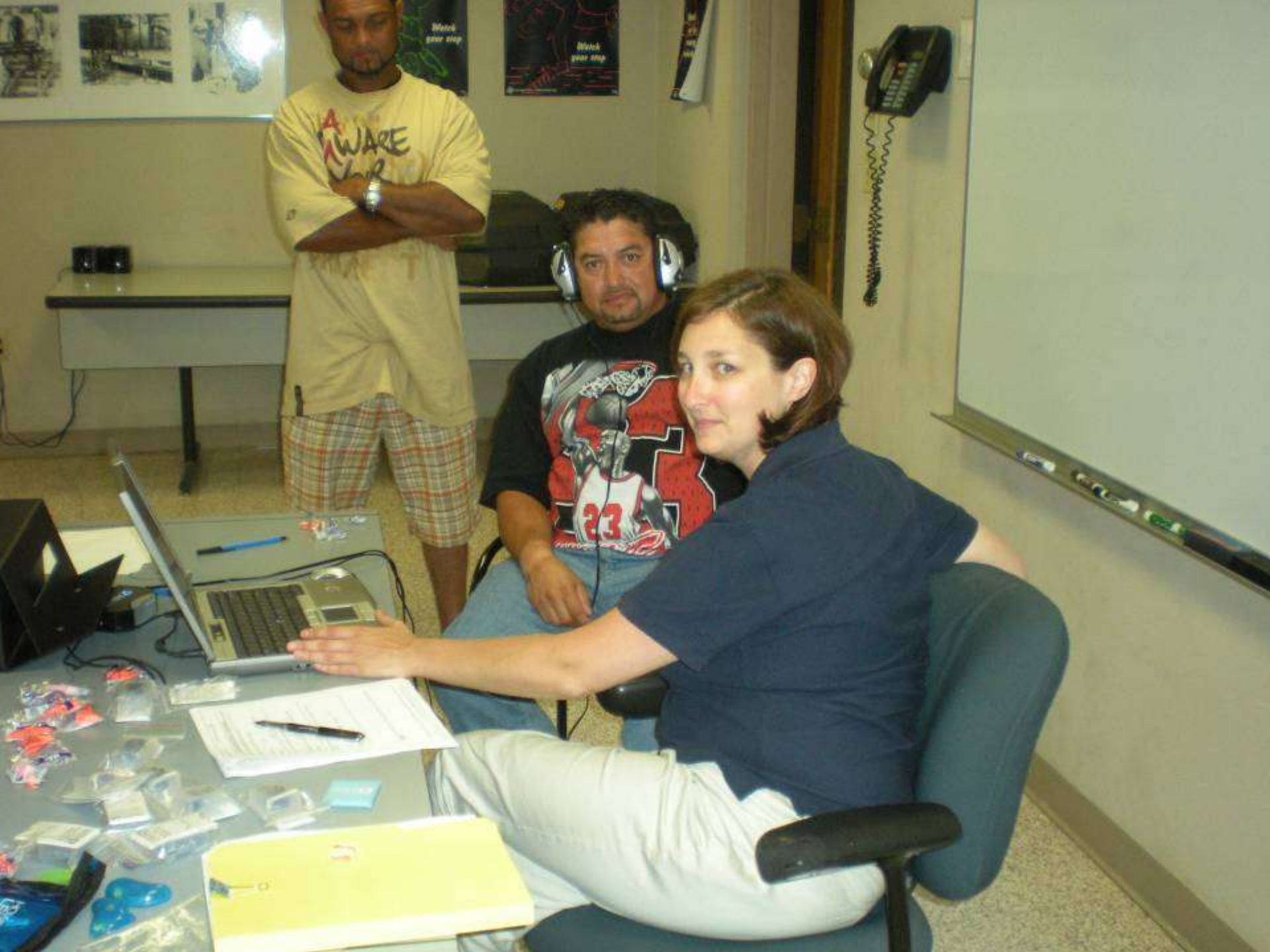
A woman with short brown hair, wearing sunglasses and a blue floral shirt, is adjusting a white protective hood on a mannequin head. She is smiling and looking at the hood. The background shows a green lawn and a house.

“How well can users predict their attenuation after a short fit-testing training session?”

Subjects

- Subjects: 17 construction workers with varied HPD experience levels
- Equipment: VeriPRO earplug fit-test system
- HPD: Volunteers
- Process: 2-4 Quick Check fits where employee sees feedback of exact PAR





Results

Data show improved PARs!

Initial	RE=19	LE=22
Final	RE=29	LE=27

Average improvement 7.5 dB

Pre- and Post-Test

How would you rate your ability to fit your earplugs?

1

2

3

4

5

Don't know how

I do OK

Expert



Initial Ability



Post-Test Ability



- Don't know how
- Not good
- I do OK
- Pretty good
- Expert Fitter

Self-Efficacy

“How much noise do you think your earplugs block?”

**76% (13 of 17)
judged attenuation as
HIGHER post-test**

Post-Test

Are you better able to assess the effectiveness of your earplugs after VeriPRO fit-testing?

1

2

3

4

5

No

Maybe

No change

Improved

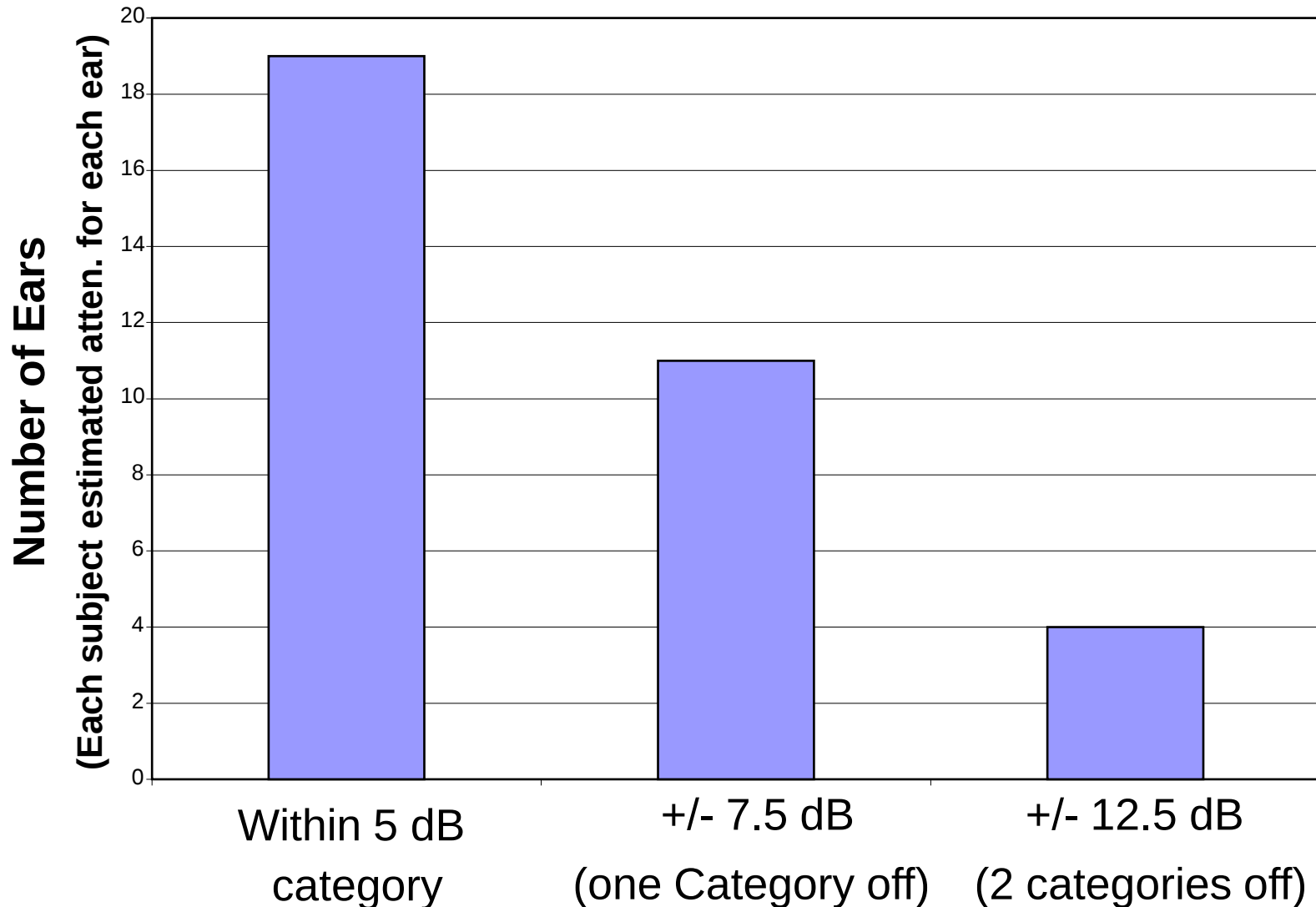
Yes

**64% (11 of 17)
rated their ability
HIGHER post-test**

“How well can users predict their attenuation after a short fit-testing training session?”



Ability to Predict Noise Reduction



Earplug Fit Testing

As a problem solver:

- Derating Schemes
- One-on-One Training
- HPD Selection
- NRR Change



0 dB

EAR #1

0 dB



EAR #2

33 dB

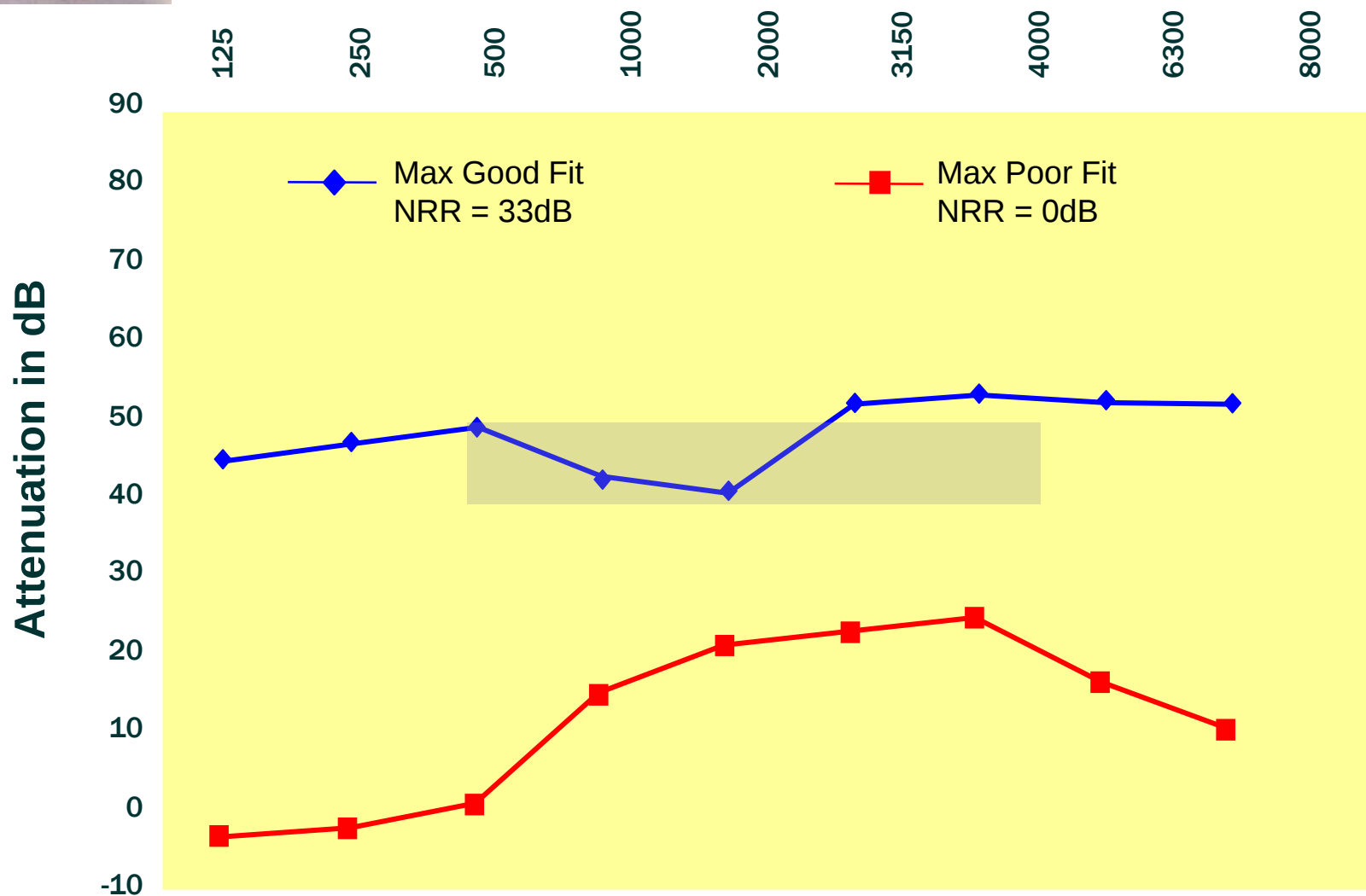
EAR #3

How much protection?



Good Fit vs Bad Fit

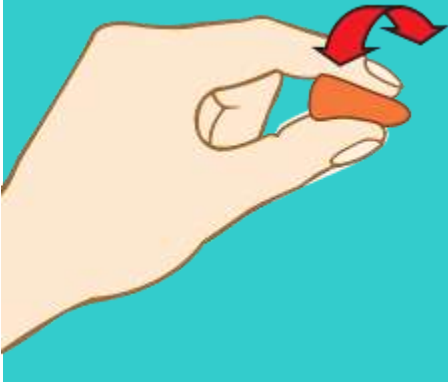
Frequency in Hz



Roll-Down Foam Earplugs

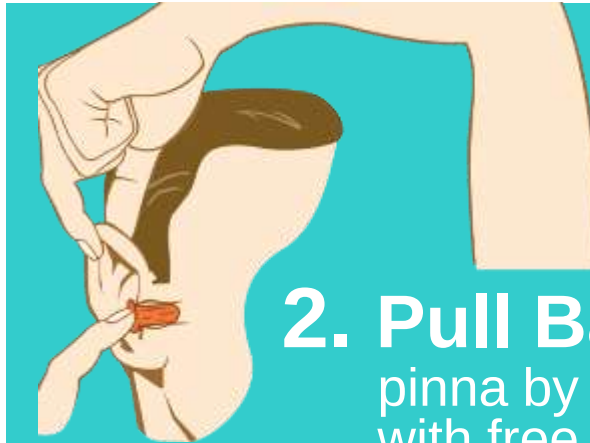
1. Roll

entire earplug
into a crease-free
cylinder



2. Pull Back

pinna by reaching over head
with free hand, gently pull top
of ear up and out



3. Insert

earplug
well into
ear canal
and hold
until it fully
expands



Fitting Tips



Multiple-Use Earplugs

1. Reach

While holding the stem, reach hand overhead and gently pull top of ear up and back.



2. Insert

Insert earplug so all flanges are well inside the ear canal.



3. Fit

If properly fitted, only the stem of the earplugs should be visible to someone looking at you from the front.

Visual + Acoustical Checks

1. Visual Check

The earplug should sit well inside the ear canal and not stick out.



2. Acoustical Check

Cup hands over ears and release. Earplugs should block enough noise so that covering your ears with hands should not result in a significant noise difference.

