

Modernize Your Hearing Conservation Program and Protect Your Employees with WAHTS Hearing



Presenter(s)

Shoshannah Russell, AuD, FAAA

Chief Audiologist, Director of Sales and Marketing

WAHTS Hearing LLC

Isaac Lambert

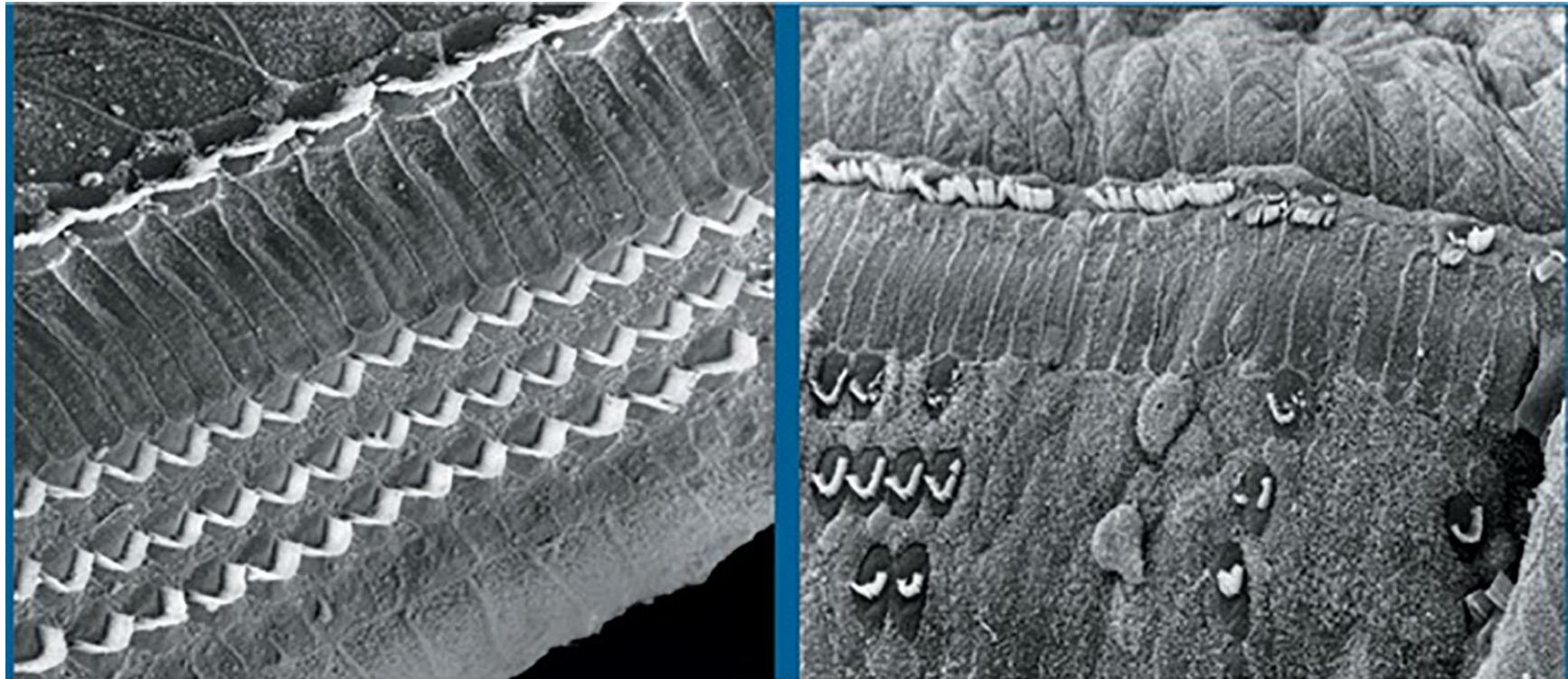
Sales & Marketing Manager

WAHTS Hearing LLC

Occupational Noise Exposure

- 22 million workers in U.S. are currently exposed to hazardous noise
- \$242 million being spent in the US each year on workers compensation claims
- Manufacturing sectors typically have the highest prevalence of noise exposure and hearing loss
- Noise-induced hearing loss is 100% *preventable*

Permanent Damage to the Cochlea



Normal rows of hair cells (left side). Missing and damaged hair cells following noise exposure (right side) Source: NIOSH

Costs of Occupational Hearing Loss

Intrinsic:

- Permanent HL & tinnitus
- Difficulty communicating
- Cardiovascular disease
- Social isolation
- Depression
- Fatigue
- Stress

Extrinsic:

- Hearing aids and clinical rehabilitation
- Reduced earnings
- Higher rates of absenteeism
- Increased risk of accidents, hospitalizations

Cost of the Hearing Conservation Program

- Cost and Effectiveness of Hearing Conservation Program at 14 US Metal Manufacturing Facilities
 - Annual costs ranged from \$67,000 - \$400,000
 - Avg cost of \$308 per worker
 - Per person total HCP costs were not significant predictors of any of the hearing health outcomes
 - ***Higher expenditures on training + fit-testing and fit-testing alone were significant predictors of lower rates of hearing loss***

Hearing Conservation Start-up Costs

Traditional System:

- One-person sound booth
\$8,500
- Audiometer \$1,218
- Headset \$1,224
- Fit test system \$3,330

Average Cost = \$14,500

WAHTS System:

- Soundbooth ✓
- Audiometer ✓
- Fit Test System ✓
- First year software ✓

Average Cost = **\$7350**

WAHTS Hearing

- **Technology developed with NIH and DoD**
- **Sales to US Military & government agencies beginning 2020**
 - Built for ruggedness and durability
- **Commercial sales**
 - Large presence in manufacturing, occupational health, oil & gas, etc.
- **Headquartered in the US**



Boothless Audiometry

- Automated, clinic quality testing without sound booths
- Changing the face of hearing conservation



Validation Studies

2024

- Niemczak, Christopher Edward and Ealer, Christin and Froese, Kaitlyn and Fellows, Abigail M. and Leigh, Samantha M. and Mirza, Sarah and Gui, Jiang and Magohe, Albert and Massawe, Enica Richard and Musiek, Frank and Buckey, Jay C., Response Times from Gap Detection Threshold Testing Relate to Cognitive Processing Speed. Available at SSRN: <https://ssrn.com/abstract=5006300> or <http://dx.doi.org/10.2139/ssrn.5006300>
- Williams E, Minesinger K, Gallagher H, Stefanson JR, Bridges N, Jackson N, Stark V, Coto J, Rajguru S, Yankaskas K, Rogers R and Hoffer ME (2024) Examining the utility of near infrared light as pre-exposure therapy to mitigate temporary noise-induced hearing loss in humans. *Front. Neurol.* 15:1366239. doi: 10.3389/fneur.2024.1366239'

2023

- Blankenship CM, Hickson LM, Quigley T, Larsen E, Lin L, Hunter LL. Extended High-Frequency Audiometry using the Wireless Automated Hearing Test System Compared to Manual Audiometry in Children and Adolescents. *medRxiv [Preprint]*. 2023 May 23:2023.05.22.23290339. doi: 10.1101/2023.05.22.23290339. Update in: *Ear Hear.* 2024 Dec 26. doi: 10.1097/AUD.0000000000001621. PMID: 37292836; PMCID: PMC10246139.
- Evelyn Davies-Venn, Odile Clavier, Kristi Oeding; Real-time measurement of ambient noise levels during hearing screening in point-of-care settings. *J. Acoust. Soc. Am.* 1 March 2023; 153 (3_supplement): A48. <https://doi.org/10.1121/10.0018115>
- Kulinski, D., Dirks, C., Carr, W., Sheffield, B., Kamimori, G., & Brungart, D. S. (2023). Field assessment of acute auditory responses to environmental exposures in close quarters tactics training. *International journal of audiology*, 62(2), 138-150.
- Niemczak CE, Ealer C, Fellows A, et al. Peripheral Auditory Function in Tanzanian Children Living With HIV With Clinically Normal Hearing. *JAMA Netw Open*. 2023;6(3):e233061. doi:10.1001/jamanetworkopen.2023.3061
- Sheffield B, Kulinski D, Schurman J, Sherlock L, Bugtong V, Spencer M, Caldwell C, Brungart D, Merkley J, and Blank A. (2023). Increasing Hearing Readiness Using Boothless Audiometry. *Military Medicine*, 188, S6:529.

Validation Studies

2022

- Bessen, S. Y., Magro, I. L., Alvarez, K. M., Cowan, D. R., Peñalba, D., Fellows, A., Gonzalez-Quiroz, M., Rieke, C., Buckey, J.C., Niemczak, C. & Saunders, J. E. (2022). "Test-Retest repeatability of automated threshold audiometry in Nicaraguan schoolchildren." *Int J Aud*, 1-8.
- Clavier, O.H., Norris, J.A., Hinckley Jr, D.W., Martin, W.H., Lee, S.Y., Soli, S.D., Brungart, D.S., Schurman, J.R., Larsen, E., Mehraei, G. and Quigley, T.M. (2022). "Reference equivalent threshold sound pressure levels for the Wireless Automated Hearing Test System." *The Journal of the Acoustical Society of America*, 152(1), 601-608.
- Kulinski, D., Dirks, C., Carr W., Sheffield, B., Kamimori, G., & Brungart, D. (2022). "Field assessment of acute auditory responses to environmental exposures in close quarters tactics training." *International Journal of Audiology*
- Kulinski, D., & Brungart, D. S. (2022). "Using a boothless audiometer to estimate personal attenuation rating in a military hearing conservation clinic." *JASA Express Letters*, 2(4), 043601.

2021

- Barr, L. (2021). "Mobile hearing test system enables quicker diagnosis, treatment."
- Behar, A. (2021). "Audiometric Tests without Booths." *International Journal of Environmental Research and Public Health*, 18(6), 3073.

2020

- Kulinski, D., Makashay, M. J., Dirks, C., Sheffield, B., & Brungart, D. S. (2020). Development of a tablet-based fit test system for military and austere environments. *The Journal of the Acoustical Society of America*, 148(4), 2805-2805.
- Magro, Isabelle, Odile Clavier, Karen Mojica, Catherine Rieke, Eric Eisen, Debra Fried, Anita Stein-Meyers, Abigail Fellows, Jay Buckey, and James Saunders. "Reliability of Tablet-based Hearing Testing in Nicaraguan Schoolchildren: A Detailed Analysis." *Otology & Neurotology* 41, no. 3 (2020): 299-307.
- Military Health System Communications Office (2019). "Portable system demonstrates capability to save hearing downrange"

2017

- Brungart, D., Schurman, J., Konrad-Martin, D., Watts, K., Buckey, J., Clavier, O., Dille, M. F. (2017). Using tablet-based technology to deliver time-efficient ototoxicity monitoring. *International Journal of Audiology*, 1-9.
- Meinke, D. K., Norris, J. A., Flynn, B. P., & Clavier, O. H. (2017). Going wireless and booth-less for hearing testing in industry. *International Journal of Audiology*, 56(sup1), 41-51.

WAHTS Features and Capabilities

WAHTS Features and Capabilities

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per hearing test

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per test
Multi-Person Testing	<ul style="list-style-type: none">- Test multiple individuals simultaneously with or without an internet connection

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per test
Multi-Person Testing	<ul style="list-style-type: none">- Test multiple individuals simultaneously with or without an internet connection
Hearing Protection Fit Testing	<ul style="list-style-type: none">- Calculation of personal attenuation rating (PAR)- Ideal for training what a proper fit feels like- Meets ANSI S12.71 specifications

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per test
Multi-Person Testing	<ul style="list-style-type: none">- Test multiple individuals simultaneously with or without an internet connection
Hearing Protection Fit Testing	<ul style="list-style-type: none">- Calculation of personal attenuation rating (PAR)- Ideal for training what a proper fit feels like- Meets ANSI S12.71 specifications
Flexible & Secure Data Management	<ul style="list-style-type: none">- PDF, CSV- Export to electronic health record systems

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per test
Multi-Person Testing	<ul style="list-style-type: none">- Test multiple individuals simultaneously with or without an internet connection
Hearing Protection Fit Testing	<ul style="list-style-type: none">- Calculation of personal attenuation rating (PAR)- Ideal for training what a proper fit feels like- Meets ANSI S12.71 specifications
Flexible & Secure Data Management	<ul style="list-style-type: none">- PDF, CSV- Export to electronic health record systems
Health Questionnaire	<ul style="list-style-type: none">- Optional health questionnaire- Customizable for streamlined workflow

WAHTS Features and Capabilities

High Attenuation	<ul style="list-style-type: none">- Enables accurate testing in many different environments- Meets OSHA and DoD requirements
Automated Testing	<ul style="list-style-type: none">- Customizable workflow- Manual testing included
Rapid Throughput	<ul style="list-style-type: none">- Average 7 minutes per test
Multi-Person Testing	<ul style="list-style-type: none">- Test multiple individuals simultaneously with or without an internet connection
Hearing Protection Fit Testing	<ul style="list-style-type: none">- Calculation of personal attenuation rating (PAR)- Ideal for training what a proper fit feels like- Meets ANSI S12.71 specifications
Flexible & Secure Data Management	<ul style="list-style-type: none">- PDF, CSV- Export to electronic health record systems
Health Questionnaire	<ul style="list-style-type: none">- Optional health questionnaire- Customizable for streamlined workflow
Remote Testing	<ul style="list-style-type: none">- Test admin can be in a different location as the listener (wearing WAHTS headset) and interact via mobile app

Portable and Durable



Each unit contains:

- WAHTS Headset
- Tablet with software preinstalled
- Output check stand
- Quick start guide
- Protective case

Standards and Regulations

Made to meet the highest standards.

Hearing Testing

FDA registered ✓

ANSI S3.6 compliant ✓

OSHA 1910.95 compliant ✓

IEC 60645-1 compliant ✓

Fit Testing

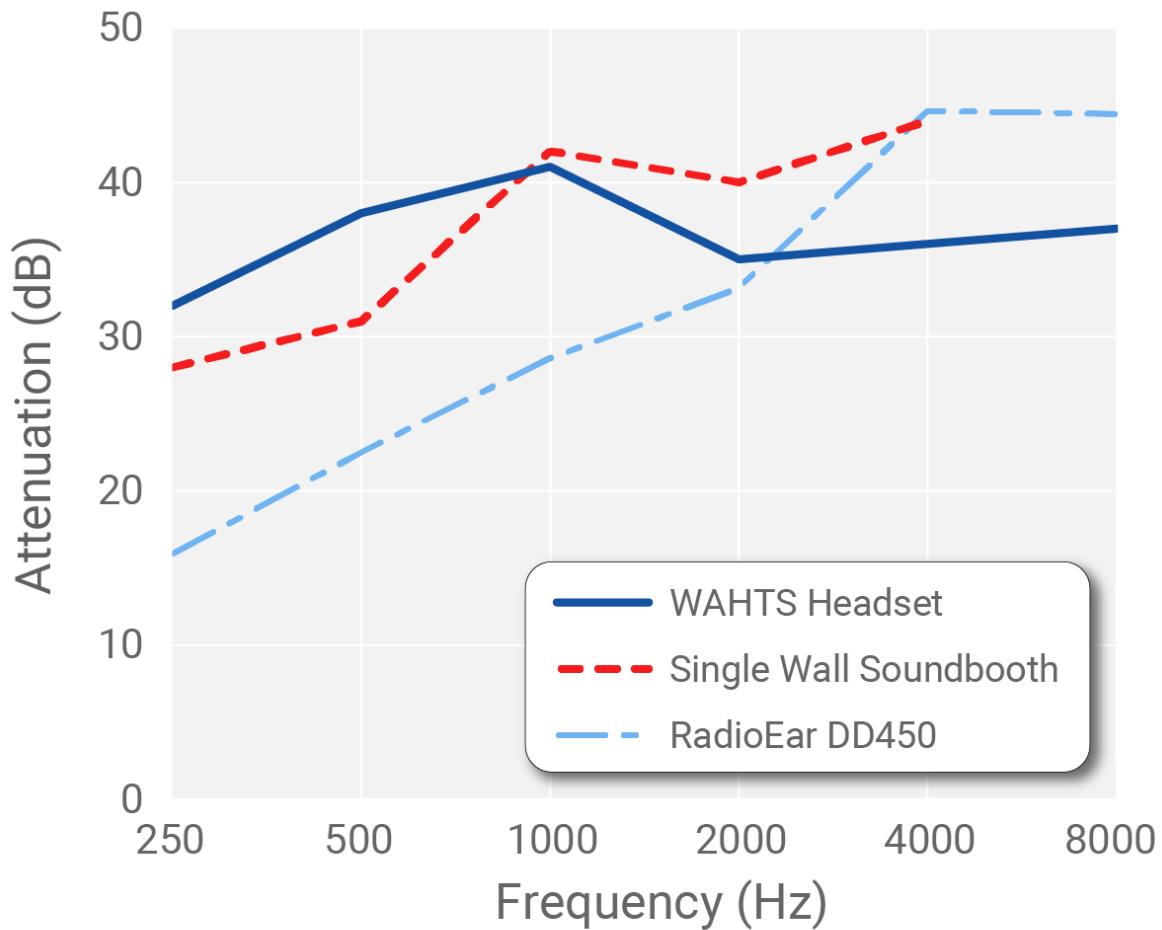
ANSI S12.71 ✓

OSHA 1910.95 ✓

DODI 6055.12 ✓

NIOSH ✓

High Noise Attenuation

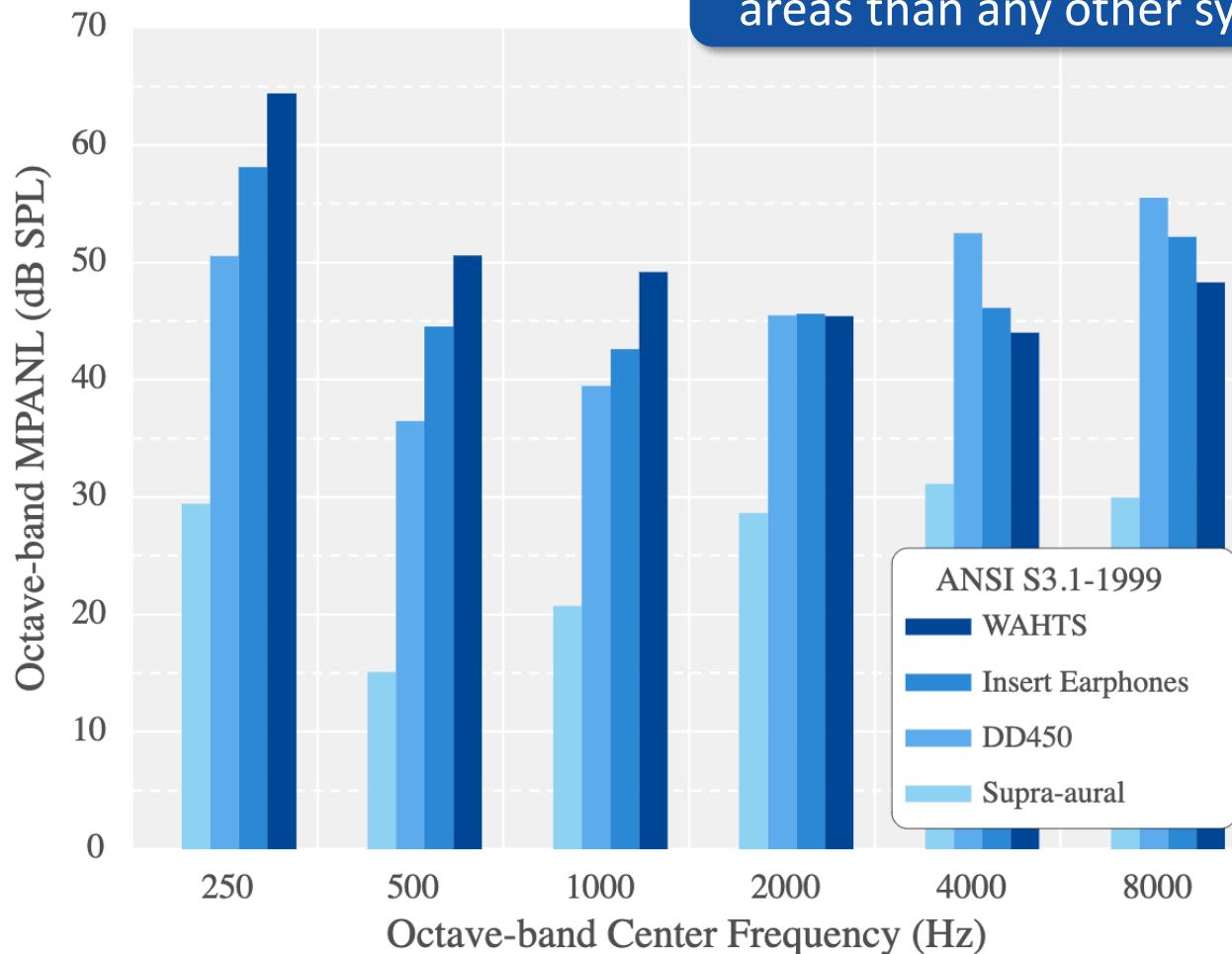


- **More** attenuation than a single wall soundbooth at 250, 500 and equivalent at 1000
- Low frequencies cause the most issues during testing

¹Attenuation measured according to ANSI 12.6-2008 Method A by Michael & Associates, Inc. (NIST NVLAP: 100427-0)

Maximum Permissible Ambient Noise Levels (MPANL)

Allows testing in higher noise areas than any other system!



Background Noise Monitoring

Connect Svantek

Manually enter noise levels, or connect Svantek SV973 for integrated noise monitoring

Background Noise Values

Connect Svantek

Enter Octave-band Noise Levels (dB SPL)

Frequency (Hz)	Measured	MPANL OSHA & ANSI
250	67.6	
500	53.6	
1000	52.7	
2000	48.8	
4000	47.1	
8000	50.4	

Done

Continuous Background Noise Monitoring

Perform Evaluations

TestTaker 3 (3) (525)

Noise (dB S... Regulation: OSHA)

Hearing Test

Manual View Pause Abort

Hearing Test Training Complete



WAHTS™

Multi-Person Testing

- With or without Internet
- Synchronous or asynchronous group testing

Photo credit: Dr. Vikki Bugtong, Ft. Meade

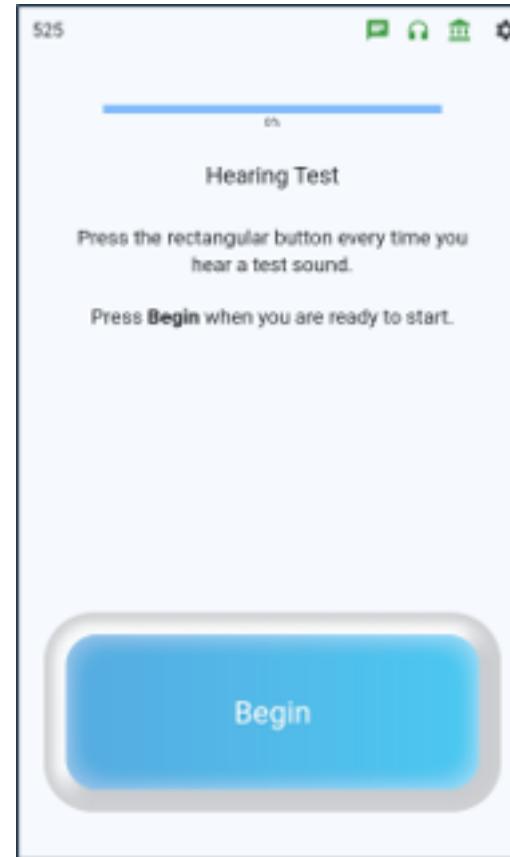
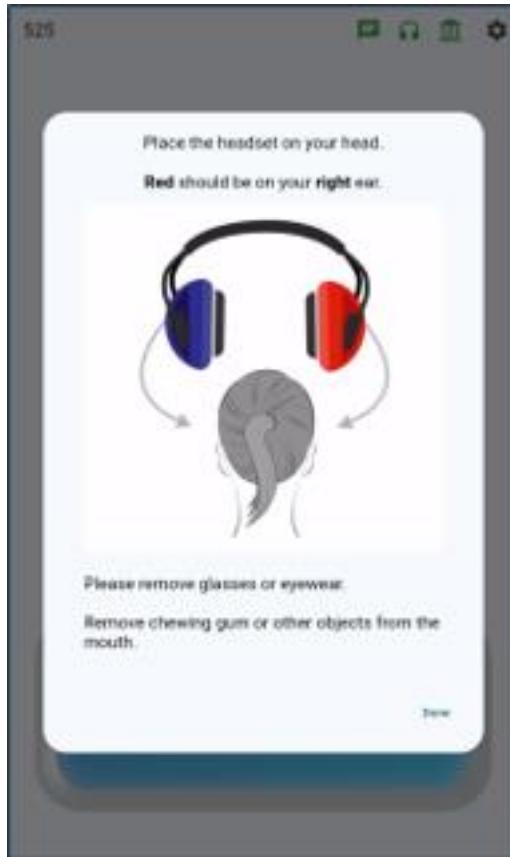
Multi-Person Testing

Oregon Army National Guard Testing



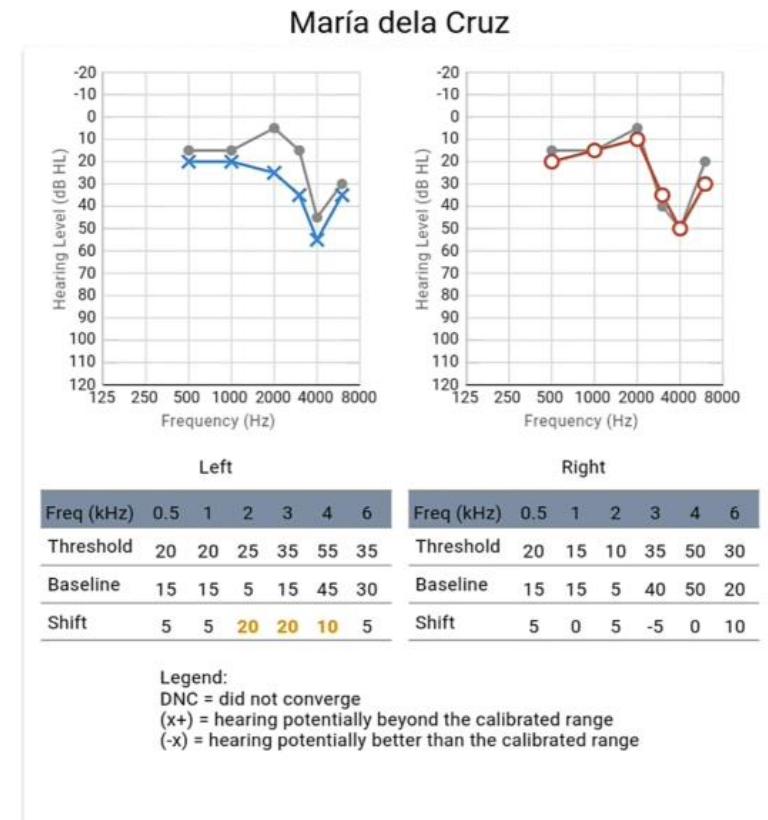
- 50 soldiers per hour in the first two hours of testing
- 12 WAHTS units
- Average test time of seven minutes

Hearing Test: Listener Prompts



OSHA Formatted Results

- Automated shift analysis
- Data stays on the tablet
- Results can be transferred
 - PDF or CSV files
 - Integrated with electronic health records (i.e. Cority)

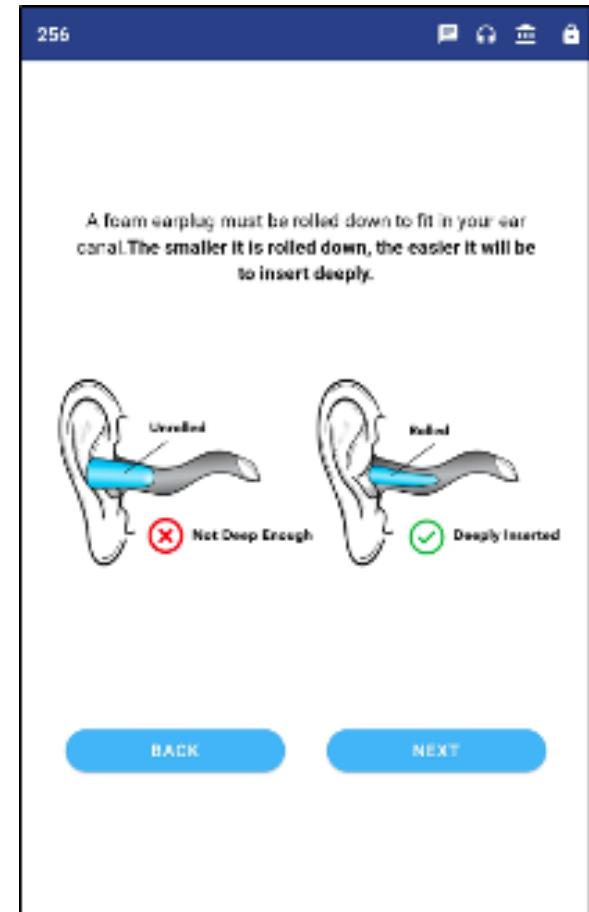


By signing below, I certify that I am the person who took the test.



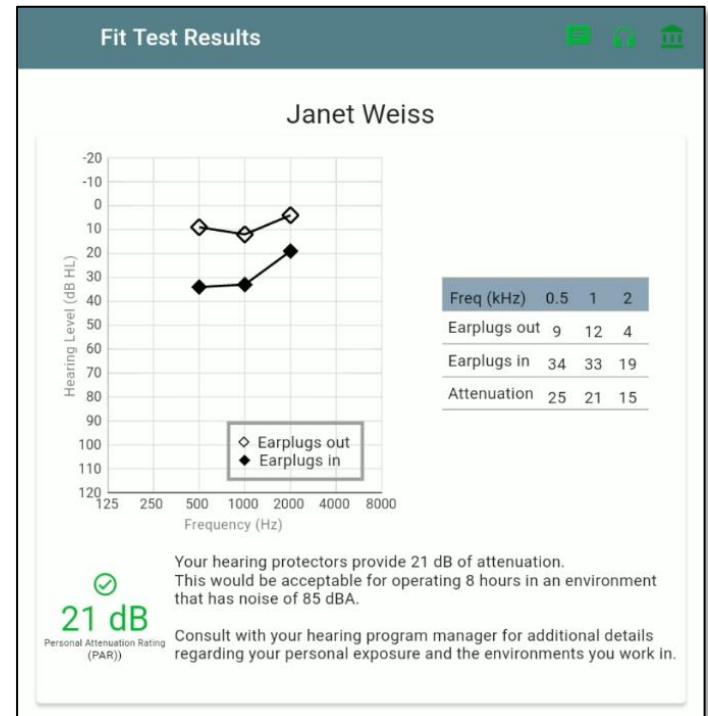
Why is Fit Testing Important?

- NRR is a laboratory value
- Individuals usually receive less attenuation than the listed NRR
- Can be a valuable training tool
- Helps reduce noise-induced hearing loss!



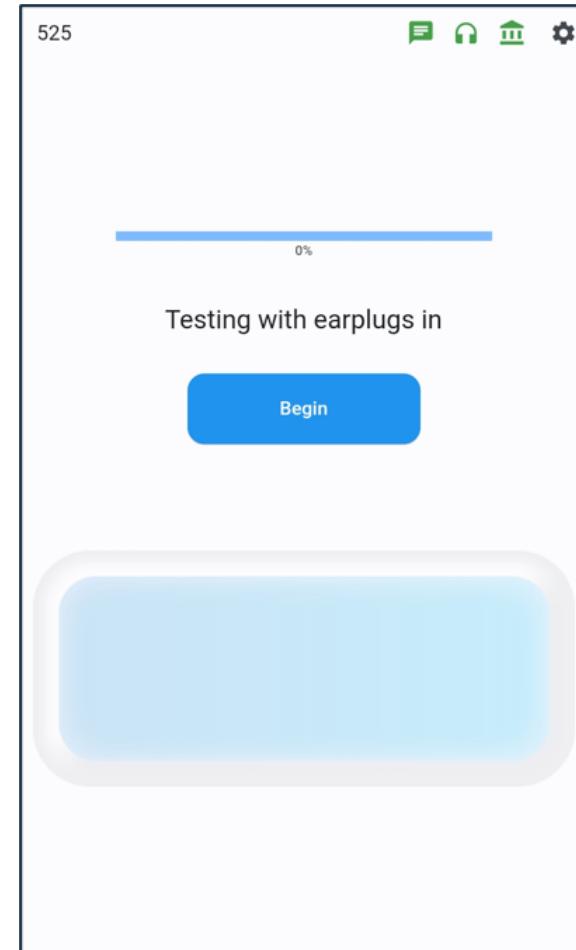
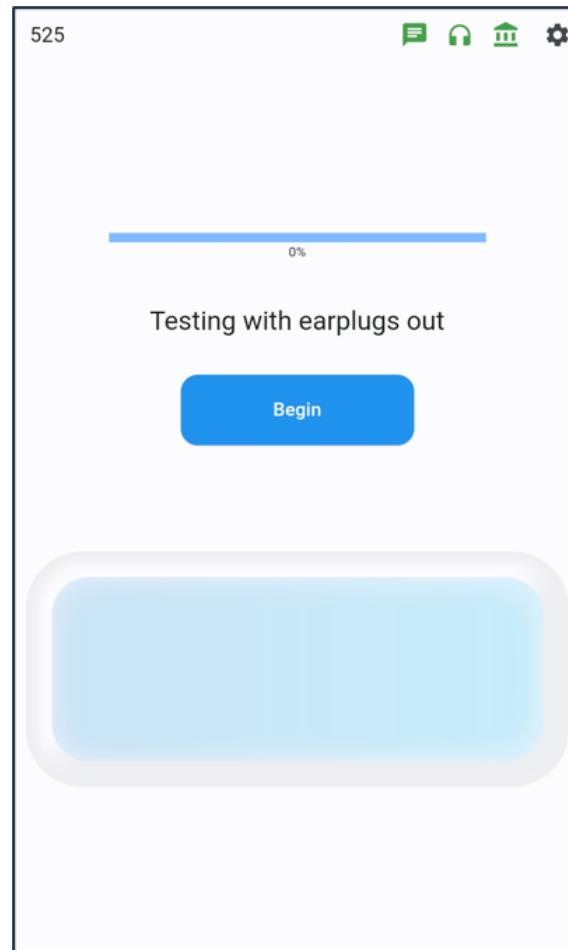
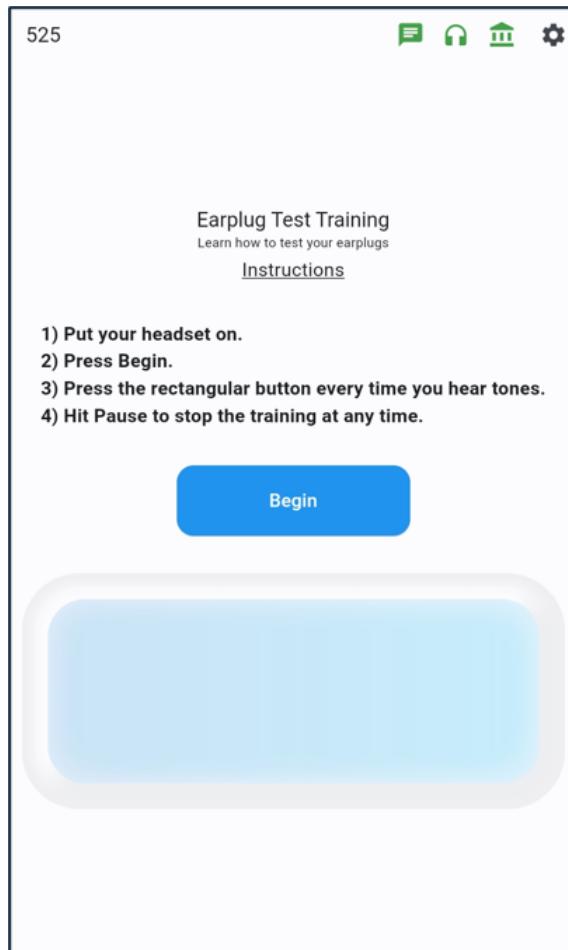
HPD Fit Testing: Ensuring Protection

- *How much protection are they getting?*
- *Are they wearing their earplugs correctly?*
- *Are they properly trained?*
- *Am I taking care of my people?*



Hearing protector fit testing is integrated into the WAHTS system
Quick --- Accurate --- Compatible with all in-ear types and brands

HPD Fit Testing: Listener Prompts



Key Takeaways

1. Boothless technology is transforming the way patient care is delivered
2. Asynchronous multi-person testing can provide rapid through-put for high volume testing
3. Hearing protector fit testing provides an objective measure of protection provided by an earplug and can help decrease +STS rates

Questions?



Contact Information

Email: info@wahtshearing.com

Phone: (603) 945-4510

Website: www.wahtshearing.com

WAHTS Hearing LLC
48 Lafayette Street
Lebanon, NH 03766

References

- Kulinski, D., Makashay, M. J., Dirks, C., Sheffield, B., & Brungart, D. S. (2020). Development of a tablet-based fit test system for military and austere environments. *The Journal of the Acoustical Society of America*, 148(4), 2805-2805.
- Masterson E, Wurzelbacher S, Bushnell T, Tseng C. (2023). Workers' Compensation Costs for Occupational Hearing Loss Claims in the United States, 2009-2013. *Seminars in Hearing*, 44, 4, 412-436.
- Meinke, D. K., Norris, J. A., Flynn, B. P., & Clavier, O. H. (2017). Going wireless and booth-less for hearing testing in industry. *International Journal of Audiology*, 56(sup1), 41-51.
- Sayler S, Rabinowitz P, Cantley L, Galusha D, Neitzel R. (2018). Cost Effectiveness of Hearing Conservation Programs at 14 US Metal Manufacturing Facilities. *International Journal of Audiology*, 57 (SUP1): S3-S11.
- Sheffield B, Kulinski D, Schurman J, Sherlock L, Bugtong V, Spencer M, Caldwell C, Brungart D, Merkley J, and Blank A. (2023). Increasing Hearing Readiness Using Boothless Audiometry. *Military Medicine*, 188, S6:529.
- Themann C, Masterson E. (2019). Occupational noise exposure: A review of its effects epidemiology, and impact with recommendations for reducing its burden. *J Acoust Soc Am*, 146, 3879-3905.