



## Defending workers against hearing loss: Why aren't workers hearing our message?

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### ABSTRACT

It is well known that hearing can be damaged by noise. Noise exposure limits, engineering controls, work rotations and hearing protection are well understood and applied in the workplace; however the incidence of noise induced hearing loss continues to increase.

This paper examines likely reasons why our current training of workers exposed to noise in the workplace is possibly 'falling on deaf ears'. Is the message too complicated? How can it be simplified? How can we make the hearing conservation message resonate more personally within the worker?

Noise injury is currently the second biggest cost to business in general workplaces but is the number one cost for organisations supporting Defence Veterans. The human cost is also high, as shown by the diminished quality of life for the affected persons.

The Australian Department of Defence has responded to this challenge by forming a 'Noise Exposure Reduction Program' taskforce charged with revamping noise and hearing conservation policies and training. This paper will showcase some of the creative yet simple techniques Defence is deploying to create more engaging training experience for servicemen and women. This is taking an important step towards changing worker's authentic engagement in personal hearing conservation.

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### 1. BACKGROUND

In 1873, the 15 year old Chester Greenwood was testing new ice skates when his ears became cold. Realising that his scarf was too bulky to be wrapped around his head, he proceeded to cut it up and had his grandmother sew the material between two loops of wire. In 1877, he had his invention patented, and the earmuff was born (3).

At the National Research Corporation in 1967, Ross Garner devised expanding memory foam as part of a project for sealing joints. The properties of this material were so amazing that further applications for it were considered. Five years on, the foam earplug came into existence (2).

Given that we have been toiling away to engineer out the noise, and have invested in the field of hearing protection for thirty eight years or more, why is hearing loss from noise exposure still an eminent problem?

When it comes to how much a human ear can be exposed to, the verdict is in. The Hearing Standard, shows that, statistically, to limit the hearing loss inflicted on (95% of) the workforce to no more than 10dB over their lifetime, exposure has to be curbed to no more than the equivalent of a continuous A-weighted sound pressure level of 85 dB(A) over an 8-hour working day (AS/NZS 1269:2005).

The most frustrating aspect about hearing loss from noise exposure is not that we don't possess the knowledge on how to prevent it, but the fact that we do. We are well-informed of all the facts necessary to how Occupational Noise Induced Hearing Loss (ONIHL) occurs and how it can be prevented, yet hearing loss continues to thrive in almost pandemic proportions.

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So, if knowledge is power, and we have the power, then why do we not seem to possess the ability to curb the progression of noise induced hearing loss? Why is hearing loss costing Australia \$11.75 billion per annum (1). Why was there a staggering 16,500 hearing loss compensation claims for permanent injury due to noise approved between July 2002 and June 2007? (4). The need for understanding the barriers obscuring the message from getting through to the workforce, is essential.

In August 2010, a paper was published discussing the barriers and enablers that play a role in effective noise control and hearing loss prevention (4).

The report describes a variety of concepts such as: fatalism; the belief that no matter what we do, hearing loss is inevitable. Optimism; the belief that it ‘will not happen to me’. Low self-efficacy; a lack of confidence to be able to do anything about noise. Nevertheless, it is important to note that none of the barriers uncovered were described as ‘impossible’ to overcome.

The report’s highly favoured recommendation is education. This entails, promoting awareness about the dangers of exposure to loud noise, the roll hearing loss plays in reduced quality of life, and the real options that are available to prevent hearing loss.

In conclusion, the report highlights that, “employers, managers and workers need to be made aware of the real risks and available solutions – and they need clear, concise, and readily available guidance on how to achieve these solutions”.

A pattern had now emerged. The theory of how ONIHL occurs is known, genuine solutions are available, but the vehicle of how to get this information to employers and their workers has proven to be difficult.

In the professional arena, concepts involving neural conduction, cell attrition, sound pressure levels, Pascal squared hours, and decibels, are commonplace. However, medical and technical jargon which relay how damage to hearing can occur, scientific methods which depict how noise and hearing loss are measured, as well as, precautionary measures, have rendered the information inaccessible to the layman.

In turn, a lack of understanding about the subject matter will not induce any action to be taken at the workplace. The greater challenge faced is to represent these concepts in an accurate, yet uncomplicated manner.

In human communication science, it is considered the fault of the speaker if the listener has not understood the intended message. As communicators of these hearing conservation principles, the focus should be placed on the finesse of the education we provide. In other words, the aim would be to disseminate this information effectively so as to strike at the core of the listener; the employer and the employees who are exposed to hazardous noise.

To do this effectively, we can extrapolate from previous proven models of behavioural modification for adult learners. This is even used in effecting change in addiction; for example the Australian National Tobacco Campaign (NTC), or as it is more commonly known, the quit-smoking campaign. Launched in 1997 with the infamous advertising slogan, “every cigarette is doing you damage” (5). The approach taken by the NTC was to abandon the cognitive appreciate of scientific facts by translating the risks of smoking into an experience which could be “felt” by viewers (5). Each advertisement brought a fresh take on the harms of smoking so as to optimise the effect on behaviour by employing several devices:

- (a). Shifting the focus away from long-term clinical damage onto the ongoing effects of smoking
- (b). Highlighting smoker moments which are definitively awkward yet familiar, so as to appeal to the smoker and convey sympathy for their circumstance.
- (c). Exposing smokers to graphic images so as to obtain a strong visceral response (5).

In addition, a free smoking cessation hotline number was displayed at the end of every advertisement to encourage smokers to take an easy step towards quitting (5).

Results from the NTC ‘s review study found that an estimated half of smokers who had seen the advertisements reported that it was effective in making them more likely to quit and 60% of recent quitters reported that the advertisements made them more inclined to ‘stay off cigarettes’ (5).

### **1.1 Explain the Effect**

Similarly, if time is invested to explain to workers how their ears actually work, a smooth transition into the topic of how damage from noise occurs and why, can take place. The process of explaining the effect of noise on hearing is not necessarily time consuming. Many excellent yet concise video clips exist that can be shown to provide this education.

As the majority of people are visual learners, demonstrating that some processes can occur in the absence of visual awareness, will deliver shock value to the audience viscerally. In this case, seeing is not believing.

Most importantly, when workers understand that they hear not with their ear, but rather with their brain, they begin to understand why defective messages being sent from the ear can be so debilitating. This provides an easy transition into talking about quality of life issues.

## **2. METHOD**

### **2.1 Project Details**

In early 2014, a project was commissioned by the Australian Department of Defence to construct an online learning module to develop an awareness and to educate workers on noise in accordance with Part 4.1 of Work Health and Safety (WHS) regulations and supporting Code of Practice – Managing Noise and Preventing Hearing Loss and in line with Australian/New Zealand Standard for Occupational Noise Management (AS/NZS 1269:2005).

The Australian Department of Defence, as an organisation, consists of approximately one hundred thousand people; eighty thousand service personnel, with the remaining number of people being contractors and visitors (who are also covered by the WHS Act) to whom Defence also owes a duty of care. Special considerations were required for personnel exposed to noise levels that are not encountered in other industries. People in such as Army artillerymen/women, Royal Australian Air Force flightline workers, Royal Australian Navy sailors can be exposed to noise for 24 hours in the day, for prolonged periods. This is reflected in the compensation claims data in Department of Veteran Affairs Annual Reports, which consistently show tinnitus and hearing loss as being the leading compensable injuries in service personnel.

Having good hearing acuity in Defence personnel is a requirement for deployment and poor hearing can result in an individual being medically discharged. As a proactive measure, Defence was looking for a package with a cost effective method of delivery compared with conventional training methods, accessibility to all personnel, at any time, in any location and having longevity and relevance into the future.

The project, awarded to Hearing Conservation Australia, was to liaise with stakeholders from the Noise Exposure Reduction Program taskforce in developing an approach that provided the required content in an effective way with positive learning outcomes and the participant's knowledge tested by progressive assessment items. This taskforce consisted of members from Group Safety Coordinators; Army, Navy, Airforce, Defence Centre for Occupational Health and Safety, Defence Materiel Organisation, Defence Support Group, Subject Matter Experts, Occupational Hygiene Capability Consultative Group members, Defence Learning Branch and Defence workers.

There was to be two versions of this e-learning package; a general awareness version, and one for people exposed to high noise environments. The course content was to be delivered via an e-learning platform called CAMPUS and provide information and guidance for audiences such as Australian Defence Force members, Australian Defence Organisation civilians, manager/supervisors, senior leaders and contractors. CAMPUS was selected as the vehicle to deliver the training as it provides a consistent message, while ensuring the legislated duty of care is fulfilled. The platform provides assurance that each person has been trained, and furthermore that the learnings have been accurately understood through successful completion of a questionnaire. In addition, the record of the successful training event automatically populates to each person's training record on the personnel management system.

### **2.2 Procedure**

A stylised video clip showing how and why the hearing instrument is damaged by noise is only a starting point. It is only 'interesting' for the viewer if it is not converted into an experience for them. The worker has to know what it will sound like to have an ONIHL before they can start to appreciate what will be the impact of this type of hearing loss on their quality of life. This can be accomplished by conducting an auditory demonstration. This can be done either live, or by playing an MP3 file through speakers. The more of the workers senses we can appeal to in order to get this message across the better. Another effective tool is to present a personal impact story. This is best done if a speaker with an

ONIHL can be found to speak to the workers. The more relevant, the more powerful the impact will be. A retired worker from the same workplace makes an ideal choice.

### 3. DISCUSSION

The true cost of ONIHL is not the dollars paid out in a worker's compensation claim nor the economic strain it puts on Australia, it is the isolation that an individual feels from their friends and family when they can no longer hear what is being said.

In order for the workers and their employers to truly 'take-on' this message, it needs to be taken one step further. It is necessary for them to understand the concepts of exposure and dose. These are well understood concepts, but just need to be applied to noise. Workers understand that if they expose their skin to long periods of sunlight and hence ultraviolet rays, they will sustain sunburn. Although the skin will repair itself over time, repeated exposures have the propensity to produce skin cancers. Describing the ear with this analogy may assist the worker to make the link that although there is an acute symptom; such as temporary threshold shift or tinnitus, with repeated exposures, permanent hearing loss and tinnitus will ensue.

Alternatively, making the education a demonstration, will appeal to the visual learners. Dose and exposure can be well represented by pouring water into a number of glasses. By taking a concept that is 'invisible' like noise, and representing it as something visual like water filling a glass, makes the concept of exposure over time and dose easy to understand. This can be used to represent the three different key concepts of hearing protection. 1. By working a longer shift, a slower pour rate has to be adopted so as not to overflow the glass. 2. If a worker has to be exposed to higher than 85dB (simulated by pouring faster), the glass fills much more quickly and so the activity can only be done for a much shorter time. 3. If the worker is wearing hearing protection, but they compromise it in some way; such as lifting up of an earmuff when communicating with other workers, this can be simulated by a steady controlled pouring of the water with sporadic 'glugs' to represent times when the earmuff has been lifted shows very visually how the glass will overflow before the workday ends.

#### 3.1 Considerations

As an Australian Government Department e-learning package, all Defence online systems and content had to provide equal access and equal opportunity to people with diverse abilities, and that people with disabilities have the same fundamental rights to access information and services as others in the community. The system had to be compliant with the Web Content Accessibility Guidelines; WCAG 2.0 (AA). This meant considering the following disabilities:

- (a). Blindness and low vision.
- (b). Deafness and hearing loss.
- (c). Learning disabilities.
- (d). Cognitive limitations.
- (e). Limited movement.
- (f). Speech disabilities.
- (g). photosensitivity, and combinations of the above.

Some of the most important considerations were to provide text for media and video imagery, use accessible colours, refraining from using flashing effects and keep clickable areas large; to aid both low vision and users who cannot control a computer mouse with precision.

#### 3.2 Limitations

Initially it was hoped that previously effective techniques of audience engagement could be used; such as videos and audio samples.

In order to conform with the Disability Discrimination Act and provide WCAG 2.0 (AA) compliant content, many appealing multimedia methods of conveying the message of the impact of noise induced hearing loss had to be abandoned. For example, audio samples demonstrating how varying degrees of hearing loss would sound to the recipient could not be heard by a deaf person, however this learning experience could not be delivered if the audio was simply subtitled.

Video samples met with bandwidth limitations, as Defence Force personnel may be accessing the content from remote locations with low bandwidth. Whilst an existing video of a former Australian Defence Force employee giving an account of his reduced quality of life after sustaining a noise

induced hearing loss could have been effectively communicated through captioning, bandwidth restrictions would have precluded its use. Using a prose version of this account for the learner to read lost the personal impact of the story.

### 3.3 Solutions

Without the ability to use audio and video samples, fresh thought was required to prevent the e-learning package from returning to the traditional “click-a-thon” or “death by powerpoint”. This was achieved by distilling the most important concepts and delivering them in a visual way, but with low bandwidth requirements. An example of this was the adaption of the water pouring video described in 3. above. Rather than using a video of the demonstration, it was replaced with a low bandwidth animation.

Audio examples were replaced with orthographic ones. An audio representation of a noise induced hearing loss contains speech filtered such that acoustically high frequency consonants are removed from the sample whilst the vowels and semivowels remain, giving a ‘mumbled’ quality. This was reproduced by presenting text with these consonants missing to recreate the incomprehensibility and draw an analogy between the two experiences.

To give the user a more engaging experience, the interface was modelled on an obstacle course. The user could see a number of obstacles on the menu screen and as they tackle certain parts of the obstacle a piece of information would be revealed. Apart from injecting a sense of fun by being more game-like in the experience, it also gave the user a clear visual reference as to how much of any given obstacle they had completed and their level of completion through the training package overall.

At the point when the programme has reached implementation stage, quantitative analysis of its effectiveness in meeting the learning objectives for participants will be undertaken.

## 4. CONCLUSIONS

For an educational campaign for adult learners to be effective, it must contain a number of fundamental elements. Firstly, the workers must be exposed to the campaign and remember it. Secondly, they must appraise that the information they have received is both believable and relevant to them. Thirdly, it must stimulate their thinking about their own behaviour, and finally, it must effect a durable change in any undesirable behaviours.

It is vital that the message of hearing conservation be pitched in such a way as to have maximum impact on workers. To do this, it is essential to present high quality, informative content in an easy to understand format. Furthermore, the format should not only be clear, but novel, interesting and engaging and even fun, so that it is easy for the worker to commit this information to memory, to be recalled when they are back on the job and analysing their behaviours with ‘fresh eyes’; and hopefully fresh ears.

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