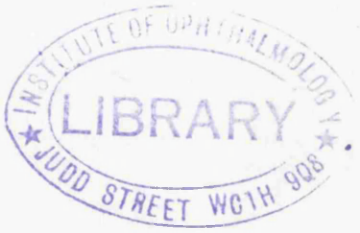
EVALUATION OF A

LOW VISION TRAINING PROGRAMME

by



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ABSTRACT

In some countries, notably the United States and Sweden, intensive training is considered an important adjunct to low vision services in the rehabilitation of the visually handicapped. Recently, such training has been introduced into the United Kingdom. Central to many of the programmes for reading are the techniques of eccentric viewing (EV) and steady eye strategy (SES). Although the techniques have been available for the last 15 years and their justification is widely accepted, to date they have not been validated by scientific studies.

Two studies were designed to test the hypothesis that intensive training improves the near vision performance with an optical magnifier. Patients with a severe central defect due to age-related macular degeneration were recruited to study "A" (N=57), and patients with a less severe defect to study "B" (N=43). One training and two comparison groups were used in each study.

During initial training, 43% of patients believed that EV would be helpful for simple tasks. However, eight months later, only 6.3% in study "A" and 10% in study "B" considered that they had used EV regularly and successfully for reading. The SES had been beneficial to 12.5% in "A" and 0% in "B". There was no significant difference in the near vision performance between the group of trained patients and the comparison groups.

A depression index, assessed by the General Health Questionnaire, correlated with neither the method of management nor visual performance for patients in study

"A".

This is the first time that a trial of this type has been undertaken. It shows that standard management is as effective as training in the rehabilitation of patients. Since standard management is less time consuming it is more cost efficient. These conclusions are relevant to a service for which there is a high requirement and low provision in the United Kingdom.

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OBJECTIVES

The purpose of the study was to test the hypothesis that low vision training improves the performance of:

1) patients with a severe loss of central vision and the subsequent inability to read printed material fluently with any optical magnifying appliance.

2) patients with a less severe visual defect and the ability to read adequately with an appropriately prescribed optical magnifier.

PART 1: INTRODUCTION

1.1 THE ELDERLY BLIND AND PARTIALLY SIGHTED POPULATION

World blindness is estimated at 30 million (International Centre for Eye Health, 1988). Cataract, trachoma, glaucoma, xerophthalmia and onchocerciasis are major problems in under developed countries. Age-related macular degeneration, cataract, glaucoma and diabetic retinopathy are the main sight threatening diseases of the Western world.

The Department of Health and Social Security compile registers of visually handicapped people in the United Kingdom. In 1988 a total of 126,828 people were on the blind register, and 79,048 were on the partially-sighted register in England (see tables 1 and 2) (DHSS, 1989). The statutory definition of "blind", under the National Assistance Act, 1948, is that the person is "so blind as to be unable to perform any work for which eyesight is essential". There is no statutory definition of "partial-sight", however, it is taken to mean persons who "although not blind..., are substantially and permanently handicapped...". Certification of legal blindness or partial sight is the result of an eye examination and completion of a BD8 form by a consultant ophthalmologist.

These figures are known to be inaccurate; the DHSS state that it is difficult to assign any particular degree of reliability to them, and several surveys indicate that the true visually handicapped population is grossly under estimated. Cullinan (1977) reviewed visual disability within the community. Registration was found to be more comprehensive for the "blind" than for the "partially

TABLE 1

NUMBER OF PERSONS ON THE REGISTER OF THE BLIND, BY AGE.

ENGLAND 1978-1988

As at 31 March	Number aged:							
	0-4	5-15	16-49	50-64	65-74	75+	Age unknown	Total
1978	328	1,838	10,777	14,009	19,422	58,015	309	104,698
1979	285	1,801	10,753	13,629	19,224	59,297	281	105,270
1980	254	1,781	10,993	13,637	19499	61,349	252	107,765
1981	..	..	..	..	..	..	..	..
1982	275	1,709	11,471	13,422	19,376	65,476	-	111,729
1983-5	..	..	..	..	..	..	..	..
1986	378	1,519	12,508	12,783	18,982	74,378	-	120,548
1987	..	..	..	..	..	..	..	..
1988	452	1,595	12,894	12,518	19,521	79,848	-	126,828

Data not available .. Nil - DHSS, 1989

TABLE 2

NUMBER OF PERSONS ON THE REGISTER OF THE PARTIALLY SIGHTED, BY AGE.

ENGLAND 1978-1988

As at 31 March	Number aged:							
	0-4	5-15	16-49	50-64	65-74	75+	Age unknown	Total
1978	176	2,387	7,430	5,070	8,298	24,190	84	47,635
1979	159	2,262	7,737	5,110	8,255	25,564	134	49,221
1980	157	2,226	7,964	5,172	8,494	27,292	121	51,426
1981	..	..	..	..	..	..	..	..
1982	165	2,062	8,662	5,635	9,417	32,062	-	58,003
1983-5	..	..	..	..	..	..	..	..
1986	177	1,768	9,731	6,282	10,994	42,152	-	71,104
1987	..	..	..	..	..	..	..	..
1988	215	1,679	10,304	6,755	11,792	48,303	-	79,048

Data not available .. Nil -

DHSS, 1989

sighted". The social and psychological implications of being publicly declared as defective may make individuals reluctant to register, plus there is little or no financial advantage. Old age, the presence of additional disabilities, living alone and the need for assistance to travel may also be contributing factors.

Graham et al (1968), during an investigation of the accuracy of the postal enquiry technique, found that in a small population, 9 out of 31 blind persons were not registered. Silver et al (1974) found that 52% of people attending the Low Vision Clinic at Moorfields Eye Hospital were not registered. Referral to this clinic is only instigated when corrected vision is inadequate to perform normal tasks, therefore the majority are likely to fulfil the registration criteria.

Estimates suggest there are approximately 520 visually disabled adults per 100,000 adult home based population (Cullinan, 1977). Brennan and Knox (1973) concluded that the Register "is probably not sufficiently accurate for medical research purposes including epidemiological or genetic studies..." and gave possible explanations for the deficiency, e.g. no operational standards or routine attempts to control accuracy.

However, the DHSS figures are useful for identifying trends. Elderly persons make up the majority of the register; over three-fifths of the blind population are over 75 years of age. Between the ages of 75 and 79 over 1% of the population is registered as blind; this figure rises to 5% over the age of 85. There are far more women in the older age groups (DHSS, 1988a). A steady increase

over the years in the number of persons registered as blind may be related to demographic factors and/or increased registration efforts by the social services.

Degeneration of the macula and posterior pole is the most common cause of permanent visual loss in the elderly population (Lovie-Kitchin et al, 1982); it accounts for over two-fifths of all cases analysed by the DHSS (1988b). The best epidemiological data on age-related macular degeneration (ARMD) come from the Framingham Eye Study, conducted in Massachusetts between 1973 and 1975 (Leibowitz et al, 1980; Khan et al, 1977a). Ophthalmological evaluation which stressed the detection of senile macular degeneration and other sight threatening diseases was undertaken on 2,675 individuals, aged 52 to 85 at the start of the study.

Overall prevalence of ARMD in the Eye Study was 9% with a prevalence rate of 2% in the age group 52 to 64, rising to 11% at age 65 to 74 and 28% at 75 to 80 (Kini et al, 1978). The increase with age was significant ($p<.05$), as was the higher rates for women than men ($p<.05$). The results are not comparable with the Register because the basic criteria differ, but the trends are the same.

"Senile" macular lesions between the years 1955 to 1960 accounted for 26.9% of all registered cases of blindness (Sorsby, 1966). Gibson et al (1985) recorded a prevalence rate of 41.5% in persons aged 76 years and over in an English community.

Age is the best predictor of visual deficiency; therefore the number of visually disabled people is

dependent upon the age structure of the general population. Lowman and Kirchner (1979) predict that the elderly visually impaired population in the year 2000 will be larger, older and more predominantly female. An RNIB report (1984) provides projections of expected numbers suffering from severe visual disability, equivalent to registrable blindness and partial sight, in England (see table 3). Increases result directly from the greater number of older people in the general population. A decrease in the registrable blind by the year 2001 takes into account improved medical techniques, e.g. for cataract.

TABLE 3 PROJECTIONS OF THE EXPECTED NUMBER OF VISUALLY DISABLED PERSONS IN ENGLAND

	1981	1991	2001
BLINDNESS	143,500	153,300	149,800
PARTIAL SIGHT	101,000	117,900	126,900

In the future, ARMD will account for an increasing proportion of blindness within the community. No definitive therapeutic option is available (see p25) and often the only help is through rehabilitation. It is widely recognised that low vision services are grossly under-funded in this country. The aim for future services must be the employment of procedures which are both clinically efficacious and cost efficient.

1.2 PATIENT ADJUSTMENT TO THE LOSS OF VISION

The patient's psychological state is an important consideration during visual rehabilitation. Management may be influenced by the individual's affect, and poor adjustment to the situation may impair performance.

The loss or threatened loss of visual function is inevitably accompanied by serious emotional stress (Adams et al, 1977). Reactions can be numerous and varied. Some patients react openly, expressing their frustration, anger and anxiety; others may demonstrate their emotions non-verbally by unusual behaviour, refusing to accept help including low vision aids (see page 26) (Emerson, 1984), or they may actually deny the loss and continue to search for a cure.

The typical pattern of acceptance of sight impairment consists of three basic phases. The initial stage is that of shock, followed by a period of depression, after which a phase of reorganisation begins (Schulz, 1977). Not all patients exhibit every phase and the intensity and duration of each can vary.

Shock is characterised by psychological immobility, a feeling of numbness and unreality; it is a period of protective emotional anaesthesia from severe stress and usually lasts from a few days to a couple of weeks (Cholden, 1954). In reactive depression the patient reacts emotionally to the loss; the extent and intensity of the depression depends on the individual and the circumstances. The patient may experience feelings of hopelessness, self-pity, loss of self-esteem and self

sufficiency, a lack of confidence and suicidal thoughts. It is a time to mourn or grieve for something that is lost. "The patient must die as a sighted person in order to be reborn as a blind man" (Cholden, 1954). No effort should be made to prevent these feelings since suppression would only delay the beginning of adjustment. Depression is not a poor prognostic sign, but it may mitigate against the successful use of low vision aids. If the devices are rejected they should be offered again at a later date. Anxiety, depression or anger may be expressed by broken appointments.

The next stage is acceptance or denial. Constant searching for a cure, and refusal to accept help indicates that the patient has not come to terms with the problem. Adams et al (1970) believe that this defence mechanism should not be broken down as it allows the patient to cope with his disability. Normally the transition from depression to reorganisation is quite gradual. There are many aspects of adjustment to blindness, both social and physical; and individuals proceed in different ways (Delafield, 1976).

Adaptation and readjustment begins with self confrontation. Self-esteem is one of the most important factors (Delafield, 1976). Effective reorganisation does not occur until the patient is convinced of his own blindness. Medical staff and well-meaning friends and family giving false hope may encourage denial (Riffenburgh, 1967a). Rehabilitation is based on emotional and motivational states and can only properly begin in the acceptance phase.

Age-related macular degeneration occurs when ego functions are already developed, hence there is disruption in all areas of life; recreation, mobility, and feelings about oneself (Blank, 1957). Loss of vision in macular disease can either be gradual or sudden. The former requires a continual series of adjustments and if practical help in the form of magnifiers and non-optical devices are available and successfully utilised then the situation may be made less traumatic. A sudden or unanticipated loss provokes considerable anxiety and depression since the patient must confront the immediate limitations. The reaction of any given individual can almost be predicted by previous response patterns to emotional stress (Adams et al, 1970).

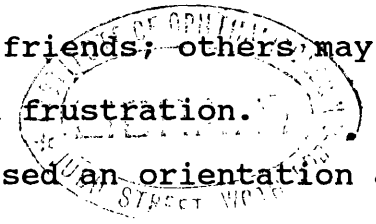
The ability to function with residual vision, i.e. visual ability, varies among individuals and involves many factors, not only visual and disease-related but also psychological and sociological (Wild and Wolffe, 1982).

Psychological factors play a significant role in the success experienced with low vision aids. Positive attitudes toward the use of residual vision and a lack of depressive symptoms are important. Overbury et al (1982) found correlations between success and the patient's self assessment of functional vision ($p<.01$); and between success and the patient's expressed past use of vision and present need of vision ($p<.05$). A negative relationship was found between the degree of success and the patient's perceived change in his/her future life-style. Surprisingly no relationship was found between the degree

of emotional support provided by family and friends and the degree of success, type of onset (sudden or gradual) or past experience with visual impairment.

Blindness acquired late in life causes special difficulties (Paton, 1972). Increasing age may adversely affect the use of residual vision (Wild and Wolffe, 1982). Elderly people may suffer from a number of other disabilities, for example hearing loss is common. They tire quickly, have less ability for adjustment to unusual circumstances and are less likely to learn new techniques. However, demands, expectations and aspirations may be lower in this age group; they may have less motivation than younger individuals in the same circumstances.

The older generation often have a feeling of loneliness and it may be difficult to wean the visually impaired from the dependency of blindness (Riffenburg, 1967b). Mixed motivation with regard to rehabilitation may be exhibited (Mehr et al, 1970). Some would prefer to be more dependent on family and friends; others may withdraw from difficult situations and frustration.



Mehr et al (1970) organised an orientation and discussion group; the partially sighted members stated that they resented being treated as totally blind and wished to use their remaining vision. White canes, even when useful, were rejected because of the strong association with total blindness. Low vision devices may be abandoned for the same reason. Rejection of appliances is most often seen in patients who have recently lost vision, and who perhaps, have not totally accepted the situation (Rosenbloom, 1970).

Robbins and McMurray (1988) found successful rehabilitation to be related to personality hardiness, age and low contrast acuity. Freudenberger and Robbins' (1959) study suggested that a relationship exists between personality characteristics and acceptance or rejection of optical devices. A patient who is an "acceptor", active (a doer), friendly and optimistic, tends to accept optical devices and is least likely to be overly demanding on the practitioner's time. A patient who is a "rejector", hostile, pessimistic (or unrealistically optimistic), and inactive (a non-doer), tends to reject the devices and be most demanding of attention. The newly blind person may fall into the "mixed" category, a combination of the two groups, because he has not fully adjusted to the situation.

1.2.1 Discussion session

Psychological support is obviously important to the patient who has suffered loss of vision. Collins (1988a) believes that the success of low vision training programmes is partly due to the support offered by the training officer, and considers it to be of equal importance to the special reading techniques. Essential to the patient's best response is the feeling that someone is interested in him, and spending time with a patient can be a valuable contribution to adjustment (Riffenburg, 1967b).

The attention paid to a patient in a research project may create a halo effect that is difficult to replicate in a clinical setting (Goodrich and Mehr, 1986). For this reason patients in one of the comparison groups (see p 55)

in this study had available to them a period of time for discussing their problems and difficulties. Advice about non-optical aids was given since accessory aids are often more valuable in everyday life than optical devices (Faye, 1976). Contact addresses were offered to the patient for the following reasons. Rakes and Reid (1982) believe that it is the clinician's responsibility to provide this information since individuals can derive enormous benefit from social support groups and they can be mutually helpful to each other (Mehr, 1970). Sharing the knowledge of a variety of aids and lessening the feeling of loneliness can be very beneficial, particularly to those who have suffered a recent loss of vision. Group therapy is popular and readily available in America but less emphasis is placed on it in the United Kingdom. During adaptation the support and recognition of low vision peers cannot be overestimated (Emerson, 1981). A club may be of great value as a outlet and as an inspiration for adjustment (Riffenburg, 1967b). However, agencies or self-help groups cannot help if the patient is determined to have nothing to do with the word "blind" (Bledsoe, 1958). Less offensive terms should therefore be used whenever possible.

The purpose of this management of the comparison group (p 55), therefore, was to provide as much psychological support as was practically possible in the clinical environment.

1.3 AGE-RELATED MACULAR DEGENERATION AND THE USE OF LOW VISION DEVICES.

Age-related macular degeneration (ARMD) is a disease which ranges from normal aging changes to advanced atrophy or disciform degeneration and which may have several aetiological influences (Delaney and Oates, 1982). The reason why a particular normal aging eye undergoes a pathological degenerative process is poorly understood.

Some of the risk factors that have been considered are race, blood pressure, refractive error, cigarette smoking, family history and iris colour (Khan et al, 1977b; Klein and Klein, 1982; Ferris, 1983; Hyman et al, 1983; Delaney and Oates, 1982; Maltzman et al, 1979; Blumenkranz et al, 1986). Results vary; Ferris (1983) summarised the findings of some main surveys.

Age-related macular degeneration can be broadly divided into two groups; the non-exudative and exudative forms (Bressler et al, 1988). Visual loss may be due to geographic atrophy (i.e. non-exudative), a disease which slowly and inexorably progresses over the years. The time factor may allow the patient to adjust to the situation and to the increasing power of the magnifying devices. Alternatively visual loss may occur as a result of a pigment epithelial detachment or sub-retinal neovascular membrane (i.e. exudative). The loss is usually more rapid (days or weeks), but is self-limiting.

Laser treatment has been shown to be beneficial in decreasing the risk of a severe loss in only a limited number of cases (i.e. 10%) (Macular Photocoagulation Study

Group, 1986a; Coscas and Soubrane, 1983; Macular Photocoagulation Study Group, 1982). When successful, loss is postponed for a period of time but there is a high recurrence rate of new vessel formation (Moorfields Macular Study Group, 1982; Macular Photocoagulation Group, 1986b). Therefore, low vision appliances remain the only practical help for most patients who develop ARMD.

The definition of a low vision aid is any device (optical or non-optical) that improves the performance of a low vision patient (Faye, 1984). Since "aids" now has other medical connotations it is sometimes replaced by "appliances" or "devices". In almost every case patients suffering from ARMD will be presbyopic, i.e. have reduced accommodation with an increase in age, therefore the appropriate spectacle correction is an important consideration.

The efficacy of low vision devices and the benefit which many visually disabled people derive from their use has been documented (Faes, 1981; Sloan, 1977; Boulton, 1977; Rosenbloom, 1970; Brazelton et al, 1970; Hellinger, 1966). Work using various diagnostic groups has been published (Faye, 1970; Silver, 1976; Fonda, 1956).

Macular degeneration is a condition with a relatively good rehabilitation prognosis (Banks, 1980; Silver, 1972; Henfi, 1969). A magnifying device enlarges the image such that the detail of an object is placed outside the scotoma on relatively unaffected retina. Rehabilitation of patients suffering from macular disease, using optical aids and educational methods of training in the utilisation of these aids and residual vision, is often

outstandingly successful; "the individual's vision and his situation in life often improves dramatically" (Nilsson and Nilsson, 1986).

A large multiple diagnostic study was carried out at New York Lighthouse Low Vision Clinic between 1953 and 1968 (Faye, 1970). Of the 6000 patients assessed 24.98% had macular disease. Devices were given to 75% of these macular patients and the success rate was claimed to be 34.67%. "Success" was defined as any aid that the patient considered to be helpful.

Dry macular scars are more successful in low vision aids rehabilitation than exudative scars (Nasrallah et al, 1988). With distance visual acuity 6/60 or worse dry scars reached a similar resolution of print but with a significantly ($p<.01$) lower power magnifier than eyes with exudative scars. In the group of patients with vision 6/30 or better the dry macular scars achieved a better print size resolution using significantly ($p<.01$) lower power visual aids than eyes with exudative scars.

Mehr and Fried (1975) itemise the prognostic factors that determine the success or failure of a particular patient. A good prognosis is indicated if the visual acuity is between 20/70 and 20/600 (approximately 6/24 plus to 2/60), the patient is highly motivated, the loss of vision is congenital or over five years duration, and the patient is aged between 11 and 60 and is well educated. Rosenbloom (1970) states that the most important factor in determining success seems to be the amount of residual vision and the functional field of view; patients

with less than 3/200 vision are least likely to benefit. Brazelton et al (1970) put less emphasis on visual acuity, age and the form of the disease, and attribute success primarily to specific task-orientated prescribing and strong motivation in the patient.

The level of magnification required for easy reading and the age of the patient, which may influence motivation, are the most important factors in the successful use of low vision devices according to Sloan (1968). Silver (1978) believes that motivation is the crucial factor and that age and visual acuity are relatively insignificant.

To the visual handicapped the ability to see a little better, even with some inconvenience, is tremendously important (Hellinger, 1966). Banks (1980) believes that the simplest magnifier that meets the patient's needs should be prescribed since sophisticated devices demanding precise fixation-coordination ability may not be suitable for the elderly.

Lighting can be considered an auxiliary low vision aid. To attain maximum visual acuity in patients with macular disease intense illumination is usually required (Silver 1976); although some individuals prefer relatively reduced illumination (Sloan, 1977).

As the normal eye ages it requires an increasing amount of light to remain efficient. Between the ages of 20 and 60 years the amount of light reaching the retina is reduced by approximately a factor of three (Weale, 1961). High illumination can improve visual performance in normal "middle-aged" persons (Weston, 1949) and also in the

partially sighted (Julian, 1983). The level of illumination has relatively more influence on the vision of the visually disabled than on normal subjects (Verriest, 1989). A weaker magnifier used in combination with a miniature high-intensity lamp can replace a stronger magnifier used in moderate illumination (Sloan et al, 1973).

Lighting is often the crucial factor in the difference between visual acuity recorded in clinics and at home (Silver et al, 1978). Elderly patients were visited at home after assessment at a low vision clinic; the lighting was so poor that visual acuity was considerably worse in home conditions than had been recorded in hospital (Cullinan et al, 1979). The number of people functioning as "blind" was twice what it should have been and a simple adjustable lamp with a 60 watt bulb improved the visual acuity in 82% of cases.

1.4 LOW VISION TRAINING

Numerous strategies have been designed to help those suffering from ARMD. Prisms have been used in an attempt to shift the image of an object from the central scotoma to an area of functioning retina (Romayananda et al, 1982); this method is generally considered to be unhelpful (Silver, 1987). A reading device known as a Kraspegig consists of a patterned card with a window through which a few words of text can be seen (Epstein et al, 1981); it has not been widely used.

Development of the Scanning Laser Ophthalmoscope has allowed the extent of a macular problem to be accurately assessed; the scotoma size, shape and density can be documented and useful retina identified (Timberlake et al, 1986, 1987, 1989). At present this instrument is used for research but it does have potential in a clinical setting. Low vision training programmes, in contrast, are well established and have been systematically used in some countries for over a decade.

Low vision training can be divided into two main categories. In the first the patient is trained to use the optical device efficiently (Goodlaw, 1968; Rosenberg, 1968; Kelleher, 1976; Watson and Jose, 1976); some practitioners believe this may be the most important aspect of low vision care (Mehr and Fried, 1975). A new way of reading must be learnt; adjustment to reduced working distance, small field of view and small depth of focus is necessary. Kelleher (1976) recommends that the first few training sessions are conducted under

professional supervision so that bad techniques can be corrected and good ones encouraged and developed. A relative or friend's participation can be of great assistance if s/he understands the correct utilisation of the device (Mehr and Fried, 1975; Goodlaw, 1968).

Age and time lapse since loss of vision may influence training (Feinbloom, 1958). Young children require a minimum of training; those aged between 80 and 100 years of age require a maximum. Persons of adult age who have recently lost their vision, i.e. within six months to two to three years, maybe extremely difficult to train. Training is unnecessary for those patients who have immediate and sufficient understanding of the use and limitations of their vision and low vision appliance (Faye, 1984).

The patient should feel that the disadvantages of the magnifier are outweighed by what can be achieved. Written instructions should be used to reinforce verbal advice, especially for the elderly who may find it more difficult to retain information (Goodlaw, 1968). In some clinics the device is not taken home until the patient has shown that he is proficient with it. Training is most efficient in daily sessions (Mehr and Fried, 1975).

Immediate praise of performance and progress should be forthcoming from the practitioner. Motivation needs to be maintained throughout the training/adaptation period; it is the most important aspect (Jose and Watson, 1975). Granger and Letourneau (1977) describe the principles of a learning situation with particular regard to inducing motivation in vision training.

The "instruction" routine described above may be used alone, or in combination with the other type of training, i.e. specialised reading techniques. Eccentric viewing is the basis of this method; the patient is taught the skill of consciously placing the image of an object onto unaffected retina.

Patients with macular disease do not spontaneously use their best remaining retina to achieve optimal acuity (Walsh et al, 1984). Using a "full field" visual acuity test consisting of a regular two-dimensional array of identical Snellen Es they found a two fold improvement in "visual acuity", as compared to linear E testing, in 90% of patients with macular degeneration. With the same test Harris et al (1985) demonstrated that 70% of patients with macular disease have potential for visual acuity at least two times better than previously measured by conventional methods.

A comprehensive and individually tailored training programme is considered by some workers to be essential to ensure the best use of an optical aid and residual vision (Inde, 1978). Inde (1978) divided the visually impaired into four categories:

1. Persons with central scotomas
2. Persons with severe difficulties controlling involuntary eye movements (nystagmus)
3. Persons with a limited peripheral visual field but intact central vision
4. Persons with other forms of visual loss, e.g. diabetic retinopathy

The training strategy is different for each group. ARMD falls into category 1.

With a diseased macula the patient is unable to define detail using central vision; learning to fixate above or below an object causes the image to fall outside the scotoma. Enlargement of the image by magnification is still necessary because the acuity in this region is less than at the fovea since fewer cones are present. The new fixation point should be just outside the scotoma to avoid excessive magnification of the image and to minimise the angle of view; this area should also provide the best visual acuity and sharpest image (Goodrich and Quillman, 1977). Determination of the position, above or below the object, depends on the nature of the scotoma (Inde, 1978); however Weiter et al (1984) found that when eccentric fixation was present, superior retina was used in the majority of cases. Since European print runs horizontally the field of fixation (i.e. the amount of text which can be seen while the eye is stationary) should be as wide as possible in this plane, therefore temporal or nasal eccentric fixation would not usually be successful (Inde, 1978).

Several methods have been employed to teach the patient to locate a target and maintain a steady fixation. Holcomb and Goodrich (1976) described two techniques, one employed a strobe to generate an afterimage on the optimum area of peripheral retina, the other involved verbal direction to encourage the patient to view eccentrically with the appropriate angle. Long training programmes were required (up to fifteen 30-60 minute sessions) and

patients' progress was measured by the ability to fixate and recognise tachistoscopically presented letters. Sample sizes were small; however of the two, the afterimage technique appeared to be the more effective.

Various other methods are available; the stand with bar involves a systematic verbal approach to training, and the "clock face" routine is a variation of this technique (Goodrich and Quillman, 1977). A rotator is helpful in teaching visual tracking, fixation and pursuit movements; and a slide projector method can be used to reinforce fixation, discrimination and recognition of targets. These methods teach "distance" eccentric viewing; however the authors comment that an improvement in reading ability is also a possibility.

Another well established method, and the one this study was designed to evaluate, is the training programme involving the eccentric viewing (EV) technique and steady eye strategy (SES). Widely used in other countries for over a decade, it was not introduced into the United Kingdom until January 1986 when the Partially Sighted Society launched a Low Vision Services Project (Collins, 1987).

Backman and Inde (1979) developed the basic concepts and techniques and published them in a training manual. Designed for use by the consumer, this book has large print and describes ocular function and different types of eye problems, and it emphasises eccentric viewing training for near vision. Lines above and below individual words aid maintenance of the appropriate fixation angle. The

authors state that the techniques are effective, although no results were published.

Such manuals may reduce clinic time; lengthy training sessions and the need for a one to one instructor to patient ratio is probably outside the financial and manpower resources of most low vision clinics and individual practitioners. Even so, additional extensive teaching may still be required to produce improved performance.

Quillman (1980) published a more comprehensive manual which contained a variety of training techniques for eccentric viewing, scanning and tracking, and other near vision tasks (Goodrich and Mehr, 1986); but it is not readily available in the United Kingdom.

1.4.1 Eccentric Viewing (EV) Technique

Some individuals discover eccentric viewing for themselves; usually for distance and intermediate ranges, for example watching television (Collins, 1987). The EV technique develops this concept and makes use of it for near vision tasks. An absolute central scotoma, although not essential to eccentric viewing, is helpful since the effort has better reward (Collins, 1988b).

An Amsler chart is a useful aid for "refining and identifying the exact angle of best view" (Collins, 1987). The extent to which the eye is moved from the central point is determined subjectively with the practitioner's guidance. Inde (1978) believes it is necessary to calculate the viewing angle accurately; using the formula

$$\tan D = x / WD$$

where D = degrees from the fovea where the image should be placed. WD = working distance, determined by the reciprocal of the dioptres in the aspheric lens. x = the distance from the text to the place above or below, where the eye should fixate to avoid the scotoma.

Although obviously more accurate than the "trial and error" technique, Inde's formula was not employed in the present study since it was designed to test the methods used in the United Kingdom.

The "clock face" routine allows the patient to appreciate the practical use of EV (Maplesden, 1984). If the practitioner's face is imagined as a clock, with the forehead as 12 o'clock and the chin as 6 o'clock, the patient can discover the most suitable viewing angle enabling the facial features to be identified. When viewing eccentrically, eye movement alone is preferable to turning the head which may cause stiff neck muscles and poor posture (Maplesden, 1984). Covering one eye, thereby preventing interference from the non-test eye, may help determine which viewing direction is preferable. Maplesden points out that, contrary to expectations, looking towards the scotoma position is not always the preferred direction reported by the patients. Successful case studies are reported, but no data or further results are documented.

Reading is an important daily task for which many patients with macular degeneration request help. To encourage EV for reading asterisks above and below words act as a guide to aid maintenance of the angle. Further exercises are advised in the manuals, in order to improve the field of fixation, tracking and localisation ability.

Training officers do not use these additional exercises routinely; however the two exercises which are sometimes helpful were made available in this study (see p58).

1.4.2 Steady Eye Strategy (SES)

This is the skill of holding the head and eye still and moving the print passed the face. The majority of books and papers describing training procedures do not mention the SES, but Collins (1987) believes it is essential if the patient is to read with any degree of fluency. He claims that a dramatic improvement in reading speed is possible; 40-60 words per minute could become 100-150 with practice, and that people who were originally fast readers find it most difficult to adapt since they continue to endeavour to scan text. Watson and Berg (1983) recommend it when the patient exhibits erratic eye and head movements, or displays the inability to find a line.

In the early stages a typoscope may assist the learning of these techniques (Collins, 1987). A standard typoscope consists of a piece of black/white card with a central horizontal aperture. Variation of the horizontal and vertical dimensions allows a typoscope to be designed for the individual. The horizontal measurement should be greater than the usable field of view (the area around the fixation point from which information is being briefly attained, however the depth of the slot does not matter (Collins, 1987). Hence the effective aperture may be horizontal or vertical (see Appendix I).

High illumination is usually necessary for the visually disabled, and the matt black card absorbs the

glare, allowing greater comfort when reading. Tracking across a line of text and locating the beginning of the following line is also easier with this guide.

A marker may be placed on the typoscope to help the patient maintain the best position of view (i.e. EV) while reading. Magnification can be used in combination with the typoscope. Collins (1987) states that magnification must be kept to a minimum so that the field of view is as wide as possible; Silver (1988) would disagree believing that some patients would prefer higher magnification in order to make the task easier.

It is claimed that after the introduction of EV and SES sometimes the power of the magnifier can be dramatically reduced (Collins, 1987). Reductions from 15X to 8X, from 8X to 2X and from 4X to conventional reading spectacles have been noted. If this were so the increased field of view and focal distance could be advantageous.

Goodrich and Mehr (1986) reviewed published works and current practice in eccentric viewing training. Subjective reports and clinical observation suggest better functional vision is achieved; however little published data are available to confirm this conclusion. In their opinion none of the existing methods are entirely satisfactory; optimum visual functioning is not provided by magnification and control of illumination, and eccentric viewing aids and training procedures have not been proven or widely adopted probably because of financial and man-power limitations. Insufficient research and/or clinical trials have been conducted to determine the validity of

procedures; and studies with small patient numbers and many variables give unrepeatable results.

It is the purpose of this study to investigate the benefits and economics of a training programme which utilises the techniques of EV and SES.

PART 2: MATERIALS AND METHODS

2.1 STUDY DESIGN

The study was designed to ensure as far as was possible that the methods were without bias, and that the variables were kept to a minimum and patient compliance to a maximum. Patients were allocated to the management groups in a random manner, strict entry criteria were adhered to, and several changes were made after analysis of the pilot study (see p42). Questionnaires and procedures were kept as short, simple and as efficient as possible so that the level of fatigue was minimal. The length of the appointment did not depend only on the type of management (one of the three groups) but also the individual's reaction to the treatment he received, e.g. if a patient in the discussion group (see p55) made it clear he did not wish to talk about personal feelings or listen to advice the session was kept brief.

The General Health Questionnaire (see p59) is available in short (12 item) or long (28 item) form. Initially the 28-item style was used but it was found to be tiring and difficult to administer due to the nature of the questions, so it was replaced with the shorter version. The scores cannot be compared directly, so the earlier results were disregarded.

The study was vulnerable to lack of cooperation from the patients in both failure to attend appointments and complete the procedures. Non-attenders were contacted by telephone and/or letter and encouraged to return for assessment.

2.1.1 Pilot Study

Three months prior to the main study commencement a pilot study was undertaken to ensure the system was workable and to improve the design. Individuals suffering from a macular disorder in the better eye, (i.e. ARMD; myopic degeneration with Foster-Fuchs spot; diabetic retinopathy and macular hole), were considered. The procedure was similar to the present study with exception of the four points below. Of 78 patients initially assessed 22 were considered suitable for follow up. Results were analysed and the following modifications to the present study were made:

1) The inclusion/exclusion criteria were tightened especially with regard to the diagnosis. ARMD was considered to be the single most appropriate eye condition (see p44).

2) Written instructions explaining how to handle the magnifier were issued to all patients.

3) Patients were required to attend the clinic for objective assessment of progress since telephone follow up was found to be insufficient.

4) The low vision training programme was modified to conform to the regime used in the UK, i.e. the methodology was changed, less homework was given to the patient, and the time lapse between appointments altered.

Early analysis of the results showed that otherwise suitable patients were being rejected because they could read fluently with the loaned magnifying device. Since it is claimed that training allows the power of the magnifier

to be reduced without a loss in performance (Collins, 1987), it was decided that patients falling into this category should be included in a supplementary project. Therefore, patients unable to read newsprint fluently with the loaned magnifier were placed in study "A", and those who could read newsprint fluently with the prescribed magnifier were placed in study "B".

2.2 SELECTION OF DIAGNOSIS

ARMD was chosen as the most suitable ocular condition for the study for the following reasons:

1. It is the largest cause of irreversible "blindness", and because it is a common condition suitable subjects are readily available.

2. Severe disability can result from loss of central vision in this condition which can be bilateral. No completely satisfactory medical or surgical treatment is available or imminent, therefore other management possibilities must be explored.

3. Macular degeneration has a favourable prognosis in low vision aids rehabilitation.

4. The condition is ideally suited to low vision training. "Macular degeneration patients have the highest success rate" in training programmes (Collins, 1988a).

2.3 SOURCE OF PATIENTS

The patients seen attended Moorfields Eye Hospital and were drawn from five sources during the period March 1988 to July 1989. The sources were:

1) general out-patient clinics
2) Retinal Diagnostic Department
3) Accident and Emergency Department
4) Low Vision Clinic
5) other hospitals

In each appropriate examination area in the hospital pink "LVA" slips were made available together with a written explanation. If the patient fulfilled the basic criteria (55 years of age or over with visual acuity 6/18 or worse in the better eye due to age-related macular degeneration) they were given a pink slip and asked to make an appointment directly with the researcher. Patients attending the Accident and Emergency Department had to be registered with a consultant ophthalmologist before referral.

The low vision assessment could not be carried out immediately after an ophthalmological examination if mydriatics had been used. A request was made that patients bring along to the booked appointment their spectacles, any magnifying device of their own and examples of the type of material that they would particularly like to manage.

Outside consultant ophthalmologists referring to the Low Vision Clinic usually provided sufficient information for suitable patients to be identified and sent an appointment with a view to joining the study.

2.4 LOW VISION DEVICES AND EQUIPMENT

In the Low Vision Clinic the practitioner can prescribe any device that is normally available in the United Kingdom (Jackson and Silver, 1983). Although various manufacturers' appliances may be technically very similar, patients often prefer or perform better with a particular design. Standard appliances demonstrated to the patient are classified below. Where possible the power is described in dioptre (D) equivalent (i.e. back vertex power) since magnification does not have a standard definition (Edgar, 1989).

1. Simple Hand and Stand Magnifiers

This group consists of single or compound convex lenses made of glass or plastics materials (which may be aspheric to reduce aberrations). The lens is usually mounted in either metal and/or plastics.

a) hand held (including folding magnifiers): ranging from +5.00D to approximately +80.00D

b) suspended magnifier - with the mount resting on the user's chest it allows both hands to be free: ranging from +3.00D to +5.00D

c) stand mounted - the focus may be fixed or variable: ranging from +5.00D to approximately +120.00D

i) bar magnifier - plano-cylinder form used on the working plane parallel to the print and magnifying the height of the letters: ranging from +9.50D to +27.00D cylinder

ii) flat field - hemispherical plano convex paper-weight magnifier of fixed focus used in contact with the working

plane: approximately x1.75

iii) flexible arm - easily adjustable working distance and consequent variation of magnification factor and field of view (illuminated and non-illuminated): ranging from +3.50D to +15.00D

d) illuminated stand magnifier - an integral lighting system gives an even illumination and prevents the need for an external luminare: ranging from +8.00 to approximately +80.00D

2. Spectacle Magnifiers

These devices consist of simple or compound positive lenses (usually aspheric) of short focal length for near viewing. They are mounted in the spectacle plane allowing the hands to be free and the field of view to be relatively large.

a) unifocal reading aids - often considered by the patient to be the most cosmetically acceptable appliance: ranging from +4.00D to approximately +48.00D

b) "bifocal" reading aids - necessary when distance correction is required: ranging from +5.00D to approximately +60.00D

c) compound spectacle magnifiers - doublet and triplet lens systems: ranging from x10 to x20

d) clip on - attached to the patients spectacles:

monocular - ranging from +6.00D to +20.00D

binocular - +4.00D to +10.00D

e) watch makers loupe - originally designed for individuals needing fine inspection capability: ranging from +12.00D to +32.00D

3. Near Telescopes

These are spectacle-mounted devices consisting of a combination of two optical components - the objective and eye lens. Galilean telescopes are more common but roof prims are also available. Of fixed or variable focus they allow magnification at a relatively longer working distance.

a) monocular: ranging from 2x to 9x

b) binocular: ranging from 1.6x to 5x

Where appropriate distance appliances (ranging from 2x to 10x) were loaned in addition to the near vision magnifier(s). Distance telescopes can be classified into monocular, binocular, hand-held or face mounted.

The same consulting room was used at all times. It was fully equipped with low vision appliances, distance and near vision charts and appropriate lighting. The illumination was arranged to provide optimum conditions for reading performance and comfort.

2.5 PROCEDURE

2.5.1 Medical Assessment

In the Retinal Diagnostic Department and general clinics a full medical history is taken with reference to general and family history, ocular disease and visual change. This information is recorded together with the aided and unaided acuities measured on a Snellen chart. External examination using the slit lamp biomicroscope and internal examination using the indirect ophthalmoscope is carried out. Further tests are undertaken when necessary, e.g. fluorescein angiography, colour fundus photography and electro-diagnostic tests, and/or visual fields.

2.5.2 Patient Recruitment

Patients were recruited as a continuous series from referrals according to the following criteria.

1) Patients were aged 55 years or over

2) Patients were diagnosed having ARMD in their better eye. The other eye may have had any condition provided the acuity was sufficiently poor for it not to be considered.

3) Visual acuity of the better eye was 6/18 or less.

4) Patients stated newsprint to be a specific requirement.

The exclusion criteria were:

1) Patients who suffered visual loss due to other disease.

2) Patients with dense cataract which prevented useful retinoscopy.

3) Patients with physical disability preventing reasonable handling of an optical appliance and materials.

4) Patients whose general health was considered not good enough to allow full follow-up.

5) Patients who were unwilling or unable to participate in the study.

6) Patients who were illiterate and/or spoke poor English.

7) Patients who had suffered disciform macular degeneration with massive haemorrhage such that vision might be unstable.

8) Patients who owned and successfully used a low vision device for newsprint.

9) Patients with a myopic prescription over -8.00 dioptres.

2.5.3 Low Vision Assessment

All assessments were conducted by the same practitioner and an effort was made to provide a relaxed and sympathetic atmosphere. Standard low vision assessment has been described by Jackson (1989). Practitioners in Moorfields Low Vision Clinic make use of magnification and control of illumination as standard rehabilitation techniques.

The initial assessment consisted of four parts:

2.5.3.1. Functional assessment and identification of visual tasks

Functional assessment of vision involved discussing problem tasks encountered in everyday living, e.g. moving around the home and out of doors, both in a familiar and unfamiliar area; crossing roads; negotiating stairs;

managing bus numbers and recognising faces. For intermediate range chores around the home and watching television were considered. Reading, handicraft and other leisure activities were discussed for near vision. Accompanying persons were invited to participate in the discussion.

Problems were not suggested to the patient; instead they were encouraged to define their own needs as clearly and specifically as possible, although occasionally it was necessary to ask provoking questions.

Most patients with macular disease state "reading" as one of their main requirements; it is important to define this both quantitatively and qualitatively. There is considerable difference between an elderly person living alone with the need to manage only essential correspondence and the active committee member with copious amounts of paperwork. Appropriate communication between patient and practitioner is essential from the beginning (Rosenberg, 1968). Both parties should feel that the goals are reasonable; unrealistic objectives will leave the patient unhappy at the conclusion of the assessment. "I want to be able to see everything" is a common and usually unreasonable request.

Patients were asked to bring to the clinic any magnifying aids they owned, even if they were of little use. Many purchase a device over the counter; some acquire help by less conventional means, e.g. taping together two or more pairs of spectacles. This information gives some idea of the level of motivation and indicates the type of device likely to be acceptable. If the appliance was found

to be sufficient to allow newsprint to be read the patient was not considered for the study since previous successful experience may have influenced attitude and aptitude. Cases where a low powered magnifier had initially aided a small visual deficit but then a severe loss occurred were still put forward for the study provided the other criteria were fulfilled.

2.5.3.2 Refraction and distance visual acuity

Any existing spectacles were checked on the focimeter and the power of the lenses recorded. With each eye in turn the patient read a Snellen chart at 6 metres first without and then with the spectacles. An auxiliary hand held chart at 3, 2, 1 or 1/2 metre was used when necessary. At the initial end point the patient was encouraged to read more until the true limit was reached.

The trial frame was centred and retinoscopy performed. Subjective verification of the prescription was necessary using spheres of suitable dioptric steps relevant to the level of vision, and Jackson cross cylinders of suitable magnitude. Back vertex distance was recorded in prescriptions over +/- 5.00 dioptres.

2.5.3.3 Reading acuity and magnification

With a +4.00 addition in the trial frame and the Vocational Near Vision Test Type (as approved by the Faculty of Ophthalmologists) at 25cm the patient was encouraged to read the smallest print possible. The chart was moved closer and further away by a few centimetres until the optimum working distance was found; this was

recorded. The level of magnification necessary to read point 5 print (see section 2.5.4) could then be ascertained (Jackson and Silver, 1983).

2.5.3.4 Performance with low vision devices

Standard techniques were used to identify the most suitable device. The task and deciding factors had been defined thereby limiting the number of suitable devices. Care was taken to avoid practitioner bias.

Initially the reading addition was increased in suitable dioptric steps until the required acuity had been achieved or reduced working distance or illumination problem became prohibitive. Simple hand and stand magnifiers were then demonstrated; spectacle mounted devices were also tried if the patient showed sufficient handling ability and understanding. Performance and the patients' reaction were recorded in each case.

The primary problem was dealt with first; if time and fatigue level allowed then the second most important task was considered.

2.5.4 Target Acuity

To be entered into the study patients had to state the desire to read newsprint. This criterion was enforced since it was important to have regular practice, or at least regular attempts, with readily available material. "Essential" correspondence alone may not appear in sufficient quantities to allow daily practice, would not be of a standard size or format, and hence it would be more difficult to quantify and qualify achievement at

home.

The near vision test chart has paragraphs of print increasing in size headed with an "N" which stands for "Near" and a number which indicates the "point" size of the lettering. Point 8 print is the equivalent size of average newsprint; however due to the poor contrast of pale ink against off-white paper the patient must usually be attempting N5 for newsprint to be managed in practice. A tabloid newspaper was used to determine the patients' ability to read fluently. Even if smaller letters were attempted, tracking or localisation problems may have impaired performance with newsprint.

2.5.5 Supply of Devices

Appropriate device(s) were issued "on loan" in accordance with standard procedure of the National Health Service. If the visual status or requirements changed, more suitable devices could be substituted after review and without charge. Unused aids were recovered and recycled. Custom made appliances not held in stock were usually collected by appointment so that sufficient explanation and demonstration could be given.

General handling, working distance, illumination and glare were discussed. Written instructions "How to use your magnifier" were supplied to reinforce and supplement verbal advice. Separate instruction sheets were available for hand and stand magnifiers, spectacle mounted aids and distance aids (see Appendix II).

Patients were reassured that using the eyes would not cause them to deteriorate further. They were then divided

into two categories according to the performance with the magnifier. Those who were unable to read newsprint fluently were placed in study "A"; those who could were placed in study "B".

2.5.6 Management Groups

The purpose of the study was explained to the patients and their consent obtained. Allocation to one of three groups was done on a random basis with the practitioner shielded from the sequence.

GROUP 1: (Comparison group)

Patients received no further instruction or training.

GROUP 2: (Comparison group)

Time was spent discussing any problems or difficulties associated with the loss of vision. The patient was encouraged to lead the conversation and talk about whatever he wished, for example worries about coping on a social level, in the personal or employment environment (a few patients in their seventies were still working). Escorts were invited to contribute to the conversation.

Helpful strategies and advice were offered, e.g. the use of contrast, colour illumination around the home, appliance for the kitchen and handicrafts, etc. Contact addresses of two organisations were offered to the patient; the Royal National Institute for the Blind's resource centre in Great Portland Street, London and a social support group known as The Macular Degeneration Society.

Up to one hour was available for this informal

discussion; the time taken depended on the patient's response. Its purpose was to overcome a phenomenon known as the Hawthorne Effect (Mayo, 1945). In an industrial environment a discussion period was found to aid the workers in "emotional release". Great advantage was accrued when problems were "talked off", the attitude towards personal situations was influenced, allowing the individual to relate to those around him and develop the desire and capacity to work better.

Patients may benefit from the psychological support rather than, or in addition to, the training techniques. It was important to isolate benefits attributable to each. The management of group 2 patients could be considered equivalent to a placebo treatment in a medical trial.

GROUP 3:

Up to one hour of directed training was designed to teach patients the specialised reading techniques of eccentric fixation and steady eye strategy. The programme employed was the same as the methods currently used in the United Kingdom (Collins, 1987). A meeting was arranged with the Partially Sighted Society's National Low Vision Services Manager, and the practitioner undertaking the present study attended a training clinic at Bristol Eye Hospital.

An Amsler chart at 25cm was used to map the central field defect (i.e. 10 degrees). With the near prescription in place and each eye in turn the patient was directed to look at the centre dot and "draw on the grid any area which seems blurry, distorted or missing". Two diagonal

lines were drawn on the chart for those who were unable to fixate the central dot; the direction then was "look towards the point where the lines cross".

The result was careful explained so that the patient understood the significance of the "bad patch" of vision and the potential of the "good" unaffected retina. Various eccentric angles of view were encouraged in an attempt to make the centre of the Amsler chart clearer.

Once the basic principal had been understood the eccentric viewing (EV) technique was put into practise; the patient was asked to look directly at the practitioner's face to see if any area seemed clearer than the rest (this should coincide with the "good" area on the Amsler chart). Various viewing angles were tried again so that the patient could identify the best line of gaze. Reference to a clock face was useful in directing the patient; for example, "look towards the 3 o'clock position and try to see my face out of the corner of your eye". The eye not in use was occluded if it interfered with performance.

The EV technique then had to be related to reading; a number of exercises were used to develop the skills required (Appendix III). A size of print that could be managed with the loaned optical device was selected from the range available. The patient was talked through correct handling of the magnifier, centric viewing, eccentric viewing with the angle chosen previously, and once this was achieved, the steady eye strategy.

The first exercise consisted of short, unrelated words with asterisks above and below; these act as a guide for

the eccentric angle of view. Unrelated words were used since patients may mask a visual disability to some extent by guessing correctly on the basis of the context of the sentence.

At the first presentation of this exercise patients were asked to read the print as well as they were able with the loaned magnifier. They were then directed to use the predetermined angle and to decide whether centric or eccentric viewing was preferable. Some time was spent comparing the two and trying to find a more satisfactory angle. If a horizontal angle was preferable the patient was encouraged to incorporate a vertical component.

Typoscopes, both horizontal and vertical, were demonstrated and loaned if found to be helpful. The edge of the card was positioned just above or below the words to aid fixation. A coloured location spot was attached to the card if it assisted maintenance of the viewing angle (Collins, 1987).

Patients were shown how to slide the print passed the stationary eye, or alternatively, move their head and magnifier together across the page (i.e. SES).

Columns of words allowed the patient to practise fixation, localisation and the steady eye strategy (Appendix III). A line drawn at a suitable distance from the words acted as a guide at the beginning, further on the patient had to attempt the viewing angle alone. This exercise was a stepping stone to "normal" print.

A pyramid of words was available to improve the field of fixation and to demonstrate the increased field

of view with a decreased working distance.

Escorts were included in the training session whenever possible. Patients were encouraged to practice the techniques on a regular basis for short periods of time; at least ten minutes twice daily was advised. Homework consisted of repeating the exercises and attempting to read normal text, including newsprint. The practitioner explained that the best magnifier had been loaned and only practise and mastery of these skills would allow further improvement in reading performance.

2.5.7 Additional Information

2.5.7.1 General Health Questionnaire

The twelve item General Health Questionnaire by Goldberg (1972) was used to assess the depression level of patients in study "A" (Appendix IV). The simple and structured interview was suitable for presentation by a lay-person. Although designed to be read by the patient, it was necessary in these circumstances to complete it verbally. Privacy was essential since the presence of a third person may have influenced the responses.

It was intended that the questionnaire should give some indication of the emotional stress patients were experiencing. The scoring ranged from 0 (minimum) to 12 (maximum depression score) and gave a quantitative indication of the individual's degree of mood disturbance.

At the initial low vision assessment the patient was asked to consider each questions on two levels; first with regard to how they had been feeling over the previous few weeks, and also when the eye problem started, i.e. when

they first realised that they could no longer read newsprint with the better eye. The length of time since visual loss was recorded. The questionnaire was completed at each follow-up.

Consent was obtained on each occasion. Patients who declined were not asked again at subsequent appointments.

2.5.7.2 General

At the initial assessment patients were asked if they anticipated that the loaned magnifying device would be "very useful", "occasionally useful" or "no help at all".

Patients were asked what their vision, as it was, actually meant to them, how it affected every day living. Any special concerns were also noted.

2.5.8 Review

Reviews took place two months and eight months after initial assessment. Patients were asked to bring the loaned devices with them and comment on the utilisation, advantages and/or disadvantages. Visual acuity and performance with the magnifier were recorded. Newsprint had been the initial requirement, so success or otherwise, both subjective (the patient's comment on his performance at home) and objective (the practitioner's opinion of performance in clinic), was noted.

Alternative aids were considered again to ensure that the best possible was in use, especially if the visual status had changed or the patient was managing so well that the level of magnification could be decreased. Further requirements were also dealt with at this time.

At the first check up patients were asked if the written instructions had been beneficial. Enquiries about lighting at each review revealed whether the patient had responded to the advice given previously.

The management procedures were repeated on each occasion; group 1 received no further attention, group 2 patients had one hour available to them for discussion and advice, and group 3 had another hour available for training. The total clinic time or each patient in groups 2 and 3 was up to four and three quarter hours. In comparison, the standard management of each patient in group 1 took approximately one and three quarter hours.

Patients in group 3 were questioned about their use of the special reading techniques at home. Eccentric viewing and steady eye strategy were categorised as a) successful, b) attempted (subdivided into regular and irregular use), or c) not used at all. Performance both with and without the techniques was noted and discussed at length. To reinforce understanding the techniques were taught again from first principals using the Amsler chart and the exercises.

2.5.9 Attendance

Hospital notes with clinical information are stored in the Medical Records Department but separate files of study data were held in the Low Vision Clinic together with dates of attendance.

Contact by telephone or correspondence was made when patients did not attend; further appointments were offered to those who failed.

PART 3: RESULTS

3.1 Number of Patients

Table 4 shows the total number of patients involved in the study. The number of patients recruited into each group is shown in table 5. The reasons for excluding 173 patients are summarised in table 6.

3.2 Age and Gender

At the start of recruitment the age range for patients in study "A" was 55 to 88 years; the arithmetic mean was 76.5. The range in study "B" was 59 to 88 with a mean of 74.6 years.

41 (71.9%) of the patients in study "A" were female and 16 (28.1%) male; 25 (58.1%) of study "B" were female and 18 (41.9%) were male.

3.3 Diagnosis

In study "A" central vision loss had resulted from subretinal neovascularisation (SRNV)/disciform degeneration in 41 (71.9%) cases; atrophic macular degeneration in 9 (15.8%) cases; 3 (5.3%) pigment epithelium detachment (PED); 1 (1.8%) cystoid macular oedema and 3 were unspecified. In study "B" 22 (51.2%) were diagnosed as SRNV/disciform degeneration; 12 (27.9%) as atrophic degeneration; 7 (16.3%) as PED and 2 (4.7%) had suffered cystoid macular oedema.

3.4 Escorts

Escorts were present during the initial assessment in 8 (42.1%), 6 (37.5%) and 12 (54.6%) cases for groups 1, 2 and 3 respectively in study "A"; and 4 (28.6%), 7 (58.3%) and 9 (52.9%) respectively in study "B".

TABLE 4

TOTAL NUMBER OF PATIENTS

Initially assessed	273
Entered into "A" study	57
Entered into "B" study	43
Considered unsuitable for inclusion	173

TABLE 5

NUMBER OF PATIENTS ENTERED INTO EACH GROUP

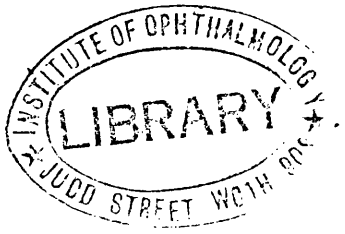
	"A" study	"B" study
Group 1	19	14
Group 2	16	12
Group 3	22	17
TOTAL	57	43

TABLE 6

REASONS FOR EXCLUSION OF PATIENTS

FROM STUDIES "A" AND "B"

Newsprint managed with a +4.00 addition or less	56
Newsprint managed with patient's own magnifying device/ myopes unaided	35
Newsprint not a requirement	19
Newsprint managed with loaned magnifier (before "B" study started)	16
Refusal to be included in the study	24
Refusal to try any magnifying device	4
Poor English/communication or illiteracy	6
Previous LVA experience	3
Cataract	3
Arthritis/tremor	2
Other	5
TOTAL	173



3.5 Patients' Initial Reaction to the Magnifying Device

The main optical appliances prescribed at the initial assessment for reading newsprint are detailed in tables 7 and 9. The patients' initial reaction to the device is shown in tables 8 and 10. No-one believed that the magnifier would be of no use at home.

3.6 Utility of the Loaned Magnifier

Table 11 shows the patients' comments at both reviews on the utility of the device at home. There was found to be no significant difference between the groups in either study; the chi-squared statistics are shown in the table. In study "B" the numbers were small therefore "occasionally useful" and "not used" were combined and analysed against "very useful".

3.7 Illumination

Table 12 shows the numbers of patients at the initial assessment and follow up claiming to make use of good illumination in their home.

3.8 Written Instructions

5 (29.4%) of the 17 patients reviewed in group 1, 8 (53.3%) of 15 in group 2 and 10 (45.5%) of 22 in group 3 of study "A" appreciated the written instructions which were issued with the magnifier. Appreciation of the instructions against ability to read newsprint is shown in table 13. The three methods of management were arranged as 3 separate two-way contingency tables for analysis; the chi-squared statistics are also shown. The proportions of patients appreciating the instructions were the same in

TABLE 7

OPTICAL MAGNIFIERS PRESCRIBED FOR READING NEWSPRINT AT THE INITIAL ASSESSMENT: STUDY "A"

GROUP	1	2	3
+8.00 HM	1	0	0
+11.50 HM	2	1	0
+20.00 SM	0	3	5
+20.00 SMILL	1	1	1
+28.00 SM	0	1	1
+28.00 SMILL	1	2	0
+36.00 SMILL	0	0	1
+44.00 SMILL	1	0	2
x10 SMILL	9	5	6
x15 SMILL	4	3	6
TOTAL	19	16	22

Key
HM = hand-held magnifier
SM = stand magnifier
SMILL = illuminated stand magnifier
NV TEL = near vision telescope

TABLE 8

PATIENTS' INITIAL REACTION TO THE MAGNIFIER: STUDY "A"

GROUP	1	2	3
"very helpful"	11	6	11
"occasionally helpful"	8	10	11
TOTAL	19	16	22

TABLE 9

OPTICAL MAGNIFIERS PRESCRIBED FOR READING NEWSPRINT AT THE INITIAL ASSESSMENT: STUDY "B"

GROUP	1	2	3
+11.50 HM	1	4	3
+20.00 HM	0	0	1
+20.00 SM	6	3	7
+20.00 SMILL	3	1	2
+28.00 SM	1	0	0
+32.00 SMILL	0	0	1
+36.00 SMILL	0	2	0
+44.00 SMILL	2	0	1
x4 NV TEL	0	1	0
x10 SMILL	0	1	2
x15 SMILL	1	0	0
TOTAL	14	12	17

TABLE 10

PATIENTS' INITIAL REACTION TO THE MAGNIFIER: STUDY "B"

GROUP	1	2	3
"very helpful"	12	10	15
"occasionally helpful"	2	2	2
TOTAL	14	12	17

TABLE 11

PATIENTS' COMMENTS ON THE UTILITY OF THE LOANED MAGNIFIER

GROUP	1stFU very useful	1stFU occass useful	1stFU not used		2ndFU very useful	2ndFU occass useful	2ndFU not used	
STUDY "A"				TOTAL				TOTAL
1	5	6	6	17	4	6	4	14
2	3	8	4	15	3	6	2	11
3	8	6	8	22	8	6	2	16
TOTAL	16	20	18	54	15	18	8	41
	X^2_4=2.74 ns				X^2_4=2.73 ns			
STUDY "B"								
1	4	9	1	14	5	9	0	14
2	5	6	1	12	5	4	2	11
3	8	5	0	13	8	2	0	10
TOTAL	17	20	2	39	18	15	2	35
	X^2_2=3.01 ns				X^2_2=4.81 ns			

TABLE 12

THE NUMBER OF PATIENTS CLAIMING GOOD ILLUMINATION AT HOME

STUDY "A"

GROUP	1	2	3
Initial Assessment	17/19	10/16	14/22
1st Review	16/17	15/15	20/22
2nd Review	11/14	11/11	14/16

STUDY "B"

GROUP	1	2	3
Initial Assessment	9/14	9/12	12/17
1st Review	12/14	12/12	13/13
2nd Review	13/14	11/11	10/10

TABLE 13

APPRECIATION OF INSTRUCTIONS AGAINST ABILITY TO READ NEWSPRINT: STUDY "A"

Newsprint Read		Instructions Helpful: YES	Instructions Helpful: NO
YES	Group 1	0/17	1/17
	Group 2	3/15	0/15
	Group 3	2/22	2/22
NO	Group 1	5/17	11/17
	Group 2	5/15	7/15
	Group 3	8/22	10/22

Chi-squared statistics from contingency table analysis

Instructions against groups	$X^2_2=2.30$	ns
Newsprint against groups	$X^2_2=1.59$	ns
Instructions against newsprint	$X^2_1=1.52$	ns

TABLE 14

APPRECIATION OF INSTRUCTIONS AGAINST ABILITY TO READ NEWSPRINT: STUDY "B"

		Instructions Helpful	
		YES	NO
Newsprint Read			
YES	Group 1	5/14	3/14
	Group 2	5/12	1/12
	Group 3	7/13	1/13
NO	Group 1	3/14	3/14
	Group 2	2/12	4/12
	Group 3	2/13	3/13

Chi-squared statistics from contingency table analysis

Instructions against groups	$X^2_2=2.46$	ns
Newsprint against groups	$X^2_2=0.41$	ns
Instructions against newsprint	$X^2_1=5.28$	$p<0.05$

each group; the proportions managing to read newsprint were also the same. It was found that the proportion who could read newsprint were the same for those who appreciated the instructions and those who did not.

The number of patients appreciating the instructions in the "B" study were 8 (57.1%) of 14, 7 (58.3%) of 12 and 9 (52.9%) of 13 in the three groups respectively. The data are shown in table 14, together with the chi-squared statistics. The proportions appreciating the instructions were the same in each group, and the proportions for reading newsprint were the same too. However, those who appreciated the written advice were significantly better (5% level) at reading newsprint. For chi-squared on 1 degree of freedom the 1% point is 6.635, so the test statistic is not quite significant at this level.

3.9 Near Vision Performance

Tables 15, 16 and 17 show the smallest point print that patients in study "A" could read at the initial assessment and the reviews. No significant difference was found between the groups at initial assessment ($F_{2,54}$=1.62 ns); at the first follow-up ($F_{2,51}$=1.27 ns); or the second follow-up ($F_{2,38}$=1.98 ns). There was no significant difference in the change of performance between the three groups. However, the F statistic for the first follow-up minus the initial performance ($F_{2,51}$=2.83 ns) was close to the decision boundary of 3.2, so the result should be interpreted with caution. There was no significant difference between the three groups for a change in performance from the first to the second follow-up

TABLE 15

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "A"

GROUP 1

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
2	5	-	-	-	-
4	10	10	n	10	n
5	8	10	n	12	n
13	5	9	n	12	n
14	5	8	n	6	y
19	8	12	n	12	n
20	5	5	n	5	n
24	8	12	n	9	n
25	6	9	n	9	n
28	6	6	y	6	n
30	9	8	n	8	n
36	8	5	n	8	n
37	9	9	n	-	-
42	8	-	-	-	-
45	5	5	n	-	-
46	<48	<48	n	12	n
49	10	10	n	-	-
50	12	9	n	10	n
51	12	10	n	12	n

KEY
Pt No = patient's study number
Initial N = point size of print read at initial assessment
1st/2nd FU = point size of print read at first/second review
News 1/2 = newsprint managed fluently at follow-up
y = yes n = no
- = data not collected

TABLE 16

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "A"

GROUP 2

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
3	9	-	-	-	-
7	6	6	y	5	y
10	6	9	n	8	n
16	6	36	n	<48	n
17	5	8	n	6	n
27	5	6	n	18	n
29	6	<48	n	-	-
31	12	10	n	9	y
33	9	6	n	6	n
35	8	<48	n	18	n
38	8	12	n	-	-
41	5	5	y	8	n
47	8	14	n	-	-
48	5	5	n	6	y
52	5	6	n	6	y
57	10	9	n	-	-

TABLE 17

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "A"

GROUP 3

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
1	6	12	n	10	n
6	8	5	y	8	n
8	10	10	n	-	-
9	10	8	n	-	-
11	8	8	n	10	n
12	6	8	n	5	y
15	5	5	y	9	n
18	5	5	y	5	y
21	10	8	n	8	n
22	5	5	n	8	n
23	5	6	y	8	n
26	5	5	y	6	n
32	12	12	n	12	n
34	6	9	n	9	n
39	8	6	n	8	y
40	6	8	n	10	n
43	10	<48	n	9	n
44	5	9	n	-	-
53	5	8	n	-	-
54	5	5	n	-	-
55	5	8	n	6	n
56	5	9	n	-	-

($F_{2,37}$=0.65 ns). The increases in response were also examined with the use of a covariate, namely the initial point size of text, but it was generally not helpful in the detection of group differences.

Tables 18, 19 and 20 show the smallest point print study "B" patients read at initial assessment and the reviews. The difference in initial performance between the groups was not significant ($F_{2,40}$=1.04 ns). Similarly there was no significant difference between the groups at the first and second follow-ups ($F_{2,36}$=1.19 ns; $F_{2,32}$=0.42 ns), nor in the change in performance, i.e. first follow-up minus initial performance ($F_{2,36}$=1.30 ns), second follow-up minus first ($F_{2,32}$=0.57 ns). Again the use of a covariate was not helpful.

3.10 Newsprint Managed

Table 21 shows the number of patients who claimed to read newsprint fluently at home, and the number who actually managed in clinic.

In study "A" there was no significant difference between the three groups in the proportions of those who could actually read newsprint at either the first follow-up analysis (X^2_2=2.19 ns) or the second follow-up analysis (X^2_2=3.36 ns). Similarly there was no significant difference in the proportions of those who could read newsprint between the three groups in study "B" in either the first follow-up analysis (X^2_2=1.06 ns) or the second follow-up analysis (X^2_2=0.06 ns). The number of data is small especially in the latter study, hence the result should be interpreted with caution.

TABLE 18

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "B"

GROUP 1

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
2	8	5	y	5	y
4	5	5	y	5	y
13a	5	5	y	6	y
13b	5	10	n	<48	n
14	5	5	y	6	y
18	5	8	n	12	n
19	5	8	n	9	n
23	5	5	y	5	y
24	5	5	y	5	y
27	5	5	y	8	n
29	5	5	y	5	y
35	5	5	y	5	n
36	5	5	y	5	y
41	5	6	n	5	n

TABLE 19

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "B"

GROUP 2

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
3	5	5	y	-	-
5	5	5	y	8	y
9	5	5	y	5	y
12	5	8	y	6	y
16	5	6	n	18	n
26	5	9	n	6	n
28	5	24	n	18	n
30	5	5	n	5	y
32	5	8	y	8	n
34	5	5	y	5	y
37	5	6	y	9	y
40	5	5	n	6	n

TABLE 20

NEAR VISION PERFORMANCE OF PATIENTS IN STUDY "B"

GROUP 3

Pt No	Initial N	1st FU N	News 1	2nd FU N	News 2
1	5	5	y	5	n
6	5	5	y	5	n
7	5	6	y	14	n
8	5	10	n	12	n
10	5	5	n	5	y
11	5	-	-	-	-
15	5	5	y	5	y
17	5	5	y	-	-
20	5	5	y	5	y
21	5	-	-	-	-
22	5	5	y	6	y
25	5	10	n	-	-
31	5	5	y	-	-
33	5	5	y	5	y
38	5	-	-	-	-
39	5	5	y	5	y
42	5	-	-	-	-

TABLE 21

THE NUMBER OF PATIENTS READING NEWSPRINT FLUENTLY

STUDY "A"

GROUP	1	2	3
FIRST REVIEW			
Subjective	3/17	6/15	6/22
Objective	1/17	2/15	5/22
SECOND REVIEW			
Subjective	1/14	5/11	3/16
Objective	1/14	4/11	3/16

STUDY "B"

GROUP	1	2	3
FIRST REVIEW			
Subjective	8/14	6/12	8/13
Objective	10/14	7/12	10/13
SECOND REVIEW			
Subjective	6/14	5/11	7/10
Objective	8/14	6/11	6/10

In the case of the 54 patients in study "A", if the difference in reading capability between any two groups was about 30%, say 5% in one and 35% in the other, the study would have an 80% chance of detecting a significant difference (see table 22). If the difference was bigger then the chance would be higher. If it were less than 25%, say 5% in one and 30% in the other, then the study would have 70% chance of detecting a significant difference.

3.11 Exchange of "Main" Magnifier During Follow Up

Table 23 shows the power of the most suitable magnifier at the review compared to the device loaned at the previous assessment. Statistical analysis was not done since the proportions of decreased magnification in the three groups of each study were very similar.

3.12 Response of Group 2 to Contact Addresses

Of the 12 patients in study "A" offered contact with organisations, 10 (83.3%) accepted the Royal National Institute for the Blind (RNIB) address and 7 (58.3%) the Macular Disease Society address. Of the 11 patients in study "B" 8 (72.7%) took the RNIB and 2 (18.2%) the self help group address.

3.13 Low Vision Training of Group 3 Patients

a) Initial training session

Eighteen (81.8%) of the 22 trained patients in study "A" and 15 (88.2%) of the 17 in "B" appeared to have reasonable understanding of the principals and techniques used in the programme.

TABLE 22

POWER OF A CLINICAL TRIAL

Total SAMPLE	% CURED Group A	%CURED Group B	% Difference	Zbeta	POWER%
54	26.00	5.00	21.00	0.1798	<60%
54	27.00	5.00	22.00	0.2567	60-69
54	28.00	5.00	23.00	0.3331	60-69
54	29.00	5.00	24.00	0.4090	60-69
54	30.00	5.00	25.00	0.4844	60-69
54	31.00	5.00	26.00	0.5596	70-79
54	32.00	5.00	27.00	0.6344	70-79
54	33.00	5.00	28.00	0.7091	70-79
54	34.00	5.00	29.00	0.7837	70-79
54	35.00	5.00	30.00	0.8583	80-84
54	36.00	5.00	31.00	0.9329	80-84
54	37.00	5.00	32.00	1.0076	80-84
54	38.00	5.00	33.00	1.0825	85-89
54	39.00	5.00	34.00	1.1577	85-89
54	40.00	5.00	35.00	1.2331	85-89
54	41.00	5.00	36.00	1.3089	90-94

(Critical P-Value fixed at 0.05)

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TABLE 23

REASSESSMENT OF REQUIRED MAGNIFICATION AT FOLLOW UP

MAGNIFICATION	GROUP 1 1st FU	GROUP 1 2nd FU	GROUP 1 TOTAL	GROUP 2 1st FU	GROUP 2 2nd FU	GROUP 2 TOTAL	GROUP 3 1st FU	GROUP 3 2nd FU	GROUP 3 TOTAL
STUDY "A"									
INCREASE	4	5	9/31	5	1	6/26	5	5	10/38
DECREASE	4	3	7/31	2	1	3/26	4	1	5/38
UNCHANGED	9	6	15/31	8	9	17/26	13	10	23/38
TOTAL	17	14		15	11		22	16	
STUDY "B"									
INCREASE	1	4	5/28	4	6	10/23	4	2	6/23
DECREASE	2	0	2/28	2	0	2/23	1	1	2/23
UNCHANGED	11	10	21/28	6	5	11/23	8	7	15/23
TOTAL	14	14		12	11		13	10	

Ten (45.5%) and 7 (41.2%) patients in "A" and "B" respectively experienced an improvement in vision when using the eccentric viewing (EV) technique for looking at a simple target, such as the practitioner's face and/or the Amsler chart. Table 24 summaries the patients' responses to EV.

In study "A" 5 (22.7%) reported that eccentric viewing was helpful for reading printed text; the preferred angle in each case was upward, i.e. towards the 12 o'clock position. The other 17 (77.3%) stated that centric viewing was better for reading.

In study "B" 2 (11.8%) appreciated EV for reading text; the best angle of gaze was directly up for one, and down and right, i.e. towards the 5 o'clock position, for the other. 15 (88.2%) elected to remain with centric viewing for reading text.

A typoscope was offered to 18 patients in the "A" study; 10 (55.6%) elected to use it. The preferred direction of the aperture was horizontal in 9 (90%) cases and vertical in 1 (10%).

Of the 11 patients shown a typoscope in study "B" 7 (63.6%) thought it may help them; of these, 6 (85.7%) chose a horizontal and 1 (14.3%) a vertical aperture.

b) First review

Of the 22 patients seen in study "A", 1 (4.5%) believed that he had used EV successfully and regularly at home. 10 (45.5%) had attempted the technique, 2 regularly and 8 irregularly, and 11 (50%) had made no effort. No patients claimed to have mastered the steady eye strategy (SES), 6 (27.3%) stated that they had attempted it and 16

TABLE 24

PATIENT RESPONSE TO EV

STUDY	"A"	"B"
INITIAL ASSESSMENT		
Improvement for simple tasks	10/22	7/17
Helpful for text	5/22	2/17
1ST REVIEW		
successful	1/22	0/13
attempted	10/22	3/13
not tried	11/22	10/13
2ND REVIEW		
successful	1/16	1/10
attempted	5/16	4/10
not tried	10/16	5/10

TABLE 25

PATIENT RESPONSE TO SES

STUDY	"A"	"B"
1ST REVIEW		
successful	0/22	0/13
attempted	6/22	2/13
not tried	16/22	11/13
2ND REVIEW		
successful	2/16	0/10
attempted	3/16	1/10
not tried	11/16	9/10

(72.7%) had not tried. Table 25 summarises the patients' reaction to the SES during follow-up.

After a further training session 21 out of the 22 patients (95.5%) in "A" appeared to have a comprehensive understanding of the training techniques.

In study "B" 3 (23.1%) of 13 patients reviewed had attempted EV; 1 regularly and 2 irregularly. No-one had used it successfully and 10 (76.9%) had made no effort. The SES had been attempted in 2 (15.4%) cases and remained unused in 11 (84.6%).

c) Second review

Of the 16 patients in study "A" who attended, 1 (6.3%) had used EV successfully and regularly at home. 5 (31.3%) had attempted to make use of the technique, 1 on a regular basis and 4 irregularly; the other 10 (62.5%) had made no effort at all. Two (12.5%) patients considered they had used the SES successfully; 3 (18.8%) had attempted it and 11 (68.8%) had not.

In study "B" of the 10 patients reviewed, 1 (10%) claimed EV had been successful used; 4 (40%) had attempted to use it (1 regularly and 3 irregularly), and 5 (50%) had not tried. The SES had been attempted in 1 (10%) case but had not been used in the other 9 (90%).

After this assessment the patients were trained for a final time and the level of comprehension of the techniques was considered to be reasonable in 15 (93.8%) cases in study "A".

3.14 General Health Questionnaire

The depression scores for study "A" patients are shown

in Tables 26, 27 and 28.

The analysis of variance gave an F statistic which indicated that there was no significant difference between the three management groups for neither the "previous" score ($F_{2,44}$=0.31 ns), i.e. how they felt when vision was first lost, nor "recent" score ($F_{2,44}$=0.11 ns), i.e. how they felt at the time of the initial assessment. The average time lapse between vision loss and the initial assessment was approximately 7 months for groups 2 and 3; for group 1 it significantly greater ($F_{2,44}$=3.52 $p<0.05$), i.e. 19.2 months.

There was no significant difference between the management groups at neither the first ($F_{2,40}$=0.71 ns) nor the second review ($F_{2,31}$=1.64 ns). Similarly, there was no difference between the groups for:

1) previous minus recent score ($F_{2,44}$=0.41 ns)

2) recent minus first follow-up score ($F_{2,40}$=0.41 ns)

3) first follow-up minus second follow-up score ($F_{2,31}$= 1.14 ns)

Analysis of the scores overall, i.e. not in relation to the groups, indicated a correlation (45 degrees of freedom) of -0.334 ($p<0.005$) between time and the recent score, i.e. the depression score decreased as the follow-up period increased (see graph 1). As expected, no significant correlation was found between the time lapse and the previous score (how they felt at the beginning of the time). A correlation of 0.354 ($p<0.05$) was found between previous minus recent score and time lapse (see graph 2), which suggests that the greater the time lapse

TABLE 26

GENERAL HEALTH QUESTIONNAIRE SCORES OF PATIENTS IN GROUP 1

Pt No	Time lapse	Previous score	Recent score	1stFU score	2ndFU score
13	2.5	6	4	0	1
14	4	4	7	4	3
19	8	3	8	3	0
20	72	5	0	0	1
24	1	2	2	0	2
25	3	0	2	1	0
28	8	0	1	0	0
30	26	3	4	2	0
36	24	0	0	0	0
37	72	7	1	0	-
42	12	5	0	-	-
45	24	2	5	3	-
46	24	6	0	0	1
49	12	10	1	0	-
50	2.5	4	4	5	1
51	12	5	3	1	1
ARITHMETIC MEAN	19.4	3.6	2.8	1.3	0.8
RANGE	1-72	0-10	0-8	0-5	0-3

KEY

Pt No = patient's study number
Time lapse = time in months between loss of vision in second eye and initial assessment in the Low Vision Clinic
Previous score = GHQ score when vision was first lost in the second eye
Recent score = GHQ score at initial assessment
1st FU score = GHQ score at first follow-up
2nd FU score = GHQ score at second follow-up
- = questionnaire not completed

TABLE 27

GENERAL HEALTH QUESTIONNAIRE SCORES OF PATIENTS IN GROUP 2

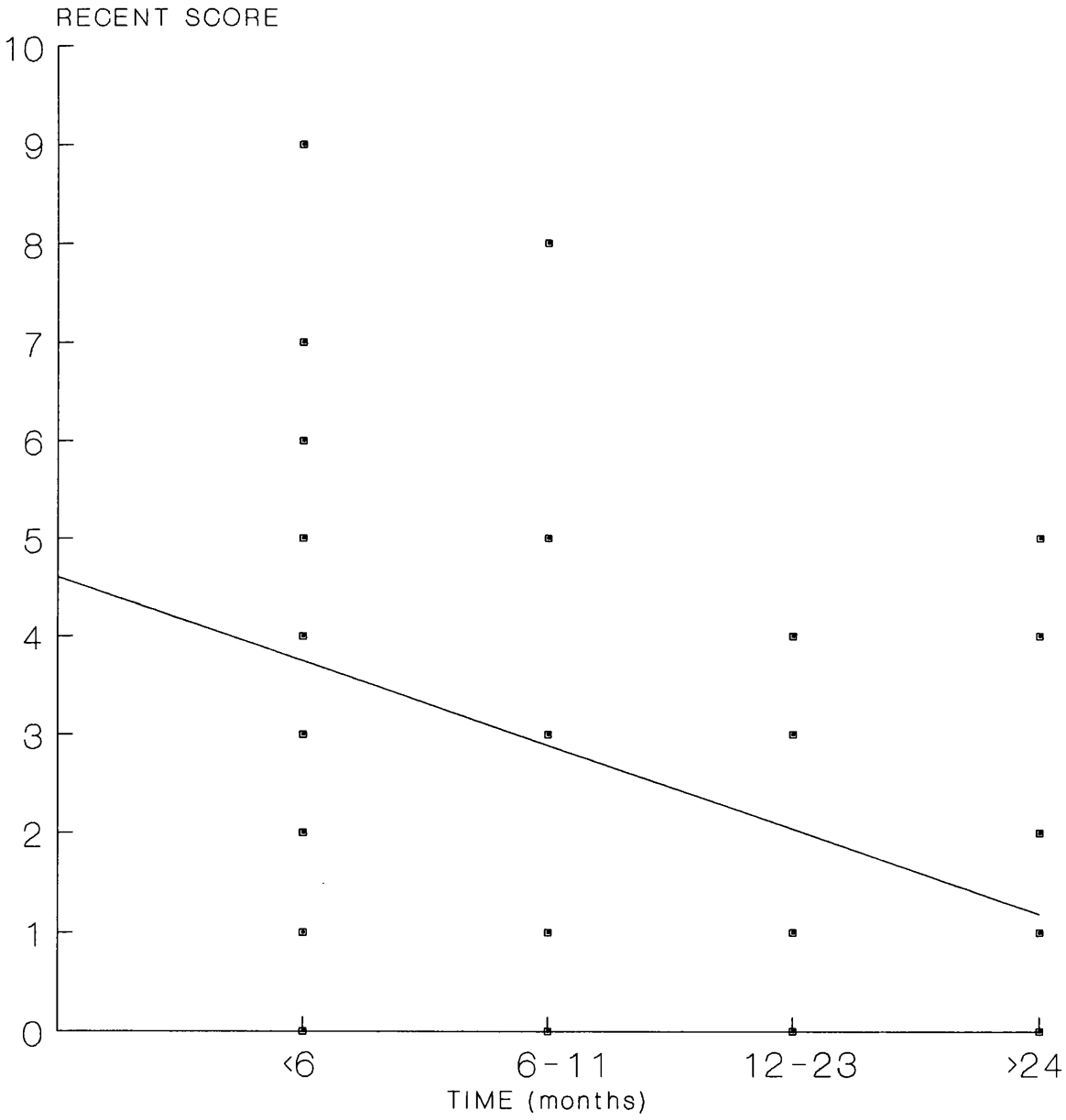
Pt No	Time lapse	Previous score	Recent score	1stFU score	2ndFU score
10	2	3	9	7	5
16	1	1	0	-	-
17	18	0	0	0	0
27	3	1	6	-	-
29	4	5	4	-	-
31	4	1	5	0	0
33	3	8	4	1	1
35	1	1	3	7	7
38	12	3	3	2	-
41	6	6	0	0	0
47	1	6	6	7	-
48	12	5	0	0	0
52	24	0	2	0	2
ARITHMETIC MEAN	7.0	3.1	3.2	2.4	1.9
RANGE	1-24	0-8	0-9	0-7	0-7

TABLE 28

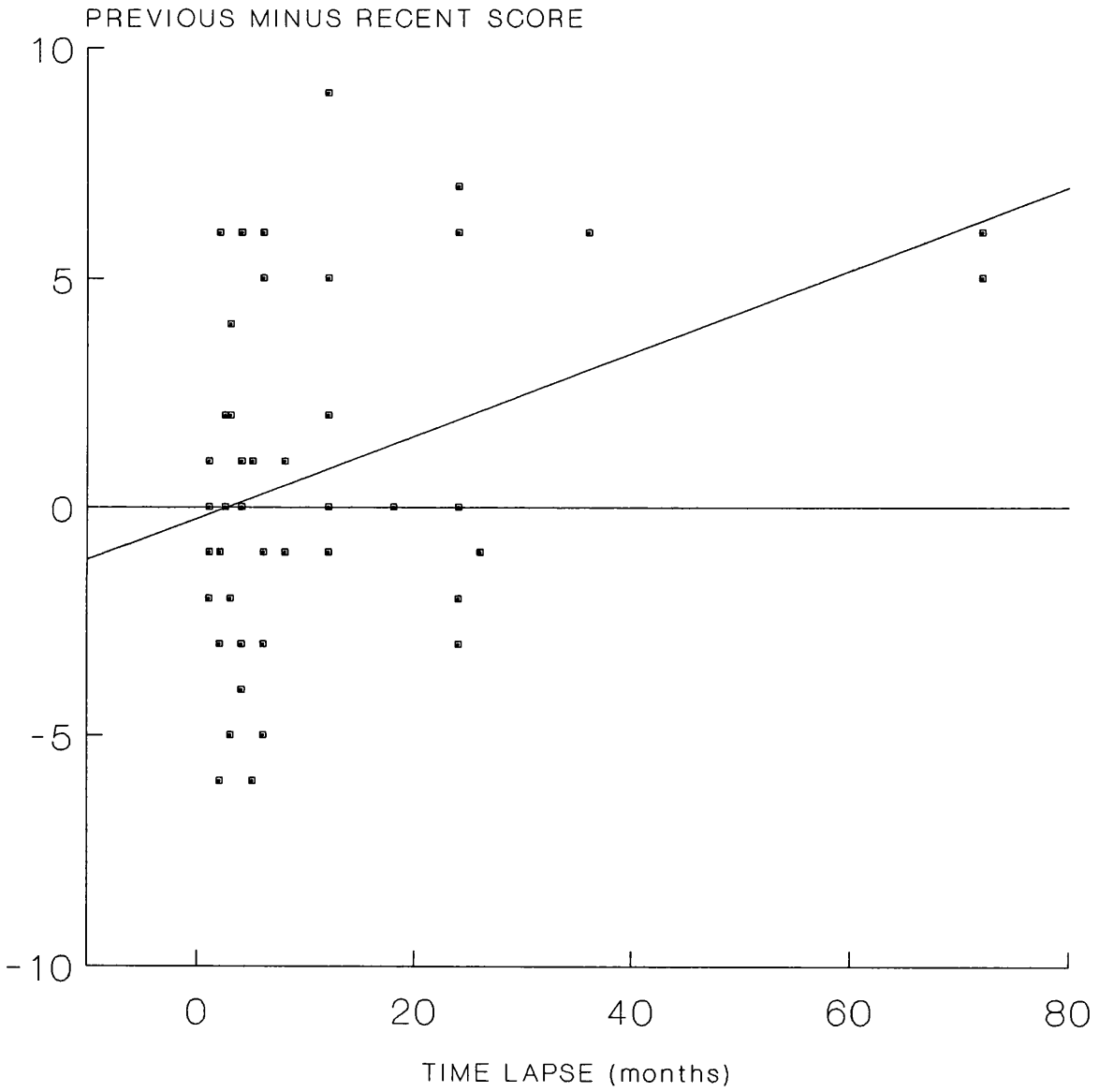
GENERAL HEALTH QUESTIONNAIRE SCORES OF PATIENTS IN GROUP 3

Pt No	Time lapse	Previous score	Recent score	1stFU score	2ndFU score
9	2	2	5	1	-
11	3	6	4	0	0
12	6	5	0	0	0
15	8	4	3	1	1
18	4	7	1	0	0
21	24	7	0	5	8
22	2	5	6	0	7
23	6	4	5	4	0
26	5	0	6	0	2
32	3	5	3	4	5
34	4	0	0	0	0
39	36	7	1	0	0
40	6	0	3	1	3
43	5	1	1	0	0
44	1	0	1	0	-
53	2	6	9	9	-
54	4	1	0	0	-
55	2	9	3	6	6
56	12	3	4	2	-
ARITHMETIC MEAN	6.5	3.8	2.9	1.7	2.3
RANGE	1-36	0-9	0-9	0-9	0-8

GRAPH 1
RECENT SCORE AGAINST TIME LAPSE



GRAPH 2
PREVIOUS MINUS RECENT SCORE AGAINST TIME



between loss of vision and the attendance at clinic the greater the difference between the two scores.

The data were analysed to see if the level of depression was related to performance. No significant correlation (-0.083) was found between the recent score from a patient and the size of the print s/he could read. The correlation between the score at the first review and the near vision performance was positive (0.153), but insufficient to be significant. The same was true for the second review (r=0.265); r=0.355 was required for significance.

3.15 Attendance

Table 29 shows the completion of the reviews in studies "A" and "B" and the General Health Questionnaire.

TABLE 29

COMPLETION OF REVIEW

"A" STUDY

Group	Total no seen	1stFU no/%	2ndFU no/%
1	19	17/89.5	14/73.7
2	16	15/93.8	11/68.8
3	22	22/100	16/72.3

"B" STUDY

Group	Total no seen	1stFU no/%	2ndFU no/%
1	14	14/100	14/100
2	12	12/100	11/91.2
3	17	13/76.5	10/58.9

GENERAL HEALTH QUESTIONNAIRE

Group	Total no seen	1stFU no/%	2ndFU no/%
1	16	15/93.8	12/75
2	13	10/76.9	8/61.5
3	19	19/100	14/73.7

KEY
Total no seen = total number of patients seen in each group
1st FU no / % = at first follow-up the number of records completed / the percentage completed
2nd FU no / % = at second follow-up the number of records completed / the percentage completed

PART 4: DISCUSSION

4.1 General

One hundred and seventy three patients of the 273 referred for initial assessment were unsuitable candidates for the study (see table 6). A normal prescription (up to and including a +4.00 addition) and advice on illumination were sufficient to give over 30% of the 173 cases good reading acuity. A further 35 (20.2%) people were rejected from the study because they had successfully acquired a suitable magnifier from another source, or because they were myopes and had good reading acuity when they removed their spectacles.

A surprisingly large number of patients (19, i.e. 11%) were not interested in reading the newspaper; the television and radio are adequate sources of information for some elderly people. Transport problems, the necessity of including an escort at follow-up, or disinterest in alternative methods of management accounted for 24 (13.9%) persons declining to be included in the study. Low vision practice usually includes a few patients who consider that a magnifier is not worth the effort; 4 (2.3%) refused to try a device at home. Physical disabilities, e.g. arthritis, tremor, usually common in the elderly population did not affect the study excessively; only 7 (4%) were rejected on these grounds.

The range and the average age of patients included in the study were comparable to the DHSS blind and partially sighted register; they were mainly "elderly". Those in study "A" suffering from a severe loss of central vision were slightly older on average, i.e 76.5 years, than those in "B" who had less of a defect and an average age of 74.6

years.

Disciform degeneration and subretinal neovascularisation were major causes of visual loss in both studies, but they was more prominent in "A" (71.9%), than in "B" (51.2%). Pigment epithelium detachments were more evident as the cause of the visual deficit in study "B" (16.3 %) than "A" (5.3%), i.e. residual vision was comparatively good with this condition. Atrophic degeneration accounted for a similar portion of each study; 22.8% in "A" and 27.9% in "B". Cystoid macular oedema provides disturbance of central vision therefore the few referred cases were included in the studies.

Demographically there are far more women in the older age group than men. Hence a majority of the recruited subjects were women, especially in study "A" (71.9%) where the average age was greater than study "B" (58.1%).

As a consequence of random allocation the various types of age-related macular degeneration, and males/females, were distributed without bias to the groups, also there was no significant difference in the initial near vision performance (tables 15-20) between the three management groups in either study.

Stand magnifiers were the most widely prescribed device for newsprint and many of those were illuminated (tables 7 and 9). Easy handling and lighting are important considerations for the elderly. Hand magnifiers were popular and were loaned when handled adequately. Maintenance of a short working distance required by spectacle magnifiers made them unsuitable for many who

tired easily or resisted adaptation. In several cases "secondary" devices, e.g. high reading additions, were loaned in addition to the simple hand/stand magnifier. One patient's best performance was with a near vision telescope which was loaned to him as the "main" appliance.

Attendance at the reviews was reasonable; several groups had 100% attendance and the lowest return was 58.9% for the second follow-up of group 3 in study "B" (table 29). Transport problems and poor health of the elderly were major hazards to the study; it was necessary to rebook some patients several times. Review over a longer period would have been desirable, but travel for these elderly patients, especially when hospital transport was used, had to be limited. Six monthly appointments were available to those who wished to continue and could arrange their own transport.

The informal conversation with group 2 patients was usually more fluent, and additional practical problems were brought to the practitioner's attention when an escort was present. Retention of extra information may have been advantageous especially if the accompanying person was in the position to arrange the home environment. However, their attendance rate at the initial assessment was surprisingly low; it ranged from 28.6% to 58.3% (both of these groups were in study "B"). Many elderly patients attended alone, especially when hospital transport had been arranged. Independent-natured patients requested that their escorts wait outside the consulting room. It is hoped that the difference in the escort attendance rate between the groups did not influence the

findings. The results of the training programme may not have been significantly improved even if more escorts had become involved.

During initial assessment a large number of patients (over 60%) in study "A" and "B" claimed to have good illumination for reading in the home (table 12). In group 1 of "A" the figure was nearly 90%. This is surprising since Cullinan et al (1979) reported poor lighting conditions in the homes of many elderly people. The term "good" lighting may have been misinterpreted even though the questions regarding the quality of the luminare and the position relative to the task were specific. Possibly the patients were eager to give what they believed to be the correct answer. The results suggest that it is necessary to visit the patient in his own environment for an accurate assessment.

The importance of lighting was impressed upon each patient; the percentage of those claiming suitable arrangements increased in all groups of both studies. Judicious use of lighting around the home as well as for specific tasks was emphasised during the informal discussion; this may have accounted for group 2 of both studies maintaining 100% throughout follow-up.

The number of patients in study "A" who appreciated the written instructions explaining handling and maintenance of their magnifier was relatively low (ranging from 29% to 53.3% across the groups). Although the print was 14 point bold type-face some patients claimed they were unable to read it. A helpful friend or family member

could have provided a solution, but some of the elderly people were living alone and without contacts. Instructions in a variety of sizes would help in most cases, apart from those with exceptionally poor vision. There was no difference in reading performance between those who did appreciate the instructions and those who did not in study "A".

More patients in study "B" believed that they had benefited from the instructions (between 52.9% and 58.3%). They had reasonable reading ability (previously demonstrated in clinic) hence the 14 point print could be read adequately. Not all remembered receiving the instructions, others found them "unnecessary" since the initial demonstration in the clinic had been sufficient. Those who had made use of the hand-out had a significantly better performance with newsprint. In conclusion, all patients should be issued with written instructions in text of appropriate size.

A positive attitude towards the prescribed optical device was evident during the initial assessment. Up to 58% of patients in study "A" declared that the magnifier would be "very useful"; the rest thought it would be "occasionally useful". Most realised that although near vision could be improved, reading would still be hard work and slow. More in study "B" (over 80%) thought they would find many uses for the magnifier. Their reading ability was better since the central vision had been less disturbed and they had already proved to themselves that newsprint could be read fluently. Their level of confidence and enthusiasm for the loaned magnifier was

likely to be greater. No-one stated that the magnifier would be of little use. The attitude at the start of the trial, therefore, was positive; each patient had some hope that his situation would be improved.

Patients in study "A", by definition, were unable to read fluently when recruited. However, at the first review the majority (approximately 70%) in each group had found the magnifier useful to some extent (table 11); reading correspondence and/or large print books, cooker/washing machine dials and looking at photographs were a few of the more common tasks achieved. Approximately 30% in each group had not used the magnifier at all. The severity of the visual deficit was such that only 8 patients (14.8%) of the 54 reviewed (tables 15, 16 and 17) could read newsprint fluently, yet 70% felt they had benefited from the loaned device.

By the second review the number of patients in study "A" finding no use for the loaned magnifier had decreased to between 28.6% and 12.5%. There are several possible explanations for this apparent increase in utility. Patients who failed to attend appointments may have been the non-achievers, or those attending may have felt the need to placate the practitioner. Alternatively, general acceptance and handling ability may have improved, allowing greater efficiency after the extended period of practice.

There was no significant difference for the utility of the magnifier between the groups (table 11), which suggests that the various managements did not effect

motivation or handling capability. Performance may also relate to utility (the use of the magnifier would probably increase if reading was much improved), but again there was no significant difference in performance between the groups.

In study "B" at the first review over 90% of the patients in each group stated that they had found the magnifier "very" or "occasionally" useful. Only a few people (range 8.3%-0.0%) had not used the magnifier. A high rate of utility was expected since residual vision was relatively good. A similar positive reaction to the magnifier was found at the second review. Only 2 patients (5.7% of the 35 assessed) did not find it helpful; everyone else felt that they had benefited. As in study "A" the three methods of management did not influence the utility of the magnifier.

Study "A" was designed specifically to test the hypothesis that low vision training improves performance with an optical magnifier for patients who are unable to read newsprint fluently. No significant difference between treatment groups was found with the performance on the near vision chart (tables 15, 16, 17). This suggests that the specialised reading techniques were not particularly beneficial. Patients appeared to appreciate the time and attention they received in training but their actual ability to read did not improve significantly. Similarly, reaction to the sympathetic discussion (group 2) was positive, but the final performance for this group was not superior to group 1 patients who had received no extra attention. People with a less severe visual loss (study

"B") were not helped either; one method of management did not prove to be superior to the others (table 18, 19, 20).

No significant difference between the groups in either study in the number of patients who were actually able to read newsprint fluently suggests that the training programme was not beneficial, and it confirms the findings that there was no improvement in performance on the near vision chart.

Eight months after recruitment 8 patients of 41 in study "A" could read newsprint fluently. Still there was no significant difference between the management groups which suggests that the findings were consistent over a period of time. Twenty patients of study "B" could still read fluently; they were evenly distributed throughout the groups.

The number of patients in each group was small; this is a weakness of the study and consequently the results should be interpreted with caution. Strict criteria were enforced in an effort to keep the variables to a minimum. The power of the study (table 22) was approximately 80%. A large difference between the groups would have been identified, but small differences would have been undetected. A study with increased numbers would be necessary for a definitive statement. Staff, finances and time were limiting factors in the present study.

More people in each group of study "A" claimed they could read than actually were able. Patients may have wanted to placate the practitioner who had spent time with them and made an effort to help, or they may not have

wished to recognise their own "failure".

In contrast, patients in study "B" claimed they were unable to read when they actually could. The expectations of people with relatively good residual vision is probably higher. They are not as far removed from "normal" as study "A" patients, and may therefore compare their present performance with past ability, with the consequent opinion that reading with the magnifier is poor. Alternatively, reading may have been impossible if the home lighting was inadequate, despite the claims of good arrangements.

Exchanges of optical appliances were made in both studies, but more occurred at the first review than the second. A particular design feature, for example illumination or stand-mounting, was the reason for substitution in some cases, i.e. the power was equivalent. Patient acceptance and ability may have improved, which allowed a more sophisticated device to be substituted. This is one of the main advantages of the National Health Service's "loan" system.

The power of the magnifier remained unchanged in many cases. More patients needed an increase than a decrease of magnification. Natural progression of the macular disease in the early stages causes the near vision to become worse which usually necessitates the level of magnification to be increased. The requirement for reading newsprint was more difficult to fulfil for patients in study "A" because the visual deficit was more severe, hence the exchange rate was higher than in study "B".

It is claimed that low vision training allows the magnification level to be reduced (Collins, 1987). Study

"B", designed specifically to test this hypothesis, did not substantiate this claim. Neither of the two patients in group 3 requiring a reduction had made use of the specialised reading techniques. In one case the distance and the near acuity had improved; in the other the requirements had altered (from reading newsprint to large print books). The two comparison groups had the same number of people requiring reduced magnification. The proportions in each group were similar and statistical analysis was considered unnecessary. Therefore, the power of an appropriately prescribed optical magnifying device, which allowed the patient with relatively good central vision to read newsprint fluently, could not be decreased after low vision training.

A minority of patients in study "A" required decreased magnification. A similar number of reductions were made in the comparison groups and the training group. Therefore, for those patients initially unable to read newsprint, the power of the most appropriate magnifying device could not be reduced after low vision training.

4.2 Informal Discussion

The patients in group 2 reacted well to the informal discussion; most were eager to talk through their problems and accept advice and guidance. Although an hour was available a typical session lasted twenty five minutes, but the range was ten minutes to an hour depending on the individual. Shortened sessions were sufficient for those who apparently coped well, and necessary for those who were impatient to leave or irritated by the discussion.

Study "B" patients in particular experienced few difficulties other than reading. People living alone with a more severe visual handicap, of course, faced greater problems. Support from social workers was requested in a number of cases.

Making contact addresses available was worthwhile. The Royal National Institute for the Blind contact was popular with patients in both studies (83.3% in "A" and 72.7% in "B"). The practical support this resource centre offers was attractive particularly to patients with a severe loss of vision.

Fewer people were interested in the Macular Disease Society. Just over half of "A" and only one fifth of "B" patients accepted this contact. Contrary to the American papers advocating benefits of support meetings (Emerson, 1981; Mehr et al, 1970; Rakes and Reid, 1982) few British patients appeared keen on the psychological back-up of a self-help group. With more reserved personalities the British are perhaps less likely than the Americans to find this type of therapy acceptable. The vision of study "B" patients was relatively good and the emotional trauma of losing their sight may not have been sufficiently severe for them to seek psychological support, especially when they felt positive about the newly loaned magnifier. Comments from patients and escorts suggested that communication and transport would be easier if clubs were available locally.

4.3 Low Vision Training

The importance of comprehension of the low vision training techniques during initial assessment was emphasised. A lack of knowledge would have influenced the results. The rate of adequate comprehension was considered to be good (over 80% in both studies) during initial assessment and it increased at follow-up for study "A" (to over 93%). A few elderly people did not understand the exercises or the theory behind them; their visual defect may have been unsuitable for them to benefit from the techniques, or they may have lacked cognitive ability. Poor observers and those who were disinterested or lacked motivation were also difficult to teach.

During initial training, the eccentric viewing (EV) technique was appreciated by more than 40% of patients, i.e. an improvement in vision was noted when peripheral retina was used for simple tasks such as viewing a face. The rate of appreciation was slightly higher in "A" (45.5%) than in "B" (41.2%). Since normal acuity rapidly decreases with eccentricity (Low, 1951), central vision may have to be significantly disturbed before the patient acknowledges an improvement. The innate reflex of foveal fixation must also be overcome.

In contrast, relatively few (22.7% in "A" and 11.8% in "B") during initial training found EV to be advantageous for reading text. Therefore, even though some patients could recognise an improvement with EV for gross tasks they were unable to use the technique for reading. The majority of patients apparently elected to remain with centric vision for reading.

Directly upward, i.e. 12 o'clock position, was the preferred angle for all those using the technique except one who favoured the 5 o'clock position initially. This agrees with Weiter et al (1984) who found that the location of the central scotoma was superior to fixation in the majority of eccentric fixation cases.

In this study a few patients chose an unexpected angle; a finding in agreement with Maplesden (1984). The preferred angle of gaze was inconsistent at follow-up in some cases. It was difficult to guide patients who had lost foveal fixation towards an appropriate angle because they were unsure of their direction of gaze.

Some patients were unable to recognise a visual defect on the Amsler chart; others were unable to see the grid because the visual distortion was so severe. It was impossible to know if the angle chosen by the patient was the most suitable for reading. Indeed, it is difficult to define the "best" fixation locus. A large area of relatively poor acuity may be more functionally useful than a small area of good acuity. Goodrich and Quillman (1977) state that the functional area lying closest to the centre of the fovea will give best acuity and provide the sharpest image. Timberlake et al (1987) using the scanning laser ophthalmoscope showed that reading speed increased when a patient was directed to view with a different retinal locus than the one she had chosen for herself. Current research using the scanning laser ophthalmoscope for psychophysical testing may aid in the determination of the "best" retinal location. Reading skills can be

observed by the operator because a real-time image of the macular and targets in the visual field are displayed on a monitor. Visual acuity can be measured at various points, the fixation locus chosen by the patient can be identified and the performance of alternative loci can be assessed.

Stars were used as a fixation guide in one of the training exercises (Appendix III), however, many patients who managed to maintain the eccentric angle between adjacent words returned to centric viewing to actually read. One patient stated she found it "impossible to take in both the stars and the word at the same time". Another patient preferred centric viewing unless the word she was trying to read was long, then it was easier to look above it.

The EV technique is central to many low vision training programmes. Study "A" patients, with seriously disturbed central vision, were expected to fare better than "B" patients since Collins (1988b) states that an absolute scotoma, although not essential to EV, is helpful. More people in "A" attempted to use the technique but the final success rate was similar in both studies.

The exercise with columns of words was found to be useful for practising localisation and tracking whilst attempting to maintain the eccentric angle. The pyramid of words, intended to improve the field of fixation, was considered to be unhelpful. An increase in the field of fixation was not apparent, although it was not measured specifically. The field of view with the optical magnifier is related to the working distance and this could be demonstrated with any text.

The steady eye strategy received a poor response from patients. The initial training session suggested that some benefit might be gained, but at the first review over 70% in "A" and 85% in "B" had not attempted it at home and no-one claimed to have succeeded in its use. A slightly better response was recorded at the second review in "A"; possibly the extended period of practise helped. Study "B" success was maintained at 0%, no-one was aware of the SES being beneficial. Collins (1987) claims that reading speeds can be dramatically improved using the SES; not one of the 39 patients on the training programme reported a significant improvement. Reading speed was not addressed in the present study, perhaps further research is required in this area.

The majority of patients, but more in "B" (63.6%) than "A" (55.6%), elected to try a typoscope in combination with the magnifier. The horizontal aperture was more popular than the vertical. Reduction in glare, improved tracking and location proved helpful in some cases. One patient experienced a dramatic improvement; from being unable to manage newsprint with the magnifier alone she read fluently.

A marker placed on the typoscope should help to maintain fixation (Collins, 1987). However, the angle of view was found to be too extreme in some instances and instead patients were directed to look at the edge of the aperture which they could place in the appropriate position. During the review period the typoscope was discarded in most cases.

Patients who underwent training had to manipulate the magnifier and in some cases a typoscope while maintaining the eccentric angle of view and the SES. The elderly patients may have found this combination very difficult, both physically and mentally. They may not have attempted the techniques even though they were aware of some benefit.

A criticism of the study is that the training and assessment of patients at review were not carried out by a different practitioner. Funding was not available to employ an independent observer. A potential weakness of the study is that both the identification of the viewing angle and assessment of success was mainly subjective. The patients' communication and cognitive ability could have been a limiting factor.

It must be stressed that the programme used in this study conformed to current training methods employed in the United Kingdom. Strategies, length of training sessions and review periods were set and no attempt was made to improve the methodology. Follow-ups at two and eight months after recruitment seem totally inadequate. The results may have been radically different if longer and more comprehensive training was undertaken. For example, daily supervision for a period of weeks to reinforce the concepts for these elderly patients could make all the difference. People visiting the patient in their own home may also help, e.g. the district nurse.

Many published papers advocate the merits of low vision training and individual case reports quote subjective improvement. This is the first study we are aware of that tested the benefits while using good

comparison groups. It has shown that the performance of a **group** of randomly chosen and trained individuals was not superior to a **group** of untrained patients. However, a few individuals were successful and anecdotal evidence is possibly based on similar cases. Two such cases are described below to illustrate this point.

4.3.1 Case Studies

Study "B": Group 3: Patient Number 7. Mr DB

This patient in particular excelled in the use of the loaned magnifying devices and specialised reading techniques. With the diagnosis of subretinal neovascularisation in the right eye and pigment epithelial detachment in the left eye the corrected visual acuity was 6/24 and 6/18 respectively. The right eye was strongly dominant and therefore preferred even though the acuity was worse than the left eye and visual distortion was present.

A Keeler x3 near vision monocular telescope and also a +20.00 dioptre hand magnifier allowed him to achieve 5 point print and read newsprint fluently. A distance monocular telescope giving 6/6 vision was also loaned for train indicator boards. This patient was highly motivated and immediately demonstrated an aptitude in handling the devices and communicating with the practitioner. The defect on the Amsler chart was found to be a large "grey" area and the best fixation point was found to be positioned towards the 5 o'clock direction (figure 1). This viewing angle allowed faces to appear "clearer" and improved the reading performance. The patient found the

FIGURE 1

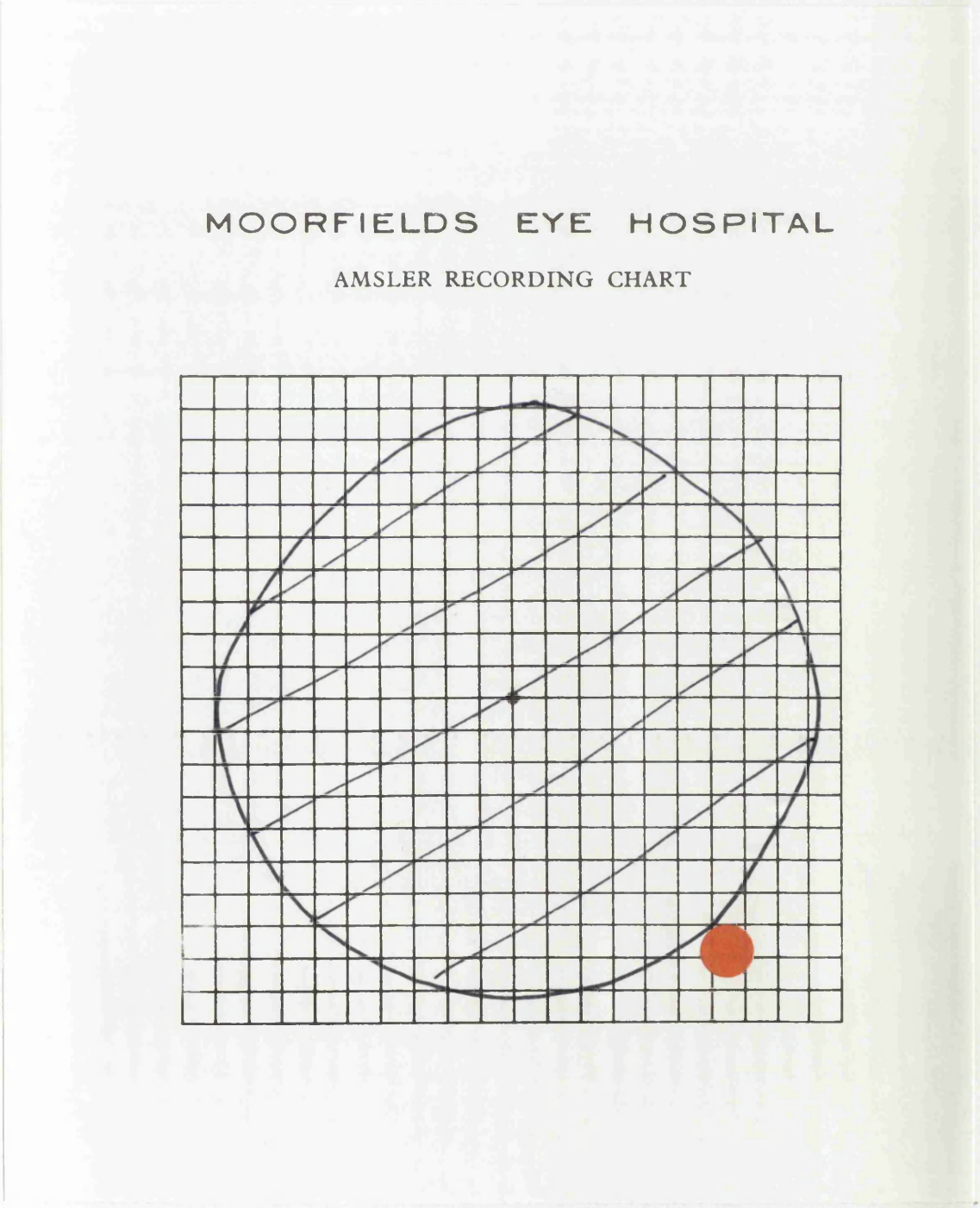
CENTRAL VISION DEFECT OF PATIENT NUMBER 7 IN STUDY "B"

AT INITIAL ASSESSMENT AND FIRST FOLLOW UP

RE with +4.00 addition

Central area: "cloudy and grey"

● preferred fixation point



angle easy to maintain but needed reminding about the SES.

Two months later at the first review the left eye visual acuity had decreased to 3/60; the right eye remained the same with a similar Amsler plot although subjectively the distortion was less. In contrast to the initial finding, centric viewing was preferable to eccentric viewing. The patient's understanding of the techniques was adequate and he had practised regularly, but reading was slower and inaccurate in comparison to direct viewing. The current devices allowed 6 point print and newsprint to be read; a +28.00 horseshoe stand magnifier was considered to be more suitable for small print and was therefore given on loan.

Six months later the visual acuity was worse; the right eye was 3/60 and with the +28.00 horseshoe magnifier only 14 point print was achieved. He now used eccentric viewing regularly and he moved his head and magnifier together when tracking across the page (a form of SES). A slightly different Amsler defect was recorded and the preferred viewing angle was towards the 9 o'clock position (figure 2). This angle was successfully used for all distance and near vision tasks. A +80.00 Keeler illuminated stand magnifier and eccentric viewing allowed 5 point print and newsprint to be read fluently; without EV the "blank spot" made it impossible to read.

At the third review the patient was aware that the visual disturbance had changed again and requested help in identifying the new viewing angle. The acuity was the same but a smaller defect was recorded on the Amsler chart and the preferred angle was towards 7 o'clock (figure 3). The

FIGURE 2

CENTRAL VISION DEFECT OF PATIENT NUMBER 7 IN STUDY "B"

AT SECOND FOLLOW UP

RE with +4.00 addition

Central area: "fainter"

preferred fixation point

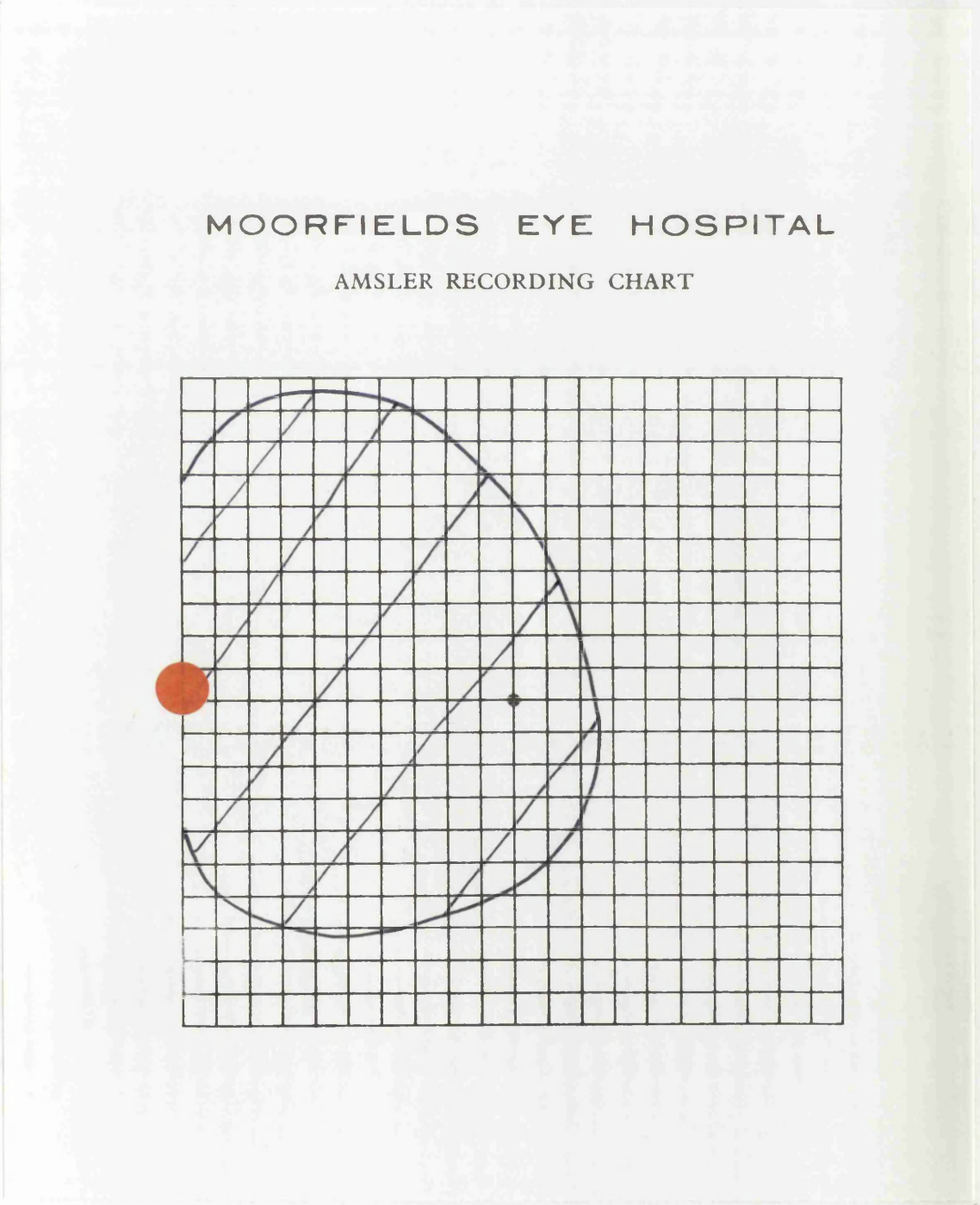


FIGURE 3

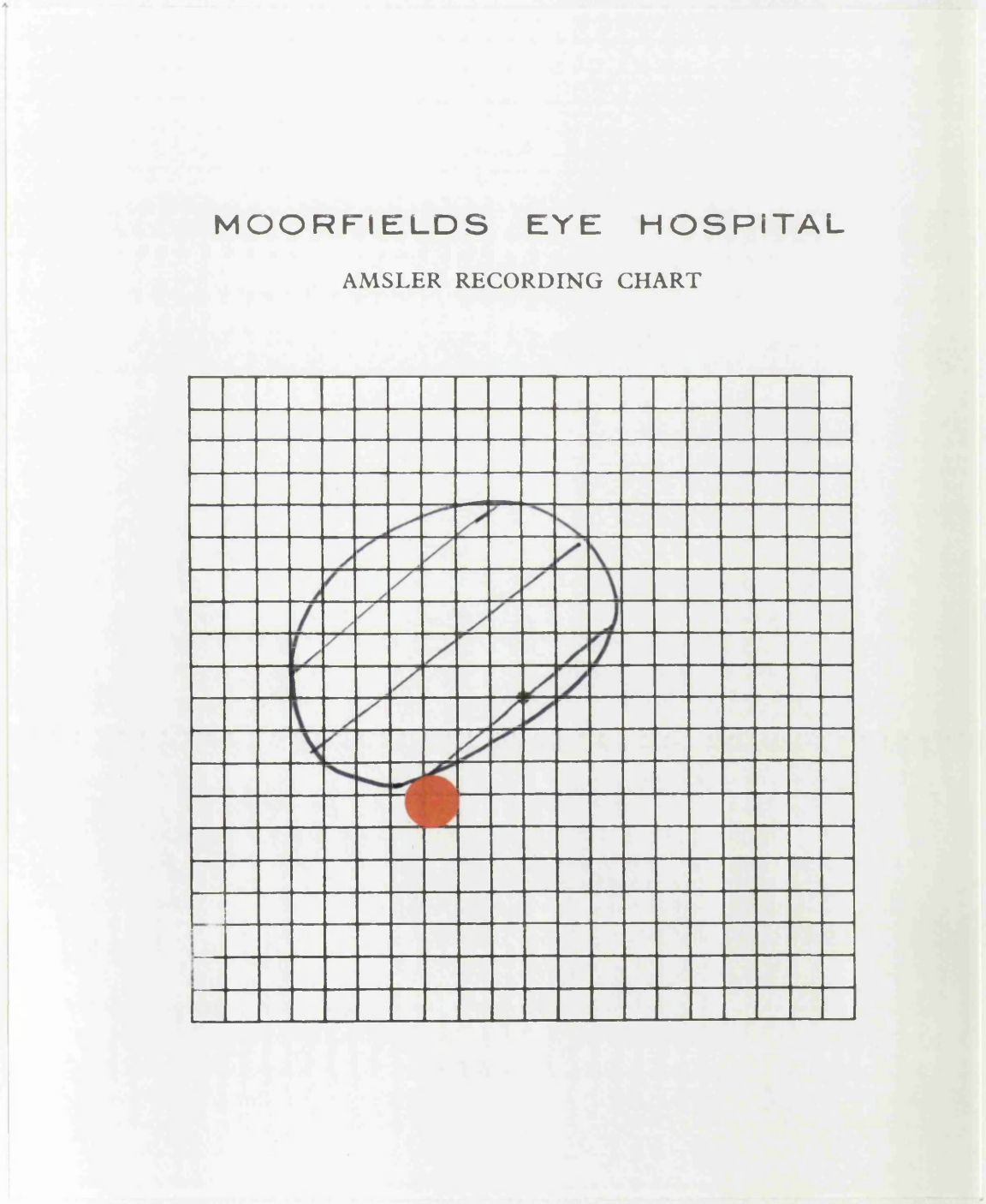
CENTRAL VISION DEFECT OF PATIENT NUMBER 7 IN STUDY "B"

AT THIRD FOLLOW UP

RE with +4.00 addition

Central area: "misty"

preferred fixation point



SES was attained in the same manner as before.

The final loaned magnifying devices were

1) x8 distance monocular telescope - 6/12 eccentrically

2) +20 hand held magnifier - N9 eccentrically

3) x5 near vision monocular telescope - N10 eccentrically

4) +80.00 Keeler illuminated stand magnifier - N5 and newsprint fluently when using eccentric viewing. The amount of magnification required was anomalous, however N5 was not achieved with a lower power.

Of the patients trained in study "B" this individual was the most successful in utilising the specialised reading techniques. At the age of 72 the patient was a capable low vision candidate and he was highly motivated. Eccentric viewing techniques in the later stages of the disease allowed a significant improvement in functional vision.

Variation in the visual disturbance, a result of disease progression was evident; the acuity, Amsler defect and distortion changed throughout the review period. Initially eccentric viewing was favoured, but during the next few months the patient returned to centric viewing. As the vision deteriorated eccentric viewing was again the method of choice. The preferred fixation position altered with each set of circumstances.

Study "A": Group 3: Patient Number 6. Mrs BL

Of the 22 patients trained this lady was the most successful in mastering and utilising the techniques. Corrected acuity of 6/60 in the right eye was the result of disciform macular degeneration; the left eye had light

perception only. A +4.00 addition gave N12 very slowly; a +20.00 dioptre stand magnifier was the optimal device but only N8 with difficulty was attained. Such anomalies in magnification and vision are frequent in macular disease. A basic Stigmat telescopic unit (1.75x) was loaned in addition for needlework.

An Amsler plot showed severe central distortion (figure 4). The best angle of view was upward towards 12 o'clock. EV improved the near vision performance. A standard type printed letter could be read using the technique and the magnifier, but newsprint was not managed. The patient had a good understanding of the basic principals although she required a lot of encouragement and complained that the techniques were very tiring.

The magnifiers proved to be very useful. At the first review the patient's opinion was that her performance had improved but she was still unable to read newsprint; in clinic she managed 5 point print and newsprint fluently. EV and SES had been regularly attempted. The distance visual acuity was the same but the distortion had decreased. There was no preference between centric and eccentric viewing.

At the second review the distance acuity was the same but the near vision performance had decreased to N8 and newsprint was no longer managed. EV had been used successfully and regularly but the SES had been abandoned. The magnifier was exchanged for a +36.00D illuminated stand magnifier which gave N5 slowly and newsprint well.

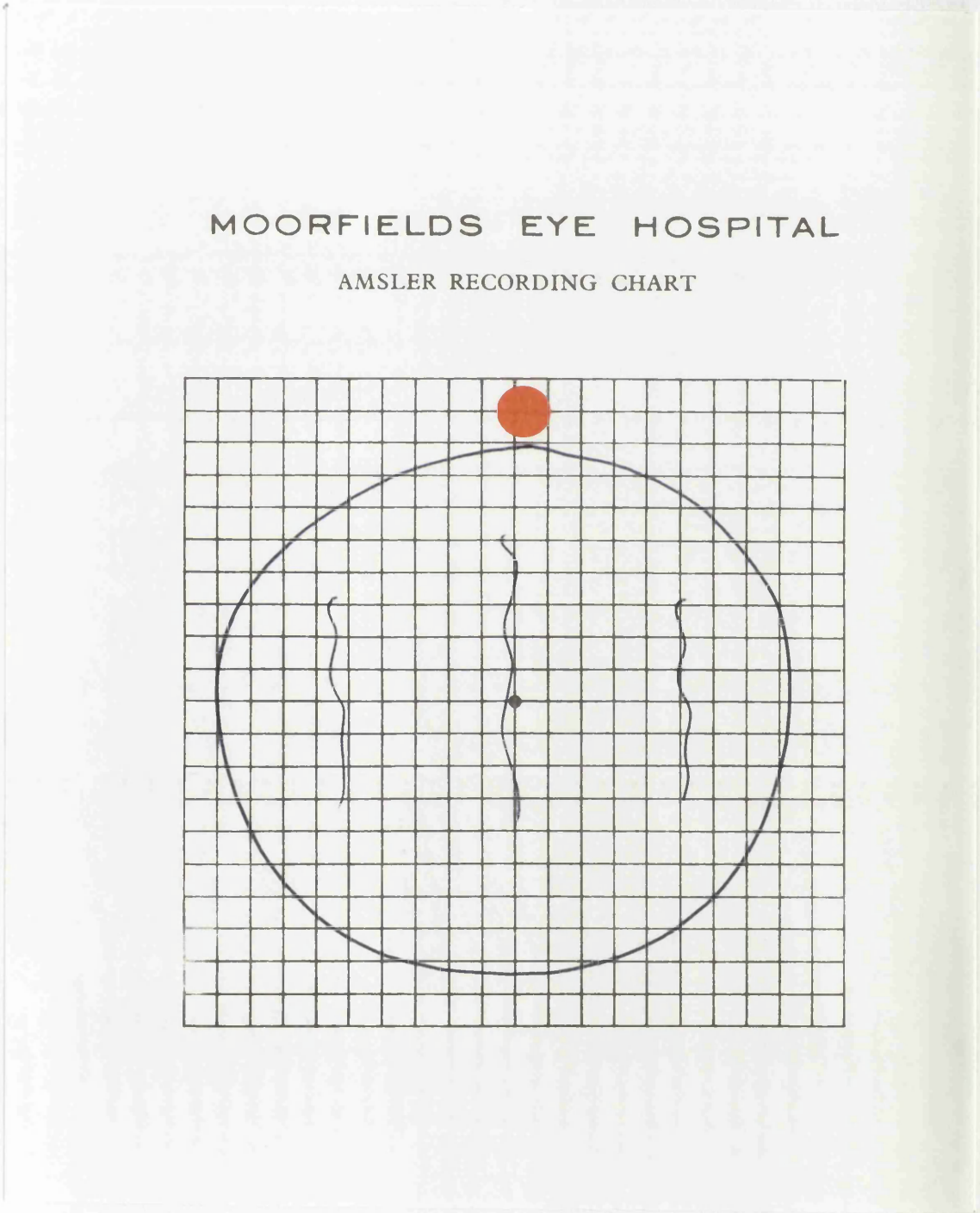
FIGURE 4

CENTRAL VISION DEFECT OF PATIENT NUMBER 6 IN STUDY "A"

RE with +4.00 addition

Central area: "distorted"

preferred fixation point



At present there is no cure for age-related macular degeneration, and treatment is limited to a minority of well defined cases. Understandably the caring professions have shown interest in strategies for which successful cases have been reported. However, anecdotal evidence alone is unsatisfactory and all advocated methods should be tested scientifically.

The improvement other workers have found with training may be the result of inappropriate prescribing. In one particular case the patient was an excellent witness and although viewing directly was the preferred method with the loaned magnifier, the power could be decreased to a point where eccentric viewing was favoured. This is a single case and no conclusion can be drawn but it might suggest the reason for apparent success in some instances.

There is no doubt that many appreciate an improvement in residual vision with EV and that a limited number of patients may benefit from training. The attention received probably helps the patient psychologically (The Hawthorne Effect), confidence is increased and a success is claimed. This study has shown that the methods described do not improve the near vision performance of patients chosen at random. Therefore, current patient management (i.e. without training) should remain unchanged until an alternative method is proven to be beneficial and cost effective. It would be appropriate, however, during the standard hospital assessment, for the practitioner to spend a few minutes explaining EV and the use of residual vision to patients who are likely to benefit. Those complaining of "a blank patch" in their field of vision

who have investigated the possibility of looking to the side of objects are good candidates, particularly if they are well motivated. Mental agility for identification of the most suitable angle of view and flexibility to cope with changes in visual status are helpful characteristics.

Blindness in later life causes special difficulties and patients may have other concerns, e.g. housing and/or family problems. Consequently their priorities may be in other directions. One lady stated that she was keen to read newsprint but her real interest was house cleanliness and it was difficult to get her to concentrate for more than a few minutes at a time. Training requires concentration and it is tiring. An hour was too long for some patients, particularly after the initial assessment.

Elderly people may tire quickly, they may have less ability to adjust to new situations and are less likely to learn new techniques. Their demands and expectations may be low and motivation poor. Therefore the group chosen for this study was perhaps the most difficult to work with. Younger patients, for example those suffering from juvenile macular disease, may be more appropriate candidates for training. Research is needed in this area.

In an effort to achieve a greater provision of services to the visually handicapped population the Partially Sighted Society launched a low vision training programme in January 1986. The Society was formed in 1973 and since then has expanded into a national organisation and registered charity offering a wide range of services. Clients can benefit from assistance and advice in

education, employment, domestic, leisure and social fields. The Annual Report of the 31st March 1989 recorded the employment of five low vision workers, with additional personnel expected in the near future. The programme at that time was available in nine hospital eye departments and the Society's two centres.

Teachers, orthoptists and unqualified persons showing an interest and aptitude, are considered suitable personnel to be trained for low vision work. However, they do not have professional qualifications and cannot prescribe magnifiers or have access to patients' medical notes. Therefore they need to work in collaboration with an optometrist. Consequently, an average training programme requires more personnel and considerably more time than standard management, e.g. approximately three and three quarter hours compared to one and three quarters.

In conclusion, the specialised techniques benefit few people and the training programme is a more expensive method of patient management. The National Health Service is currently under-funded and understaffed for the size of the visually handicapped population it attempts to serve. Hospitals welcoming low vision programmes possibly lack the manpower (i.e. optometrists) and financial resources to cope alone. The Partially Sighted Society offer their services apparently "free"; in fact the Department of Health and Social Security partly support them.

In planning future services, procedures with maximum benefit to the patient and minimum cost should be utilised. The simpler system of standard management when

compared with low vision training would allow approximately twice the number of patients to be seen per day.

Patients may react favourably to the training programme because they receive attention, understanding and advice during the traumatic transition period. Psychological support is a welcome service but it is quite separate from the reading techniques and perhaps should not have the title "low vision training".

The potential of training programmes should be investigated further. This study has shown that the particular programme advocated by the Partially Sighted Society did not help. Other concepts need to be developed and tested. It is particularly important to encourage those who advocate training to scientifically validate their techniques. In this way all centres may benefit from proven methods and resources can be allocated to worthwhile managements.

4.4 General Health Questionnaire

The questionnaire was employed to make a quantitative assessment of emotional trauma and to investigate the effect of the three treatments. It served the purpose for which it was intended; a complete psychological assessment was not the aim. The limitations however are evident; it was designed to detect influences of affect, and therefore it has been used out of its normal context. Also the researcher has had no training in psychology or psychiatry. Advice was sought from a qualified psychiatrist and the questionnaire was chosen for its ease

of administration. The data were analysed on a relative scale, a change in score being the important factor. The results are interesting, trends suggesting normal adjustment were found.

Generally the reaction of patients to the questionnaire was favourable; the majority were pleased to discuss their feelings. Only two patients declined to be interviewed. The results may have been influenced by a lack of data from non-attending patients who may have been psychologically different from the others, e.g. they may have been more depressed.

During the rehabilitation period it is understandable that patients are eager to talk to a sympathetic listener, especially if that person has some knowledge about their condition, can reassure them and offer practical advice. In investigating the effect of the three types of management with the depression index the patients' psychological status may have been influenced, which may in turn have effected performance and consequently the results of study "A". For example, all consenting patients spent an equal amount of time completing the questionnaire with the practitioner so its effect should have been equivalent across the groups, however, group 1 should have received "no further attention". Therefore the strategies were not as pure as they might have been if the questionnaire had not been used.

Two patients were not seen in the low vision clinic for six years after visual loss on the second eye. Depression or apathy on the part of the patient, or lack

of referral from the clinic may have been the cause. Magnifying devices were loaned and both patients did well. Too frequently people are unaware of low vision services. Some patients with a severe loss of vision can not be helped, but every individual with "form vision" should be given an the opportunity for assessment; this fact needs to be impressed upon the referring bodies.

Patient allocation to the groups had been without bias and, as expected, no difference was found between the three groups for either the "previous" or the "recent" scores. No significant difference in scores was found between the groups at any stage during the review period which suggests that the level of depression, as indicated by the questionnaire, was not influenced by the different management strategies. It was interesting that patients in group 2 scored as high as the other groups even though many stated that they felt better after the discussion period.

To assess the general trends the scores of all patients were analysed together, i.e. not in relation to the groups. Those giving a zero score at each stage may be ignoring or denying the loss, they may be defensive, evasive (easily done with questions requiring yes/no answers), alternatively they may have accepted the situation. Three patients scored zero throughout; two had long standing macular degeneration of 24 and 18 months and may have adjusted to the situation. The third person with consistent zero score had lost vision only 4 months previously; a short period of time in which to come to terms with the loss. It is difficult to imagine anyone

feeling "no different from usual" when vision is first lost (i.e. previous score).

Some patients exhibiting relatively high scores had suffered a recent visual loss. For example, number 14 in group 1; numbers 10 and 47 in group 2 and 53, 55 and 32 in group 3 were constantly "high" scoring (3 or over); all had lost vision within the few months prior to the first assessment. If the questionnaire was repeated over an extended period the results may be similar to longer standing cases.

It is expected that people feel better as time passes and as they adjust to their new visual status, indeed, graph 1 shows that the depression scores decreased with time. This is confirmed by the finding that the greater the time lapse since visual loss and attendance at clinic the greater the decrease in the score (graph 2).

To determine the effect of the severity of the loss in terms of visual ability the depression scores were compared with performance with the magnifier, but no correlation was found. This may be explained by the fact that study "A" patients were used; initially none were able to read newsprint and therefore they were aware of the severity of their loss even if later their performance improved a little.

The trend of initially high and progressively decreasing scores was expected. However, in more than one third of all cases the recent score was higher than the previous score, i.e. the patients were more depressed at the initial assessment than when they had first lost the

vision. The reasons given were:

"my vision has got worse in recent months"

"initially I was too shocked to understand what it meant"

"I have recently lost my wife/husband"

"the problems increase as vision decreases, and gradually you realise what it means"

"at first I did not realise the seriousness of the situation"

"I thought the doctors would make it better at first and I felt worse when I realised there was no help"

"I now realise that I cannot do some things"

"initially I could not believe it had happened"

These comments reflect some of the emotions experienced after a traumatic experience; the shock, disbelief and gradual realisation. This is the typical pattern described in the psychological literature on rehabilitation. Loss of a helpful partner would undoubtedly make the situation more difficult, particularly during the adjustment phase.

The question "What does your vision as it is now actually mean to you; how does it effect your daily life?" allowed the patient to express his/her own specific problems. The frustration of being slower than normal; the lack of privacy; the limitations on hobbies when living alone and the restriction on reading, sewing, knitting, shopping, eating, driving and watching television were common problems. Dependency and a burden to the family, other peoples' reaction, not being included in conversations and loss of eye contact were upsetting for them. Some felt less happy and carefree, or angry at the

loss of their retirement years; and statements like "I'm only half here, half a person", "I do not feel like myself" and "not a man anymore" indicated feelings of unreality and change from normal.

Any "special concerns" of the patient were recorded during the initial assessment. The majority asked for reassurance that the vision would not be lost completely, and expressed concern about the future. The suddenness of visual loss, feeling frightened about the new situation, living alone and being afraid of burglars were a few of the comments. Some were concerned that there would be further ocular problems including cataract formation; others were more worried about the consequences of not being able to see, for example house cleanliness. Learning to accept the situation and finding out what they could manage, increased concentration and tidiness were some of the more positive aspects of adaptation.

Psychological assessment of some patients in the low vision clinic might be useful; it may provide the practitioner with valuable information about the stage of adjustment and receptiveness. Reassessment at reviews would monitor progress. Measurement of "life satisfaction" may be more appropriate than assessment of depression alone. Those suffering from serious disorders and requiring specialist care would be identified. Such a questionnaire would have to be brief, easy to complete and analyse. Staff would need to be trained and extra clinic time made available, but this is probably not viable in most low vision clinics. A psychologist's skills would be

required if the index was complicated. Perhaps such personnel should be included in the multi-disciplinary team; low vision patients may benefit. This is an area where further research is needed.

PART 5: CONCLUSIONS

5.1 Primary Conclusions

1. The low vision training programme used in this study did not improve the near vision performance of the vast majority of patients with age-related macular degeneration.

2. A small percentage of patients appeared to benefit from training in the techniques of eccentric viewing and steady eye strategy. Low vision practitioners should explain these concepts briefly to suitable patients during the assessment.

3. The power of the most suitable optical device prescribed for a specific task could not be reduced after low vision training.

4. The training programme was less cost effective than standard management.

5. The level of depression, as indicated by the General Health Questionnaire, was influenced by neither the management strategies nor visual performance.

5.2 Secondary Conclusions

1. Medical staff should be made aware of the potential benefits of low vision assessment to ensure that all suitable patients (i.e. with any form vision) are referred to the low vision clinic.

2. Written instructions, in a suitable type-face, should be supplied with the optical device.

3. Organisations and support group contacts should be made readily available to patients.

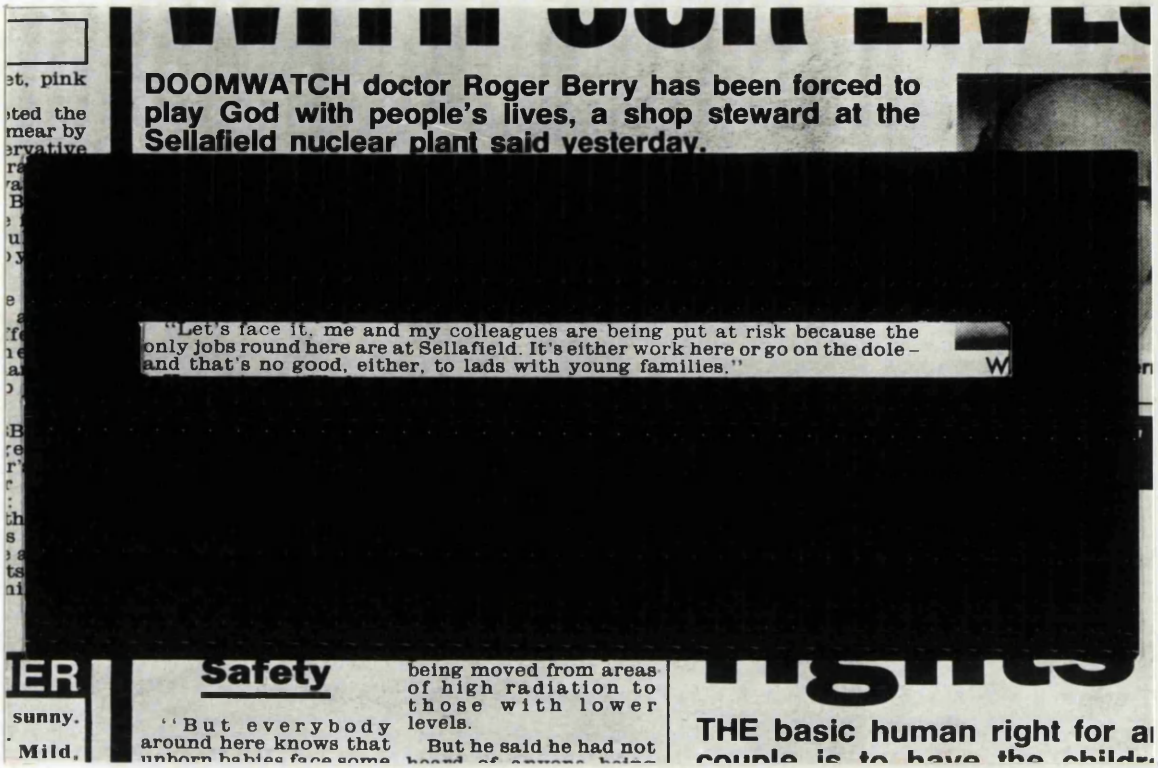
5.3 Suggestions for Further Investigation

1. Scientific validation is required of current training programmes that are advocated but unproven. Training of eccentric viewing may have potential and new methods, based on some proven strategies, should developed.

2. The Scanning Laser Ophthalmoscope, a relatively new instrument, allows the operator to view a real time image of the fundus and visual stimuli on a TV monitor. Psychophysical testing allows investigation of functional vision in relation to ocular pathology. Although this method still relies on patient response, the objective information and control of the viewing angle may improve a training programme significantly. The patient's chosen fixation locus can be noted and alternative positions investigated. The patient can be guided to the most appropriate viewing angle and taught to use this area for all visual tasks. Current research at The Institute of Ophthalmology, London may show that this instrument has an important role to play in visual rehabilitation of the future.

3. Psychological assessment of patients may give professionals involved in treatment and rehabilitation important and useful information regarding the patients' needs. The type of data required, how and by whom it would be collected and used, needs to be investigated.

APPENDICES



DOOMWATCH doctor Roger Berry has been forced to play God with people's lives, a shop steward at the Sellafield nuclear plant said yesterday.

"Let's face it, me and my colleagues are being put at risk because the only jobs round here are at Sellafield. It's either work here or go on the dole – and that's no good, either, to lads with young families."

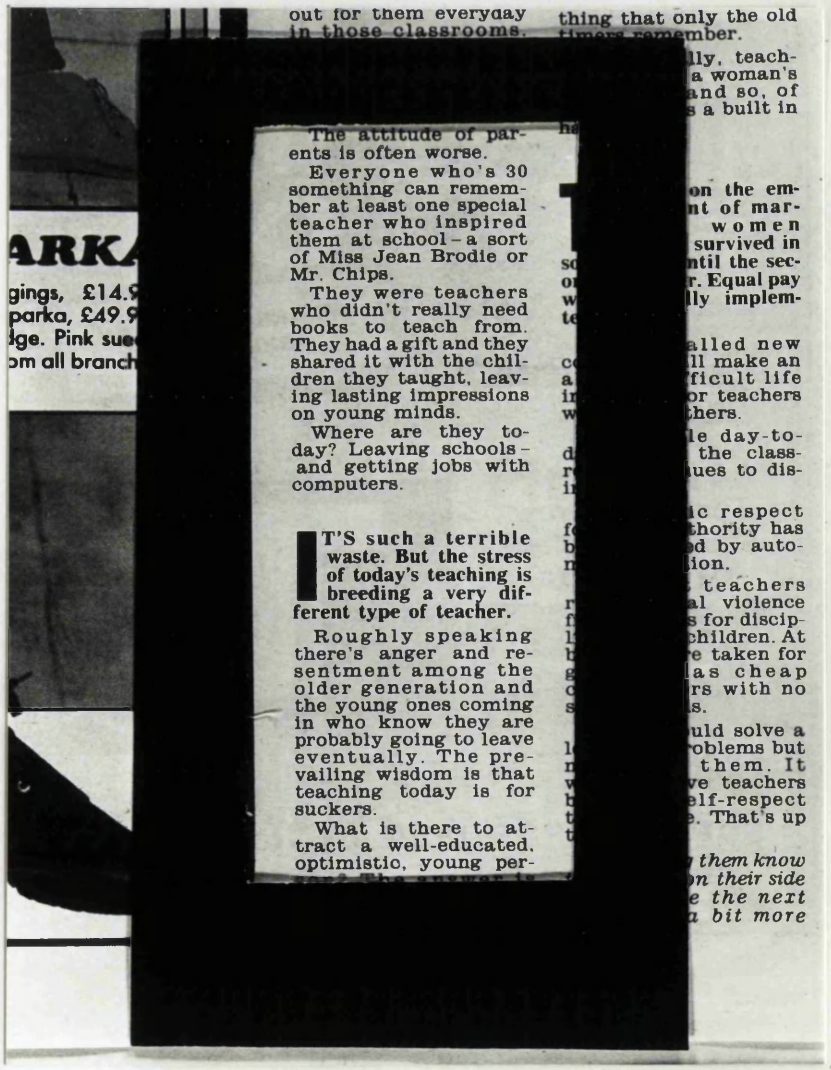
Safety

"But everybody around here knows that

being moved from areas of high radiation to those with lower levels.

But he said he had not

THE basic human right for a



out for them everyday in those classrooms.

The attitude of parents is often worse.

Everyone who's 30 something can remember at least one special teacher who inspired them at school – a sort of Miss Jean Brodie or Mr. Chips.

They were teachers who didn't really need books to teach from. They had a gift and they shared it with the children they taught, leaving lasting impressions on young minds.

Where are they today? Leaving schools – and getting jobs with computers.

IT'S such a terrible waste. But the stress of today's teaching is breeding a very different type of teacher.

Roughly speaking there's anger and resentment among the older generation and the young ones coming in who know they are probably going to leave eventually. The prevailing wisdom is that teaching today is for suckers.

What is there to attract a well-educated, optimistic, young per-

thing that only the old

HOW TO USE YOUR HAND MAGNIFIER

1. Try to keep your aid clean, and wipe the lens with a soft cloth preferably dampened with methylated spirit.

2. Make sure you have a good light shining directly onto the print so that it does not cast a shadow; as we showed you in the clinic.

3. You should wear your distance/reading/no glasses.

4. The print should be on a firm surface (table, reading stand or clipboard).

5. The magnifier should be inches (cms) from the print. If you hold the magnifier too far away from the print it will look blurred. If you hold the magnifier too close the print will look smaller.

6. Locate what you want to read (with your finger or piece of card). Then move the magnifier slowly along so that you follow the line of print.

7. Try to practise with your magnifier every day; for short periods at first and then build up the time.

8. Using your eyes can in no way harm your vision.

HOW TO USE YOUR STAND MAGNIFIER

1. Try to keep your aid clean and wipe the lens regularly with a clean cloth preferably dampened with methylated spirit. Regularly check that the batteries are working.

2. Make sure you have a good light shining directly onto the print so that it does not cast a shadow; like we showed you in the clinic.

3. You should wear your reading glasses.

4. The print should be on a firm surface (table, reading stand or clipboard).

5. The magnifier should stand on the page. The print should be inches (cms) from your eyes. The closer the magnifier is to your eyes the wider your field of view.

6. Locate what you want to read with your finger, then move the magnifier slowly along so that you follow the line of print.

7. Try to practise with your magnifier every day; for short periods at first and then build up.

8. Using your eyes can in no way harm your vision.

HOW TO USE YOUR MAGNIFYING AID

1. Try to keep your aid clean, and wipe the lens(es) with a soft cloth preferably dampened with methylated spirit.

2. Make sure you have a good light shining directly onto the print so that it does not cast a shadow as we showed you in the clinic.

3. The print should be on a firm surface (table, reading stand or clipboard).

4. Locate what you want to read (with your finger or piece of card). Slowly bring the print closer to your eyes until it appears clear and keep it at this position. The print should then be inches (cms) from your eyes.

5. Hold your head still and move the page along slowly so that you follow the line of print.

6. Try to practise with your aid every day; for short periods at first and build up.

7. Using your eyes can in no way harm your vision.

HOW TO USE YOUR TELESCOPE

1. Try to keep your aid clean, and wipe the lens with a soft cloth preferably dampened with methylated spirit.

2. The telescope is for distance but it can also be focused for near by lengthening the tube.

3. For efficient use of your aid: spot the object, then bring the telescope up to your eye and focus.

   If you are unable to spot the object, use the aid to follow along horizontal and vertical lines, eg fences and telegraph poles until you locate the object, then focus.

4. Hold the telescope as close to the eye as possible to give a wide field.

5. Move your head and aid together - do not try to look around by moving your eyes only.

6. At first practise on simple tasks while sitting or standing still. Then try more complex tasks eg moving targets. Practice daily for short periods of time.

7. Using your eyes can in no way harm your vision.

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single	these	report	object	advice
sister	arrive	credit	table	design
timbers	stores	stitch	friends	instruct

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all work
at length
two of us
in all truth
the letter said
take your time
bring your coat
I asked you to
we will be ready
it arrived on time
the man walked away
some people win
now I can sew properly
he taught mathematics well
father says to arrive earlier
the whole hospital is equipped
you are requested to attend tomorrow

APPENDIX IV

GHQ 12

HAVE YOU RECENTLY / PREVIOUSLY:

-been able to concentrate on whatever you are doing?	better	same
	less	much less
-lost much sleep over worry?	not	no more
	rather	much more
-felt that you are playing a useful part in things?	more	same
	less	much less
-felt capable of making decisions about things?	more	same
	less	much less
-felt constantly under strain?	not	no more
	rather	much more
-felt that you couldn't overcome your difficulties?	not	no more
	rather	much more
-been able to enjoy your normal day-to-day activities?	more	same
	less	much less
-been able to face up to your problems?	more	same
	less	much less
-been feeling unhappy and depressed?	not	usual
	rather	much more
-been losing confidence in yourself?	not	usual
	rather	much more
-been thinking of yourself as a worthless person?	not	usual
	rather	much more
-been feeling reasonably happy all things considered?	more	same
	less	much less

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