

WORKERS COMPENSATION FOR INDUSTRIAL DEAFNESS

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ABSTRACT: In 1997, the final report of the Heads of Workers Compensation Authorities made the following recommendations: a percentage loss of hearing (PLH) threshold of 10% will apply for compensability but a PLH of 5% or greater will trigger rehabilitation for the worker and workplace assessment as a preventive initiative; where the threshold for compensability is attained, the full PLH will be compensated; and subsequent claims must demonstrate at least a further 5% deterioration from the previous PLH. The relationship between PLH and requirement for hearing aids and the retest variability of PLH were investigated in order to obtain information that could be used to assess these recommendations. Requirement for hearing aids begins at a PLH of about 5% for some clients and approximately 16% of claimants with a PLH between 5 and 9.9% will require hearing aids. It seems more reasonable, therefore, to set a PLH threshold for compensation of 5% rather than 10%. The standard deviation of the retest variability of PLH was found to be 1.94%. This means that a change in PLH of 4.5%, or 5% when rounded to the nearest whole percentage point, is significant at the 1% level. The recommendation that an increase in PLH of 5% must occur before any subsequent claim can be made therefore seems reasonable.

I. INTRODUCTION

The term "hearing loss" is ambiguous: it can mean impairment of the threshold sensitivity of the ear (threshold impairment) or it can mean loss of the ability to hear in everyday life (hearing disability). Threshold impairment and hearing disability must be distinguished from one another. The common use of the term "hearing loss" refers to hearing disability, i.e., loss of the ability to hear the sounds of everyday life. The results of research that has been carried out so far indicates that threshold impairment in a person with initially normal hearing must reach about 20 dB before hearing disability begins to occur. This conclusion has been based mainly on reports of hearing disability by people with threshold impairment. However, it should be realised that people with impaired hearing tend to underestimate the extent of their impairment and that continuing research into subtle hearing abilities, such as the localisation of sources of sound, is likely to reveal that there are disabilities associated with lesser degrees of threshold impairment than 20 dB. It seems likely, therefore, that further research will result in tables of hearing disability which begin at threshold impairments less than 20 dB. However, current trends in compensation for industrial deafness are moving in the opposite direction.

Throughout Australia, hearing disability is assessed for compensation purposes in terms of percentage loss of hearing (PLH), determined from the hearing threshold levels of the compensation claimant [1]. The cost of compensation for industrial deafness in Australia has escalated in recent years. Figure 1 shows that the cost of compensation claims for industrial deafness in New South Wales grew from about 12 million dollars in 1988 to about 101 million dollars in 1996. Faced with increasing costs of this kind, the response of some

statutory authorities and legislators has been to introduce thresholds of PLH, of the order of 5 - 10%, that must be exceeded in order for claimants to be eligible for compensation. In South Australia and Northern Territory, the threshold is currently 5%, in New South Wales 6%, in Victoria 7% and in Western Australia 10%.

Since a large proportion of compensation claims for industrial deafness are for a PLH of 5% or less, a threshold for compensation of this order means that the costs of many claims and the associated administrative costs are avoided. This is illustrated in Table 1 which shows, for New South Wales, the number of industrial deafness claims from 1995/96 in various payment categories. With an approximate relationship of \$1000 compensation for each percentage point of PLH, it can be calculated that introduction of a compensation threshold of 6% reduces claims to less than 40% of the original number. In the case of a compensation threshold of 10%, claims would be reduced to about 20% of the original number.

In 1994, the Industry Commission Report on Workers Compensation in Australia [2] recommended that a common Table of Injuries be developed to apply across all Australian jurisdictions. As a result, the Heads of Workers Compensation Authorities included this as a part of the national harmonisation process. Review of PLH thresholds has formed part of the review under the Standardised Measurement of Impairment Project. In 1997, the final report of the Heads of Workers Compensation Authorities [3] recommended that:

- a PLH threshold of 10% apply for compensability; but
- a PLH of 5% or greater will trigger rehabilitation for the worker and workplace assessment as a preventive initiative;

where the threshold for compensability is attained, the full PLH is compensated; and subsequent claims must demonstrate at least a further 5% deterioration from the previous PLH.

The following work was carried out in order to provide information that can be used in assessing these proposals. Two relevant matters were investigated: first, the relationship between PLH and requirement for hearing aids; second, the retest variability of PLH.

TABLE 1

HEARING LOSS CLAIMS IN NSW IN 1995/96	
Payment in Dollars	Number of Claims
0-999	3286
1000-1999	761
2000-2999	729
3000-3999	637
4000-4999	565
5000-5999	504
6000-6999	489
7000-7999	493
8000-8999	433
9000-9999	365
10000-14999	1214
15000-19999	364
20000+	593
TOTAL	10413

2. RELATIONSHIP BETWEEN PERCENTAGE LOSS OF HEARING AND REQUIREMENT FOR HEARING AIDS

The relationship between PLH and requirement for hearing aids was investigated in two ways. In the first approach, a sample of the hearing thresholds of 436 child and age pensioner clients provided with hearing aids by Australian Hearing Services was drawn at random from files and the binaural PLHs of the clients were calculated from their thresholds. The results are shown in Table 2. The one client in the category 0-4.9% had a PLH of 4.9%. This result indicates that some clients with a PLH of about 5% require hearing aids.

In the second approach, the associated binaural PLH was calculated from the hearing thresholds of 282 war veterans whose threshold impairments were mainly due to noise exposure and whose requirements for hearing aids were known. The results are shown in Table 3. No veterans with a PLH in the range 0-4.9% required hearing aids. All of the veterans with a PLH of 20% or greater required hearing aids. In the intermediate ranges, the percentage of veterans requiring hearing aids gradually increased. A graph of the findings with a straight line fitted to the data is given in Figure 2. The real function underlying the relationship apparent in the data is probably sigmoidal but the straight line is a satisfactory approximation for practical purposes. Given the illustrated linear relationship and an even distribution of the number of claimants through the range of PLH from 5 to 9.9%, it can be

calculated that approximately 16% of claimants with a PLH between 5 and 9.9% will require hearing aids. The results of this approach also indicate that the requirement for hearing aids begins at a PLH of about 5%. This conclusion is supported by findings in a study of hearing impairment in the Western Australian noise-exposed population. Monley et al. [4] reported that examination of the associated group mean audiogram suggests that a noise-induced PLH of 5% would require consideration of hearing aids and rehabilitation.

These findings do not mean that hearing disability begins to occur at a PLH of 5%. Hearing disability exists if the PLH is 0.1% or greater. The requirement to use a hearing aid does not begin at the point at which hearing disability begins. Hearing disability must reach a certain degree (for some people, a PLH of 5%) before the advantages of hearing aid use outweigh the associated disadvantages.

TABLE 2

PERCENTAGE LOSS OF HEARING OF CHILDREN AND AGE PENSIONERS WITH HEARING AIDS	
Percentage Loss of Hearing	Number of Clients
0-4.9	1
5-9.9	10
10-14.9	22
15-19.9	39
20-24.9	33
25-29.9	31
30-34.9	48
35-39.9	47
40-44.9	28
45-49.9	36
50-54.9	17
55-59.9	26
60-64.9	23
65-69.9	15
70-74.9	14
75-79.9	9
80-84.9	8
85-89.9	7
90-94.9	5
95-99.9	16
100	1

3. RETEST VARIABILITY OF PERCENTAGE LOSS OF HEARING

Percentage loss of hearing is obtained from the claimants hearing thresholds by means of the National Acoustic Laboratories procedure [1]. Since there is retest variability associated with hearing thresholds and PLH is derived from hearing thresholds, there is retest variability associated with PLH. The purpose of the following investigation was to determine the retest variability of binaural PLH from the known retest variability of hearing thresholds. It is well known that, in the absence of a real change in threshold sensitivity, hearing thresholds vary on retest in accordance with the law of random error and the changes are, therefore, normally distributed and that there are no correlations between the random variations of the thresholds at the various test frequencies.

TABLE 3

**RELATIONSHIP BETWEEN
PERCENTAGE LOSS OF HEARING
AND REQUIREMENT FOR
HEARING AIDS
FOR WAR VETERANS**

Percentage Loss (%)	Number of Clients	With Hearing Aids	Without Hearing Aids	Percentage with Hearing Aids
0-4.9	47	0	47	0
5-9.9	21	3	18	14.3
10-14.9	17	9	8	52.9
15-19.9	20	16	4	80.0
20+	177	177	0	100

The audiograms of 684 war veteran, child and age pensioner clients who had been provided with hearing aids by Australian Hearing Services were obtained from files and the associated binaural PLH was calculated. The thresholds were then varied randomly in accordance with the standard deviations of test-retest differences reported by Jerlvaall and Arlinger [5] for cochlear hearing losses tested in steps of 5 dB, using a function in the statistical program CSS:Statistica which provides a random real number from a normal distribution with a mean of zero and a given standard deviation. The values of the standard deviations used in the calculation of the changes are shown in Table 4. The value at 1500 Hz was obtained from those given by Jerlvaall and Arlinger at 1000 and 2000 Hz by linear interpolation on a logarithmic scale of frequency. The calculated changes were rounded to the nearest 5 dB. The associated PLH was then re-calculated and the differences between the PLH before and after the random changes were determined. The standard deviation of the distribution of differences was found to be 1.94%. This means that a change in PLH of 3.2% is significant at the 5% level or, adopting a more stringent criterion of statistical significance, a change in PLH of 4.5% is significant at the 1% level.

TABLE 4

**STANDARD DEVIATIONS OF RETEST VARIABILITY
FOR COCHLEAR HEARING LOSSES
TESTED IN STEPS OF 5 DB**

Frequency (Hz)	Standard Deviation (dB)
500	3.73
1000	3.02
1500	3.15
2000	3.24
3000	3.93
4000	4.44

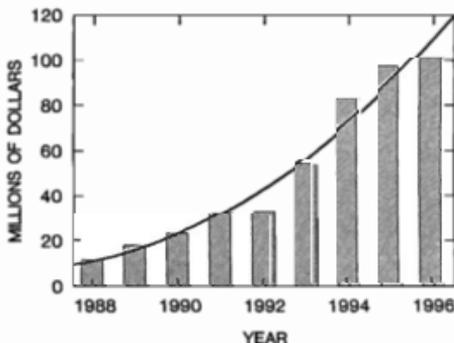


Figure 1. Cost of workers compensation for deafness in New South Wales (1988-1996).

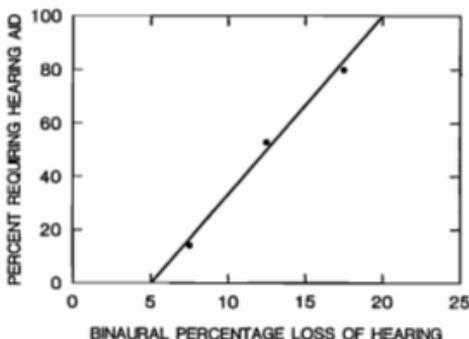


Figure 2. Relationship between percentage loss of hearing and requirement for hearing aids.

4. CONCLUSIONS

The Heads of Workers Compensation Authorities recommend that a PLH threshold of 10% apply for compensability and that a PLH of 5% will trigger rehabilitation for the worker and workplace assessment as a preventive initiative. In the light of the information presented in this article, it would seem more reasonable to set a PLH threshold of 5% for compensation. Figure 2 shows that about 33% of those with a PLH of 10% can be expected to require hearing aids. Requirement for hearing aids begins at a PLH of about 5% for some clients and approximately 16% of claimants with a PLH between 5 and 9.9% will require hearing aids. If a 5% threshold is adopted then there is no need for a trigger for rehabilitation but a trigger for workplace assessment as a preventive initiative should be set at a PLH of 0.1% or greater, since a considerable

amount of threshold impairment occurs before the onset of hearing disability. Monitoring audiometry in industry should detect this threshold impairment and trigger preventive action but an extra trigger in terms of PLH may be useful in circumstances where monitoring audiometry is not carried out. If, instead of a threshold of 5%, a threshold of 10% is adopted, the PLH trigger of 5% for rehabilitation and workplace assessment as a preventive initiative becomes especially important. The approved rehabilitative measures should include the provision of hearing aids, where appropriate, since about 16% of claimants with a PLH in the 5 to 9.9% range will need hearing aids.

The Heads of Workers Compensation Authorities also recommend that an increase in PLH of 5% must occur before any subsequent claim can be made. This seems to be a reasonable proposal in view of the results presented in this article. If the more stringent 1% criterion of statistical significance is adopted, then a change in PLH of 4.5% is required before a real change in PLH can be considered to have occurred. This becomes 5% when rounded to the nearest whole percentage point. The error rate for a significance level of 1% is 1 in 100, i.e., for 1 out of every 100 claimants with an increase in PLH of 5%, the increase will not be real.

However, for the remaining 99 claimants, a real increase in PLH has occurred. This is a suitably low rate of error. The recommendation that an increase in PLH of 5% must occur before any subsequent claim can be made therefore seems reasonable.

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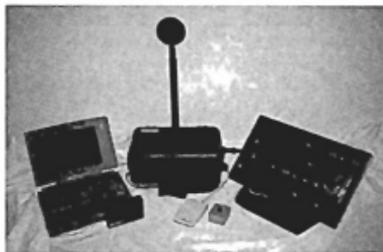
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