NATO Command and Control Center of Excellence Human Factors in Medicine 285 Briefing

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June 27, 2019

This briefing is UNCLASSIFIED

Disclosure

- The views expressed in this presentation are those of the authors and do not necessarily reflect the official policy of the Hearing Center of Excellence, Defense Health Agency, Department of Defense, or United States Government.

- I have nothing to disclose.

Agenda

- Hearing the military
- Department of Defense (DoD) Hearing Center of Excellence (HCE)
- Human Factors in Medicine 285
- Next Steps
- Future projects/research
- Questions

Military operations are chaotic and the ability to hear and communicate is critical to safety, command and control

Hearing is essential to military operations:

1) Communication

2) Detection and Identification

3) Localization

4) Acoustic Stealth

Hearing in the Military

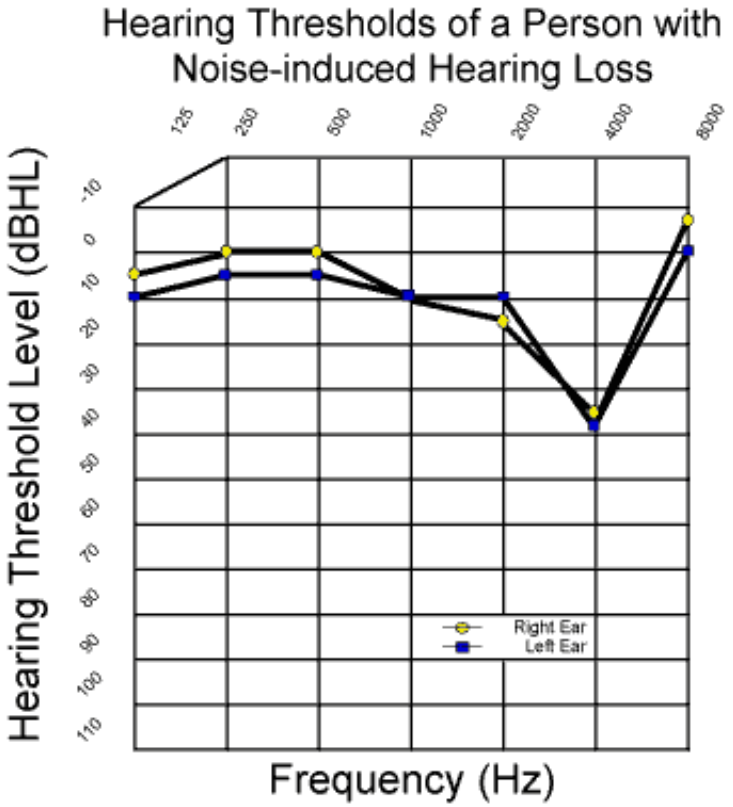
- Functional and situational aspects
  - ❑ Understanding
  - ❑ Cognitive load/fatigue
  - ❑ Surroundings/direction
  - ❑ Tasks/duties
  - ❑ Distractions/attention
  - ❑ Warning signals
  - ❑ Long hours/ops tempo
  - ❑ Noise
  - ❑ Equipment etc.
  - ❑ Foreign languages

Hearing in the Military

- Hearing is vulnerable to damage from military noise exposures
- Up to 20% of Active Duty Army Soldiers have some degree of measurable HL
- 6% have clinically significant HL

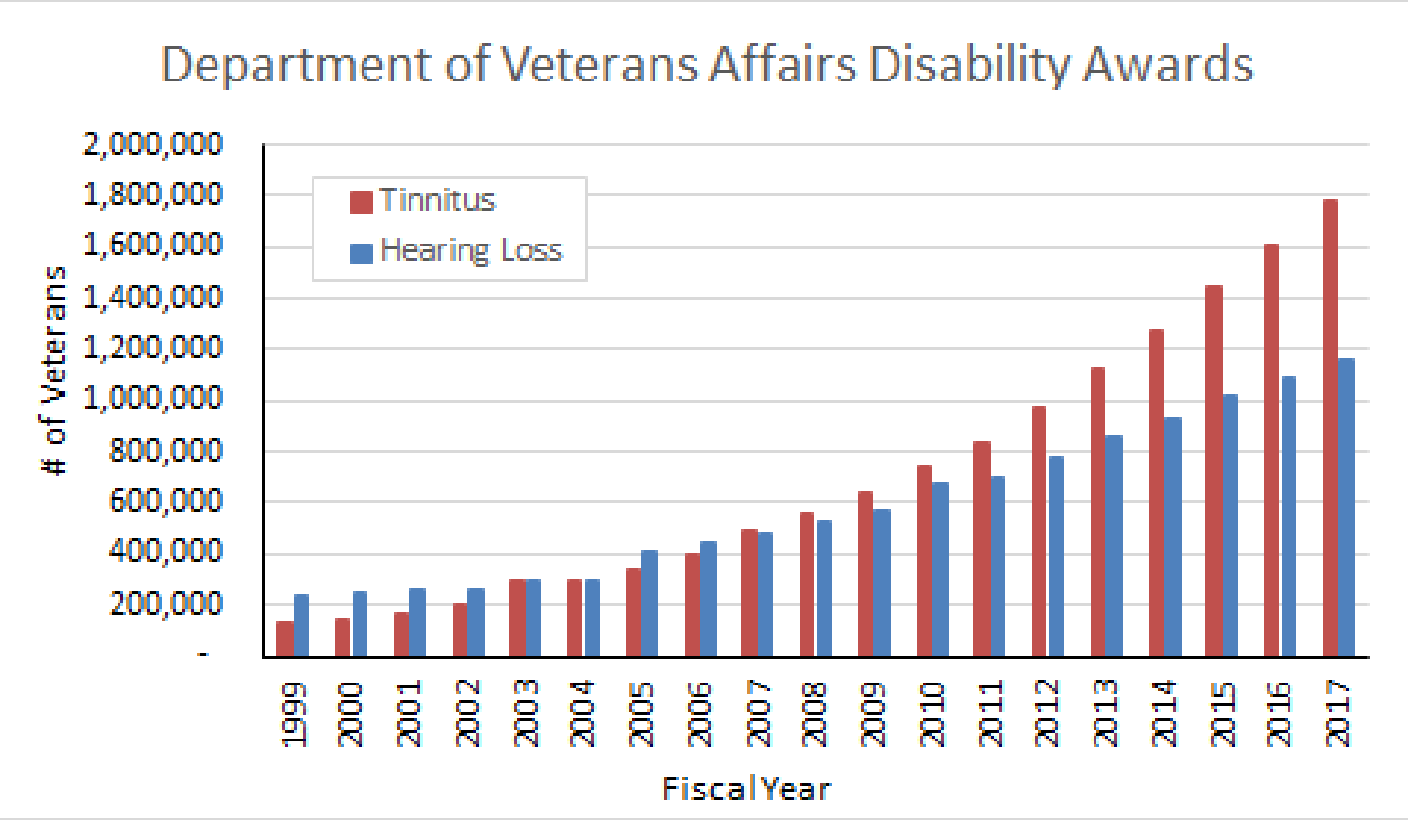
(Army Public Health Center data)

- Similarities in other nations



Prevalence of Hearing Loss and Tinnitus in Veterans

Department of Veterans Affairs Disability Awards –
Tinnitus and Hearing Loss are the Top Two Disabilities in Veterans



(VBA, 2018)

Hearing Center of Excellence Congressional Mandate

Public Law 110-417 Duncan Hunter National Defense Authorization Act (NDAA) for FY 2009, Section 721:

- Secretary of Defense shall establish, within the DoD, centers of excellence (CoE) to include a CoE focused on the prevention, diagnosis, mitigation, treatment, and rehabilitation of hearing loss and auditory system injury
- The Secretary shall ensure that the center:
  - **Collaborates** to the maximum extent practicable with the Secretary of Veterans Affairs, institutions of higher education, and other appropriate public and private entities (including international entities)
  - Collaboratively **develops a registry** with bi-directional data exchange to identify and track incidence and care for hearing loss and auditory injury
  - Uses registry data to **encourage and facilitate the conduct of research, development of best practices and clinical education**

Vision

Trusted Source.

Better hearing, Stronger force.

Mission

Provide support to optimize operational performance, heighten medical readiness, and enhance quality of life through collaborative leadership and advocacy for auditory/vestibular (hearing and balance) health.

Why HFM 285?

- Military Communication Factors
  - ❑ Tasks in Noise
  - ❑ Situational awareness
  - ❑ Direct communications
  - ❑ Radio Transmitted Communications
  - ❑ Sound detection and identification
  - ❑ Sound Localization
  - ❑ Acoustic stealth
  - ❑ Coalition environment

- Challenges:
  - ❑ Noise
  - ❑ Acoustic parameters
  - ❑ Hearing ability
  - ❑ Hearing experience
  - ❑ Language knowledge
  - ❑ Dichotic hearing
  - ❑ Quality of speech
  - ❑ Radio Transmitted quality
  - ❑ Expectations, Awareness, Exhaustion, Concentration,
  - ❑ Fitness, Mood/Thoughts/
  - ❑ Distractions

HFM 285

- **Speech Understanding of English language in Native and non-Native Speakers/Listeners in NATO with and without Hearing Deficits**
- Kick-off Meeting in Paris in June 2018
- HFM 229 – **Optimizing Hearing Loss Prevention and Treatment, Rehabilitation and Re-Integration of Soldiers with Hearing Impairment** - results and recommendations prompted HFM 285 as a new effort
- Currently conducting studies and experiments – Dr. Brungart will discuss further these efforts

HFM 285 Background

- Acoustic communication (speech and hearing) – one of most important abilities for military personnel to perform their tasks
- Misunderstandings can cause fatal accidents or lead to errors in decision making
- NATO Coalition communications occur between native and non-native English-Speakers and English-Listeners
  - Communications can be difficult or progress to non-functioning
    - Especially in non-native language/between listeners and speakers even with the best of language skills
    - Variations in levels of language training
    - Environmental noise
    - Operational acuity
    - Adjunct communication gear
    - Previously mentioned challenges and factors

HFM 285 Background

- Most communication occurs via speaking and listening to transfer of acoustic information
  - ❑ Radio transmission used in most chains of command – in speaking and listening mode
  - ❑ Most common mode of conveyance: acoustic transmission – often needed quickly
    - 70% of information is transmitted acoustically
    - 30% by vision
    - <1% others (Tactile; Smell)

    The faster the information needed → the more acoustic pathway is utilized
  - ❑ Manual or tactile communication requires line of sight or close proximity – averting focus from weapon contact to pass on non-verbal communication especially in ground forces
  - ❑ Written communication – time consuming, special equipment (printers, monitors) not always available
  - ❑ Multiple domain environment – ground, air, sea, space, cyber and across many theaters
- Accurate communications are a necessity

Considerations

- English as default language for NATO communication considerations
  - ❑ Many with other-than-English native tongue
  - ❑ Heterogeneous extent of language training in the English language (different writing, reading, listening abilities)
    - Numerous factors – extent of English education in school or general education level
  - ❑ Military vocabulary and Tactical operational language and communication are not taught in school systems
  - ❑ Dialects, pronunciation, slang, education, etc. can endanger native-English speaking communications (consider different words for the same thing: phone – mobile – handy…)
- Impact of miscues
  - ❑ Life threatening risks to personnel, weapon systems, and the mission
  - ❑ Errors in decision making result in decreased unity of effort and overall operational performance

Considerations

- Typical NATO scenario
  - ❑ French soldier communicating with a German or Polish soldier in English
  - ❑ Pronunciation of English words is less clear than from native English speakers
  - ❑ Auditory differentiation ability of French-spoken English phonemes by a German or Polish soldier is reduced in comparison to their ability to understand a native English speaker
  - ❑ Reliability of communication is at greater risk
    - ➢ Reduced foreign language understanding in noise
    - ➢ Early hearing fatigue in conversation

Considerations

- Already known that noise adversely impacts hearing ability
- Hearing loss
  - Combat injury - Common sequelae of military training and operations
  - Increasingly common health problem in many populations
  - Will further degrade communication quality
- Suspect non-native speakers likely to perform like hearing impaired and that this is a risk factor for NATO operations
- Aim is to reduce communication risk for NATO forces

HFM 285 Objectives

- Define standards for acoustic communication based on linguistic and hearing abilities
- Analyze the risks – identify and mitigate potential threats
- Optimize ability to exchange information without errors
- Operational speech tests need to be developed for cross-examination across participating NATO nations
  - ❑ Delivered/performed in typical military environments
  - ❑ Superior to standard speech tests traditionally performed in quiet or white noise settings
  - ❑ Ability to identify specific risk of communication failure

Operational tests

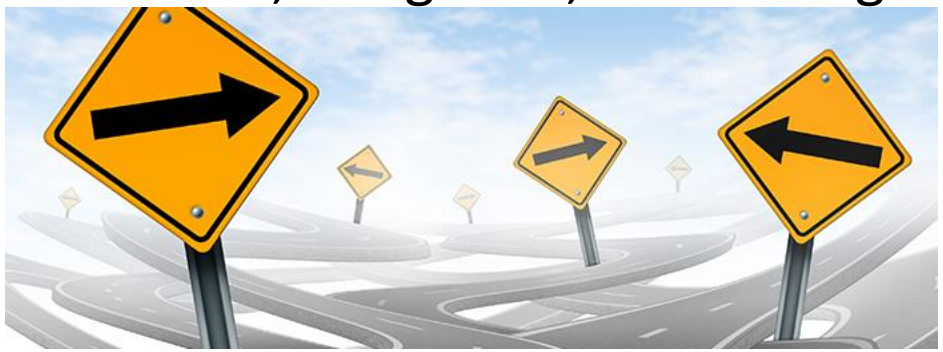
- Audiogram/hearing tests
  - ❑ Pre-operational/deployment hearing status rarely known across coalition forces
  - ❑ Identify normal hearing population and classify hearing impaired soldiers
  - ❑ Hearing requirements for different professions or duties must be assessed
  - ❑ Hearing ability as a Fitness for duty requirement - will be discussed by Dr. Brungart

Operational tests

- Further details follow in Dr. Brungart's presentation
  - ❑ Speech tests which are independent of English language knowledge including auditory English differentiation abilities from various countries
  - ❑ Validated standard speech tests in quiet settings – Native vs English language tests enable determination of auditory differentiation abilities for coalition members with higher level of English language knowledge/training
  - ❑ Validated standard speech tests in noisy surroundings – enable determination of advanced auditory differentiation abilities in closer to real life field situations may correlate better with operational performance

Next steps

- Attempt to predict real-world military function and provide specific communication risk data for native/non-native speakers and listeners
- Demonstrate the risk and increased hearing effort required when English-speakers communicate with non-native English speakers at various education levels
- Recommend training and guidance to enhance communication readiness and function and improve communication in non-native English coalition personnel
- Reduce risk through identification, mitigation, and management recommendations



Other Considerations - Hearing Protection: The right device for the right job

Future projects/Next steps

- Structured National Databases – Hearing injury/hearing health registries
  - In the works by several nations
  - HCE Joint Hearing and Auditory System Injury Registry (JHASIR) near completion
- Hearing Rehabilitation – bringing forces back to work
- Military specific hearing protection – passive and electronic
  - Numerous aspects to consider – design, cost, standardization, etc.
  - Integrated hearing protection and communications equipment

Future Research/Next steps

- Communication quality and standards (international)
- Communication requirements (multichannel, English)
- Noise exposure mapping and risk analysis of communication errors

Discussion or Questions?

For more information,

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