Critical Review:
The Effectiveness of Hearing Conservation Initiatives on the Incidence of Noise Induced Hearing Loss Amongst Industrial Workers

Rhys Kooistra
M.Cl.Sc (AUD) Candidate
University of Western Ontario: School of Communication Sciences and Disorders

Noise exposed industrial workers are at a constant risk of noise-induced hearing loss (NIHL) but the effectiveness of hearing conservation programs (HCPs) is often difficult to evaluate. The large variety that exists amongst industrial settings and HCPs calls for objective outcome measures that can be compared across programs. The most common method of evaluation of these programs at present is the measurement of workers' audiometric thresholds over time. Such evaluations are valuable in that the results may be useful as support for current practices or as evidence that a new approach is necessary in regards to HCPs. In light of these challenges, this critical appraisal reviews several studies published over the last decade with the aim of evaluating the effectiveness of hearing conservation initiatives on the incidence of noise induced hearing loss (NIHL) amongst industrial workers.

Introduction

It is estimated that nearly 30 million American workers are at risk of noise-induced hearing loss (Rogers et al., 2009). The World Health Organization reports that occupational noise induced hearing loss (NIHL) is second only to accidental injury in terms of years of healthy life lost (Concha-Barrientos et al., 2004). Furthermore, the cost of NIHL in the United States is estimated in the billions of dollars (Rabinowitz, 2000). Whereas legislation in Canada and the United States has established standards for allowable noise exposure and hearing protection requirements in most areas, issues regarding adherence (Horie, 2002), enforcement (Daniell et al., 2006), effectiveness (Rogers et al., 2009), and implementation (Brink et al. 2002) result in continued risk of occupational NIHL for noise exposed workers. The effectiveness of hearing conservation programs (HCPs) is an ongoing topic of research across a broad range of industries and strategies. So far the evidence for the effectiveness of such interventions is lacking (Rabinowitz et al., 2010) or contradictory (Verbeek et al., 2009). The large variety that exists amongst industrial settings and HCPs calls for objective outcome measures that can be compared across programs. While there are promising new possibilities in regards to such measures (Miller et al., 2004), the measurement of workers' audiometric thresholds over time remains the most important outcome measure at present. This measure is not perfect. Neither the research community nor organizations such as the American National Standards Institute (ANSI), despite their efforts, have been able to produce an effective method for evaluating HCPs based on audiometric data which has been consistently adopted (Davies et al. 2008). Nonetheless, considering the implications of occupational NIHL, it is worthwhile to review the existing outcome-based evidence with the aim of either lobbying for these programs or calling for a restructuring of our approach. In light of these challenges, this appraisal reviews studies conducted over the last decade with the aim of evaluating the effectiveness of hearing conservation initiatives on the incidence of NIHL amongst industrial workers. The implications of this type of evaluation will speak to the cost-effectiveness of HCPs in terms of the health of industrial workers as well as the financial considerations to the employer. Additionally, researchers may benefit from the data by borrowing and improving research designs and methods as well as by attaining a body of literature which can be referenced and compared to future studies. Finally, audiologists stand to benefit from the information presented here by providing better counseling to their clients on issues surrounding HCPs and personal hearing protection (PHP).

Objectives

This paper aims to provide a critical review of several independent studies as they pertain to the effectiveness of HCPs on the incidence of NIHL amongst industrial workers.

Methods

Search Strategy

Scopus, PubMed, CINAHL, Web of Science, and Google Scholar were the primary databases used in this literature search. The following search terms were used:

(hearing conservation) AND (hearing loss) AND (noise-induced)

(veteran) AND (military) AND (child) AND (agriculture) AND (education) AND (construction) AND (mining)

Results were limited by date to include only those articles published in or since the year 2000.

Selection Criteria

Only papers presenting evidence of the effect of an HCP on the long term audiometric thresholds of noise exposed workers in an industrial setting were included in this review. Although various HCP methodologies

workers to their moment to moment exposure may result in more consistent use of PHP as well as increased efforts to reduce excessive exposure. These factors likely contribute to the significance of the intervention effect.

This rational for this study

Limitations

The studies reviewed above have many similarities in their design, which are to some extent dictated by the nature of the research, and therefore have several

The specific knowledge gained by these studies must be viewed in light of the inherent limitations of this type of research as discussed above. Most notably, retrospective cohort studies of this kind have many confounding variables to account for and seem to rely on self-reported data for a number of these variables (Davies et al., 2008, Brink et al., 2002). These

Lumber Mills. *Journal of Occupational and Environmental Hygiene*, 6(1), 32-41.

7. Horie, S. (2002). Improvement of occupational noise-induced temporary threshold shift by active