Recent Developments in Aids for the Visually Handicapped

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There are over 120,000 registered blind in Britain, but various estimates suggest that there are about another 80,000 whose vision is such that they could be registered. The general public tends to assume that blind people are those without sight. However, the registered blind population is largely one afflicted with seriously defective vision rather than complete blindness (Table 1).

Table 1. The vision of those registered as blind in England and Wales[1].

| Vision Type                             | %   |
|-----------------------------------------|-----|
| Total blindness (no perception of light)| 3.4 |
| Almost total blindness (perception of light only) | 10.4 |
| Useful vision (hand movements and vision up to 3/60 Snellen) | 58.8 |
| Vision more than 3/60 Snellen           | 27.4 |

Fig. 1(a). Macular degeneration.

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Someone once said 'It's no good coming up with the answers before you've decided what the questions are.'

And that, in a nutshell, is the principle behind the series of Black Horse Guides.

We like to think that they are something of a breakthrough. Although they have been produced by one bank — Lloyds Bank — we have tried to make them quite unbiased. From long experience, we have learned how to most people the financial world presents a confusing picture. Financial institutions seem complex and often it is after the importance of managing money that is far greater the way in which people handle their personal affairs is perhaps a little matter which needs personal finance.

To help bridge this gap, we have produced guides to the matters which talk about services we discuss your problems rather than the areas covered a wide range of subjects.

We believe we are meeting a need. There is a limit to the extent which a financial value but if you find this material can help people who have just taken their commitments.

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Fig. 1(b). Diabetic retinopathy.

Visual acuity is not the only factor determining the usefulness of residual vision. For instance, the field of vision is very important and Figs 1(a), (b) and (c) illustrate simulations of three forms of blindness. These simulations should be viewed with the gaze fixed on the centre of the picture. There are large variations between different patients, but the pictures represent fairly typical examples, if the inevitable technical limitations are taken into account.

Most low vision aids are prescribed by ophthalmic opticians, either privately or through the Hospital Eye Service. As well as recommending optical aids they can advise on lighting. Good lighting does not mean just bright light, but lighting that does not glare, and properly designed colour schemes.

Fig. 1(c). Diabetic retinopathy.
The main technological advance for those with residual vision has been closed-circuit television reading aids (Fig. 2). These devices usually provide variable magnification, enhanced contrast and image reversal (white letters on a black background). The disadvantages are the cost (from £650 to £3,000) and the weight of the machines (typically 25 kg). Despite the disadvantages, these aids have proved to be very useful for patients whose needs have not been met by conventional optical aids.

The blind have severe problems with mobility, particularly in unknown environments. The traditional aids are the guide-dog and the long cane, which have about 3,000 and 10,000 users respectively in the UK. One of the problems with the long cane is that it does not provide information about obstacles at head height, for example, overhanging branches or lorry wing-mirrors. A number of electronic aids have been developed to provide extra information for the blind pedestrian, but, unfortunately, most of the aids have been developed by engineers who have not first systematically studied the information required by a blind pedestrian and the optimum method of displaying this information to the human. As a result, there are no electronic mobility aids in widespread use in the UK.

Aids for access to written information have either an audio or a tactual output for users with no useful residual vision. Probably the most useful technical aid is the cassette tape-recorder. The main disadvantages are the user's inability to vary the speed and the lack of a good indexing system. The variable speed problem will be partially solved by the increasing availability of inexpensive 'compressed speech' modules. These devices correct the pitch changes caused by increasing the speed. Blind professionals need faster speeds, but many elderly blind people find the existing recordings too fast. The indexing problem is not so easily solved. What is required is an inexpensive system that enables the blind user to feed in a number or keyword; the machine then automatically finds the information. Such systems exist but are prohibitively expensive.

A variety of commercial devices with speech output are now available. The speech can be spelled out, compiled or synthetic. In spelled speech the output is done character by character; the advantage is very low cost but the quality is unacceptably low for any application involving prolonged listening. With compiled speech the machine has a limited vocabulary of whole words, and spells out words not in the vocabulary. A vocabulary of 8,000 words and their plurals copes with more than 90 per cent of most texts. In synthetic speech the machine simulates a human speaker. The quality of the output depends on the size of the computer programme. High quality synthetic speech systems are still very expensive; a reading machine with optical character recognition and synthetic speech output costs about £19,000; costed over five years, it would be cheaper to employ a sighted reader. However, the cost of such machines should decrease significantly during the next few years.

The best-known communication medium for the blind is Braille, which uses a six-dot cell that gives 64 possible combinations. One of the disadvantages of Braille is the considerable bulk of the text which, typically, are 20 times larger than those of the printed versions. This bulk is reduced by 25 per cent by the use of a number of contractions and abbreviations. There is an acute shortage of people skilled in transcribing text to contracted Braille, so a number of computer-based systems have been developed to do this work. Such systems mean that a typist with no knowledge of Braille can produce documents in both ink-print and contracted Braille from a single typing operation.

Computer-based systems are significantly cheaper than manual transcriptions of information which already exists...
in digital form, and two major banks now use an automated system to produce statements of account in Braille. Total automation minimises the risk of error in the Braille version. Recently, information from the British Telecom Prestel viewdata system has been fed into a computer-based Braille system. This is particularly important to those who are both deaf and blind, and who do not have ready access to the news and the weather forecasts.

Despite numerous predictions to the contrary, Braille has not been superseded by other forms of non-visual media and is still supreme in the recording of reference and technical material. It is also important that a blind person can write Braille without having to invest in expensive equipment. A number of systems have been developed for storing Braille digitally on cassette or floppy disc[2]. These systems incorporate a transitory display such as an array of pins which can be raised to represent the Braille characters. The decreasing cost of microprocessors has permitted the introduction of sophisticated searching and editing facilities, but these devices are hardly used in the UK because the cheapest still costs more than £3,000.

A number of devices for converting printed characters to some form of tactual output have been developed. Most of these devices do not recognise the characters but present some form of tactual display which has to be recognised by the human reader. The most widely used device is the Optacon which gives a tactual image that is a tenfold enlargement of the letter being scanned. The advantage of this device is that it can be used on any printed or typewritten material, including labels on tins of food. The disadvantages are the considerable training and practice required to reach speeds of 50 words a minute, and the cost (about £2,000).

Although the majority of registered blind people have residual vision, it is only very recently that modern technology has been used to produce reading material for them. The most notable development is the application of laser printers to the fast production of large or 'clear' print. A laser printer is capable, with special computer programmes, of producing good quality prints of any size at speeds of up to four pages a second. These printers are very expensive, so, for economy, only an existing printer with spare capacity should be used. Work on laser printing was pioneered by Lloyds Bank, which needed to produce large-print statements of account for their visually handicapped customers.

It must be emphasised that the majority of useful aids are simple and inexpensive. They include simple plastic templates (Fig. 3) to assist the visually handicapped in writing addresses on envelopes by hand. Another simple device can be fitted to objects that are often moved, such as a deck-chair or lawnmower. The device emits a bleep triggered by a hand-clap within a 7 metre radius. One blind husband fitted the device to his blind and deaf wife and so could find her by a clap of his hands.

The visually handicapped now need the conversion of existing prototypes to reliable and reasonably priced aids rather than the invention of something new.

Acknowledgements

The simulations in Fig. 1 were prepared with the help of Miss J. Silver and the photographs were taken by Mr M. G. Gould.

This article is based on a paper read at the Conference on Assessment and Management of Complex Disability held at the Royal College of Physicians in November 1981.

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