Innovations to Test and Protect Hearing
28 October 2021
1420 – 1520 (ET)

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Stephanie Karch, Ph.D., Au.D. is a research audiologist at the Naval Submarine Medical Research Laboratory (NSMRL) and works as a principal investigator on the Regional Hearing Conservation Program of Record. In this role, she investigates the prevention of auditory injury (e.g., hearing loss, tinnitus) among service members. Specifically, she studies the effect of training and verification of hearing protection in the field, clinic, and laboratory; and the effect of hearing protection on auditory function (e.g., situational awareness, speech intelligibility, and localization).

A graduate in audiology from Gallaudet University, Dr. Karch has over seven years of doctoral level experience in military medical research, having served in Navy and Army medical research laboratories. Previous to her work at NSMRL, she characterized the vestibular function of military aviators, and investigated the comorbidity of auditory injuries and mild traumatic brain injuries. Dr. Karch also holds the American Speech Language Hearing Association's Certificate of Clinical Competence in Audiology (C.C.C.-A.).

Devon Kulinski, Au.D.

Devon Kulinski, Au.D. has supported Department of Defense (DoD) auditory research for the last seven years as a post-graduate research assistant at the Naval Submarine Medical Research Laboratory (NSMRL) and as a doctoral student at National Center for Rehabilitative Auditory Research (NCRAR). He is currently providing contract support as a research audiologist affiliated with Walter Reed National Military Medical Center (WRNMMC). His primary areas of support include the development of tablet-based fit-test systems for hearing protection devices, assessment of military hearing health education programs, and the measurement of acute auditory effects of blast exposure on active duty military personnel.

Disclosures

- Dr. Kulinski has no relevant financial or non-financial relationships to disclose relating to the content of this activity.
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- This work presents results from numerous studies.
  - The study protocol NSMRL.2018.0004 was approved by the Naval Submarine Medical Research Laboratory Institutional Review Board in compliance with all applicable federal regulations governing the protection of human subjects.
  - All other reported study protocols were reviewed by the Naval Submarine Medical Research Laboratory Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects and was determined to not be human subject research.
- This work described herein is/was supported by the U.S. Navy Bureau of Medicine and Surgery funding work unit F1016.
- *Approved for public release: distribution unlimited.*

Innovations to Test and Protect Hearing: Hearing Protection Device Fit-Testing

Stephanie J. Karch, Au.D., Ph.D., C.C.C.-A.

Learning Objectives

At the conclusion of this activity, participants will be able to:

1. Define Hearing Protection Device (HPD) fit-testing.
2. Describe the different HPD fit-test methods, along with the pros/cons of each.
3. Explain the effect of the total number of frequencies used has on the time and accuracy of test results.
4. Discuss the utility of boothless audiometry in a hearing conservation clinic.
5. Identify how boothless audiometry can increase readiness and reduce referrals.

The Naval Submarine Medical Research Laboratory Team

(Facebook/Naval Submarine Medical Research Laboratory, n.d.)

- Dr. Jeremy Federman
  - Principal Investigator
- Mr. Derek Schwaller
  - Research Engineer
- Mr. Joshua Ginsberg
  - Research Associate
- Ms. Iram Qureshi
  - Biostatistican

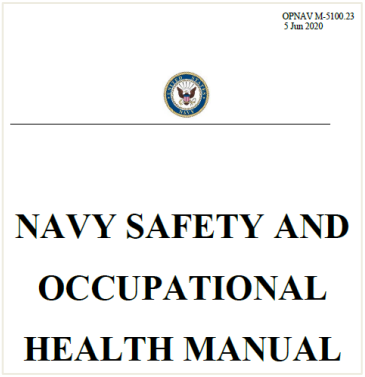
Hearing Protection Device (HPD) Fit-testing, Defined

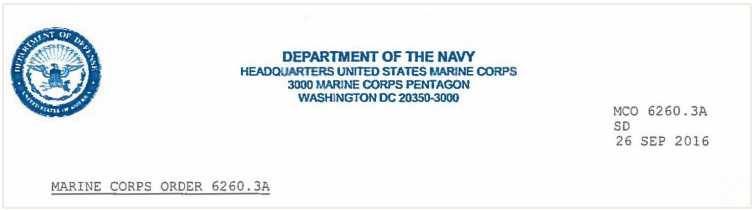
- HPD Fit-testing measures the individual attenuation achieved while wearing a given earplug or earmuff.
- The fit-test system calculates the personal attenuation rating (PAR), an individualized value of the total amount of attenuation achieved.
- Typically this is accomplished by taking two measures:
  - With the HPD donned (i.e., occluded)
  - Without the HPD donned or doffed (i.e., unoccluded)
- PARs are not static!
  - They can vary over time (including the same day) with different types of HPDs, and after training

Like photographs, PARs capture a moment in time.

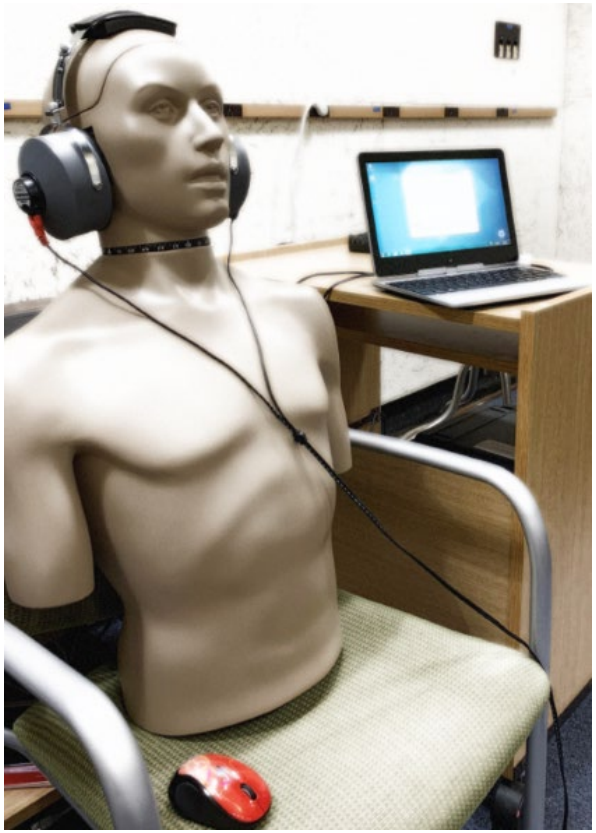
But why?

- HP Checks can be used to:
  - ❑ Train the user
  - ❑ Train the trainer
  - ❑ Validate HPD fit
  - ❑ Document achievable attenuation with issued HPDs
  - ❑ Aid in the selection of appropriate and adequate HPDs
  - ❑ Identify persons who require an alternate size or design





Test Methods Vary



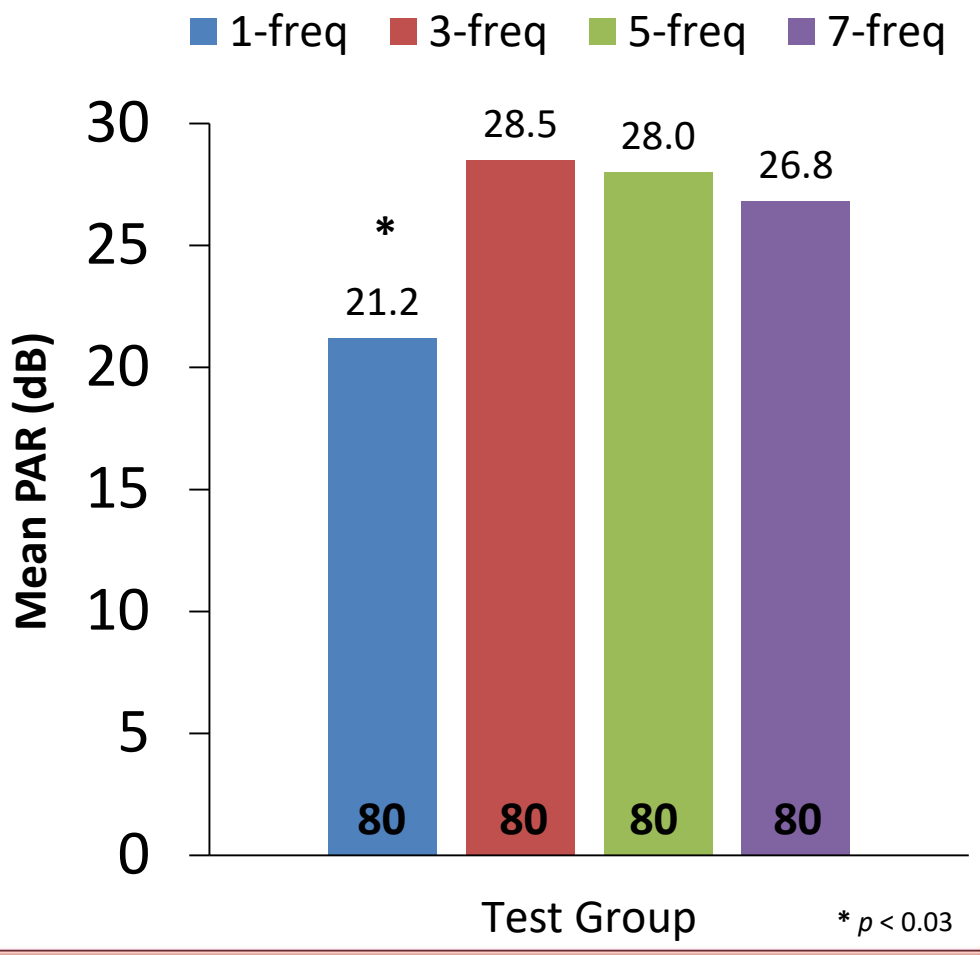
(Photo courtesy of Joshua Ginsberg)

- Commercial off the shelf HPD fit-test systems will use one of three test methods:
  - Real Ear Attenuation at Threshold (REAT) – like*
    - Békésy tracking method
    - Earplugs only
  - Alternating Binaural Loudness Balance (ABLB)
    - Don one earplug at a time, adjust the loudness until noise is perceived to be the same across ears
    - Earplugs only
  - Microphone-in-Real-Ear (MIRE)
    - Earplugs or Earmuffs
    - Uses surrogate earplugs and probe microphones

One, Three, or More: The Effect of Total Number of Tested Frequencies (freq) on PAR[1]

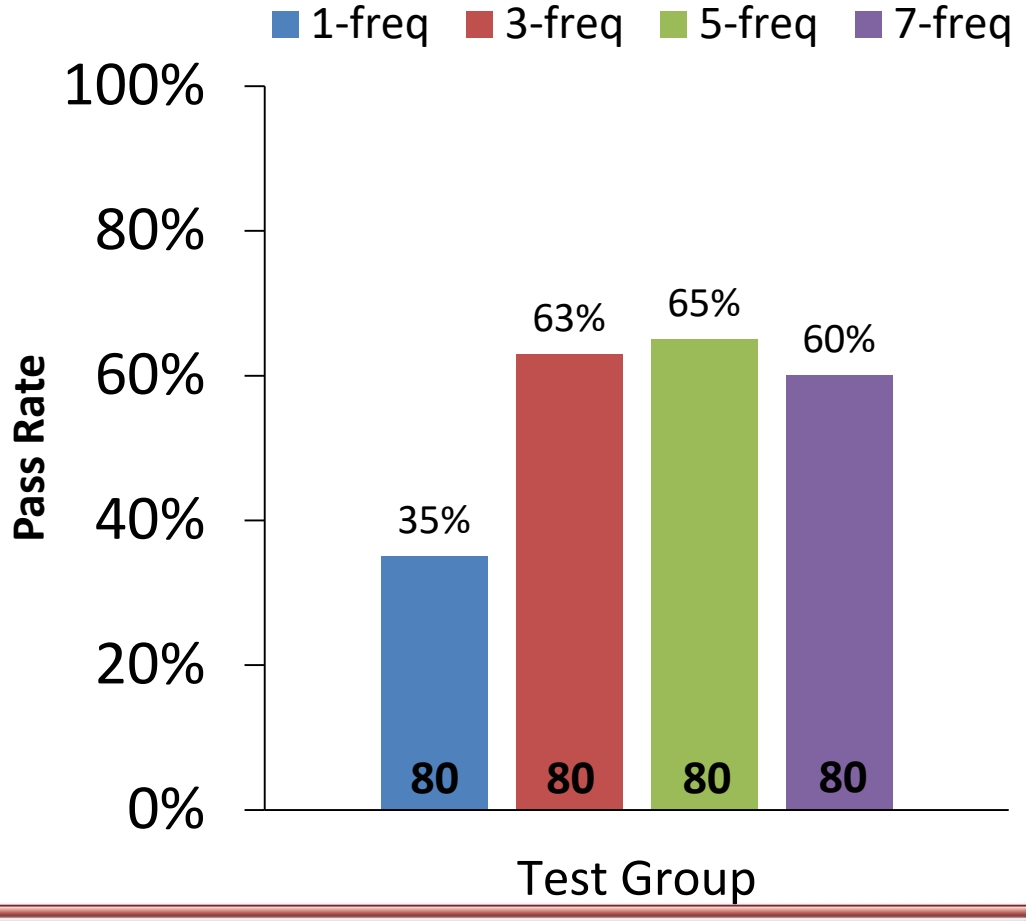
	0.25	0.5	1	2	3	4	8
1-freq		X					
3-freq		X	X	X			
5-freq	X	X	X	X		X	
7-freq	X	X	X	X	X	X	X

Note: Frequencies are displayed in kilohertz (kHz).

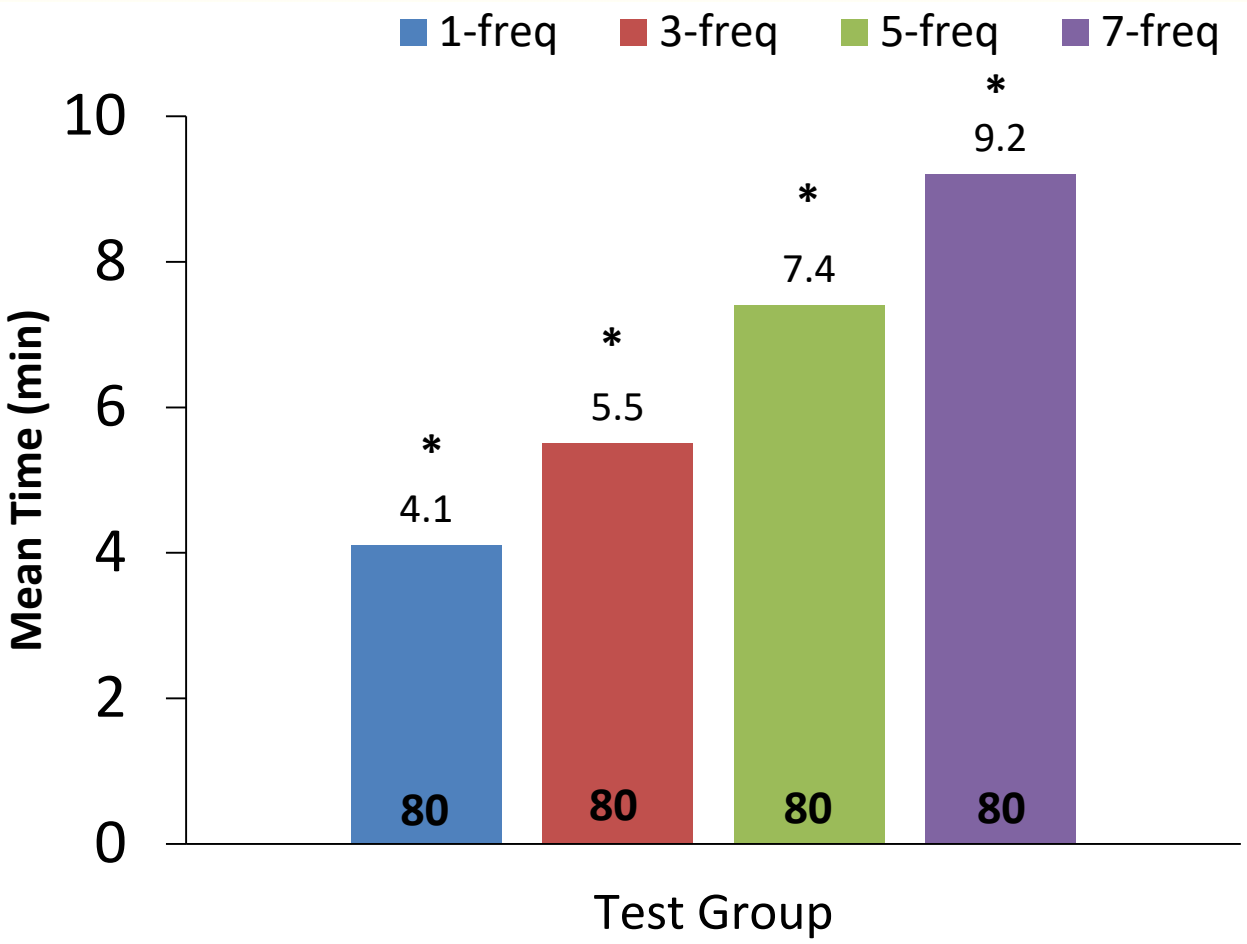


One, Three, or More: The Effect of Total Number of Tested Freq on pass rate[1]

- Pass rate refers to the total number of individuals who achieved the minimum target PAR
  - In this data set, the minimum target PAR was 25 dB attenuation.



One, Three, or More: The Effect of Total Number of Tested Freq on time[1]

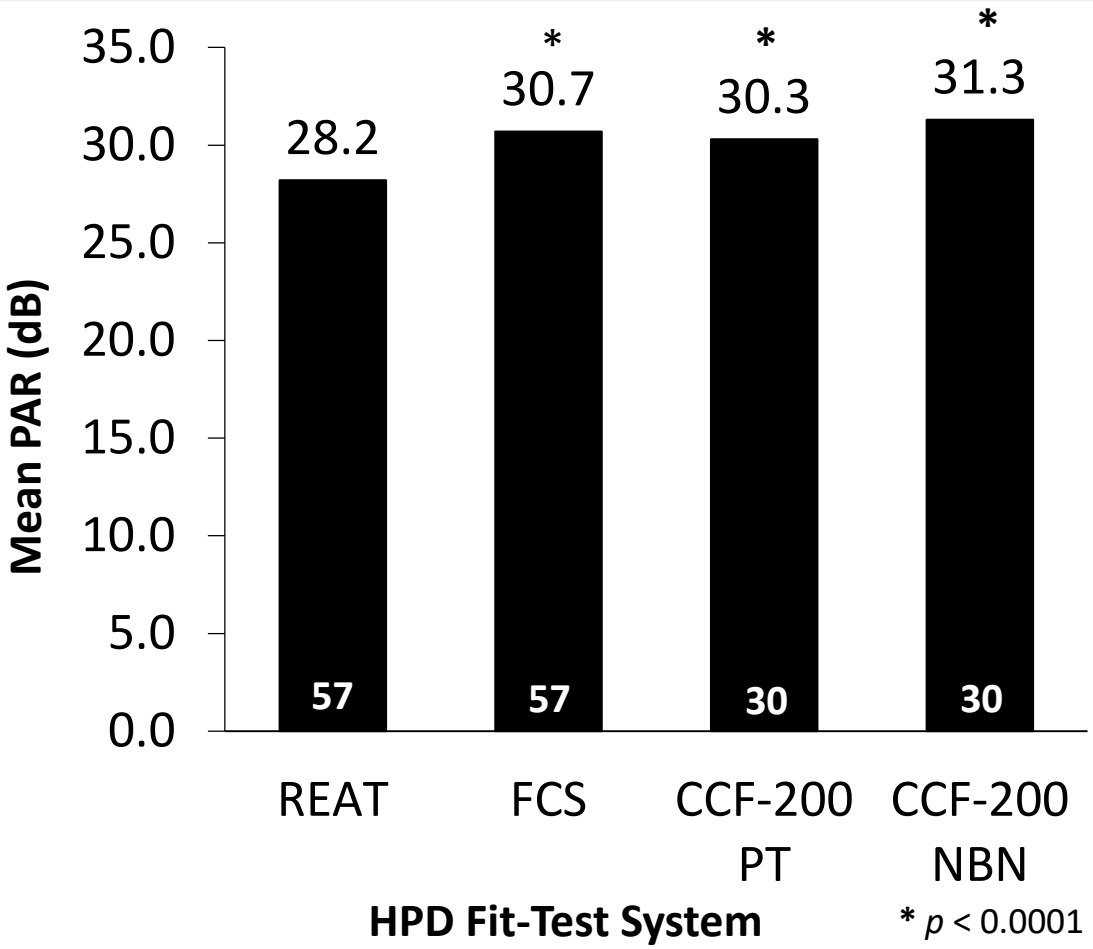


* $p < 0.01$

One Ear or Two… what to do?

- Varies by test system and intent of the tester (e.g., clinician/safety officer, industrial hygienist)
- The gold standard method to test HPD attenuation (i.e., REAT testing) is to test both ears simultaneously.
- Why consider single ear testing?
  - ❑ Calculated PAR for the right and left ears independently
  - ❑ Identify which ear(s) requires an alternate size earplug or HPD design
  - ❑ Asymmetric hearing thresholds at one or more test frequencies
- Single ear testing will take longer than testing both ears simultaneously.

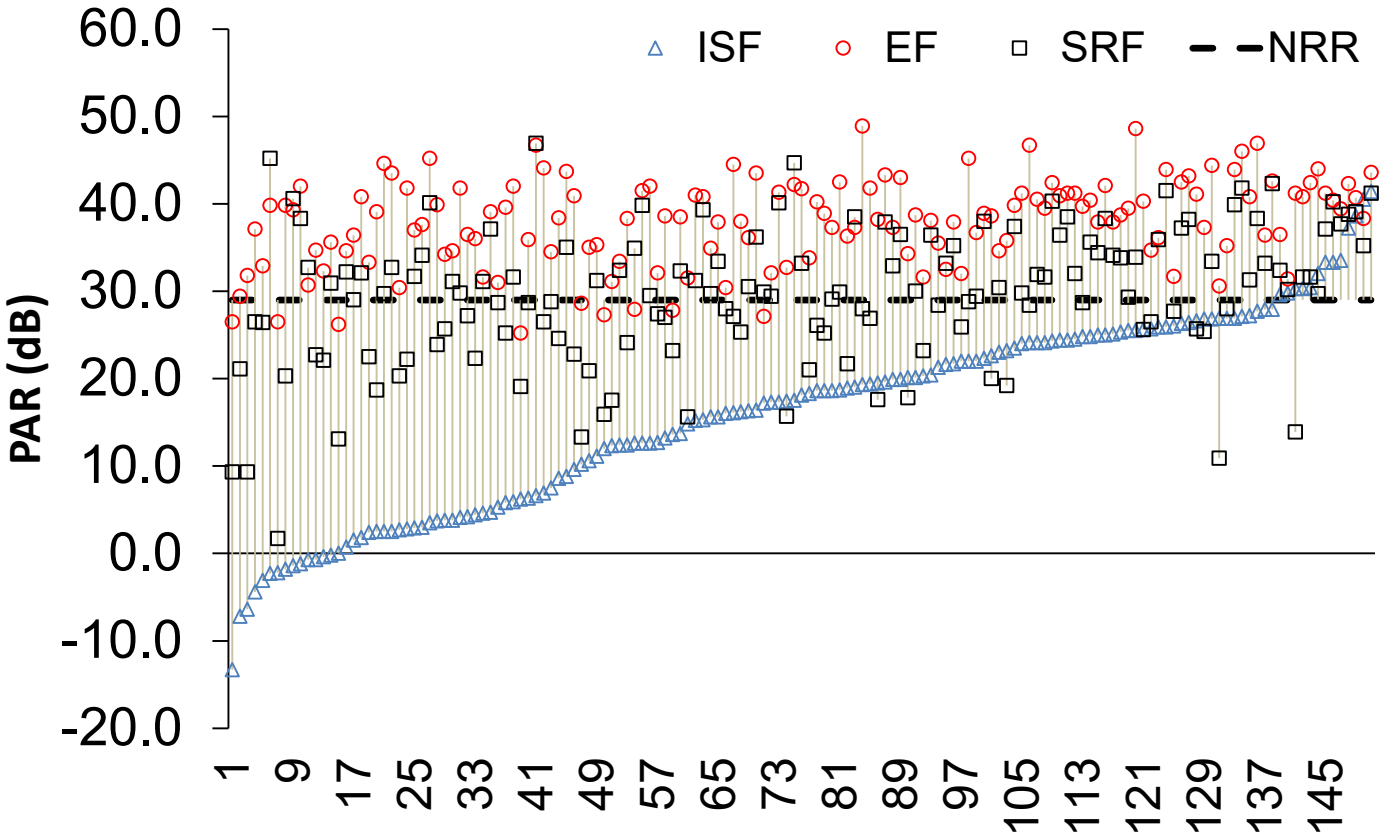
Does the test system influence the PAR?[2]



- While statistically different, the mean PAR across test methods is approx. 3 dB, and therefore not clinically/ operationally significant.

- *Note.*
  - *REAT: Real Ear Attenuation at Threshold*
  - *FCS: FitCheck Solo™*
  - *CCF-200: Computer Controlled Fit-tester*
  - *PT: pure tone*
  - *NBN: narrow band noise*

PARs Document What is Achieved

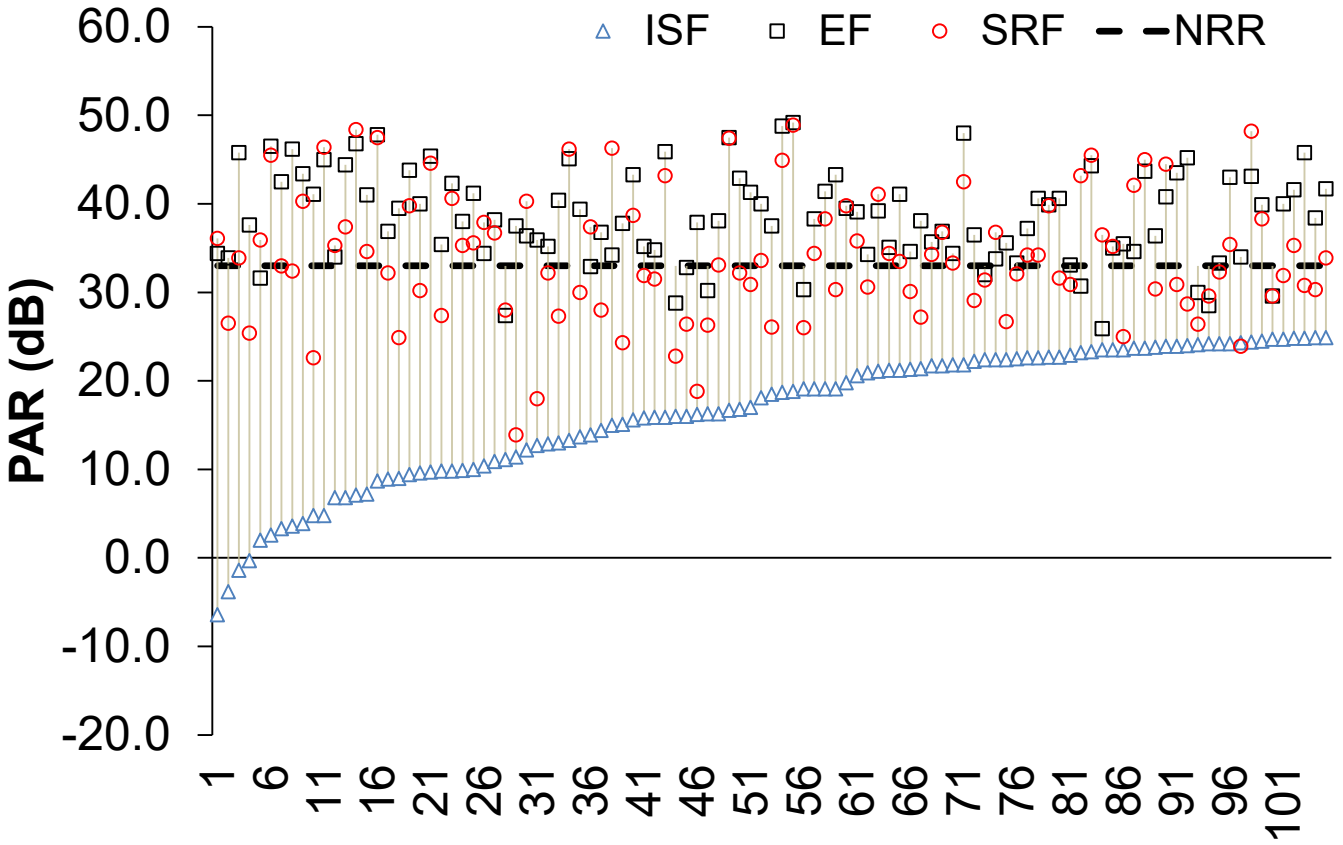


Experiential HPD (eHPD) Fit-Training Method (n = 151). [3]

Note: The HPD tested is a cylindrical foam earplug with a NRR of 29 dB.

ISF – Initial Self-Fit
EF – Expert Fit
SRF – Self Re-Fit
NRR – Noise Reduction Rating

PARs Document What is Achieved



eHPD Fit-Training Method (n = 105).[4]

Note: The HPD tested is a tapered foam earplug with a NRR of 33 dB.

ISF – Initial Self-Fit
EF – Expert Fit
SRF – Self Re-Fit
NRR – Noise Reduction Rating

Calculating Effective Exposure: De-rating vs. PAR

HPD (NRR)	De-rating 50%[5]	Pre-Training PAR of 16.0	Post-eHPD Fit-Training PAR of 29.6
Foam Earplug (33 dB)	87.6	84.6	71.0
Foam Earplug (33 dB) + Earmuff (30 dB)	73.3	--	--

Note. The 8-hr TWA is 100.6 dBA.

- To calculate the effective exposure, the following formulas were used:
  - Single HPD:
    - *De-rating* = TWA dBA – [(NRR – 7) * 0.5];
    - *PAR* = TWA dBA – PAR
  - Double HPD:
    - *De-rating* = TWA dBA – [((NRR – 7) + 5) * 0.5]
- Verifying earplug fit via HPD fit-testing results in the identification that **the earplug alone provides sufficient protection** for the employee's work environment.

Innovations to Test and Protect Hearing: Using Boothless Audiometry in the Clinic (and out) to Enhance Hearing Readiness

Devon Kulinski, Au.D.

Learning Objectives

At the conclusion of this activity, participants will be able to:

1. Describe the utility of boothless audiometry in a hearing conservation clinic
2. Discuss how boothless audiometry can increase readiness
3. Explain how boothless audiometry can reduce referrals

Hearing Conservation Programs (HCPs)

DoD Instruction 6055.12

Hearing Conservation Program (HCP)

(U.S. Department of Defense, 2019)

"Policy is written in order to protect all military personnel and noise-exposed civilian personnel from hearing loss resulting from hazardous occupational and operational noise."

HCP Procedures

- Noise measurement and analysis
- Noise abatement
- Personal hearing protectors
- Hearing Health Education
- **Audiometric monitoring**
  - **Reference and annual testing**
  - **Defense Occupational and Environmental Health Readiness System – Hearing Conservation (DOEHRS-HC)**
- Others: Written plan, implementation, recordkeeping, program evaluation

Defense Occupational and Environmental Health Readiness System – Hearing Conservation (DOEHRS-HC)

HEARING CONSERVATION DATA
(This form is subject to the Privacy Act of 1974 – use Blanket PAS – DD Form 2005)

1. ZIP CODE/APO/FPO/PAS

2. DOD COMPONENT: A (A – Army, N – Navy, F – Air Force, M – Marine Corps, C – Coast Guard, 1 – Other)
3. SERVICE COMPONENT: R (R – REGULAR, V – RESERVE, G - NATIONAL GUARD, 1 – OTHER)
4. SOCIAL SECURITY NUMBER
5. NAME (Last, First, Middle Initial)
6. DATE OF BIRTH
7. SEX (M – MALE, F - FEMALE)
8. PAY GRADE UNIFORM SERVICE
9. PAY GRADE CIVILIAN
10. SERVICE DUTY OCCUPATION CODE: 25B
11. MAILING ADDRESS OF ASSIGNMENT W00129
12. LOCATION – PLACE OF WORK
13. MAJOR COMMAND
14. DUTY TELEPHONE (Include area code) ( ) -
15. AUDIOMETRY: 2
a. PURPOSE (1 – 90 DAY, 2 – ANNUAL, 3 – TERMINATION, 4 - OTHER)

AUDIOMETRIC DATA RE: ANSI S3.6 - 1989	LEFT 500	LEFT 1000	LEFT 2000	LEFT 3000	LEFT 4000	LEFT 6000	RIGHT 500	RIGHT 1000	RIGHT 2000	RIGHT 3000	RIGHT 4000	RIGHT 6000
b. CURRENT AUDIOGRAM DATE: 26-MAR-2021	10M	5M	5M	35M	35M	25M	10M	15M	30M	25M	30M	15M
c. REFERENCE AUDIOGRAM DATE: L: 21-MAR-2018 R: 21-MAR-2018	10M	10M	10M	20M	20M	15M	10M	5M	10M	20M	25M	0M
d. SIGNIFICANT THRESHOLD SHIFT (STS) L: 1 R: 2+ (1 – NO, 2 - YES) / e. THRESHOLD SHIFT ---------->		-5	-5	15	15			10	20	5	5	

f. REMARKS (Include Exposure Data)
Steady Noise Exp(TWA dBA): Not Entered, Impulse Noise Exp(dBP): Not Entered, H-1, Other HPD: Other, HPD Fit Today,Health Ed Prov,Tinnitus.

g. TYPE OF PERSONAL HEARING PROTECTION USED: 6 (1 – SINGLE FLANGE (V5-1R), 2 – TRIPLE FLANGE, 3 – HAND FORMED EARPLUG, 4 – EAR CANAL CAPS, 5 – NOISE MUFFS, 6 – OTHER, 7 - NONE)

https://www.dvidshub.net/image/6480243/audiology

- All SMs enrolled in Hearing Conservation Program require annual hearing tests
- DOEHRS-HC: Collects, maintains, compares and reports hearing conservation, hearing readiness and deployment data for Department of Defense personnel
- Typically performed in multi-person booths (up to 8 SMs) with automated test

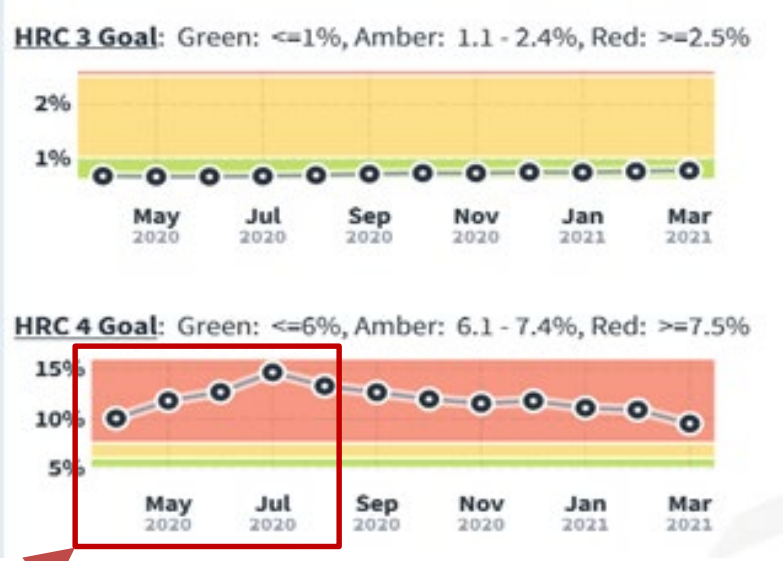
- **COVID-19 had a significant impact on the ability for hearing conservation clinics to maintain hearing readiness**
  - Army Hearing Program (AHP) best practice guidelines (TA 538-0520) to reduce community transmission
  - Resulting in significant backlog of personnel needing annual hearing exam

Hearing Readiness Classification

HEARING CLASSIFICATION	INFORMATION SUMMARY
Hearing Readiness Class 1	Soldier's unaided hearing is within H-1 standards for both ears (IAW AR 40-501). Annual audiogram (DD Form 2216 or DD Form 2215) within 12 months.
Hearing Readiness Class 2	Soldier has DD Form 2215 or 2216 within 12 months. Soldier's unaided hearing is within H-2 or H-3 standards (IAW AR 40-501). H-2 and H-3 Soldiers must have a documented permanent hearing profile entered in e-Profile (DA Form 3349) and MEDPROS Web Data Entry (MWDE). H-2 Soldiers must have a complete audiological evaluation on record. H-3 Soldiers must have a complete audiological evaluation and Speech Recognition In Noise Test (SPRINT) on record. H-3 Soldiers must have completed a MAR2. If required, Soldier has prescribed hearing aid(s) and 6 month supply of batteries on hand.
Hearing Readiness Class 3	Soldier has DD Form 2215 or 2216 within 12 months and unaided hearing is within H-2 or H-3 standards. • HRC 3A – Complete audiological evaluation has not been completed • HRC 3B – e-Profile (DA Form 3349) and MWDE not complete • HRC 3C – MAR2 not complete • HRC 3D – Does not meet standards with hearing aid • HRC 3E – Soldier meets HRC 2 standards, but does not have required hearing aid(s) and 6 month supply of batteries on hand
Hearing Readiness Class 4	Soldier has not received a DOEHRS-HC audiogram within 12 months, or received DOEHRS-HC audiogram but requires a follow-up test. • HRC 4A – Soldier's most recent audiogram is more than 12 months old • HRC 4B – Audiogram within 12 months, however, STS identified and follow-up hearing test is required • HRC 4C – Soldier demonstrated a STS and did not complete follow-up testing within 90 days of the periodic hearing test

https://phc.amedd.army.mil/PHC%20Resource%20Library/TIP_No_51-075-0517_DOEHRS-HCandMEDPROSHearingReadinessClassificationDiscrepancies.pdf#search=hearing%20readiness%20classification

Hearing Readiness during COVID-19



	APR 2020	MAY 2020	JUN 2020	JUL 2020	AUG 2020	SEP 2020	OCT 2020	NOV 2020	DEC 2020	JAN 2021	FEB 2021	MAR 2021
Compo 1 (AC) - Percent Not Hearing Ready - HRC 3	0.66%	0.65%	0.65%	0.66%	0.68%	0.7%	0.72%	0.72%	0.74%	0.73%	0.75%	0.76%

	APR 2020	MAY 2020	JUN 2020	JUL 2020	AUG 2020	SEP 2020	OCT 2020	NOV 2020	DEC 2020	JAN 2021	FEB 2021	MAR 2021
Compo 1 (AC) - Percent Not Hearing	9.96%	11.74%	12.61%	14.59%	13.22%	12.58%	11.9%	11.46%	11.72%	11.02%	10.82%	9.43%

Peak HRC-4 of **14.6%** in July 2020

- target is <6%
- pre-pandemic was ~5%

"Medically Ready Force…Ready Medical Force"

The Coronavirus Aid, Relief, and Economic Security (CARES) Act Funding

38 tech positions across 28 locations

RHC-Atlantic

Region	Location	Total Positions	Onboard	In Progress	Candidate Needed
RHC-A	Aberdeen Proving Ground	3	3	-	-
RHC-A	Aberdeen Proving Ground - Edgewood	1	1	-	-
RHC-A	Carlisle Barracks	1	1	-	-
RHC-A	Fort Campbell	4	3	-	1
RHC-A	Fort Detrick	1	1	-	-
RHC-A	Fort Jackson	2	2	-	-
RHC-A	Fort Knox	1	1	-	-
RHC-A	Fort McNair	1	-	1	-
RHC-A	Fort Meade	1	1	-	-
RHC-A	Fort Myer	1	1	-	-
RHC-A	Fort Stewart	2	1	-	1
RHC-A	Letterkenny AD	1	-	1	-
RHC-A	New Cumberland	1	1	-	-
	TOTAL	**20**	**17 (85%)**	**2 (10%)**	**2 (10%)**

RHC-Pacific

Region	Location	Total Positions	Onboard	In Progress	Candidate Needed
RHC-P	TAMC	1	-	1	-
	TOTAL	**1**	**0 (0%)**	**1 (100%)**	**0 (0%)**

RHC-Central

Region	Location	Total Positions	Onboard	In Progress	Candidate Needed
RHC-C	Fort Bliss	3	3	-	-
RHC-C	Fort Hood	2	2	-	-
RHC-C	Fort Huachuca	1	1	-	-
RHC-C	Fort Irwin	1	1	-	-
RHC-C	Fort Leonard Wood	1	-	1	-
RHC-C	Fort Polk	2	-	2	-
RHC-C	Fort Sam Houston	1	1	-	-
	TOTAL	**11**	**8 (73%)**	**3 (27%)**	**0 (0%)**

RHC-Europe

Region	Location	Total Positions	Onboard	In Progress	Candidate Needed
RHC-E	USAG Baumholder	1	1	-	-
RHC-E	USAG Grafenwoehr	1	1	-	-
RHC-E	USAG Hohenfels	1	1	-	-
RHC-E	USAG Kleber	1	1	-	-
RHC-E	USAG Wiesbaden	1	1	-	-
RHC-E	USAG Vicenza	1	1	-	-
	TOTAL	**6 (100%)**	**6 (100%)**	**0 (0%)**	**0 (0%)**

Boothless audiometry benefits

- In the context of a pandemic, boothless audiometry enables testing to be completed at accelerated rates in many ways improved from the standard booth:

  (1) permitting social distancing practices during testing (i.e., 6+ feet of separation)

  (2) keeping personnel out of confined spaces where air exchange rates may be limited

  (3) increasing the number of personnel who can be tested simultaneously by a single hearing technician

  (4) eliminating the need for SMs to travel to a centralized location in order to complete annual hearing test requirements.

“WAHTS SOP” Development (Wireless Automated Hearing Test System)

- Scope of Practice needed for a DOEHRS-HC equivalent test to augment Army Hearing Readiness during COVID-19 response and recovery
  1. **Development of custom protocol**
     - reflect Benson-CCA (Computer Controlled Audiometer) 200 specs
  2. **Guidance on test environment**
     - Maximum Permissible Ambient Noise Levels (MPANL), Calibrations
  3. **Test administration and advanced features**
     - Test Battery, automated masking, additional HCON features

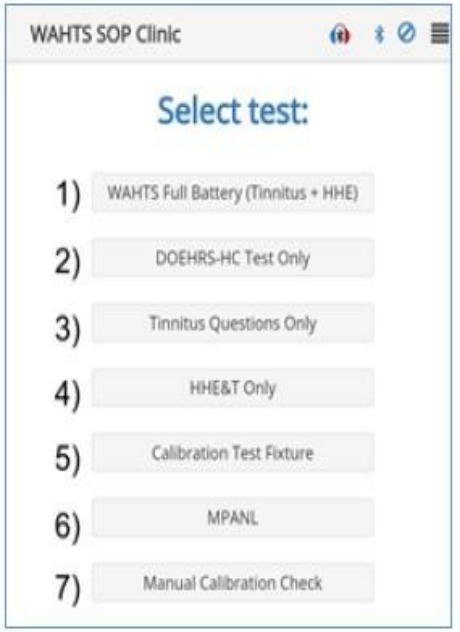
(https://www.edareinc.com/edare/wireless-automated-hearing-test-system-wahts/, n.d.)

APPENDIX A: Maximum Permissible Ambient Noise Levels (MPANL) for testing using the Wireless Automated Hearing Testing System

Unless otherwise specified, all measurements reflect dBZ – SPL (Unweighted)

Category	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
GREEN	≤59.6	≤63.2	≤63.4	≤70	≤73.3
AMBER	59.7 – 67.4	63.3 – 71.8	63.5 – 71.6	70.1 – 78	73.4 – 80.5
RED	≥67.5	≥71.9	≥71.7	≥78.1	≥80.6

MPANL for testing using the WAHTS System (measured with Type II SLM with no octave band analysis available)	If using a sound level meter without octave band analysis capability: MPANL will not exceed:	
	≤53 dBZ SPL	27 dBA
	≥54 – 72 dBZ SPL	≥28 – 32 dBA
	> 73 dBZ SPL	> 33 dBA

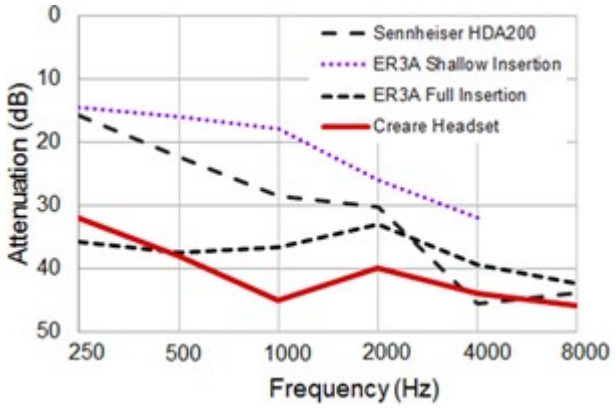


1. Development of custom protocol

Wireless Automated Hearing Test System (WAHTS)

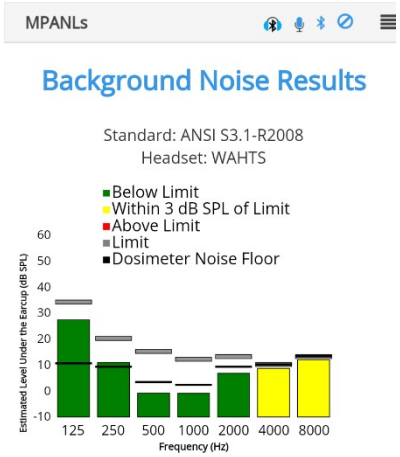
Meinke (2017)
https://www.unco.edu/news/articles/hearing-testing-technology-easy-low-cost-audiology.aspx

https://svantek.com/products/sv-104-personal-noise-dosimeter/



TABSINT

Shapiro (2019)
https://tabsint.org/



2. Guidance on test environment

Maximum Permissible Ambient Noise Levels (MPANLs)

Unless otherwise specified, all measurements reflect dBZ – SPL (Unweighted)

Category	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
GREEN	≤59.6	≤63.2	≤63.4	≤70	≤73.3
AMBER	59.7 – 67.4	63.3 – 71.8	63.5 – 71.6	70.1 – 78	73.4 – 80.5
RED	≥67.5	≥71.9	≥71.7	≥78.1	≥80.6

Guidance for Type I/II SLMs *with* octave band analysis

	If using a sound level meter without octave band analysis capability:	
MPANL for testing using the WAHTS System (measured with Type II SLM with no octave band analysis available)	MPANL will not exceed:	
	≤53 dBZ SPL	27 dBA
	≥54 – 72 dBZ SPL	≥28 – 32 dBA
	> 73 dBZ SPL	> 33 dBA

Guidance for Type II SLMs *without* octave band analysis

MEASURED SOUND LEVEL

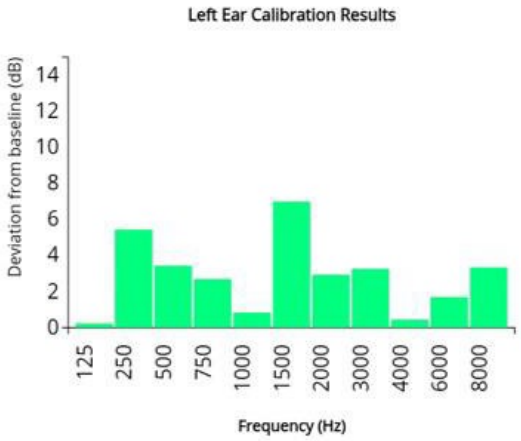
Overall level	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz

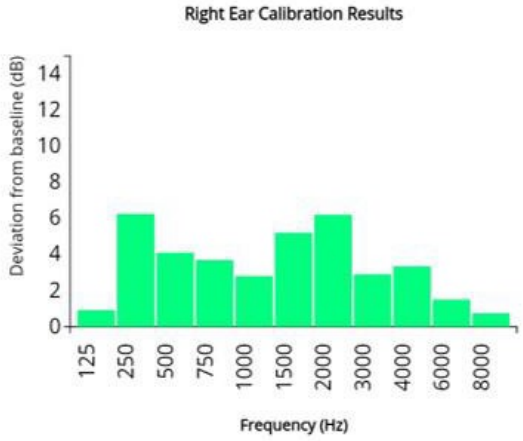
Sound levels are: GREEN AMBER RED

Technician will measure ambient noise and record on template

2. Guidance on test environment

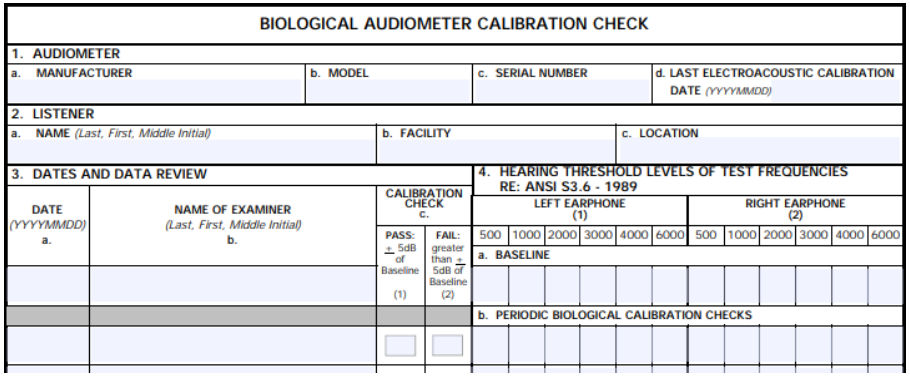
Daily Calibration





Calibration Results Table

Frequency (kHz)	0.5	1	2	3	4	6	8
Left (dB)	-3	0	-2	-3	0	-1	-3
Right (dB)	-4	2	-6	-2	-3	-1	0



BIOLOGICAL AUDIOMETER CALIBRATION CHECK

1. AUDIOMETER

a. MANUFACTURER	b. MODEL	c. SERIAL NUMBER	d. LAST ELECTROACOUSTIC CALIBRATION DATE (YYYYMMDD)

2. LISTENER

a. NAME (Last, First, Middle Initial)	b. FACILITY	c. LOCATION

3. DATES AND DATA REVIEW

4. HEARING THRESHOLD LEVELS OF TEST FREQUENCIES RE: ANSI S3.6 - 1989

DATE (YYYYMMDD) a.	NAME OF EXAMINER (Last, First, Middle Initial) b.	CALIBRATION CHECK c. PASS: ± 5dB of Baseline (1)	CALIBRATION CHECK c. FAIL: greater than ± 5dB of Baseline (2)	LEFT EARPHONE (1) 500	1000	2000	3000	4000	6000	RIGHT EARPHONE (2) 500	1000	2000	3000	4000	6000
				a. BASELINE											
				b. PERIODIC BIOLOGICAL CALIBRATION CHECKS											

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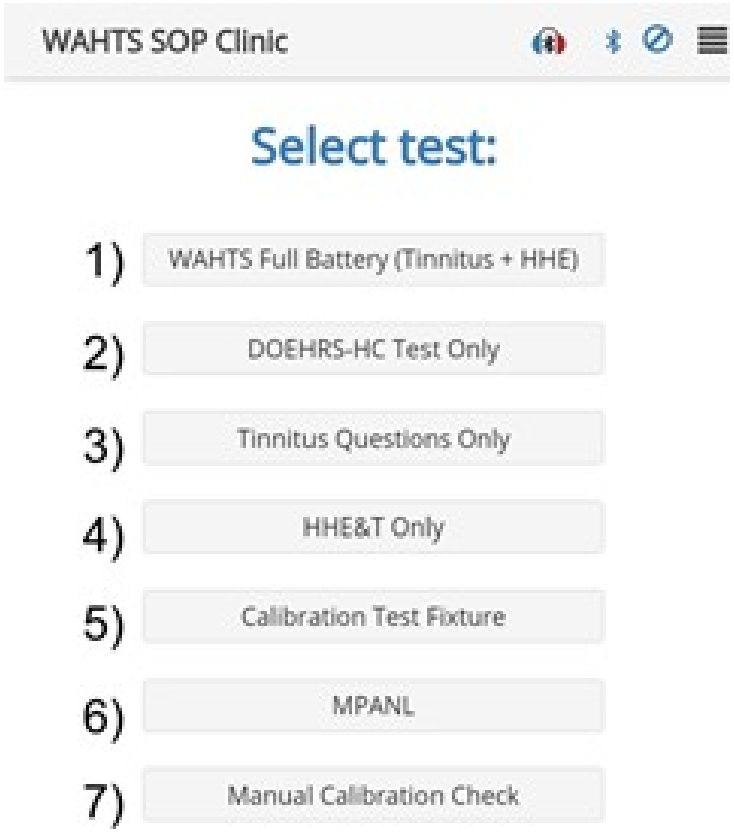
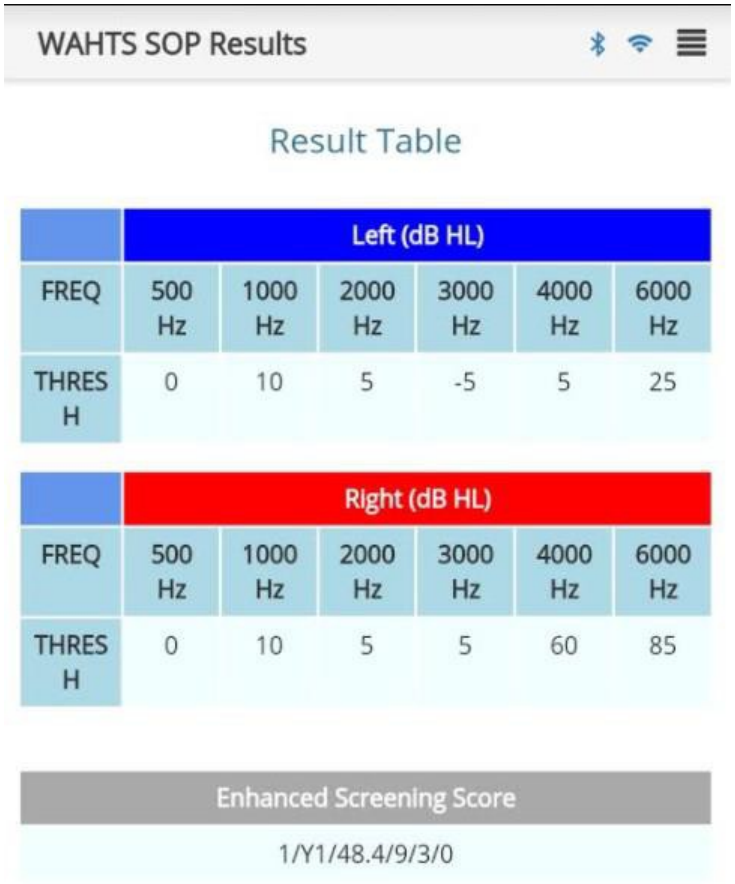
3. Test Administration & Advanced Features





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Interfacing with DOEHRS-HC Data Repository

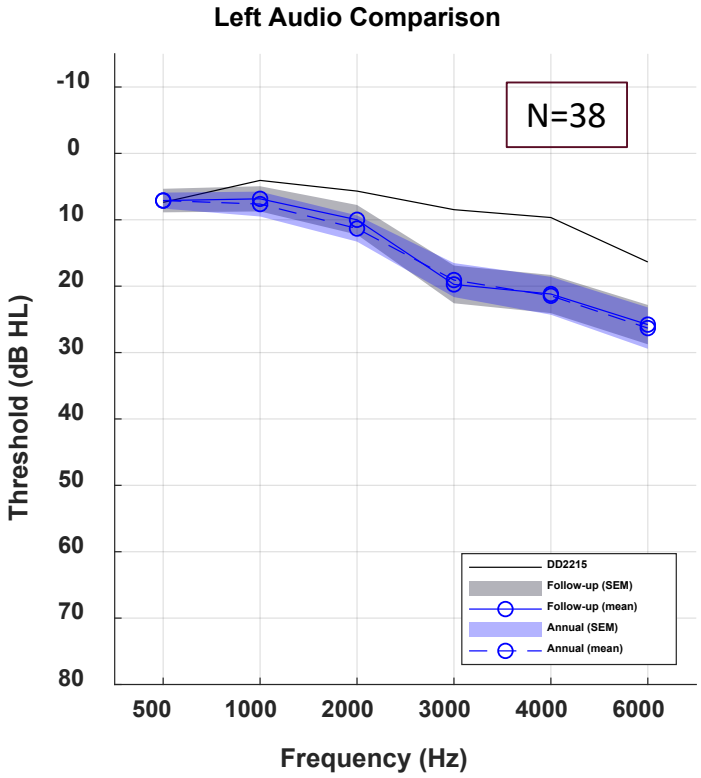
- Audiometric results are manually transposed from the tablet Results Table into the medical encounter in DOEHRS-HC Data Repository

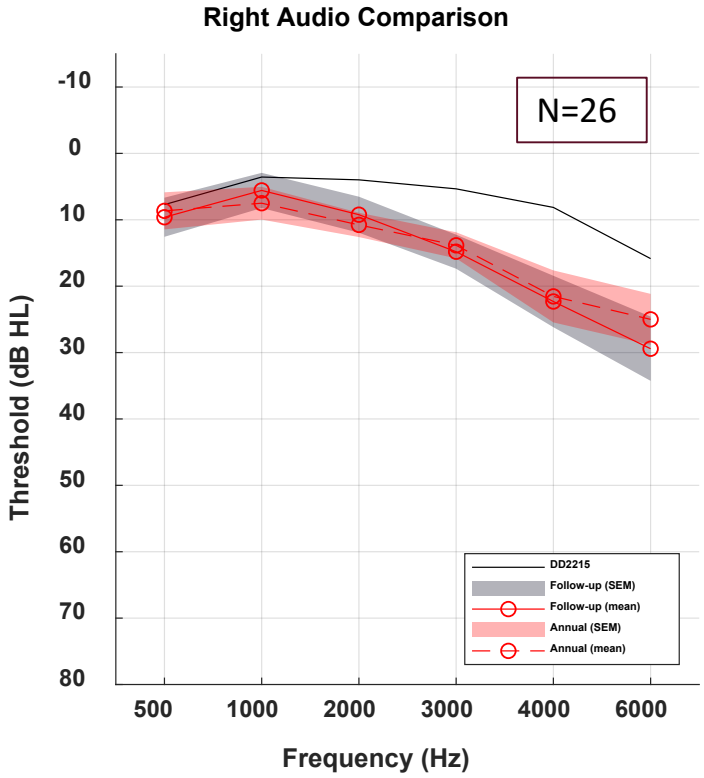
- The DOEHRS-HC software automatically calculates against reference audiogram of record (DD2215) to determine:
  - ❑ Significant Threshold Shifts (STS) ***most common**
    - ≥ 10 dB difference @ 2, 3, 4 kHz
  - ❑ Other reasons for referral (contralateral masking, tinnitus, other medical referral)

- WAHTS never used to re-establish baseline
  - ❑ SMs will need to return for testing with standard DOERHS-HC testing or manual audiometry performed by audiologist to confirm any change in hearing reported by WAHTS

WAHTS vs DOEHRS-HC Follow-up

Data collected between March – June 2021





SMs identified with Positive STS (via WAHTS) referred for follow-up testing with standard DOEHRS-HC procedure (CCA-200)

Positive STS Comparison

WAHTS(annual) vs CCA (f/u1)

Frequency (kHz)	.5	1	2	3	4	6	All
Difference (dB HL)							
Mean difference (dB HL)	-0.40	1.90	2.80	-2.60	-1.90	-2.40	-0.43
Standard deviation (dB HL)	5.33	5.97	6.78	6.64	9.09	8.76	7.10
Absolute differences (dB HL)							
Mean absolute difference	3.80	4.50	5.80	5.20	6.30	7.20	5.47
Standard deviation	3.72	4.32	4.45	4.84	6.76	5.46	4.92

Table 1: Differences between WAHTS (annual test) and CCA-200 (follow-up) threshold estimates

CCA (annual) vs CCA (f/u1)

Frequency (kHz)	.5	1	2	3	4	6	All
Difference (dB HL)							
Mean difference (dB HL)	-0.19	1.11	1.67	1.02	1.20	-0.83	0.66
Standard deviation (dB HL)	7.07	4.73	8.74	9.59	9.41	9.85	8.23
Absolute differences (dB HL)							
Mean absolute difference	4.81	2.78	6.11	6.39	6.94	6.94	5.66
Standard deviation	5.13	3.97	6.42	7.17	6.40	6.97	6.01

Table 2: Differences between CCA-200 (annual test) and CCA-200 (follow-up) threshold estimates

Positive STS Rate (JUN – SEP 2019)
Ft. Meade MEDDAC

DOEHRS-HC Data Repository	Positive Significant Threshold Shift by Zip/PAS/UIC Jun-01-2019 to Sep-30-2019	16-Sep-2021

Selected ZIPPASUIC(s): 20755 - Ft Meade - Army

Testing Inst. Name - Zip/PAS/UIC	Person DoD	N w/Periodic	N w/STS on Periodic	N TTS	N PTS	N Reestab DD 2215	N No F/U 1 Test	N No F/U 2 Test	N F/U 1 w/STS Resolved	N F/U 2 w/STS Re-solved	N New Cases w/STS	% w/STS on Per-iodic	% TTS	% PTS	% Re-estab DD 2215	% No Test on F/u1	% No Test on F/u2	% STS Re-solved on F/u1	% STS Re-solved on F/u2	% New Cases w/STS	% New Cases Total
Military & Civilian																					
Ft Meade - 20755																					
	Air Force	55	10	3	7	5	2	2	2	1	5	18.18%	5.45%	12.73%	166.67%	20.00%	33.33%	20.00%	16.67%	50.00%	9.09%
	Army	1,601	94	54	40	14	25	0	46	8	19	5.87%	3.37%	2.50%	93.33%	26.60%	0.00%	48.94%	34.78%	20.21%	1.19%
	Marine Corps	147	6	3	3	2	1	0	3	0	3	4.08%	2.04%	2.04%	100.00%	16.67%	0.00%	50.00%	0.00%	50.00%	2.04%
	Navy	124	10	6	4	1	3	0	6	0	1	8.06%	4.84%	3.23%	100.00%	30.00%	0.00%	60.00%	0.00%	10.00%	0.81%
	Other	8	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		1	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Totals: Ft Meade - 20755		1,936	120	66	54	22	31	2	57	9	28	6.20%	3.41%	2.79%	104.76%	25.83%	6.25%	47.50%	28.12%	23.33%	1.45%
Grand Totals:		1,936	120	66	54	22	31	2	57	9	28	6.20%	3.41%	2.79%	104.76%	25.83%	6.25%	47.50%	28.12%	23.33%	1.45%

Positive STS Rate (JUN – SEP 2021)
Ft. Meade MEDDAC

DOEHRS-HC Data Repository

Positive Significant Threshold Shift by Zip/PAS/UIC
Jun-01-2021 to Sep-30-2021

16-Sep-2021

Selected ZIPPASUIC(s): 20755 - Ft Meade - Army

Testing Inst. Name - Zip/PAS/UIC	Person DoD	N w/Periodic	N w/STS on Periodic	N TTS	N PTS	N Reestab DD 2215	N No F/U 1 Test	N No F/U 2 Test	N F/U 1 w/STS Resolved	N F/U 2 w/STS Re-solved	N New Cases w/STS	% w/STS on Per-iodic	% TTS	% PTS	% Re-estab DD 2215	% No Test on F/u1	% No Test on F/u2	% STS Re-solved on F/u1	% STS Re-solved on F/u2	% New Cases w/STS	% New Cases Total
Military & Civilian																					
Ft Meade - 20755																					
	Air Force	40	4	0	4	0	4	0	0	0	3	10.00%	0.00%	10.00%	0.00%	100.00%	0.00%	0.00%	0.00%	75.00%	7.50%
	Army	809	41	0	41	0	41	0	0	0	31	5.07%	0.00%	5.07%	0.00%	100.00%	0.00%	0.00%	0.00%	75.61%	3.83%
	Marine Corps	116	5	0	5	0	5	0	0	0	4	4.31%	0.00%	4.31%	0.00%	100.00%	0.00%	0.00%	0.00%	80.00%	3.45%
	Navy	126	7	0	7	0	7	0	0	0	6	5.56%	0.00%	5.56%	0.00%	100.00%	0.00%	0.00%	0.00%	85.71%	4.76%
	Other	2	1	0	1	0	1	0	0	0	1	50.00%	0.00%	50.00%	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	50.00%
Totals: Ft Meade - 20755		1,093	58	0	58	0	58	0	0	0	45	5.31%	0.00%	5.31%	0.00%	100.00%	0.00%	0.00%	0.00%	77.59%	4.12%
Grand Totals:		1,093	58	0	58	0	58	0	0	0	45	5.31%	0.00%	5.31%	0.00%	100.00%	0.00%	0.00%	0.00%	77.59%	4.12%

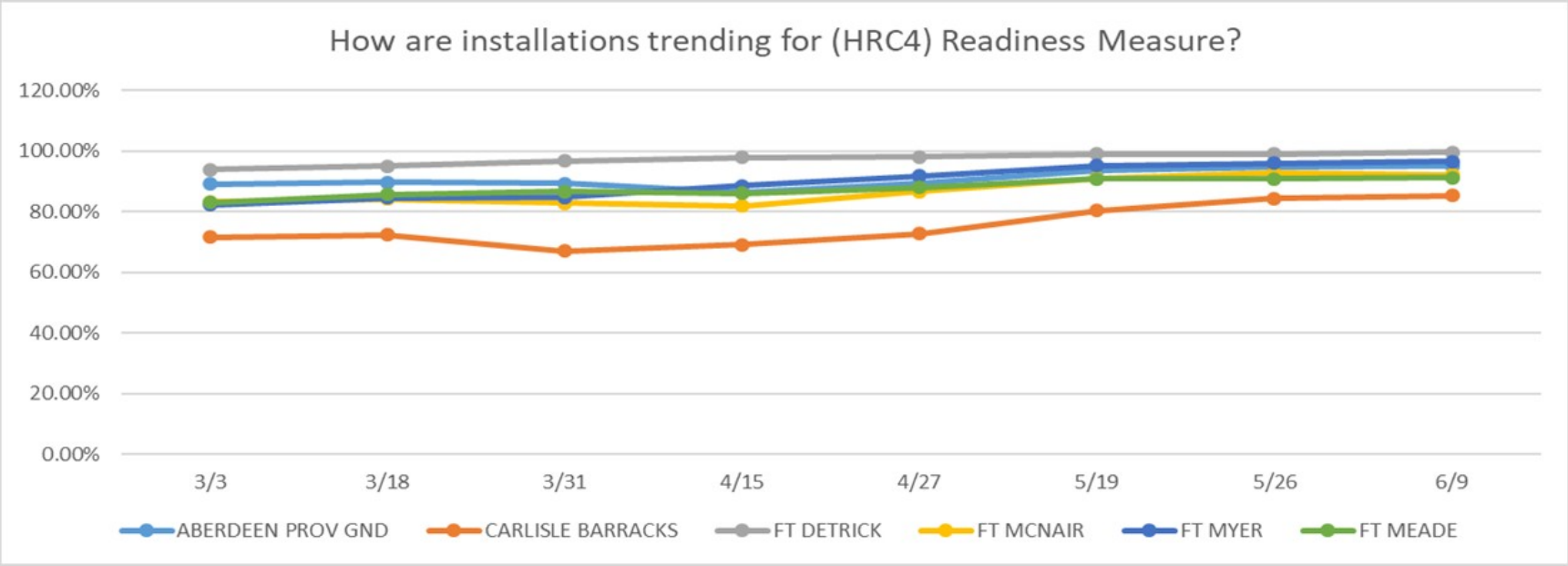
KACC Construction Brings Opportunity

Boothless Hearing Conservation Clinic held at Ft. Meade's McGill Training Center

Photo: Victoria Bugtong, AuD

- Construction required Ft. Meade HCON to be shut down from June – October 2021
- Boothless audiometry allowed for continued compliance/ throughput
- Additional portability to bring hearing testing "to the unit"
- What if boothless audiometry was not an option?

MEDDAC Hearing Readiness Improving Due to WAHTS & Dedicated HCON Technicians



Additional Capability: Leveraging WAHTS to Reduce Referrals

- Advanced Medical Technology Initiative (AMTI) Grant
  - "Addressing Masking Referrals from DOEHRS-HC with Boothless Audiometry Technology"

- The objectives of this project are to:
  - Evaluate the use of boothless audiometry to automatically measure masked thresholds at DoD Hearing Conservation sites and reduce clinical referrals for contralateral masking.
  - Determine the need for clinical referrals for tinnitus evaluation using an enhanced tinnitus screening protocol administered via tablet to SMs reporting they are bothered "a little" or "a lot" in response to the current DOEHRS-HC tinnitus question.

Reducing Referrals

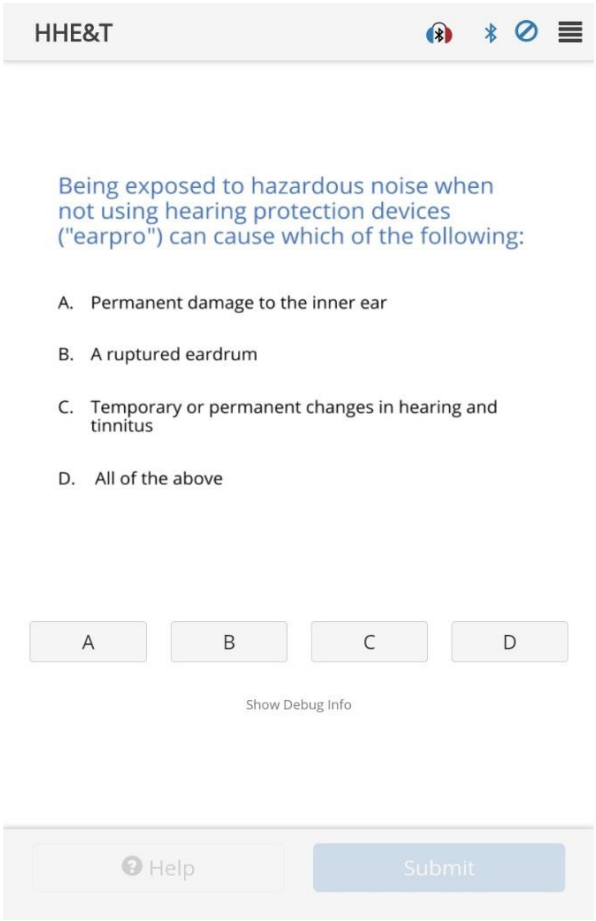
Automated Masking

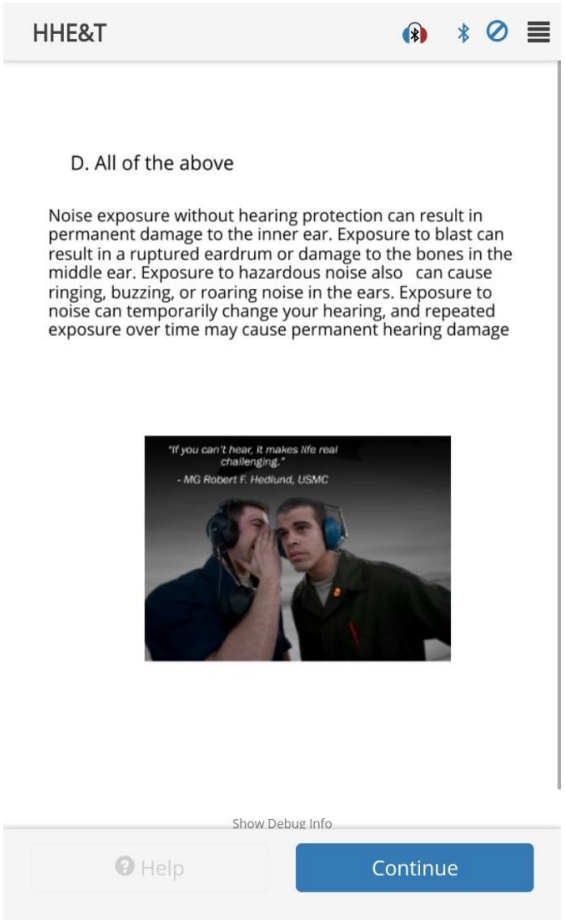
- Development of automated masking feature with WAHTS
- Phase 1: each SM requiring masking will receive an automated masked audiogram using WAHTS and manual masked audiogram from DoD audiologist
- Phase 2: implement validated automated assessment and calculate return of investment (ROI).

Tinnitus

- Additional tinnitus screening question according to Hearing Center of Excellence (HCE) "Tinnitus Question Response Guidance"
- Responses trigger administration of Tinnitus Functional Index (TFI) And Tinnitus and Hearing Survey (THS) on tablet
- Outcome metrics from questionnaire will determine correlations between tinnitus screening response and management recommendations.

Hearing Health Education & Training





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Key Takeaways

- HPD fit-testing can be used to measure the amount of attenuation achieved with the tested HPD and fitting condition.
- HPD fit-testing should not replace HPD fit-training. If anything it should be used in conjunction.
- The PAR value provides an objective measure of HPD fit, which can inform if the HPD is appropriate for the employee's work environment.
- Annual audiometric monitoring is a key element of maintaining a hearing ready force and helps to identify early changes in hearing.
- Utilization of boothless audiometry during this public health crisis has been successful to meet the mission in maintaining a medical ready force.
- Innovations as a direct result from this endeavor highlight several improvements in comparison to current standards of care that should be considered for permanent inclusion in DoD Hearing Conservation.

Acknowledgements

■ Army Public Health Center (APHC)

- LTC Andy Merkley (Army Hearing Program Manager)
- Mr. Benjamin Sheffield (Auditory Research Engineer)
- Dr. LaGuinn Sherlock (Research Audiologist)
- Mr. John Bugay (Audiology Technician)
- Ms. Stephanie Bullock (Audiology Technician)

■ Walter Reed National Military Medical Center (WRNMMC)

- Dr. Doug Brungart (Chief Scientist, Audiology and Speech Pathology Center)
- LTC Deepa Hariprasad (Director, Audiology and Speech Pathology Center)
- Dr. Devon Kulinski (Research Audiologist)
- Dr. Jaclyn Schurman (Research Audiologist)
- Ms. Rebecca Holtzman (Research Program Manager)
- Ms. Anisa Swann (Research Assistant)

Ft. Meade (Kimbrough)

- Dr. Victoria Bugtong (Chief, Audiology and Hearing Conservation)
- Dr. Michele Spencer (Audiologist)
- LTC Christopher Caldwell (Chief of Vision and Hearing)
- Ms. Laura Pomeroy (Audiology Technician)

Office of The Surgeon General / Defense Health Headquarters (OTSG)

- COL Amy Blank (Audiology Consultant, Deputy Chief of Staff for Public Health)

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Questions?

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