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The Efficacy of Low Vision Device Training in a Hospital based Low Vision Clinic

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Abstract

Background/Aims

Hospital based low vision services in the UK typically involve one consultation with an optometrist. In this study we investigate the effect of adding further low vision device training.

Methods

Participants were recruited from those attending their first low vision assessment (LVA). Participants completed the Massof Activity Inventory (MAI) questionnaire by telephone before their appointment. After LVA, participants were randomised to an intervention group (who received a further appointment to review device handling) or a control group. The MAI was readministered one and three months after the initial LVA. MAI data were converted to Rasch scores for goal difficulty.

Results

96 participants completed the study. Both groups experienced a significant improvement in goal difficulty following low vision intervention, ($p < 0.0001$), equivalent to a visual acuity improvement of approximately 0.55 logMAR. There was no significant difference in improvement between the group randomised to the training visit and those in the control arm ($p = 0.80$).

Conclusion

Self-perceived difficulty with daily visual tasks decreases following a low vision appointment. An additional visit for device handling training resulted in no further improvement. This could be due to the relatively simple nature of the devices prescribed in this clinic.

Introduction

Despite advances in treatment for sight threatening conditions, at least one in twenty-five people in the UK over the age of 40 have significant vision loss.¹ Vision loss can have a profound impact on quality of life,² although this varies among individuals.³ Visual impairment has the potential to impact upon a person's physical, emotional and social well-being, as well as their independence.^{4,5,6,7,8} The loss of sight can present practical barriers to common daily activities such as reading.⁹ Functional ability and quality of life of these people is improved by low vision intervention.^{10,11} Optimal low vision care is thought to involve multiple visits with a multidisciplinary team of clinicians and rehabilitation workers,^{12,13} although this is reasonably expensive.¹⁴

A single consultation with a low vision optometrist is the norm in the UK hospital service.^{15,16,17} This is usually an hour long appointment comprising history taking, refraction, advice on lighting, prescription of optical magnifiers which are loaned to patients, discussion and demonstration of electronic magnifiers and referral to other agencies as needed with no further training in the use of low vision devices. Anecdotal reports have suggested that a follow up visit by a trained Low Vision Support Worker might be beneficial. However, Reeves and colleagues found no additional improvement with enhanced low vision intervention in patients with neovascular age-related macular degeneration. This study was a three-arm randomised controlled trial: (1) conventional hospital-based low vision care, (2) the same hospital –based low vision care followed by three home visits from a trained rehabilitation officer and (3) the hospital – based low vision care followed by home visits from a community care worker which was not vision specific. In their study, the quality of life was not improved in any group.¹⁸ This negative finding might be due to either the low sensitivity to change of the questionnaire, or disease progression in the patients assessed.

The Reeves study used four questionnaires: the UK Short-Form 36 Health Survey Questionnaire, The Nottingham Adjustment Scale, The Vision Related Quality of Life Questionnaire and The Manchester Low Vision Questionnaire.

They also assessed task performance at twelve months. For example they were asked to identify the use-by-date on supermarket grocery items.

A more comprehensive measure of functional ability related to vision is the Activity Inventory developed by Massof. A detailed description of the Massof Activity Inventory (MAI) has been published elsewhere.^{19,20} The MAI has a hierarchical structure and is based on the Activity Breakdown Structure (ABS). The ABS views specific activities (e.g. cooking) as *goals*. Each goal has a collection of *tasks* (e.g. reading a recipe). For this study we used a version of the MAI that assesses difficulty achieving 50 activity goals in three domains: daily living, social, and recreational.

A further aspect of low vision is the ability to handle and use low vision devices. We assessed this with the Manchester Low Vision Questionnaire, part 1 (MLVQ) which asks how often the low vision devices were used, the average length of time they were used, the longest time used how difficult they were to use and what kinds of difficulties were encountered.

Following the work of Reeves and colleagues, we aimed to assess whether an additional follow up by a trained support worker, a relatively low cost intervention, would be beneficial in a real life setting including all new visitors to the low vision clinic regardless of condition. In a randomised masked controlled trial we compared the effect of conventional low vision assessment with or without a second follow up on daily activities and handling of low vision aids. We extend the work of Reeves and co-workers by using the MAI questionnaire, and also assess low vision device handling using the MLVQ part 1.

Methods

This study was approved by the Local Research Ethical Committee, registered with the ISRCTN (05434212) and conformed to the CONSORT guidelines.

Patient records for those attending for a low vision assessment at the St George's low vision clinic of Moorfields Eye Hospital were assessed. Inclusion

criteria were all first time attendees to the low vision clinic over the age of 18. They were written to in large print inviting them to take part in the study .

When written consent was received, the research optometrist telephoned the participants and checked they met the study inclusion criteria . Specific exclusion criteria assessed at this time included patients who were not independent, those who were not fluent in English, those who were hospital in-patients, those who previously attended a low vision assessment elsewhere, and those with serious hearing impairment. The baseline modified Massof Activity Inventory (MAI) was then administered by telephone.

We modified the MAI by removing activities which were not relevant to the majority of British participants with low vision: driving, shooting, and leatherwork. We were informed that this would not affect the validity of the instrument (Personal communication, Dr R Massof, 2005).

All participants received a standard low vision assessment (LVA) within 2 weeks. At this stage, patients were excluded from the study if their visual acuity was better than 6/12 and they had no significant field loss in their better seeing eye. After the LVA visit, the participants were randomised by the low vision optometrist to the intervention and the control groups. A sealed envelope technique was used. All investigators were masked to the randomisation.

Those randomised to the intervention group had a one hour appointment with a Low Vision Support Worker (LVSW) two weeks after the initial LVA. The LVSW was a qualified dispensing optician who trained alongside Moorfields Eye Hospital trainee optometrists in basic elements of low vision assessment. He sat in with senior staff in the LVA clinic and gained experience of a multidisciplinary low vision service at The Royal National Institute of Blind People in London. During the appointment he reviewed handling of low vision devices, discussed specific problems noted at home and if necessary issued new devices or exchanged them for something more appropriate. He also ensured that

participants were aware of all services available to them through local social services and the voluntary sector. After the visit, he remained as a named contact for any further advice, given by telephone.

Those randomised to the control group had a well person check with a nurse who measured height, weight, vision and blood pressure. If they expressed difficulty with their devices they were referred back to the LVA clinic after the questionnaires were completed.

The extra appointment was approximately equal in length for those in the control and intervention group.

Approximately two weeks after the follow up visit, the research optometrist administered the MLVQ part 1 and a follow up MAI by telephone. Three months after the initial visit, the MAI and MLVQ part 1 were repeated by telephone. Data were analysed on an intention to treat basis. The principal outcome measure was task difficulty. A sample size calculation was performed using the programme PS (V3.0).²¹ In order to detect a clinically meaningful difference between groups of 0.7 logits (corresponding to functional change of 5 lines on an ETDRS acuity chart) the required sample size is 110, or 55 per group (based on a two-tailed t-test for independent samples with a standard deviation of 1.3 logits [R Massof, personal communication]; $\alpha = .05$, power = .8). To detect a change of 0.7 logits from before the LVA to after LVA would require only 29 patients per group (based on a two-tailed t-test for dependent samples).

Results

The records of 549 patients attending the LVA were reviewed for eligibility. 343 patients were invited to take part, and 171 patients were enrolled. The main reasons for not being enrolled were either that they had previously received low vision care elsewhere (177 participants); met the exclusion criteria (58) or declined to participate (100).

In addition, 19 patients failed to attend the LVA and 32 patients attended the LVA but decided not to continue. A total of 120 participants were randomised. Of these, 24 participants failed to complete the study, 12 from each group. 17 participants failed to attend the follow up appointment, 3 participants did not have the second interview, and 4 participants did not have the third interview. The data of the 96 participants who completed the study was analysed. Figure 1 summarises the number of patients in different stages of the study.

Participants were matched in age ($t=0.40$, $p=0.69$), sex ($\chi^2=0.46$, $p=0.50$) and visual acuity ($t=0.10$, $p=0.92$) (table 1)

	Intervention	Control
Mean Age in years	73.3	72.8
Sex M:F	39: 61	36:64
VA (Mean and range) in logMAR	0.70 I(0.3 to 1.6)	0.63 (0.3 to 1.6)

Vision loss was primarily due to AMD in 41.5% of the participants, Glaucoma in 18%, Diabetic Retinopathy in 15% and Cataract in 6.5%. The remaining 19% included patients with corneal opacity, optic atrophy, congenital nystagmus, and retinal dystrophies.

Effect of low vision intervention

Task ability improved from a mean value of 0.18 logit to 0.82 logit in all subjects after receiving the low vision intervention ($p<0.0001$). This effect is comparable to a +0.55 logMAR improvement in visual acuity.²¹ Although the intervention group had a slightly greater increase in score, there was no significant difference in the magnitude of this improvement between the intervention and control groups: improvement was 0.73 logit for the intervention and 0.53 logit for the control group ($p=0.34$).

Table 2 shows the mean person measures, by group, pre- and post-intervention. It can be seen that a significant improvement in person score occurred for both the intervention and the control groups.

	Intervention Mean (s.d.)	Control Mean (s.d.)	Difference between groups
Baseline	0.15 (0.15)	0.28 (0.14)	0.13; p=0.52
+1 month	0.88 (0.21)	0.81 (0.19)	0.07; p=0.80
+3 months	0.71 (0.21)	0.81 (0.23)	0.10; p=0.75
Difference between baseline and +1 month	0.73; p<0.0001	0.53; p<0.001	0.20; p=0.34
Difference between +1 and +3 months	0.16; p=0.28	0.00; p=0.98	0.16; p=0.41

At three months after the intervention, the mean person measure was 0.71 for the intervention group and 0.81 for the control group. This was not significantly different from the score immediately following the intervention (matched pairs: intervention group p=0.28; control group p=0.98). This indicates that the improvement conferred by a low vision assessment does not reduce significantly over a three month period.

Although those allocated to the intervention group had fewer problems with device use on some of the dimensions of the MLVQ: for example, 15% of the intervention group reported difficulty with device handling (control group: 25%); 2.4% reported posture problems (control group: 5.5%); and 7.3% difficulty with reading along a line (control: 16%) the differences between the two groups were not statistically significant, perhaps because of the relatively rare reporting of problems (Fishers exact test: Device handling, p=0.22; Posture problems, p=0.23; Line difficulty: p=0.63).

Discussion

Our study showed that a visit to a hospital based low vision service is related to an improvement in functional ability, as assessed using the MAI. The improvement for those seen by a conventional hospital low vision service is equivalent to an intervention which improves visual acuity by 0.55 logMAR units. The addition of a second visit with a low vision support worker who added training in the use of devices did not improve functional ability further.

Our results differed from those of Reeves who demonstrated no improvement in quality of life following LVA. There are important differences between the two studies that may account for the apparent discrepancy. First, the follow-up period in the Reeves study was longer (twelve months as opposed to our three months), and the lack of a sustained effect at twelve months following low vision intervention has been reported elsewhere.²² Second, all of their participants had age-related macular disease (AMD) whereas over half of participants in the present study had a diagnosis other than AMD. Disease progression and therefore progressive vision loss which would impact negatively on quality of life may be more dramatic for AMD. Finally, we used a more comprehensive instrument (the Massof Activity Inventory) which may be more sensitive to changes in functional ability

Although our service is not multidisciplinary involving multiple visits, eccentric viewing training and the provision of electronic magnifiers, we have shown that it has a beneficial affect on quality of life. This may be further improved with an enhanced service using low vision trainers and more extensive follow up, following the model of, for example, the Veterans Administration.²³ We have not attempted with this study to determine the utility of eccentric viewing training or more elaborate rehabilitative techniques.

Our service tends to prescribe more hand and stand magnifiers and fewer spectacle mounted telescopes or more advanced devices than other low vision clinics.^{15,24,25,26} We have speculated previously that this may be as a direct

consequence of not having device training available.¹⁵ If our clinic issued more complex devices, device handling training may have been more beneficial.

Some of the limitations of our study were that we were reliant on self report of difficulties which are not always reliable and consistent. A limitation imposed by the ethics committee is that only participants who were able to see and return their consent form were able to be recruited into this study. This may have excluded those with the most severe visual impairment. The exclusion of non-English speakers may also have introduced a bias. However, this would be unlikely to contribute to the lack of difference between the control and intervention groups we report. A second limitation is that while we exceeded our recruitment goal of 110 patients, only 96 patients completed the study. However, our original power calculation assumed a standard deviation of MAI scores of 1.3 logits. The actual standard deviation obtained in the study was 1.0 logits which gives us a power of 0.92 to detect a clinically meaningful difference of 0.7 logits between groups.²

Both our intervention and control groups attended a conventional low vision assessment followed by a second visit, to either device training or a control group, hence the utility of a single LVA appointment with no follow-up visit can not directly be assessed. However we would argue that the additional visit to a well-person check should not improve vision related visual function more than a single visit to a low vision clinic. Our work therefore supports the claim that there is a clear improvement in functional ability conferred by a single visit to an optometrist led hospital based low vision clinic. An extra visit to review device handling does not further enhance the utility of this form of low vision intervention.

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