

# Extra-Auditory Benefits of a Hearing Conservation Program

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Thus far, the EARLog<sup>1</sup> series has discussed laboratory and real world performance aspects of hearing protection devices (HPDs). The most recent EARLog #5, analyzed how a hearing protector operates and examined seven factors that contribute to poor HPD performance in the real world. One of the most significant problem areas is misuse and abuse of HPDs, attributed in large part to poor employee training and motivation. This situation can be rectified by developing an effective hearing conservation program (HCP); one that includes (but is not limited to) appropriate managerial, educational, and motivation techniques.

Proper operation of any program requires the active support of all concerned. Not only must employees be convinced of the program's merit, but so too must *all* levels of management. Therefore, we will direct our attention towards the functionality of HCPs and begin in this, EARLog #6, by examining their beneficial extra-auditory aspects. We will present information suggesting that an effective HCP may not only prevent industrial noise-induced hearing loss, but also improve general employee productivity and safety.

## Extra-Auditory Effects of Noise

It has been clearly established<sup>2,3</sup> that habitual exposures to noise levels in excess of 90 dBA will cause significant hearing loss in a sizeable portion of the exposed population. Additionally, there are ample data to suggest that levels of 85 dBA or even 75 dBA will be injurious to some<sup>4,5,6</sup>. Beyond these obvious and well-documented deleterious effects, noise has been linked to many other physiological and behavioral effects, although the evidence is inconclusive. These extra-auditory effects are

very difficult to quantify since they are often non-specific in nature and since many other noxious stimuli and/or stressful circumstances often coexist with high sound levels.

Analysis of the proceedings of the 1973 and 1980 International Congresses on Noise as a Public Health Problem<sup>7,8</sup> leads one to conclude that although extra-auditory effects have been frequently hypothesized, there is widespread disagreement as to the validity and interpretation of the supporting data. Often, for every study that correlates noise exposure with a particular extra-auditory effect, another study finds contradictory results.<sup>9,10</sup> In general, the data tend to support the following statements, applicable to the industrial setting:<sup>11,12,13</sup>

1. Levels of noise necessary to produce adverse psychological effects are high,  $\approx$  95 dB.
2. Noise affects tasks requiring accuracy rather than speed.
3. Noise detrimentally affects demanding tasks, especially those requiring attention to multiple signal sources, however, it may actually improve the performance of monotonous, routine tasks.

Studies which tend to demonstrate the extra-auditory benefits of HCPs<sup>14,15,16</sup> have been conducted on a number of industrial populations. For example, Jansen<sup>14</sup> examined the health records of 1,005 iron and steel workers in very noisy and less noisy industries. He found from 5 to 15% greater occurrence of peripheral circulation problems, heart problems, and equilibrium disturbance in the very noisy group. It is useful to highlight these possible advantages to management, since, of course, they too must be motivated to actively participate in the HCP.

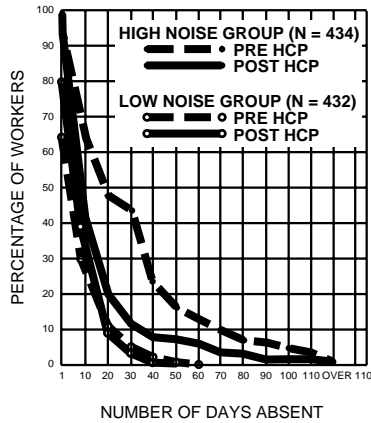
## Recent Industrial Studies

An even more direct approach to substantiate the beneficial aspects of reduced employee noise exposures is to examine employee health and safety records before and after the advent of an HCP. Cohen<sup>15</sup> reported on such a study involving 434 noise exposed ( $\approx$  95 dBA) boiler plant workers. Data were compared for two-year periods, before and after the advent of an HCP involving the use of HPDs. Results indicated fewer job injuries, medical problems, and absences in the post-HCP period, as typified by the results in Figure 1. For comparison, the data for a control population of 432 low noise ( $\leq$  80 dBA) workers from the same plant are also shown. Since the control population exhibited no pre/post HCP reduction in absenteeism, but the high noise group did, it is likely that reduced noise exposure, as a result of HPD usage, was the controlling variable.

Cohen also attempted to rate each employee's degree of HPD usage and correlate these findings with the degree of reduction of the various problems. That analysis indicated no significant relationship, and thus tempered somewhat the strength of any conclusions relating HPD usage to decreased extra-auditory problems.

Another significant finding in Cohen's study was that comparisons of injury data, before and after the advent of the HCP, evidenced that the use of HPDs reduced rather than increased the number of mishaps. "This appears to counter the notion that wearing HPDs could increase the likelihood of accidents by attenuating not only noise, but also the audibility of sound signals depicting danger" (c.f. EARLog #3!).

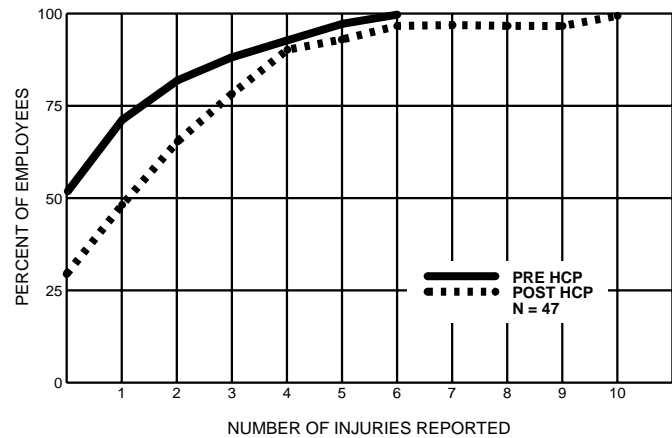
**CUMULATIVE FREQUENCY DISTRIBUTION OF WORKERS FROM HIGH AND LOW NOISE GROUPS WITH SPECIFIABLE NUMBER OF DAYS ABSENT**



This curve is plotted in an inverse manner. Each point represents percentage of workers having had as many or more days absent as read off the abscissa. After Cohen.<sup>18</sup>

Figure 1

**COMPARISON OF THE CUMULATIVE FREQUENCY DISTRIBUTION OF REPORTED INJURIES FOR THE SELECT GROUP DURING TWO 5-YEAR PERIODS**



Each point represents percentage of workers having had as many or less reported injuries as read off the abscissa. After Schmidt et al.<sup>16</sup>

Figure 2

Recently, Schmidt et al<sup>16</sup> conducted a study very similar to Cohen's, wherein they examined industrial injury data for five years preceding and five years following the institution of an HCP at a North Carolina cotton yarn manufacturing plant. They utilized two test groups totaling approximately 150 subjects. No hygienic or other major environmental changes other than the HCP occurred during the study years. They found a significant reduction in reported injuries for both groups after the advent of the HCP. The data for the "select group" are shown in Figure 2. (The select group consisted of 47 permanent full-time employees with at least six months of service prior to the ten-year study period, and an average length of service of 22 years).

Schmidt et al. reported a significant observation that provides additional support for their results. They had access to employee audiometric records for the ten years that were studied. Analyses of these data indicated that the females were wearing their HPDs more effectively and receiving better protection than were the males. Therefore, it would be ex-

pected that they should show a greater reduction in industrial injuries than did the males. The data confirmed this hypothesis, thus closely linking HPD usage to the rate of industrial injuries.

**CONCLUSION**

Only tentative conclusions may be drawn from the available literature, but the inference exists that elevated noise exposures may cause extra-auditory physiological and/or psychological disorders. This suggests that effective HCPs may not only prevent noise induced hearing loss, but also improve general employee health and productivity.

**References and Footnotes**

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