Efficacy of Work-Based Hearing Conservation Programs: A Systematic Review

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Background

- Occupational noise-induced hearing loss (NIHL) has a global estimated prevalence of 16-24%.
- NIHL primarily impacts communication abilities, but can also cause other negative consequences such as depression, social isolation, and increased risk of accidents in the workplace.
- Occupations such as mining and construction are at the highest risk for NIHL. However, other occupations not previously associated with excessive noise are also at risk for NIHL, including occupations such as baristas and daycare employees.
- In 2014, a Cochrane systematic review examined current interventions to prevent occupational NIHL. Articles through January 2012 were included, and their results showed little evidence of effectiveness of hearing conservation programs (HCPs).
- Our purpose for this systematic review is to review the current literature and investigate whether any new advances or improvements in HCPs have been published since 2012.

Clinical Question

In occupations with high risk of noise exposure, how effective are hearing conservation programs in reducing the occurrence of noise induced hearing loss?

Methods

Our systematic review was conducted using two databases, PubMed and CINAHL. Specific search terms used were: “hearing conservation programs” AND “noise-induced hearing loss” AND “occupation”. The publication dates of articles searched was restricted from February 1, 2012 to January 31, 2018, and results were limited to full text, research performed on humans, and English as the publication language. Other exclusion criteria include non-peer reviewed articles, and research including secondary and post-secondary students.

Results

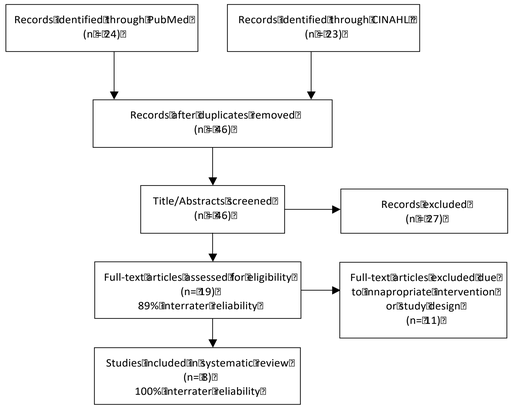

Figure 1: *PRISMA diagram of search results*

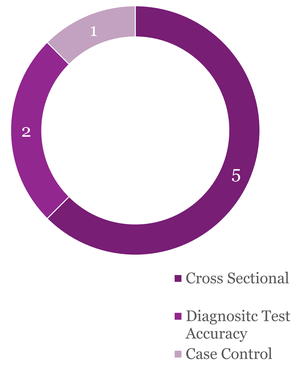

Figure 2: *Study types*

Author(s)	Target Population	Reported HCP Components	Y/N Effective	Results	Quality Rating
Cason (2012)	Airforce personnel including civilians	Audiometry	No	Higher pure tone shifts (PTS) in officers; HL increases with age for all participants	Lesser
Donoghue et al (2016)	Aluminum industry workers	Hearing protective devices (HPDs), meetings, DVD, ‘FitCheck’, audits, visual signage, stickers, ‘Buy Quiet’, and dosimeters/ noise indicators	Yes	Decline in PTS	Adequate
Feder et al (2017)	Canadian workers	Audiometry, DPOAEs, and questionnaires	No	PTS in reported noise-exposed workers	Lesser
Folmer et al (2012)	Veterans	Self-administered computer-based program and questionnaire	Yes	Positive report from participants	Lesser
Konopka et al (2014)	Military aircraft workers	Audiometry, DPOAEs, and HPDs	No	Higher PTS and decline in DPOAEs even with HPD use	Lesser
Nadon et al (2017)	General at-risk worker population	Field monitoring using DPOAEs	Yes	Detected temporary threshold changes from ambient noise	Adequate
Neitzel et al (2014)	Aluminum industry workers	Individual and facility-level temporal evaluation of noise	Yes	Exposures declined at both the individual and facility-level	Adequate
Rabinowitz et al (2013)	Aluminum industry workers	Audiometry, questionnaire, and dosimeters	Yes	Monitoring noise with dosimeters controlled noise under 85 dBA	Adequate

Table 1: *Results from studies*

Discussion

Approaches to HCPs fell into four different categories:
1) Use of ear-protective devices (HPDs)
2) Monitoring hearing status (audiometry and DPOAEs)
3) Education on NIHL
4) Reduction of environmental noise level

In general, hearing conservation programs are somewhat effective in preventing NIHL. Five out of eight studies showed effective HCPs, however no effect sizes were reported. Confounding variables such as age, recreational noise, and incorrect use of hearing protection devices were not well controlled for. Overall, the quality evidence for efficacy of work-based hearing conservation programs was low-to-fair.

Future Directions

Some advancements in hearing conservation efforts were noted since the 2014 Cochrane Review, including computer-based education, incorporating DPOAEs into monitoring, and use of ear-level personal noise dosimeters. Future research should incorporate these tools in determining their long-term effects, as well as controlling for confounding variables in a well designed study. Our search also highlighted many occupations not previously associated with noise-exposure. A more diverse inclusion of occupations should be included in future research, as a majority of the literature is currently focused on military and industrial settings.

References

References provided upon request:
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Acknowledgements/Disclosures

This project was completed as an assignment for SPHS 701 under the tutelage of Drs. Tom Page and Jessica Dykstra Steinbrenner.
We have no conflicts of interests to disclose.