Atelier : Comment impliquer le personnel concerné ?

Barriers to occupational noise management

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Summary
This presentation looks at work aimed at determining the characteristics of the barriers that exist in many workplaces to the successful implementation of a noise exposure management programme. The results are presented from surveys questioning workers from many workplaces about their attitudes and thoughts toward noise exposure and the prevention of occupational hearing loss.

Résumé
Cet article présente les conclusions d'une étude visant à déterminer la nature des obstacles à la mise en place de programmes efficaces de gestion du bruit au travail. Les résultats présentés sont issus de questionnaires soumis à des employés sur divers lieux de travail, concernant leurs comportements et leurs opinions par rapport au bruit au travail et à la prévention des risques auditif professionnels.

Currently around the world the true incidence of occupational hearing loss (OHL) is not decreasing [1,2]. This is despite a full understanding of the cause if not the exact mechanism of hearing loss and the constant creation of better ideas to reduce noise exposure. Some jurisdictions have demonstrated an apparent decrease in the incidence of new claims for OHL in the workers'compensation system however, this can be explained by the introduction of a 'fence' or specific degree of hearing loss that must be demonstrated before a claim can be lodged [3].

OHL is completely preventable [4] and the majority of those who are exposed to noise in the workplace are well aware that constant exposure to high levels of noise will damage their hearing [5,6,7]. However, even with the best of intentions occupational noise management programmes do not seem to work as well as expected and barriers seem to exist impeeding successful implementation [7,8].

Method

Individuals were asked to complete a questionnaire when attending an audiometric test clinic. Audiometric testing is required in Australia [9] if an occupational noise management programme, mandated by the respective jurisdictional occupational health and safety (OHS) legislation, is to meet the Australian Standard [9] and applicable codes of practice [3]. The Standard states that if individuals work in areas considered noise exposed then they shall have audiometric tests on a regular basis to monitor their hearing. All participants were personally approached by the audiometric tester and asked if they were willing to participate. Hence only those agreeing are included in these results (ie 100 % participation). All of the experimental work was covered by appropriate ethical approval and audiometric tests were carried out to Australian requirements [3]. The questionnaire consisted of twenty closed questions and two open questions. The questions addressed attitudes, perceptions, feelings of susceptibility and self-efficacy and barriers to action with respect to noise in the workplace and requested responses on a four point Likert scale ranging from *"Yes, I strongly agree"*, *"Yes, I agree"*, *"No, I disagree"* to *"No, I strongly disagree"*. Two open ended questions asked for responses to the questions : *"What is the main thing that stops you from reducing noise you experience at work ?"* and *"If there was one thing that could assist you in reducing the noise you work in what would it be ?"*.

The questions themselves had been developed, piloted and verified as part of prior similar studies [7,10,11]. The responses to the questions presented were intended to represent the feelings, thoughts and attitudes of the individual and not that of the workplace, management, their work colleagues or others responsible for the workplace. Only the results addressing barriers specifically are presented here. The questionnaire items relating to barriers are presented in *Table 1*.

Results

There were 154 subjects (39 female, 112 male, 3 undeclared) who participated in this project from Tasmania, Victoria and NSW in Australia. The average age was 39, 3 years (range 15 to 67 yr, SD 12, 5) while the mean time in the workforce was 13 years (SD = 11, 5) with the time in the current position ranging from two weeks to 50 years (mean = 10, 7 yr, SD 11, 0). The type of work carried out by participants could be divided into five main categories 'laborer', 'operator', 'trades person', supervisor or 'manager', except for one individual who was a pilot. Gender was spread evenly across the work types.

The average three frequency hearing loss at 3k, 4k, 6k Hz for all participants was 21,7 dB HL (range 0 - 81 dB HL, SD = 16, 9). Those individuals who declared they felt they had a hearing loss had an average three frequency loss of 27,4 dB HTL (SD = 19, 5) while those who said they had no loss had an average three frequency loss of 15,3 dB HTL (SD = 10, 5).

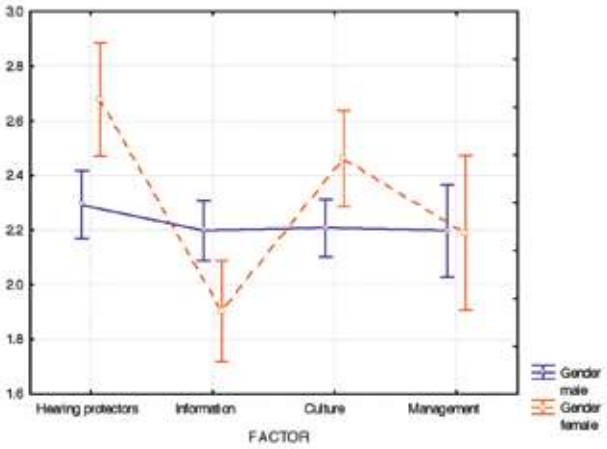

Fig. 1 : Ratings for barrier factors showing significant differences between men (N = 112) and women (N = 39) [F (3,402) = 5, 5, p = 0, 001]. Vertical bars denote 95 % confidence intervals
NOTE : Higher ratings indicate a poorer approach to reducing noise exposure

Closed question analysis of perceived barriers

A factor analysis with varimax rotation (using *Statistica®*) was performed on responses to the nine questions relating directly to the perceived barriers to reducing noise at work. This analysis revealed four prominent factors (*Table 1*) accounting for 63 % of the total variance. The majority of items displayed factor loadings higher than 0, 7. Two items with factor loadings of 0, 67 and 0, 54 were included as these loadings were well above the values for other items and these two items add clarity to the interpretation of the respective factors. The final column indicated whether the ratings for the item were reversed prior to analysis. Scale reversal was performed for these items to ensure that a high rating consistently indicated a poorer approach to reducing noise exposure. The four factors identified in order based on the percentage variance accounted were labeled : *Hearing protectors ; Information ; Culture* ; and *Management.*
Further analysis revealed a difference in responses to the barrier items between males and females, [F (3,402) = 5, 5, p < 0, 001], *Fig. 1*. Comparisons show that results for three of the barrier factors, hearing protectors, information and culture, differed significantly between males and females at the 0, 05 level (p = 0, 02, 0, 04 and 0, 04 respectively). Females rated hearing protectors and culture more poorly than males while males rated information more poorly than females. However, the perception of barriers presented by management was not significantly different between genders (p > 0, 05).

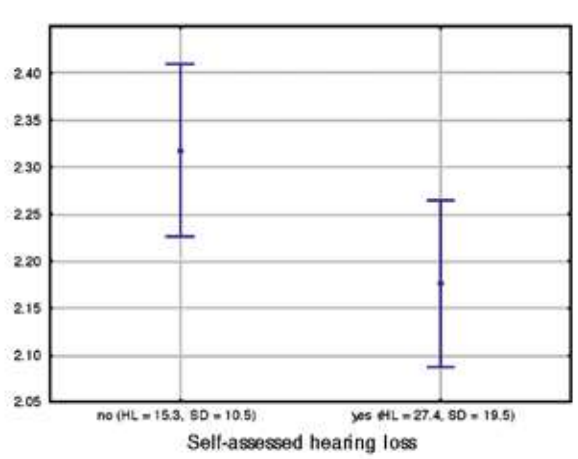

Fig. 2 : Comparison of overall rating of barriers for those who felt they had a hearing loss (N = 80) and those who did not (N = 71). People with a self reported hearing loss had lower ratings, indicating a better approach to reducing noise exposure [F (1, 135) = 4,78, p = 0,031]. Vertical bars denote 95 % confidence intervals, point locates mean

Factor label (proportion of total variance)	**Individual questionnaire item**	**Factor loading**	**Reversed for analysis?**
Hearing protectors (0,20)	*I do not like wearing earmuffs or earplugs*	0,76	Yes
	I cannot communicate using earmuffs or earplugs	0,70	Yes
	Ear muffs and earplugs are uncomfortable	0,75	Yes
Information (0,18)	*I would like to know how to reduce noise*	0,67	No
	Work should supply more information on noise	0,84	No
Culture (0,13)	*I do not have time to do anything about noise*	0,73	Yes
	My mates at work do not worry about noise	0,77	Yes
Management (0,12)	*The management does try to reduce noise at work*	0,81	No
	The management at work is not interested in OHS	0,54	Yes

Table 1 : Summary of the factors from the analysis of responses to the nine, closed questionnaire items relating to barriers

There was also a significant difference in the overall perception of barriers between those who felt they had a hearing loss and those who did not [F (1, 135) = 4, 78, p = 0, 031]. Those who felt they had a hearing loss perceived barriers to preventative action were less. This is illustrated in Fig. 2. The average hearing level of people who felt they did (N = 80) and did not (N = 71) have a hearing loss was, respectively, 27,4 dB HL (SD 19.5) and 15,3 dB HL (SD 10.5). This can be interpreted as those who do not have a hearing loss do not perceive noise as a relevant problem or hazard.

Open question analysis of perceived barriers

There were wide variety of answers to both questions and *Table 2* summarises these responses according to the four factors from the factor analysis for the closed questions. The percentage distribution of responses is calculated based on the number of responses not on the number of participants. Not all responses could be categorized in this way hence the category of *"other"*. Some responses were difficult to assign to particular factors but all reasonable attempts were made before assigning difficult responses to other. Three of the factors derived from the responses to the nine barrier closed-question items relate well to the qualitative information provided by the open questions. The *Information* factor was not as well represented in the responses to the open questions and relatively few respondents (7 %) identified a need for further information about reducing noise.

To the first question, *"What is the main thing that stops you reducing noise you experience at work ?"*, there were 96 responses of which 31 (32 %) referred to hearing protectors. Responses included : "*not always having hearing protectors with me*", *"I find earmuffs and earplugs uncomfortable"* and tend to say *"It'll be a short time only…"*, and *"wearing earmuffs in hot conditions"*.

These 31 respondents focused primarily on hearing protectors, to the exclusion of other factors. The other 65 respondents made a variety of comments ranging from very negative responses to positive thoughts. Examples of selected comments are : *"changes outside my scope" ; "attitude, blasé" ; "most machines have to make noise to do the job'; "inconvenience" ; "I don't have the right to tell people to stop banging things so loudly" ; "nothing really" ; "myself" ; "identifying main contributors to the site';* and *"complacency of a lifetime of just using machinery"*.

Eighteen comments (19 %) concerned machinery, e.g. "*lack of engineering on noise equipment*", "*most machines have to make noise to do the job*", "*efficiency of mufflers fitted to existing machines*". Twelve comments (13 %) related to people and workplace behavior, e.g., "*poor work practices of other people*", "*difficult to rearrange work schedule*", "*I don't have the right to tell people to stop banging things so loudly*", and "*inconsiderate and noisy employers*". Some of these comments could also be broadly categorized as workplace culture. Overall 33 % of responses related to workplace culture, "*nature of the industry and cottonseed processing plant*", "*type of work*", "*part of the job*". Fourteen comments (15 %) referred to inconvenience and inability to make time, e.g. "*lack of making time*", "*time management*, "*inconvenience*", and "*cost/time*". Several comments indicated that people felt they could not do anything about the problem themselves (i.e., low perceived self-efficacy), for example, "*out of my control*", "*not in a position to do anything*" and "*changes outside my scope*".

The second question, *"If there was one thing that could assist you in reducing the noise you work in what would it be ?"*, again elicited a wide variety of responses with 46 out of the 99 written comments (46 %) specifying the use of hearing protectors as the main solution. Thirty comments (30 %) referred to management or changes that would need to be implemented by management : eg *"remove all noise, isolation of noisy equipment, managing change in the plant"*, "*money*", *"my OHS officer, "ban the loud playing of radios on work sites", "change alarm bells to a flashing light system", "replacing machinery with quieter equipment", "more isolation of the plant", "removing noise source" and "separate area for noisy work"*. Examples of negative replies were *"don't really know"* and *"retire"*.

Overall the combined results of the open and closed questions indicate that people knew that noise causes hearing loss, would like more information but still see hearing protectors as the main solution. A number of participants had the misconception that hearing loss was something that only happens to people with sensitive ears. This is consistent with an optimistic bias [12] (Weinstein : 1986).

Factor	**Q1:** *What is the main thing that stops you reducing noise you experience at work?*	**Q2:** *If there was one thing that could assist you in reducing the noise you work in what would it be?*	**Average %**
Hearing protectors	30 %	46 %	38 %
Information	7 %	7 %	7 %
Culture	33 %	2 %	18 %
Management	8 %	30 %	19 %
Other*	22 %	15 %	19 %

*Note: * Not all responses were able to be categorised according to the four factors.*
Response % is related to the numberof responses to the open questions note the overall number of participants.

Table 2 : An approximate distribution of responses to open ended questions compared to factors derived from the analysis of closed questionnaire responses

Discussion

This analysis highlights four significant factors that influence action that may be taken to reduce personal noise exposure in the workplace : hearing protectors ; information ; culture ; and management. These barriers that prevent the individual from taking action could be considered as having two main origins *extrinsic* and *intrinsic* :

- *Extrinsic barriers* are those barriers that have their origin(s) external to the individual, such as lack of management policy ; non-supply of personal protective equipment ; lack of consultation, education and training ; while

- *Intrinsic barriers* are those barriers that have their origin(s) internal to the individual, such as lack of knowledge ; lack of education ; lack of self-efficacy.

The actual barriers that present in the workplace may be some combination of intrinsic and extrinsic factors. For example, consider the 'information'factor arising from the present results. The two questions from which this factor arises were *'Work should supply more information on noise'*and *'I would like to know how to reduce noise'*. The first question is essentially extrinsic in that the workplace should be supplying more information, a source external to the individual, while the second question is essentially intrinsic with the individual declaring a lack of knowledge and wishing to know more. Some self-motivating individuals may act so as to find out more information by themselves, while others simply wait in a passive manner hoping that the workplace will be more forthcoming. Only a small percentage of people (7 %) mentioned the need for additional information through the open questions.

Part of the driving force for preventative action for individuals may be how seriously they view the consequence(s) of their not taking any action will be to their future health. This is where optimistic bias plays a significant role. Research shows that individuals consistently underestimate their own risk for a variety of health problems [12,13,14,15,16,17,18]. In comparison to their peers individuals *"on average see themselves as below average risk"* (p 129) [13]. While optimistic bias can be beneficial in encouraging people to strive harder for success in positive situations, this same attitude can lead to harmful behaviour when it does not match the existing risk in negative health situations [14].

If we relate this concept to workplace noise, this implies that, although individuals realise there is a definite risk to hearing health when exposed to noise, they interpret their personal risk as being less than that of the general population. Thus, there is less incentive to take preventative action. This is in line with results found with respect to smoking behaviour [16], and attitudes toward both motor vehicle accidents and skin cancer [18].

An optimistic bias is evidenced when those without a hearing loss see less reason to take preventative action than those who are experiencing the difficulties that come with a loss. This is related to hearing loss not being perceived as a problem until actually experienced [4,19].

Conclusion

Four main factors acting as perceived barriers to the adoption of preventative action against noise exposure in the workplace were identified : hearing protectors ; information ; culture ; and management. Individuals who felt they had a hearing loss tended to have a lower overall perception of barriers to preventative action. There were differences between men and women for the first three of the factors but not for the fourth. Together with these barriers there was evidence for an optimistic bias effect whereby individuals tended to estimate their potential risk to a noise health hazard as being less than the risk to others.

If individuals do not perceive they have a problem, why would they take preventative measures ? If we expect to be able to reduce workplace noise exposure and the incidence of occupational hearing loss the dual problems of perceived barriers and optimistic bias need to be appropriately addressed.

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