

## EVALUATION OF DISABILITY AND HANDICAP IN NOISE-INDUCED HEARING LOSS

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In January 1990, a conference was held under the auspices of the National Institutes of Health (National Institute on Deafness and Other Communication Disorders) in Bethesda, Maryland. The topic of the conference was "Noise and Hearing Loss". The conference was planned to be accessible to the public as well as to a professional audience. It was organized around five questions: "What is noise-related hearing loss?"; "What sounds can damage hearing?"; "What factors, including age, determine an individual's susceptibility to noise-related hearing loss?"; "What can be done to prevent noise-related hearing loss?"; "What are the directions for future research?"

The present author was asked to give a paper on the issue of "quantification of handicap" resulting from noise-related hearing loss. The press for quantification arises from the physico-biological orientation of most researchers involved in study of this occupational injury. While my own research endeavours have been affected by that orientation, the question pursued - namely, how to evaluate handicap - has always been seen as qualitative in nature. Thus, opportunity was taken by means of this conference presentation to consider the broader issue of appropriate approach to evaluating disability and handicap arising from this impairment to hearing. Following is the text of the conference paper, as amended consequent to this journal's referees' comments. I acknowledge with thanks their suggestions for amendment and clarification.

The terms "disability" and "handicap" have been used in various ways in literature addressed to the issue of effects of hearing impairment. So as to get definitional problems out of the way, I will start by explaining the usages I rely upon in discussion of such matters. These are the World Health Organization (1980) definitions and, in the context of impaired hearing, the term "disability" refers to loss or reduction in a person's capacity to perform hearing acts, such as the detection or discrimination of audible events in the everyday world; "handicap" is used to refer to the disadvantage in daily life resulting from this disability or impairment.

A question relevant to the aims of the present Conference is with respect to evidence that hearing impairment due to noise injury results in disabilities sufficient to cause handicap, to cause "disadvantage in daily life". One issue raised in this paper concerns what form of evaluation of hearing can furnish evidence of such disadvantage. Flowing from that, and given that evidence of hearing disability and handicap is accepted, then the question of significance is surely: - "What can be done to prevent noise-induced hearing loss?" I would urge this Conference to put that question at the top of its agenda.

One of the earliest systematic investigations of noise-induced hearing loss was by Thomas Barr in 1886. This classic study captures the essence of the issue about how to evaluate disability, on the one hand, and, on the other, how to evaluate handicap. Barr used the tick of his pocket watch to perform functional tests on three groups of workers exposed to distinctly different amounts of noise at work, namely, ship's boilermakers, iron-moulders, and letter-carriers. By using the watch to assess the least amount of acoustic energy detectable, Barr was measuring the comparative extent of disablement of the auditory systems of the three samples.

But Barr also inquired directly of the people studied about handicap, about the disadvantage in their daily life due to disablement of hearing. He asked them to report on their capacity to hear in a public place. Among the boilermakers, not only was there severe hearing impairment compared with the other groups, as revealed by the watch-tick test, but the majority of them reported difficulty hearing at a public meeting or church service, to the point where many said they had ceased attending such gatherings. This finding dramatizes the profoundly handicapping effect hearing disability can produce. It has become clear from subsequent investigation that interference with everyday communication, and not so much hearing at public gatherings, is the major source of handicap suffered by those with injured hearing.

The principal point emerging from mention of Barr's work is that evaluation of impairment may be appropriately carried out by the testing of some aspect of hearing

capacity, be that by use of a ticking watch, a whispered voice, an electronic sound maker, or an elaborately devised speech discrimination procedure. But *handicap*, the disadvantage in everyday life resulting from disability, cannot be determined by any such test. It can only be assessed by the person who suffers the disability, because that is the one who experiences any disadvantage; and how such disadvantage occurs is a function of the life the person lives. In evaluation of handicap, the self-assessment of the person affected cannot be avoided.

Of course, impairment and disability are related and both are, in turn, related to handicap. Before going on to say more about the self-assessment approach as such, it is appropriate to say something about that relationship, as reflected in the relation between measurements of hearing impairment using various tests, and self-assessed disability scores. I'm focussing my attention on research specifically among people with noise-induced hearing loss. Research such as by Kryter and colleagues (1962), Macrae and Brigden (1973) and Suter (1978) shows hearing capacity at audio-frequencies higher than 2 kHz plays a significant role in affecting the discrimination of speech heard in noisy background conditions. These sorts of conditions, of course, typify the communicative circumstances for most people working in noisy jobs, not to speak of the noisy background conditions we all have to contend with when trying to hear in the street, in the store, at the restaurant, or whatever. So it is predictable, and borne out in results, that self-assessed hearing disability and handicap in people with noise-induced hearing loss correlates more closely with results of hearing sensitivity tests when threshold levels at frequencies higher than 2 kHz are included in the analysis (see, e.g., Parving and Ostri, 1983; Phaneuf et al., 1985).

In subsequent decades following Barr's pioneering work, testing of hearing sensitivity predominated over other methods of evaluation, and the question of a role for self-appraisal in assessment of handicap was never raised. This may be because the issue of compensation in noise-induced hearing loss was not addressed on a large scale until after the second world war. In addition, rehabilitation of people with disorders of hearing also developed more strongly as a practice around that time. It is really only with the emergence of these practices that evaluation of handicap becomes an issue at all.

Over the last 25 years numerous attempts have been made to measure hearing disability and handicap using questionnaires, check-lists, and other self-assessment devices. Some of these have taken the form of devices constructed with attention to principles of psychometric measurement, such as reliability and validity. Insofar as it is considered appropriate to apply a numerical value to self-assessed handicap (or self-assessed disability), then it has

made sense, in the construction of scaled questionnaires, to look to their properties as measuring instruments. It is not my purpose to give you a lecture on principles of psychometrics; I merely seek to have you appreciate that there is a difference between a questionnaire got up in half-an-hour on the back of an envelope, and one that attempts to provide stable, meaningful and valid measurement of the property or properties it claims to assess.

So far as I am aware, the first effort to devise a self-assessment questionnaire with attention to psychometric criteria was the Hearing Handicap Scale of High, Fairbanks and Glogri (1964). This device focused on hearing for speech. The second scaled questionnaire on the market, constructed with more elaborate developmental steps, was the Hearing Measurement Scale, by myself and Gordon Atherley in 1970. It covered areas of everyday hearing, such as hearing for speech, non-speech sounds, localization of sounds, speech distortion, and tinnitus. Subsequent to its emergence, I went on to express arguments in some detail (Noble, 1978) about the limitations of tests of hearing impairment for assessment of hearing disability and handicap, and about the rightful place of self-appraisal in the suite of auditory evaluative procedures.

In the last 10 to 15 years, several scaled and unscaled questionnaires have emerged, designed for different used in different target populations. Among these are, for example, The Hearing Performance Inventory, developed originally by Giolas and colleagues (1979), the hearing Handicap Inventory for the Elderly by Ventry and Weinstein (1982), and the Communication Profile for the Hearing Impaired by Demorest and Erdman (1987). By use of these and other questionnaires, the self-assessment approach to hearing disability and handicap has found a significant place in various contexts. Self-assessment has been used historically in census-taking of hearing capacity in the population at large, but the method has lately become more psychometrically refined (e.g., by Lutman et al., 1987). Self-assessment has been used for rehabilitative screening procedures (e.g., by Schow & Nerbonne, 1982), in evaluation of hearing aid benefit (e.g., by Newman & Weinstein, 1988), in counselling for, and evaluation of, rehabilitation programmes of various kinds (e.g., by Giolas, 1982), in evaluation of general problems due to hearing impairment (e.g., by Barcham & Stephens, 1980), in evaluation of specific effects such as those due to tinnitus (e.g., by Tyler & Baker, 1983), as well as in development of schemes for assessment for compensation purposes (e.g., Salomon & Parving, 1985).

It has consistently emerged from application of the self-assessment procedure that the principal disability, and source of the resulting disadvantage experienced by people who suffer impairment of hearing, is interference with

occasions of commonplace spoken communication, be that in face-to-face interaction, telephonic conversation, or picking up information from electronic media. Among commonplace sounds that may go undetected, those linked to communication - the telephone or door-bell - are identified by people with impaired hearing as most highly salient (Barcham & Stephens, 1980). Among the difficulties caused by tinnitus, its interference with communication is reported as outweighing its other disturbing qualities (Tyler & Baker, 1983).

Other areas of everyday existence are reportedly affected by impaired hearing. For instance, reduction of the ability to detect the occurrence of various domestic noises (the whistling kettle, the pet dog seeking entry), or of warning signals (a car horn, the neighbour's call) is reported as having a handicapping result. The sounds in question may not be those of spoken speech, but they are still communicative or associated with communication. This underscores my point that the central handicapping disability of hearing impairment is loss or reduction of communicative contact with others.

Of course, it becomes quite understandable that interference with communication is the key handicapping effect of hearing impairment, once it is remembered that the basis of human life is communication. That is the case because human life is essentially, uniquely, and unavoidably linguistic. I want to say more on this point, because an appreciation of it should assist in your appreciation of an issue to be raised in the closing part of my address.

Most people, most of the time, take their communicative ability for granted. In exactly the same way, they take their capacity to see and hear for granted. We only really notice these features of ourselves, in our mundane activities, when something goes wrong. That most of us are engaged in communicative activity almost all of our waking lives can come as something of a surprise. Surely we do other things besides communicate? I don't intend to get into a major argument on this point. I do want to suggest that human beings don't do *much* besides engaging in communicative activity - but I want you to understand that by "communicative activity" I include anything undertaken for the purpose of showing others as well as saying things to others.

Even if we restrict the notion of communication to vocal interchange, the business of *saying* something to someone else is only one of a host of such communicative acts. We *ask* things of others, we answer them, we inform each other, we misinform, we beg, command, tell secrets, tell jokes, gossip, complain, argue, discuss, praise. I could go on at length. All these and myriad other communicative acts are undertaken by humans in virtue of their having access to

one or more natural languages. We chat to each other routinely. And once we recognize this ordinarily taken-for-granted feature of human life, we can see more clearly what it *means* to be human. The things I listed are quite familiar to us all, though I suspect we tend to forget we do all these things when groups of us lock ourselves into conferences to discuss the handicapping effects of hearing impairment. When we break for a coffee or lunch, though, we go into taken-for-granted chat mode with a vengeance. Bringing these familiar, taken-for-granted features of human life to the forefront of attention can surely assist us all in seeing what is so fundamentally damaging about hearing impairment. Interference with communication is interference with the basis of human life.

A recent refinement of the self-report approach to evaluation of the handicaps resulting from noise-induced hearing loss is to be found in the work of Héту and colleagues (e.g., Héту et al., 1988). This work tells most strongly as regards the points I have just made. In the work of Héту's research group, a formal self-report scale is replaced by semi-structured interviewing, and the content of resulting transcripts independently examined to extract themes and descriptors emerging from the discourse of participants. Interviews are typically carried out among hearing impaired workers and their spouses, and a significant outcome has been discovery of the extent to which other family members must adjust *their* behaviour in order to compensate for the difficulties experienced by the workers. These adjustments are, in turn, due to efforts by workers to minimize the display of signs of disability. The upshot is that the disadvantage suffered by the hearing impaired worker introduces a fresh disadvantage, to their family, in coping with the worker's disability. The problem shifts, then, in the conceptualization of Héту's group, from a clinical disorder affecting individuals, to an issue of *public* health, affecting the families and close friends of those injured.

There are many plausible reasons why people with impaired hearing are reluctant to admit they have problems. If communication is central to human life, as I have just stressed, anything which threatens that will be highly unwelcome and barely acknowledged. Motivation to conceal a reduction in communicative ability will be reinforced by others, who will typically take any signs of *communicative* incompetence as evidence of incompetence *as a member of society*. It does one's standing no good, in the eyes of others, to be so regarded. Héту and colleagues (1990) have also pointed out to a phenomenon arising from the experience of working in hazardous conditions. They refer to the work of Dejours et al. (1985) which identifies a drive, by those exposed, to diminish perception of the riskiness of occupational hazards, so as to make the matter of working in the hazardous environment tolerable. A

further pressure to conceal hearing difficulty is fear of discrimination in employment and promotion chances. Who, after all, is likely to put a hearing impaired person in a position of responsibility; in a position where they *must* be able to communicate effectively with others.

Despite a vast wealth of knowledge about the causes, mechanism, likelihood and incidence of noise-caused hearing impairment, this injury remains one of the most intractable occupational hazards. Risk of damage to hearing continues on an epidemic scale. One part of the reason why this is so is due to the forces I have just described. These serve to keep the pressure low, from among those exposed, as regards taking action to reduce noise levels to safe limits.

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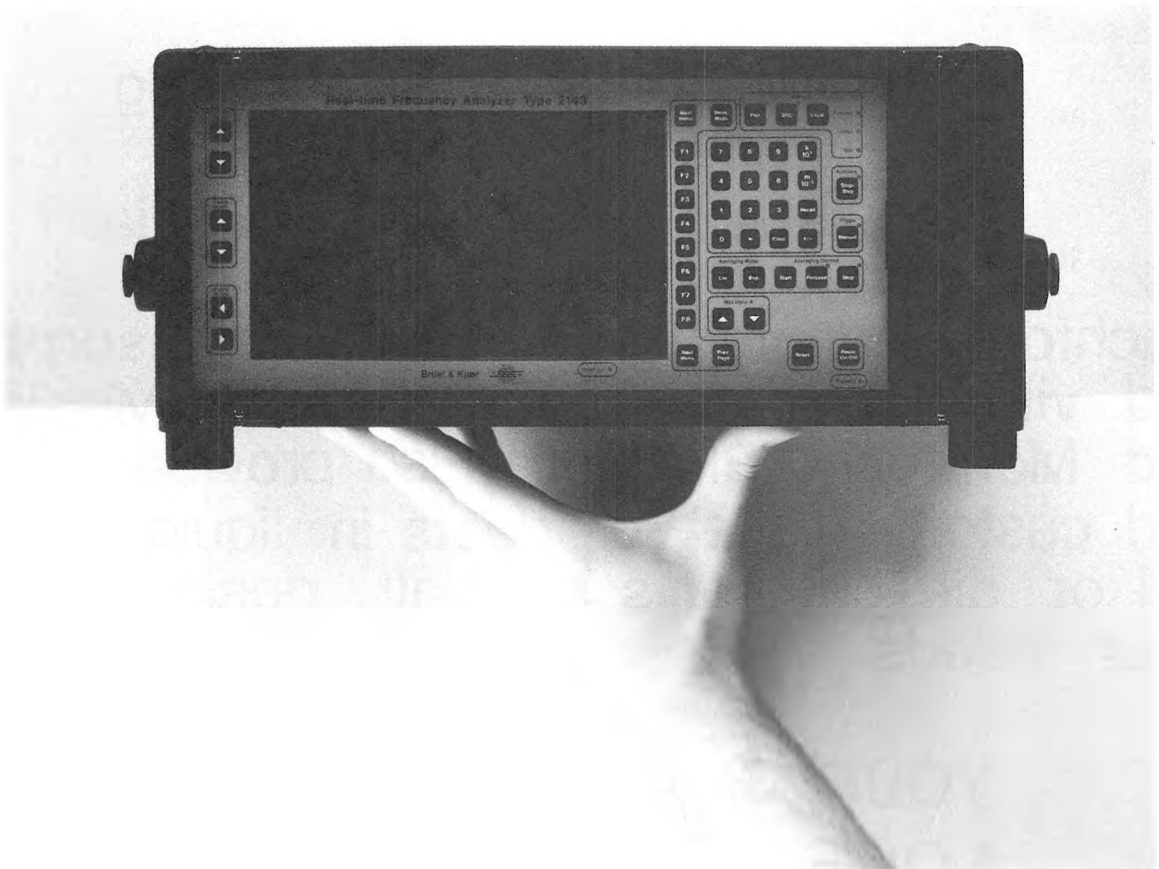


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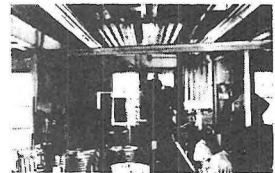
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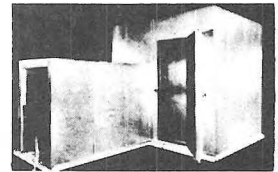
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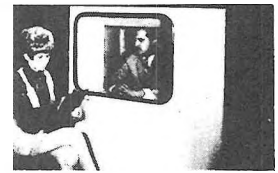
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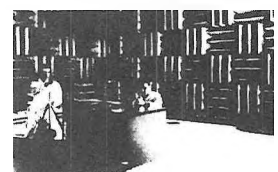
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