SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF OTOLOGY

President: RONALD MACBETH, D.M., F.R.C.S.

Discussion on The Effects of Noise upon Hearing

May 6th, 1960

THE opening papers will be found on pp. 447-486.

WING COMMANDER P. F. KING. In the Royal Air Force we have for some time been aware of the need to protect the hearing of those exposed to hazardous noise levels.

We have acted by defining limits of noise beyond which the hearing is likely to be hazarded and outside which men require protection. In the case of those working on aircraft engines, protection is provided by a British production of the Canadian National Research Council's ear-muff.

We have not yet started the measurement of hearing of men in noise-exposed trades before, during and after employment because of the large staff required to cope with the numbers involved.

We are solving this by constructing an automatic audiometer—the first of three—which will test the hearing of 21 subjects in a 20 minute sitting. This machine, made in the Acoustics Laboratory, is nearly completed, and I had hoped to show it today for your interest.

Two semi-skilled operators only will be required for each machine, to help the subjects and adjust headphones, etc.

After the machine is started, determination of threshold will be made on six frequencies—200, 500, 1,000, 2000, 3,000 and 4,000 c.p.s., in a range of + 50 to —10 decibels, relative to normal threshold.

Test tones will be relayed in descending intensity, in 5 decibel stages, the subject receiving 2 "pips" of the test tone at each intensity. The subject responds by pressing a key, which initiates a photographic process, marking an audiogram form preprinted in the machine.

The performance criteria specified in the British Standard relating to threshold measurement are observed.

With equipment of this sort we aim to measure the hearing of all entries to the Service and to follow all men through their career. Such an audiometer may well be of use in industry, where it could be used on a co-operative basis by several concerns.

D. E. HICKISH, said that the research work on noise at present being undertaken by Dr. Challen and himself at the Occupational Hygiene Service at Slough was an endeavour to study the effect of noise on the hearing of workers engaged

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in various processes, particularly those found in small firms. The intention was to perform serial audiometry, at yearly intervals, on a selected group of employees, and to make regular assessments of their noise exposure. One difficulty which had been experienced was the fairly high labour turnover in some of the workshops, which rapidly reduced the size of the group being studied.

Another aspect of their work was the investigation of noise problems on an *ad hoc* basis, both by environmental noise measurements and Temporary Threshold Shift audiometry. It was often relatively easy to show the presence of a hazard to hearing, but extremely difficult to reduce the hazard significantly other than by the use, by the exposed persons, of ear defenders of appropriate type. Many of the processes were inherently noisy, and considerable technical study would be required before noise reduction at source could be effective. However, he felt that there were some basic noisy processes, common to many industries, which merited study, as for example punch presses, automatic machine tools and compressed air jets. He hoped that some appropriate research body might undertake this work for any successful measures could then be widely applied, and make a considerable contribution to the reduction of of occupational hearing loss.

MR. H. V. FORSTER said that he had looked forward and had listened with much interest to Dr. Glorig's address, but was no less interested to see how fresh legislation would deal with this problem in Britain.

It was the duty of Otologists to examine the effects of continuous noise upon the Cochlea though its nuisance value was not confined to members of our speciality.

DR. DONALD STEWART's amusing reference to sales resistance to quieter motor bicycles was not unexpected and in his own City when investigating, with the assistance of the Medical Officer of Health, a complaint of a persistant humming noise, not even confined to week days, he Mr. Forster had discovered this to be from a powerful exhaust pump used to protect the worker from silicosis in a factory using sand blasting machinery and at a very considerable distance from the home of those making the complaint.

DR. G. KAZANTZIS said Audiometry in industry should not be embarked upon lightly. There are many variables which should be controlled, and factors to be taken into account if the tests are to mean anything. To take but a few:

How long should the subject be removed from a noisy environment before being tested? He should obviously not be tested while under the effects of a noise induced temporary hearing loss.

Extraneous noise within the testing booth should be controlled, and standard maximal noise levels should be adhered to.

The subject should not be tested during the course of an upper respiratory tract infection, and he should be asked about drugs he might be taking—quinine produces a temporary hearing loss.

Again, the subject should understand clearly exactly what it is he has to do, and what signals he has to give.

An experienced operator is required to explain the test, to fit the earphones correctly, to see that friction from the cord does not produce extraneous noise when the signal is being delivered. There are a number of such points to be taken into account.

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P. J. R. CHALLEN said, "I would like to comment on certain points mentioned by Dr. Kazantzis because they are of importance in the study of noise and its effect on hearing. Firstly, he is incorrect in his statement that there are no minimum acceptable octave-band noise levels for audiometric rooms, and I would refer him to those, amongst others, drawn up by Webster 1954, Cox 1955 and Glorig and Harris 1957. He poses the question of how long a period of freedom from exposure to noise should be allowed before an audiometric test, so as to eliminate temporary threshold shift. Dr. Hickish and I can speak from personal experience of this problem, having exposed ourselves to various noises for stated periods, and although the question is too complex for a brief reply, we consider that a minimum period of 48 hours should be allowed. However, in practice this is difficult to achieve because, in general, it means that all subjects would be tested on a Monday morning, and in industry this is not feasible. Therefore a compromise between scientific and practical expediency must be a period of 12-14 hours and audiometric tests can then be carried out every morning before entry into the noisy workshop.

Epidemiological surveys of occupational deafness, where the significance of results obtained from serial testing will only be inferred from statistical analysis, demand a greater precision in audiometric technique than is required for the assessment of clinical disorders. Calibration of the audiometer should be carried out weekly by one method or another. (It is essential that all noise measuring equipment be calibrated before each field survey.)

The psychological factors which influence the results of audiometric testing are a subject worthy of detailed study, particularly for the epidemiologist, viz. fatigue in the observer and the observed and the influence of emotional factors and the intelligence level on the response of the observed, etc.

In my opinion, the study of occupational deafness is a neglected one in this country, which is unfortunate because, with the advent of increasing mechanization and automation, noise is a rapidly growing problem. One cannot expect manufacturers to devote time, energy and financial resources to the extremely difficult task of quietening noisy machines if we do not provide them with reliable clinical evidence of the noxious effects of this noise".

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