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The Use of Residual Vision by Visually Disabled Persons

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WHO MEETING ON THE USE OF RESIDUAL VISION BY VISUALLY IMPAIRED DISABLED PERSONS

Brussels, 28-30 January 1981

1. INTRODUCTION

A Meeting on the Use of Residual Vision by Visually Impaired Disabled Persons was held at the Institute of Hygiene and Epidemiology, Brussels, from 28 to 30 January 1981. The participants constituted a multidisciplinary group of representatives of national research organizations and laboratories, professors of visual science, ophthalmologists, representatives of private societies for the visually disabled, and WHO staff members. (A list of participants is annexed.)

Professor S. Halter, Secretary-General, Ministry of Public Health and Family Welfare, Belgium, welcomed the group on behalf of the Belgian Government, on whose initiative the Meeting was convened by the WHO Regional Office for Europe.

Dr B. Nižetić, Regional Officer for Research Promotion and Development, WHO Regional Office for Europe, expressed thanks to the Belgian Government for its interest and its generosity in sponsoring the Meeting.

Professor J. François was elected Chairman and Dr F.W. Campbell Vice-Chairman; Dr Constance Atwell acted as Rapporteur.

1.1 Review of the present situation

It is estimated that sensory impairment and related disabilities and handicaps are among the most prevalent afflictions in the WHO European Region. Disability and handicap related to visual impairment occupy an important place in this respect. Furthermore, among the aging populations of European countries the absolute number of sufferers is likely to increase.

The categorization of visually impaired, disabled and handicapped persons still presents conceptual and organizational difficulties. The Meeting therefore discussed criteria for categorizing persons with residual vision and for assessing their numbers and the different problems they face. Special attention was paid to the availability and assessment of existing technology and to the need to develop appropriate and simple aids which would enable people with residual vision to maintain their independence. Existing

services and the available manpower were also reviewed with the aim of rectifying gaps as seen from professional and consumer points of view.

This Meeting and the resultant recommendations form part of WHO's contribution to the International Year of Disabled Persons. A further objective of the Meeting was to identify what research is needed in the area of visual impairment at the basic, clinical, epidemiological and health services levels, including biomedical as well as behavioural and environmental sciences. An important aspect of the Organization's efforts to promote research development is the practical application of basic research results (transfer of technology). This includes the dissemination of findings and newly developed technologies within the European Region and their use as models for developing countries.

1.2 Problems of definition and categorization

In accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, WHO has published for trial purposes a manual of classification relating to the consequences of disease, the *International classification of impairments, disabilities and handicaps* (Geneva, WHO, 1980). This manual served as the basis for discussion on the definition and classification of visual impairment. There was general agreement with the approach taken in the WHO publication; however, some reservations were expressed about its usefulness in general clinical practice. The need for a functional definition of visual impairment in addition to the widely used visual acuity measures has been recognized by the inclusion of coding digits for disabilities (e.g. communication, locomotor, personal care), including severity of disability and assessment of prognosis. It was suggested that an additional scale relating to the degree of assistance necessary be added for each category of disability.

One main concern with the classification system as it is now presented for ocular impairments is the misleading use of terms such as normal vision, low vision, and blindness. The current designation in most European countries and the United States of individuals with visual acuity of less than $^{6}/_{60}$ or $^{20}/_{200}$ as legally blind has led to an arbitrary cut-off in eligibility for social and rehabilitative services and has had the unfortunate effect of directing individuals with some residual vision into programmes designed exclusively for the totally blind. It is therefore recommended that the "WHO category of vision"[a] be eliminated entirely from the terminology for classifying impairments of visual acuity. In using the WHO classification system it is important to recognize that the proposed categories are simply designations of the current status of the individual and are therefore only temporary codings. An individual's classification is likely to change over time.

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[a] **World Health Organization.** *International classification of impairments, disabilities and handicaps.* Geneva, 1980, p. 80.

There was general concern that the complexity of the *International classification of impairments, disabilities and handicaps* would result in its being useful only for research purposes rather than for clinical application. Since the use of these codes as criteria of eligibility for rehabilitative services is a major goal, further work to simplify the codes is recommended. This is particularly important because of the potential application of the classification system to Third World countries which lack personnel trained to make sophisticated judgements concerning classification. It should also be noted that disability as a result of visual impairment may be defined in various ways according to different social and cultural contexts.

There was considerable discussion of the stigmatizing effect of categorization upon some people, and it was recognized that this can be psychologically harmful. While categorization may be necessary for statistical purposes, there must be sufficient flexibility to ensure that services are available to satisfy needs in a particular instance. Additionally, any system needs to ensure that individuals are not denied access to appropriate services simply because they do not wish to accept a stigmatizing label. Despite this potential difficulty, the use of a consistent classification system within a given country, and perhaps internationally, could serve to stimulate more rational planning of service delivery.

Individuals with multiple handicaps should be classified for each handicap separately.

1.3 Epidemiology

It has been said that blindness statistics are to eye care what mortality statistics are to the rest of medicine. At this Meeting attention was focused on individuals with partial sight, thus morbidity statistics might be considered a more appropriate analogy here. Because of the previous lack of uniformity in defining visual impairment, reliable data that can be subjected to international comparison are virtually nonexistent. Household surveys in England, Wales and the United States do show some common features, however, particularly the high proportion of elderly persons among those with severe visual impairment.

The National Society to Prevent Blindness in the USA has recently analysed data from a continuing nationwide survey conducted by the National Center for Health Statistics on the noninstitutionalized civilian population of the country. This survey, carried out in 1977, estimated that 1.4 million persons had a "severe" vision impairment, i.e. they could not read ordinary newsprint even with the aid of glasses. This figure includes the legally blind (490 000) as well as some 901 000 persons with a visual acuity better than $^{20}/_{200}$ but probably not better than $^{20}/_{50}$. Of those with severe visual impairments, 71% were aged 65 years and over, and 60% were female. Cataract was the most frequently reported cause of severe impairment,

accounting for 41% of the cases, followed by glaucoma (7%). A significant proportion of the severe impairments is due to general diseases such as diabetes and cardiovascular diseases; this is less frequently the case in lesser degrees of impairment. These figures are in contrast to the causes of legal blindness, in which glaucoma (12.5%) and macular degeneration (11.7%) lead the list. In Belgium genetic diseases are the leading cause of blindness, which highlights the importance of genetic counselling in European countries.

In order to obtain more accurate estimates of the prevalence and specific causes of impaired visual acuity, the National Eye Institute of the National Institutes of Health in the USA will soon begin a population-based study of adults with visual acuity worse than $^{20}/_{40}$ in either eye with best correction. Clinical examination will determine the presence of ocular diseases in the impaired eyes and the extent to which each disease present affects visual acuity. Analyses will be conducted to detect differences linked to age, sex, race and geographic factors. It is hoped that case control studies conducted concurrently with the eye examinations will permit the development and testing of hypotheses about the etiology of major specific eye diseases.

The identification of the elderly as the most vulnerable group for visual impairment has important implications for health service planning. In Sweden, and indeed in most European countries, visual rehabilitation services have been directed primarily at children and those in the employable age range. There are a number of reasons why the elderly seem to have been relatively neglected in the provision of services. As noted in the report on a previous WHO meeting,[a] many of the elderly tend to accept gradual failure of sight as one of the inevitable consequences of growing old and consequently fail to seek appropriate help for their visual disability. In addition, elderly patients with seriously impaired vision are often not as effective in communicating with clinicians about their needs as are younger patients. There is often an assumption that elderly patients are not as capable of rehabilitation, although recent experience with patients recovering from scotomas that occurred as a result of vascular accidents belies this assumption.

Ophthalmologists often feel that they are seeing patients too late in the progress of a disease to permit optimal treatment and prevention of disability. Better epidemiological information would permit screening of high-risk populations for the purposes of early detection on a more cost-effective basis than is possible with untargeted mass screening. An increased ability to identify visually disabled persons would have important implications for health planning. Would the services required then create an untenable burden

[a] **WHO Regional Office for Europe.** *The role and functions of national institutes of ophthalmology:* report on a WHO Meeting. Copenhagen, 1979 (EURO Reports and Studies, No. 5).

for the health care system? What is the optimum use of available resources? While these are important and difficult questions, they should not prevent attempts to collect more systematic and reliable data within a given country or region, or on an international scale.

2. INTERDISCIPLINARY AND MULTIDISCIPLINARY PERSPECTIVES ON THE USE OF RESIDUAL VISION

The participants at this Meeting represented many different disciplines, including neurophysiology, psychology, bioengineering, sociology, public health, epidemiology, and ophthalmology. Several described work in their own areas of expertise that would have relevance to the use of residual vision by visually impaired persons. There was, for example, a discussion of the neurophysiology of feature detection and image processing, in which the visual system was described as exhibiting economy and abstraction at each level from the retina to the cortex. Knowledge of the organization of the visual brain in this manner means that some potential aids to vision, such as prostheses attempting to create a visual image by stimulating points on the cortex, will be discarded as "unphysiological" and probably unethical. There was also discussion of the usefulness of relatively new sensory assessment techniques like the contrast sensitivity function, which measures a person's sensitivity to different spatial frequencies at varying levels of contrast.

Conventional measures of visual acuity use high-contrast black and white alphanumerics. However, in daily life much of the scene around us is of much lower contrast. An extreme case would be vision through mist and fog. Over the past decade, many workers have measured visual performance over wide ranges of contrast. The data obtained have widened our horizon of normal visual performance. Only recently have these methods been applied to abnormal vision.

By varying the contrast of the target, it is possible to describe normal and abnormal vision much more accurately than is now possible using just visual acuity targets. Alterations in contrast sensitivity have been found in different types of amblyopia, optic neuritis, glaucoma, and multiple sclerosis. This development has the potential for assisting in the diagnosis and understanding of the nature of the visual defect, something not available from conventional ophthalmological tests. In the future, this information might be useful in the design of new visual aids and in matching the patient to the aid.

This approach is very similar to that already employed with regard to auditory defects and hearing-aids. The rapid increase in the sophistication of microprocessors and the sharp decrease in their price, with accompanying small size, weight and power requirement, could lead to the design of sophisticated tailor-made visual aids for each type of disability.

Additional research on phase relationships among spatial frequency components of visual targets such as sinusoidal gratings may be especially important for clinical application. By alternating the phase of test gratings it is possible to measure the electroretinogram and the evoked potential from the higher visual centres. As the voltages are small, an averaging technique will be required. This provides a more objective measure of visual performance, particularly in subjects unable to make threshold judgements, for example, young children and patients who are seriously ill from other conditions such as brain damage.

Research in this field is already under way in a number of pilot studies being conducted in New York, Melbourne, London, and Cambridge (United Kingdom). The preliminary results are encouraging. These units should be encouraged also to include studies on the partially disabled, as they may lead to a more informed attitude concerning the design of visual aids.

It is also important that ophthalmologists be educated regarding the clinical potential of newly emerging psychophysical and neurophysiological techniques; they need to be made more aware that there is more to vision than the eye.

The importance of the psychological context in which rehabilitative treatment occurs was highlighted by the group's discussion of enhanced residual vision in patients with cerebral lesions. More than 100 000 patients in the Federal Republic of Germany suffer from visual problems due to cerebrovascular trauma, and other countries in the western world may be presumed to have a proportional number of such patients. The injuries result in dense blindness in the contralateral visual field, often producing hemianopsia. The high number of such patients is usually not revealed in statistics on eye diseases because of the neurological etiology of the disorder. Ophthalmological treatment for such patients was previously nonexistent. Basic research within the last decade, however, has shown that such patients are often still able to use visual information, although not for fine-detail discrimination as generally measured in the usual visual acuity tests. Such patients apparently use information sent via the superior colliculus to other areas of the cortex. It has been shown that the efficiency of these pathways can be substantially increased by systematic training, resulting in an improvement in spatial orientation. This residual sensitivity to visual targets presented in the "blind" part of the patient's visual field is demonstrated by a correlation between target eccentricity and the size of saccadic eye movements when the patient is asked to look towards the "unseen" target. Orientation to a target in space, then, does not appear to require conscious perception of that target.

Other studies have shown that systematic training to discriminate light stimuli at the border of a scotoma results in an expansion of the functional visual field. Quite a few patients have returned to work after intense training of their visual functions in this manner. The importance of the psychological

context arises during the training phases of these treatments. While it would be possible to programme the training targets for these patients by computer, experience has shown that the necessary motivation to participate in such training comes only through human contact. Computers, while efficient, may be ineffective.

Further discussion on recovery from trauma centred on those features that vision has in common with other sensory modalities. It was noted, for example, that recovery of function is far more likely if treatment is begun within three months of trauma for both visual and auditory defects, thus implying a common critical period for these senses. The desirability of supplementing vision training with stimulation of other sense modalities (e.g., auditory or vestibular) was also noted.

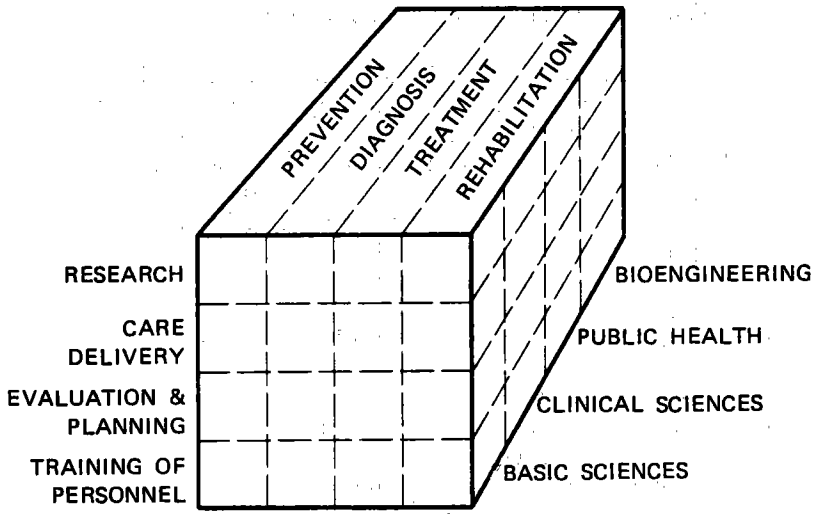
The preceding two topics may be considered examples of interdisciplinary research and treatment, i.e., combining various disciplines within a single project. A multidisciplinary approach defines a patient's problems in performance or functional terms and then identifies components of the problems or tasks that can best be tackled by specialists in various disciplines. This team approach was considered the most appropriate for helping the partially sighted to use their residual vision.

In each country one or more comprehensive multidisciplinary centres might be established, encompassing not only care delivery but also evaluation and planning, research, and the training of personnel. Such centres or institutes would have responsibility for the prevention of disability (not necessarily prevention of disease), as well as the diagnosis, treatment and rehabilitation of the visually impaired. They would be staffed by specialists in the basic, clinical, social and public health sciences, bioengineering, mathematics, etc. The model shown in Fig. 1 illustrates this three-dimensional concept.

At a given centre there might be a nucleus or core staff who would have access to more specialized resources as needed. Specialists to be represented at these centres or in supplementary resource centres for specialized services should include ophthalmologists, neurologists, neurophysiologists, psychologists, low-vision teachers, ophthalmic opticians (optometrists), occupational therapists, social counsellors, otologists, technicians, ergonomists, genetic counsellors, paediatricians and geriatricians. These multidisciplinary teams would probably be located at centres in existing hospital regions or similar administrative divisions in each country. The number and diversity of the centres would have to be matched to existing demographic and geographic conditions. Low-vision clinics or centres more widely distributed at local level within each country for primary service delivery would have continuing contact with the regional or national comprehensive centres.

The research function of such centres would be especially important. The placement of research facilities in close proximity to service delivery

Fig. 1. Functions of comprehensive multidisciplinary centres



facilities might result in a definition of research questions that is more closely attuned to the clinical and service needs of the visually impaired patient.

Access to large and heterogeneous populations of visually impaired persons may also make research results more generally applicable than has been possible on the basis of research on only a few individuals. The expected flow of information from the research function to the care delivery and training functions is also expected to facilitate the practical application of research results.

For the purposes of planning and the allocation of scarce resources, the identification of target groups of consumers for low-vision rehabilitation services is of importance. Attention in the past has been focused upon the working-age group of the population, presumably because of its economic importance. Particular attention should now be paid to the early detection of visual disabilities in children, which also necessitates appropriate child care facilities. The elderly constitute another important group in this context, and the fullest possible use should be made of auxiliary health personnel and social workers for the detection and rehabilitation of low vision in such patients. If social workers are properly trained to recognize the problems of the visually impaired elderly, they could help to identify such people and also make minor adaptations and adjustments to their environment and aids.

One of the main barriers to progress in the use of residual vision is the current low status and scientific standards of work in the field of rehabilitation in general. Centres such as those described above should have the function of training service delivery personnel in technical and medical knowledge to a higher level than is now typical. Conversely, ophthalmologists, optometrists and/or equivalent professionals must become more fully aware of the social and environmental requirements of their patients, and of new technological developments that are applicable to the partially sighted. It was suggested that medical education in general should include more technical education, e.g., engineering aspects, and that the application of technical advances in medicine should feature more prominently in the curricula of technical universities. The continuing education of personnel in all of the relevant disciplines was recommended. Simulation demonstrations of different forms of visual impairment might be particularly useful. Depending on the observer's initial orientation, such demonstrations might generate hypotheses about the basis of a given disorder, or provide insight into the problems that patients experience under these restricted visual conditions. Workshops and courses or lectures at professional meetings might also be helpful.

The Meeting stressed the importance of stimulating and strengthening interdisciplinary communication in the field of low-vision rehabilitation. Contacts between all medical, social and technical disciplines involved in such rehabilitation should be promoted at both international and national level.

Because the need for coordination of resources is so great and the opportunities for real progress do exist, the participants unanimously urged WHO to establish a standing multidisciplinary panel of experts who would consider further the problems of the partially sighted. The tasks of this panel should include the submission of recommendations to governments through WHO on a coordinated research and service agenda for visual impairment and on strategies for the implementation of that agenda, the dissemination of lists of ongoing and planned projects in the participating countries, and the distribution of summaries of completed research or project evaluations.

One important function of national and international advisory bodies is the transfer of knowledge. This includes not only intra- and interdisciplinary communication within a given country and within the European Region, but also the transfer of new knowledge from more technologically developed to the less developed countries.

One of the main objectives of this Meeting was to develop a research agenda in areas considered to be of highest priority in promoting the use of residual vision. A number of general principles emerged that set the context for discussion of specific research topics. It was agreed that, while it is important to establish research priorities in advance for planning purposes, it is nevertheless essential to preserve opportunities for serendipitous discoveries. Many of the most important discoveries in both the basic and clinical sciences

have been the accidental products of research aimed initially at entirely different problems. Plans to facilitate research in the most needed areas should be formulated but research enterprises should not be structured in such a way that important but unanticipated results go unappreciated. A related principle is the allocation of research resources according to the likelihood that a research question will, in fact, be met with a usable answer, rather than strictly according to the perceived importance of the problem.

The desired multidisciplinary collaboration would be facilitated by the statement of research questions in problem-oriented or performance-oriented terms (e.g. mobility at night with reduced peripheral vision) rather than in terms of ophthalmic impairment. Component problems or tasks could then be addressed by specialists in the relevant disciplines.

Another major concern is that research and development on aids to vision should emphasize "appropriate" technologies. Such emphasis would certainly include cost-benefit analyses but, more importantly, would include the involvement of consumers in the initial design of the research as well as in the evaluation of aids eventually produced. The multidisciplinary research centres already suggested would provide an appropriate environment to facilitate the necessary contact between consumers and researchers.

There is a perceived need for a registry of ongoing research in the field of residual vision, in order to prevent unnecessary duplication and promote coordination of projects both within a single country and on an international basis. It was noted that John Gill (University of Warwick, United Kingdom) currently publishes a list of research and development projects in this area, but there is clearly a need for a more comprehensive research register.

The participants discussed a great variety of research topics that could be addressed from interdisciplinary and multidisciplinary perspectives. Each of the topics was discussed in terms of its position within the spectrum of health-related research presented in Fig. 2.

The following list of research tasks should be considered illustrative of research needs relative to the use of residual vision by visually impaired disabled persons.

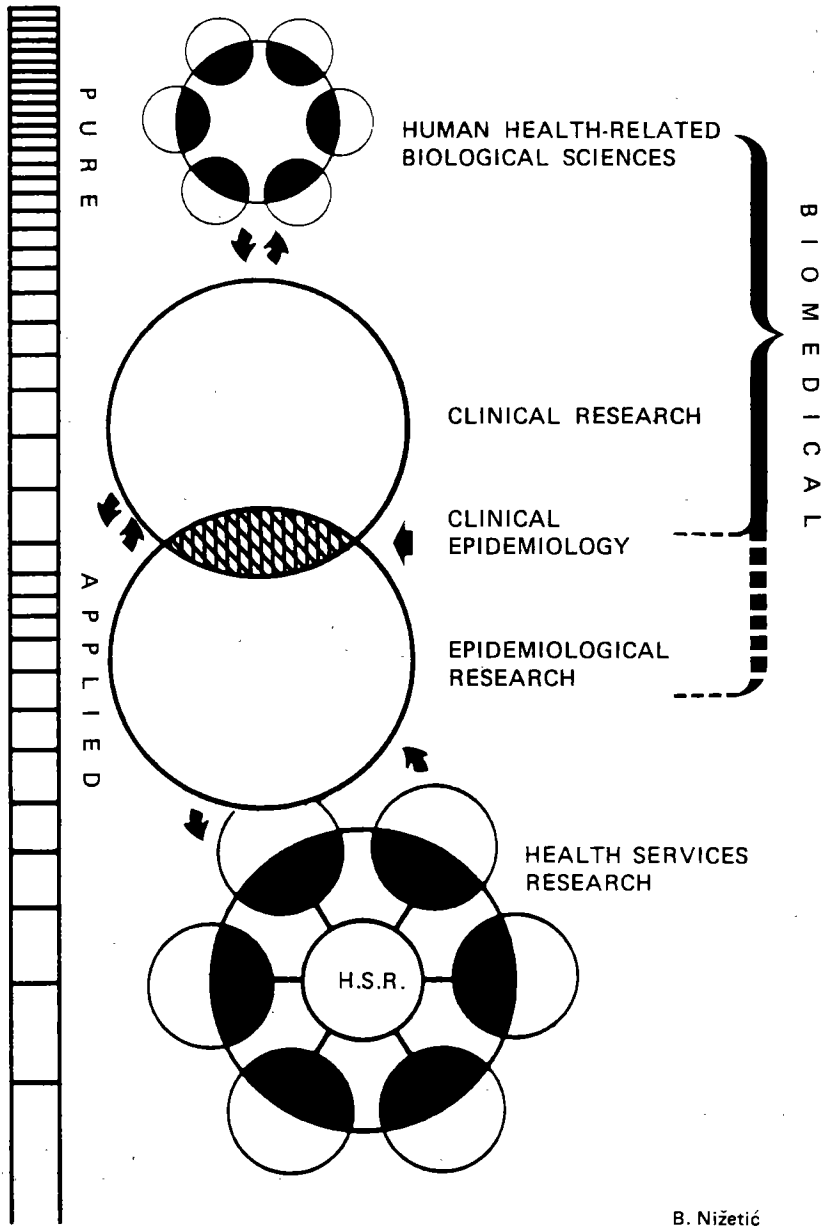
Suggested list of research topics

(1) There is a need to develop a battery of diagnostic tests that correlates with both ocular pathology and actual visual performance in daily life.

(2) The importance of contrast, size, colour, motion, luminance and temporal factors in various diseases and functional disabilities should be investigated.

(3) Ergonomics and research into human factors (man-machine and man-environment studies) should be stimulated.

Fig. 2. Spectrum of health (or health-related) research



B. Nižetić
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(4) Simple, clinically useful means of assessing visual function in infants and young children should be devised.

(5) The visual performance characteristics of the normal elderly population should be evaluated.

(6) The recovery of visual function in patients with cerebral injuries (e.g. visual field functions, oculomotor behaviour) should be studied.

(7) The neurophysiological and neuroanatomical basis of visual "plasticity" in patients with partial sight and in animal models should be identified.

(8) The functional basis of amblyopia (including the importance of spatial phase information) in children and in animal models should be investigated.

(9) The usefulness of noninvasive techniques (e.g. evoked potentials) in differentiating disease states or functional impairment should be assessed.

(10) Research should be conducted to forecast the effects of technological and social developments on the position of visually disabled children and adults in society.

3. EXISTING TECHNOLOGY: ASSESSMENT AND FUTURE NEEDS

Technological advances have been one of the major factors in the rapidly changing social, political and cultural climate of the western world. Such technological advances have both beneficial and adverse effects on different segments of society. There is a great need to predict the effects of developing technologies on the visually impaired population in particular. As we move towards a society in which the handling of information is of paramount importance, individuals with sensory disabilities are finding themselves affected to a disproportionate degree. Nevertheless, the same technologies that give rise to increased difficulties for such disabled persons may also provide the solutions to those problems. Specific studies of ways in which modern technology could be used to benefit disabled people in order to improve their general situation or to compensate for unavoidable disadvantages resulting from the general development of society are clearly needed.

Examples of the unintentional disabling effect of technological advances can be seen in the development of modern telephones which, because of increasing technical "perfection", have decreasing leaks of electromagnetic

fields, thus in some cases aggravating the use of hearing-aids in conjunction with telephones, or the increasing use of various alphanumeric displays, which in many cases are difficult or impossible for visually disabled people to use.

As society becomes more complex, visually impaired individuals have increasing difficulty in negotiating society's infrastructure. The multidisciplinary institutes or centres suggested above could take a broad look at transportation systems, government services and general environmental constraints as they affect the visually disabled person. Recommendations could then be made to the relevant government agencies to reduce the various handicapping effects of technological changes.

The Meeting's discussion of the use of technical aids by visually disabled persons began with an analysis of reasons for the frequent rejection of current aids. Incorrect design of aids at the outset was considered the main obstacle to continued use. The involvement of the consumer in the initial design of an aid and in its subsequent development and evaluation is crucial if the device is to receive widespread acceptance. Even when technical aids do fulfil their compensatory function, they sometimes introduce other unanticipated difficulties at the same time. These may be emotional or psychological in nature.

Participants called for a study of the needs of visually disabled people as a basis for developing aids and training techniques. They agreed that merely asking the consumer what he needs will not necessarily produce the proper answers. Observational studies of visually impaired persons in the varying environments to which they must adapt may be necessary to identify the true range of needs. A multidisciplinary approach to such studies is again required, perhaps along operational research lines.

Existing technical aids for the visually impaired have been insufficiently evaluated for technical effectiveness and for acceptability to the consumer. There is a great need for a coordinated evaluation protocol for such aids, so that results can be compared. An immediate first step would be to devise a list of the criteria by which aids would be evaluated.

Information about existing aids is not easily available to the visually impaired person in all countries. In the Federal Republic of Germany, for example, no catalogue of aids is available, although one is currently in production. In the United States such information is available from the Sensory Aids Foundation and the American Foundation for the Blind. The Scandinavian countries are now using a model for the categorization of technical aids for the handicapped. Clearly there is a need to coordinate these efforts, and it would seem reasonable for WHO to undertake such a task.

Throughout the discussion of "appropriate" technologies there was agreement that simple devices rather than complex ones are to be preferred, not only because of their greater acceptability to the visually impaired public but also for reasons of cost. Cost-benefit analyses should be part of any evaluation strategy for developing a technology or aid. Cost considerations play a part not only in prototype development, but also in the production of

aids. Because of the need to individualize treatment for the visually disabled, the market for a given aid may not be big enough to warrant commercial production. In such instances, governmental subventions may be required.

The provision of aids to vision by social service or rehabilitation agencies without cost to the consumer or reimbursement for such devices under government or private insurance schemes may increase the size of a given market and thereby make the availability of a product more likely. Cost reduction could also be achieved by adapting existing technical aids to individual situations. The studies of consumer needs described above might make possible the development of generalized aids that could then be modified to suit the needs of the individual.

4. SERVICES FOR THE VISUALLY IMPAIRED

4.1 Objectives

(1) Prevention of disability.

(2) Rehabilitation and integration of the individual into "normal" society with as great a degree of independence in functioning as possible. This includes the right of disabled people not only to receive direct personal services, but also to have access to all the facilities of society on a basis of equality with the non-disabled. If the person is still unable to function at the level of his full abilities and potential after utilizing all the available rehabilitation facilities, he should have access to appropriate forms of alternative assistance.

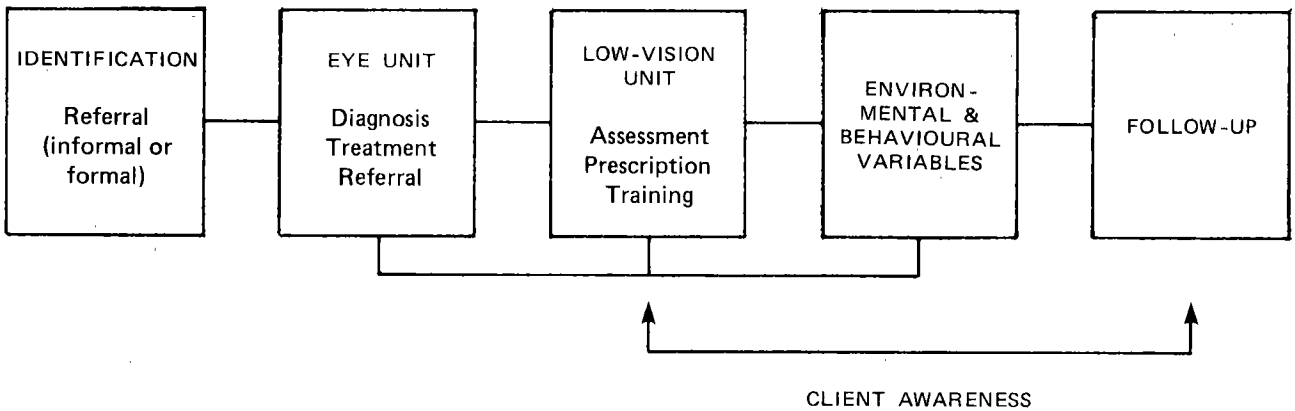
4.2 Types of activity

The concept of services for the visually impaired has two major aspects: (*a*) activities designed to adapt the impaired individual to his society, and (*b*) activities designed to adapt the environment to the requirements of the impaired person.

An example of the first kind of activity (adaptation of the individual) may be found in the model for low-vision rehabilitation suggested in a report on an international workshop in Uppsala, Sweden, 25–27 September 1978 (*Uppsala reports on education*, No. 3, July 1979), and illustrated in Fig. 3.

The first step in the model is the identification of affected individuals. As indicated earlier the main target groups for possible screening would be the elderly and young children. The Uppsala meeting recommended referral of "all persons who have sufficient vision to see light or to take directions from it and to use it for functional purposes".

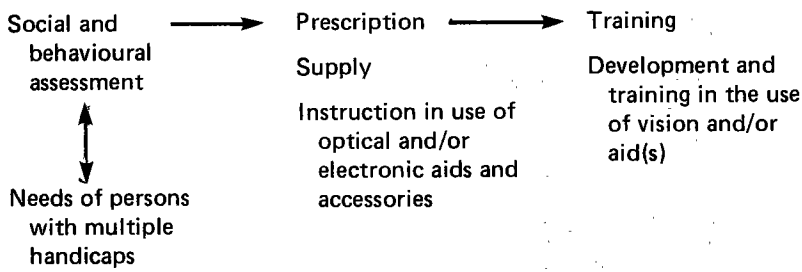
Fig. 3. Model for low-vision rehabilitation



In the eye unit traditional ophthalmological and optometric examinations are performed for the purposes of diagnosis and medical prognosis. Patients receive the appropriate medical and surgical interventions and are then referred to the low-vision unit for more individually-oriented diagnosis and treatment. It is very important that the referral from the eye unit to the low-vision unit should be accompanied by sufficient information on the medical condition and etiology of the visual disorder, since rehabilitative strategies must be tailored to the individual's physiological as well as psychological and sociological situations.

The three tasks of a low-vision unit are: assessment, prescription, and training. A team of multidisciplinary professionals must work together to analyse the problems of the patient. The solutions to the problem are often arrived at through educational, technical, sociopsychological and medical teamwork. Fig. 4 illustrates the requirements of a low-vision unit. Awareness of the special requirements of individuals with multiple handicaps is especially important when the multidisciplinary team discusses potential rehabilitation programmes.

Fig. 4. Requirements of a low-vision unit



Low-vision patients can be divided into two groups: (*a*) persons with visual experiences, and (*b*) persons without visual experiences. Different means are often necessary to satisfy the needs of these two groups. Developmental training in the use of vision aids is offered in Norway and Sweden by specially trained low-vision teachers. The low-vision teacher also coordinates activities at the low-vision clinic.

Some of the tasks of the low-vision teacher are:

(1) motivating the patient to participate in the rehabilitation programme and giving psychological advice;

(2) teaching the patient to develop his residual vision by training him to use certain techniques (e.g. eccentric viewing) and by training him to use properly and make the most of his optical and electro-optical aids and accessories:

(3) providing information and advice on the design, visual contrast features and illumination of workplaces for the visually handicapped in industry, in offices, at school, and in the home;

(4) making the necessary contacts with school authorities, teachers, pre-school counsellors, itinerant teachers, social counsellors for the visually handicapped, vocational rehabilitation authorities and the various rehabilitation courses for the visually handicapped;

(5) making the patient aware of the different aids for daily living skills that are available.

The fourth component of the service model focuses on environmental and behavioural variables. This includes making sure that the aids and training received by the patient in the clinic are appropriate and usable in the patient's everyday environment. Ergonomic analysis of school, occupational and home environments is essential in this regard. At present, however, there are few such analyses available.

Attention should be paid to the differing requirements of the congenitally and adventitiously visually handicapped, who are often elderly. The low-vision unit should therefore be linked with and complemented by other resources for the visually handicapped in society. For example, a person with limited peripheral vision may be quite able to read when illumination is good, but completely unable to travel after dark. The low-vision rehabilitation must in this case and in some others be complemented by orientation and mobility techniques for the blind.

Careful follow-up of patients is an indispensable part of services for the visually impaired. Since many low-vision patients have progressive eye disease, continuing patient evaluation and support is essential. Frequent reassessment of the patient's medical condition, prescribed optical aids, and methods of utilizing residual vision are necessary.

A service delivery system similar to that described above has been implemented on a trial basis in Norway, with encouraging results during its first year of operation.[a]

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[a] **Sentralinstitutt for industriell forskning** [Central Institute for Industrial Research]. *The National Council for Technical Measures for the Handicapped: provision of technical aids for the handicapped.* Oslo, 1980 (Report No. 76 07 07 – 2 A).

An important component of a multidisciplinary centre for the partially sighted would be research and development facilities. This would permit the feedback of relevant data to the various service components and provide a sufficiently large and diverse patient population for studies to be carried out.

As he progresses through this integrated rehabilitation and treatment system, the disabled person himself must be considered an integral member of the assessment and rehabilitation team. Only in this way can service be truly individualized and therefore optimally effective. A strategy that works for one patient may, for physiological, psychological or environmental reasons, be entirely inappropriate for another. Eliciting the maximum participation of the patient in all phases of planning for his treatment and services is therefore critical.

As a supplement to the coordinated low-vision units described above, it would be expedient to have guides providing the necessary information to the consumer about the advisory and research services available. These guides should also be distributed to all professionals involved in the delivery of services.

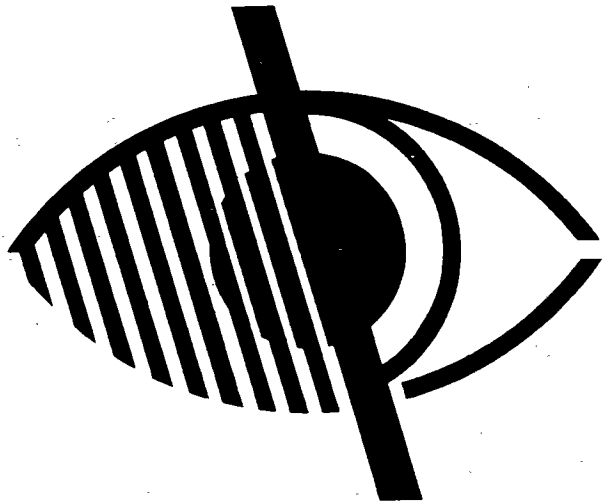
4.3 Adaptation of the environment

In addition to the special services and aids described in the preceding section, the visually impaired segment of the population should have access, as far as possible, to the same general services as the non-disabled members of society. In Sweden, for example, deaf people are now being supplied with telephones of a keyboard and screen type at the same price as those with normal hearing pay for their standard telephones. The Swedish State Railway Company has taken persons with physical, visual and hearing impairments into account when designing the interior of its new railway coaches. Buildings must by law have general accessibility, so that, for instance, persons with impaired mobility can move around easily. Visually impaired people benefit from audible traffic signs at pedestrian crossings, daily newspapers on audio-cassettes, and adapted illumination in office buildings and workplaces.

During the International Year of Disabled Persons, a new symbol is being launched in the United Kingdom to serve the access needs of visually disabled people (see Fig. 5). The symbol is intended to be used in a similar fashion to the now internationally known and recognized wheelchair symbol for physical disability. It can be displayed in shops, restaurants and other public buildings and places known to be safely accessible to visually disabled people, and where their particular problems are given consideration. By individual choice, the symbol can also be used to make an otherwise undetectable visual disability known to others as circumstances dictate.

The Meeting recommended that WHO encourage international acceptance and promotion of this symbol.

Fig. 5. Visual disability symbol



4.4 Communication

There is a need for improved knowledge among the general population about disability and its dynamic state. Such knowledge should therefore be included in programmes of general education. The mass media should be encouraged to develop programmes of information and highlight questions about disability as well as integrating this subject in regular programmes when appropriate. An illustrative case is the general misconception about low-vision people stemming from misuse of the word "blind". It seems reasonable, therefore, to suggest that only persons who cannot perceive light should be designated as "blind". General education about the range of visual disabilities would be useful.

There is an additional communication problem within the service delivery system as it now exists in most western countries, namely, insufficient communication between ophthalmological and rehabilitation units. In Belgium, for example, a recent attempt to classify all known cases of visual impairment ran into difficulty when it was discovered that the cause of impairment was known in only two thirds of the cases. There is often insufficient differentiation between etiology and the site or type of disorder. Complete ophthalmological information on each patient must be available to the social and rehabilitative unit or it will be lost during

follow-up. Centres combining these functions, such as those described above, would facilitate this communication.

4.5 Training

Training in the use of residual vision is central to the rehabilitation of visually impaired people. The Meeting therefore discussed at length various techniques to maximize the use of residual vision. Sensitivity to visual stimuli may be increased through enhanced stimulation procedures, such as those in use for amblyopia in the USSR, or by discrimination training for stimuli located near the border of a scotoma as a result of a cerebral accident. Expanding the range of stimulus features recognizable by a visually impaired person may also be possible with very small increments in successive stimuli. Other unimpaired sense modalities (e.g. hearing or touch) may be used to facilitate training within the impaired visual modality. Thus, vibrotactile presentation of images may help a visually impaired person to recognize objects by association with their somatic representation. Eventually, the tactile stimulus may no longer be necessary and the person may be able to recognize the object through vision alone.

A system of 23 county-based low-vision centres in Sweden uses a co-ordinated set of training procedures that may illustrate the individualized approach to visual training. In this system, persons with visual impairment are divided into four groups according to the symptoms of eye disease or injury that they display. Training techniques to increase ease of reading are tailored to the nature of the impairment.

Persons with central scotomas (e.g. resulting from senile macular degeneration) are trained to fixate eccentrically above or below their central scotoma, in order to gain as wide a fixation field as possible, and are given magnifying aids to compensate for the lower density of cones outside the macula. Persons who have difficulty in controlling their eye movements (e.g. in nystagmus) are instructed to move their heads while reading and thus keep their eyes as steady as possible in whatever position elicits the least nystagmus. Persons with a limited peripheral visual field are trained to use their eyes in shorter and more exact distances and to pause more often in each line of text. Alternatively, they are trained to keep their eyes still and move the text into the residual central vision. Persons with other forms of low vision (e.g. myopia, diabetic retinopathy, amblyopia, strabismus) are trained primarily to use optical or other aids because of their low visual acuity.

Since successful visual rehabilitation depends so heavily upon the ability to train disabled patients, there is a great need for studies aimed at determining optimal learning techniques for these individuals. Especially important are psychological studies on adjustment to adventitious visual impairment and on motivational factors in rehabilitation.

5. RECOMMENDATIONS

For each of the major topics discussed it became clear that there were certain problems common to all the countries represented: some participants suggested courses of action at both the international and the national level that could be taken without the need to obtain additional information, whereas others pointed to some gaps in the available knowledge that needed to be filled before further action was possible. The following recommendations, adopted unanimously by the Meeting, and mentioned also in the body of the report, are thus grouped by suggested courses of action and areas for research.

5.1 Problems of definition and categorization; epidemiology

5.1.1 *Courses of action*

(*a*) WHO should encourage the use of the *International classification of impairments, disabilities and handicaps* (WHO, Geneva, 1980), particularly in relation to coding for type of disability, severity of disability, and assessment of prognosis. The experience gained with this classification system should be fed back to WHO so that the codes and scales could be revised if necessary. The more general WHO categories of vision (normal vision, low vision, and blindness) should be eliminated; the term "blindness" should refer only to the absence of light perception.

(*b*) Attempts should be made to simplify the classification system along functional lines for use in less developed countries.

(*c*) WHO should encourage governments to use the combined classifications for ocular impairments, functional disability and prognosis, rather than the degree of visual impairment alone, as criteria for eligibility to receive social and rehabilitative services.

(*d*) WHO should coordinate the collection of data on visual impairment by governments using the *International classification of impairments, disabilities and handicaps*. The resultant statistics should be used as a basis for health care delivery policies and planning.

5.1.2 *Research needs*

(*a*) Demographic analyses, especially age-related analyses, should be performed of population-based visual impairment data collected using the *International classification of impairments, disabilities and handicaps*.

(*b*) Better data need to be obtained on the causes of blindness and visual impairment, use being made of the analytical tools of clinical epidemiology.

5.2 Interdisciplinary and multidisciplinary perspectives on the use of residual vision

5.2.1 *Courses of action*

(*a*) WHO should establish a standing multidisciplinary panel of experts to consider further the problems of the partially sighted. The tasks of this panel should include the following:

- formulating recommendations to governments on a coordinated research and service agenda in relation to visual impairment;
- recommending strategies for implementation of the agenda;
- disseminating lists of ongoing and planned projects in the participating countries;
- disseminating summaries of evaluations or the results of completed research projects.

(*b*) There should be additional *ad hoc* follow-up meetings to discuss in detail the topics addressed briefly at this Meeting, for the purpose of informing the standing panel whose establishment is recommended in 5.2.1(*a*).

(*c*) Governments should be encouraged to establish multidisciplinary low-vision institutes or centres for prevention, diagnosis, treatment, rehabilitation services and research to assist the partially sighted. Access to experts in the following disciplines is recommended: ophthalmologists, neurologists, neurophysiologists, psychologists, low-vision teachers, ophthalmic opticians and contact lens specialists, occupational therapists, social counsellors, otologists, technicians and ergonomists.

Because of variations in health care delivery systems, these institutes must be adapted, as appropriate, to serve either as central service and research facilities or as resource centres for a network of service delivery clinics.

(*d*) There is a need for continuing education of specialists in the disciplines comprising the service and research team so as to make them aware of the potential contributions of the other disciplines. They must also be made aware of the consequences to the individual of visual impairment and be educated about the range of services available and the appropriate means of referral. The revision of medical school curricula to emphasize the importance of continued involvement by ophthalmologists in visual rehabilitation is also recommended.

5.2.2 *Research needs*

(*a*) Research problems should be defined in functional or performance terms in order to encourage an interdisciplinary approach. An analysis is needed of the importance of contrast, size, colour, motion, luminance, and temporal factors in various visual tasks, diseases and functional disabilities.

(*b*) There is a need to develop a battery of diagnostic tests that correlates with both ocular pathology and actual visual performance in daily life.

(*c*) Studies should be made of the recovery of visual function following injury or deprivation in patients with partial sight and in animal models, using psychophysical, neurophysiological and discrimination-learning techniques.

(*d*) The visual performance characteristics of infants, young children and the normal elderly population should be evaluated.

(*e*) Ergonomics and research into human factors (man-machine and man-environment studies) should be stimulated. In this connexion, psychological, sociological and economic analyses should be made of the effects of technological developments on the visually impaired.

5.3 Existing technology: assessment and future needs

5.3.1 *Courses of action*

(*a*) Technological advances have both positive and negative effects on different segments of the population. WHO should urge governments to establish committees or agencies to predict the effects of developing technologies on the visually impaired and to reduce the handicapping effects of such changes in the infrastructure (e.g. transportation systems, government services, architecture, communications media).

(*b*) A WHO panel should devise a coordinated evaluation protocol for visual aids, to be used by all countries, specifying the criteria for evaluation.

(*c*) WHO should maintain a catalogue of all technical aids that have been evaluated with the standard protocol. Prior to this, WHO should collect information from all participating countries on currently available catalogues of aids and apply a standard classification system to the aids.

5.3.2 *Research needs*

(*a*) The need of visually impaired persons for aids should be assessed; observational studies as well as surveys should be included.

(*b*) A system of consumer involvement in all phases of research on aids for the visually impaired (design, development, and evaluation) should be established.

(*c*) Cost-benefit analyses of developing technical aids should be performed.

(*d*) There should be increased emphasis on mobility aids.

(*e*) Analyses should be made of the impact of environmental factors on visually impaired disabled persons.

5.4 Services for the visually impaired

5.4.1 *Courses of action*

(*a*) The need for services should be assessed in both functional and clinical terms by a multidisciplinary team and should be focused on the whole person rather than on a single handicap or disability.

(*b*) The disabled person should be considered an integral part of the assessment and rehabilitation team and consulted and kept informed accordingly.

(*c*) Whenever possible, rehabilitation should be carried out in the community rather than in isolated facilities. Community awareness of the positive and dynamic aspects of visual disability should be promoted through public education campaigns and the mass media.

(*d*) The provision of services for the visually impaired should not be restricted to personal services alone, but should extend also to modification of the environment so as to ensure reasonable access to all the facilities enjoyed by society (buildings, means of transportation, newspapers, etc.).

(*e*) WHO should promote the coordination of service activities and planning internationally, and encourage such coordination at national, regional and local levels.

(*f*) In every country there should be low-vision teachers trained professionally in their own discipline and with a working knowledge of the related areas represented on the service team (e.g. ophthalmology, pathology, optics, psychology).

(*g*) WHO should promote the preparation of guides to service delivery advisory and referral facilities within each country, to be distributed to both consumers and eye care professionals.

5.4.2 *Research needs*

(*a*) A comparative study should be made of legislation and regulations in different countries regarding access to appropriate services.

(*b*) The problems encountered by the visually impaired as a result of current regulations should be surveyed.

(*c*) Psychological studies should be performed on the response by individuals to various treatment and rehabilitation strategies.

5.5 Training and education

5.5.1 *Courses of action*

(*a*) WHO should develop a coordinated set of training materials available to all participating countries, perhaps along the lines of the existing Swedish model.

(*b*) Governments should direct attention to vision training as an important component of rehabilitation programmes, particularly in the area of mobility training.

(*c*) Attempts should be made to adapt effective training strategies from other sensory modalities (e.g. touch, hearing) to the visually impaired.

5.5.2 *Research needs*

(*a*) The effectiveness of training to increase sensitivity through techniques such as sensitization and altered fixation strategies should be investigated.

(*b*) Studies should be conducted on training in or the facilitation of sense transfer (e.g. touch to vision).

(*c*) Optimal learning strategies in visual rehabilitation, including the importance of motivational factors, should be determined.

Annex

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