



## **Manage your Safe Listening - beyond occupational exposures**

Safe listening - beyond occupation - is important to address the rising but avoidable risk of hearing injury due to daily sound exposures. Work-related noise exposures have been managed by reliable federal and military standards for decades. However, an emerging concern is the exposure to loud sound as part of today's lifestyle as shown in Figure below. Lack of awareness coupled with underestimation of the risks of noise hazards are causing a rise in Noise Induced Hearing Loss (NIHL) particularly among young adults.

NIHL adversely affects professional growth, productivity and personal health beyond hearing loss. In a 2020 Lancet Commission report on dementia, hearing loss was identified as 1 of 12 major risk factors.



The good news is that NIHL is preventable.

### **Balancing lifestyle and safe exposures**

Unsafe noise exposures can occur through personal audio devices or from day-to-day environmental exposures at work, social venues or home. Repeated, unsafe sound exposures, or a single exposure from a very loud noise, can lead to damage of hair cells, membranes, nerves, or other parts of the ear. The damage is painless but progressive, can

be temporary or permanent, can impact one or both ears, and can lead to ringing in the ear (tinnitus).

The damage is preventable by managing:

1. Decibel (dB): Loudness
2. Distance: Closeness
3. Duration: Length of exposure

The dB scale is logarithmic; accordingly, safe listen times can decrease from 'the whole day' at 70 dB to about 3 hr at 90 dB. In addition, daily exposures at different sound levels accumulate over the course of the day. There are several workplace standards for management of environmental noise exposures. These include:

- OSHA Permissible Exposure Level (PEL): 90 dBA (A-weighted dB) over 9 hour
- CDC-NIOSH Recommended Exposure limit (REL) with a Sound Level Meter App.: 85 dBA over 8 hour
- Department of Defense, Hearing Center of Excellence standards for service personnel recommend exposure levels similar to PEL, REL

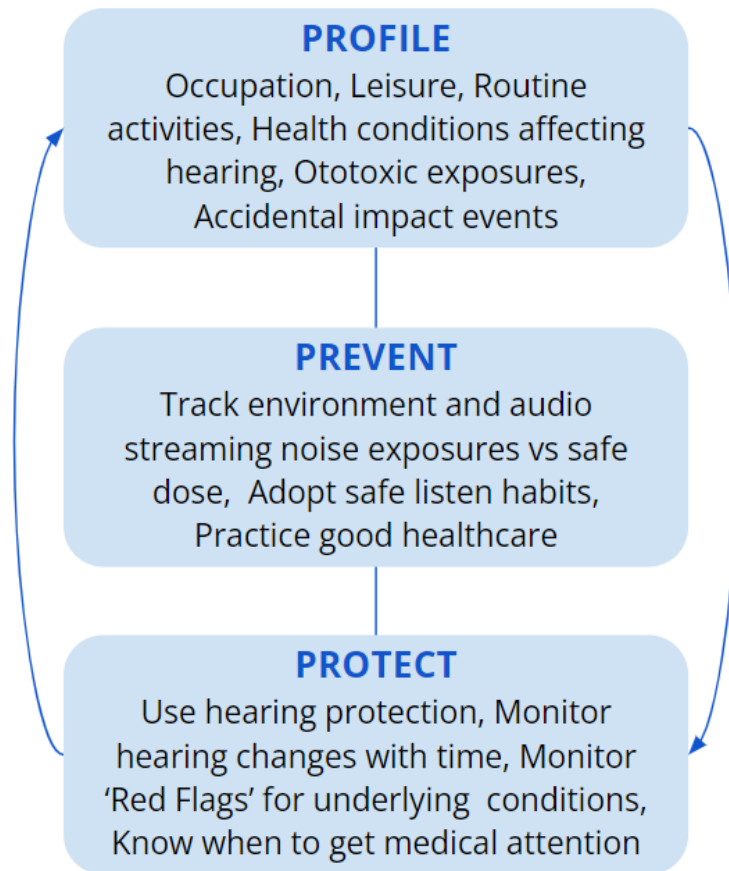
In 2019, the World Health Organization and the International Telecommunications Union published the WHO-ITU H-870 standard for safe audio streaming exposures.

These standards are relevant to assessing day-to-day environment and audio streaming exposures, at work and outside work, by activities related to one's lifestyle choices. Understanding safe listen time at any dB and monitoring daily and weekly exposures vs. safe listen doses can

help guide personal safe listen practices that can be integrated into one's lifestyle.

### **Self-management of hearing health**

Each individual has a unique hearing trajectory that is shaped throughout life by modifiable and unmodifiable risk factors. These factors play an important role in assessing individual susceptibility to hearing damage - beyond unsafe noise exposures. The pandemic has highlighted the need for self-care that balances risks with prevention and protection measures.



Factors impacting hearing capacity can be experienced throughout one's lifetime, with varying susceptibility levels. A life-long

self-management can be achieved by three approaches as described in the figure.

**Profile:** The effect of unsafe noise exposures can be made worse when combined with other risk factors. These factors can be unmodifiable (e.g. age, race, gender, genetic mutations) but several that are modifiable and can be controlled by the individual.

**Prevent:** There can be different perceptions of 'noise' among individuals and thus safe listening guided by recognized standards can be effective. Additionally, practicing good healthcare can reduce the impact of other health conditions on hearing.

**Protect:** Wearing hearing protection along with self-monitoring and knowing when to consult with a healthcare professional are important.

### **Audition Technology's Safe Listening product**

The ATLAS Resonate App and Online Self-Management Tool, used as part of a healthy lifestyle, helps you to track and make decisions to reduce potentially harmful noise exposures, while maintaining your lifestyle.

The App helps you to (i) monitor - by instantly providing safe listen times for environmental and headphone (audio streaming) dB per OSHA and WHO-ITU standards and (ii) make safe listening choices - by providing color-coded outcomes of your daily and weekly exposures along with tips and reminders to check exposures.

The Online Tool is for managing your listening lifestyle by providing essential information on hearing, guides for checking personal hearing profile, and practical approaches for protecting and monitoring hearing

health. Both the App and Tool have been presented to the US Military, the US Food and Drug Administration (FDA) and to the ITU.

Both App and Tool meet current Privacy and Cybersecurity standards.

### **References:**

CDC: Centers for Disease Control and Prevention

FDA: Food and Drug Administration

EPA: Environmental Protection Agency

NIDCD: National Inst. of Deafness and other Communication Disorders

NIOSH-REL: National Institute of Occupational Safety and Health, Recommended Exposure Level

OSHA-PEL: Occupational Safety and Health Administration, PEL: Permissible Exposure Level

DoD-HCE: Dept.of Defense - Hearing Center of Excellence

US Preventive Services Task Force

WHO: World Health Organization, World Report on Hearing

WHO-ITU H.870: WHO-International Telecommunications Union, Guidelines for safe listening devices/systems

### **Publications:**

Integrating User Voice in Hearing Care with Focus on Off-Duty Warfighter *Military Medicine* 2021

Global Safe Listening Solution. Pitch Finalist. *ITU Digital World, E-Health, 2020*

Development of Hearing Technology with Personalized Safe Listening Features. *IEEE, 2019*

Development of Hearing Technology with Safe Listening Features (Young Author Award). *ITU Kaleidoscope, 2019*

Integrating User Voice in Hearing Care with Focus on Young Adult Warfighter (poster). *Military Health System Research Symposium. 2019*

*International Patent System PCT (pending): Method for safe listening and user engagement*

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