The effect of eccentric viewing on the visual function of persons with age-related macular degeneration

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ABSTRACT

Eccentric viewing is a strategy which has been shown to ameliorate the impact of sight loss due to Macular Degeneration. In this study two different methods of eccentric viewing training are compared. A pre/post test design was used to determine if eccentric viewing training had an effect on ability to perform activities of daily living and ability to see print. Results indicated improvement in near vision and activity of daily living scores with no significant difference between methods of eccentric viewing training used.

Key words: eccentric viewing, age-related macular degeneration, rehabilitation, activities of daily living.

INTRODUCTION

Age-related Macular Degeneration (AMD) is the leading cause of blindness for people aged over 65.[1] As AMD results in the loss of macular vision, visual function is severely compromised and this can have a major impact on ability to perform everyday tasks such as reading, seeing faces and driving.[2-5] The impact of AMD can be reduced with the use of appropriate rehabilitation strategies. Whilst the centre field of vision in patients with AMD is lost, the peripheral vision is usually preserved, therefore individuals affected by the disease can learn to use their remaining vision for reading and activities of daily living. The technique of using peripheral vision instead of central is called eccentric viewing.[5-8] The technique has been shown to be effective in decreasing the size of print a person is able to read but the impact of eccentric viewing on the performance of tasks of daily living has not been assessed. The aims of this study are to compare two methods of eccentric viewing training, the 'ECCVUE'[9] computer program and the 'Eccentric Viewing Home Kit'[10] the measures used to indicate change in visual function were ability to read print (near vision) and the ability to perform daily living tasks. In addition a subjective measure of improvement was used as an indication of the participants perception of the impact of training.

MATERIALS AND METHODS

Participants

There were ten participants, two male and eight female. They were aged between 75 and 94, with an average age of 82.5 years (SD = 6.13). All the participants were clients of the Low Vision Clinic, Vision Australia Foundation and legally blind as a result of longstanding wet AMD. No other ocular pathology was diagnosed. They had all undergone conventional intervention from the Low Vision Clinic which included the use of magnification aids. The participants had not previously had any form of eccentric viewing training, nor had they developed any mechanisms to use it on their own.

Procedures

Participants were randomly allocated to one of two groups. Group 1 was trained using the 'Eccentric Viewing Home Kit' and group 2 with the 'ECCVUE' computer training program. Both groups were pre-tested for near visual acuity using the near 'Logmar' visual acuity chart. In addition, the participants skills in activities of daily living (ADL) were assessed using the 'Melbourne Low Vision Activities of Daily Living Index'.[11] These skills included tasks such as reading newspaper headlines, dialing a telephone, pouring a glass of water, writing a cheque etc. These outcome measures (near vision and a functional assessment of ADL) were re-assessed once training was complete.

All participants were trained in their own homes apart from two who were trained in a clinic setting. The 'ECCVUE' computer program was presented by laptop where subjects were trained in their own homes. The participants in group 1 used a focal light during training while those in group 2 used only ambient lighting. Participants used prescription reading glasses during training, but no low vision aids. The number of training sessions for each participant ranged from 6 to 9 sessions, the average being 7.7 (SD = 2.0). The duration of each training session was approximately 45 minutes. The sessions were conducted twice a week for a minimum of four to a maximum of six weeks. In order to determine best peripheral macular area to be used for eccentric fixation, a 'Bjerrum' or 'Amsler' visual field was performed prior to training. All participants were asked to state a goal prior to commencement of training and this was evaluated once the training was complete. Participant details are recorded in Table 1.

Table 1.Participant details

Participant number	Gender	Age	Number of training sessions	Program type
1	Female	80	7	Home Kit
2	Male	77	7	Home Kit
3	Male	86	6	Home Kit
4	Female	77	12	Home Kit
5	Female	84	9	Home Kit
6	Female	89	8	EccVue
7	Female	75	8	EccVue
8	Female	78	6	EccVue
9	Female	85	5	EccVue
10	Female	94	9	EccVue
		82.5	7.7	
		SD = 6.13	SD = 2.00	

RESULTS AND DISCUSSION

Figure 1 demonstrates participant near acuity before and after training. Pre eccentric viewing training the near acuity of the participants ranged from n32 to n96.5 (mean = n64.4, SD = 16.04). Post training near visual acuity ranged from n12 to n96.5 (mean = n35.2, SD = 20.81). Eight participants had an improvement in near vision, one had a slight improvement and one did not improve at all. The improvement in near vision was significant ($t = 4.668$ $p = 0.001$).

Figure 1

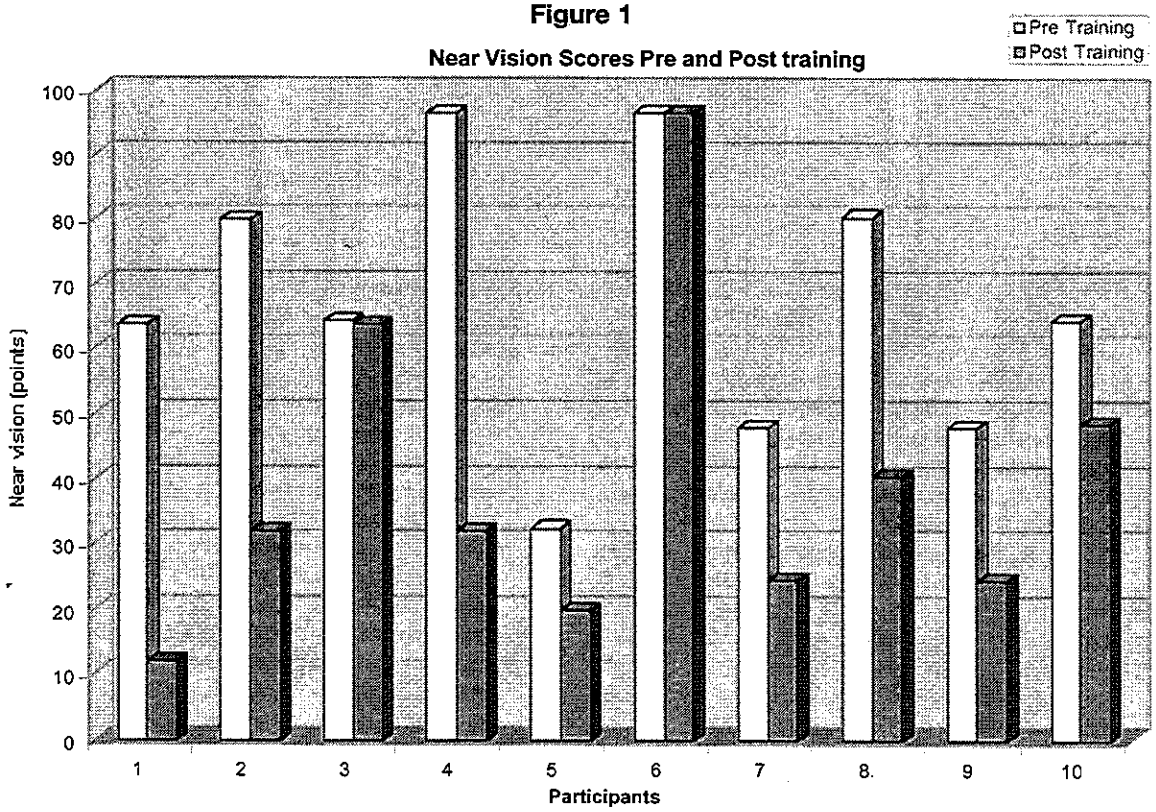


Figure 2 demonstrates pre and post training ADL scores for all participants. The ADL tasks were given a score between one and one hundred. Increased ability is indicated by a higher number. ADL scores prior to training ranged from 36 to 74 (mean = 57, SD = 12.79). After eccentric viewing training the ADL scores of the participants ranged from 39 to 77 (mean = 63.3, SD = 11.8). Analysis indicated that eccentric viewing improved the ADL score of the participants ($t = 5.645$, $p = 0.001$)

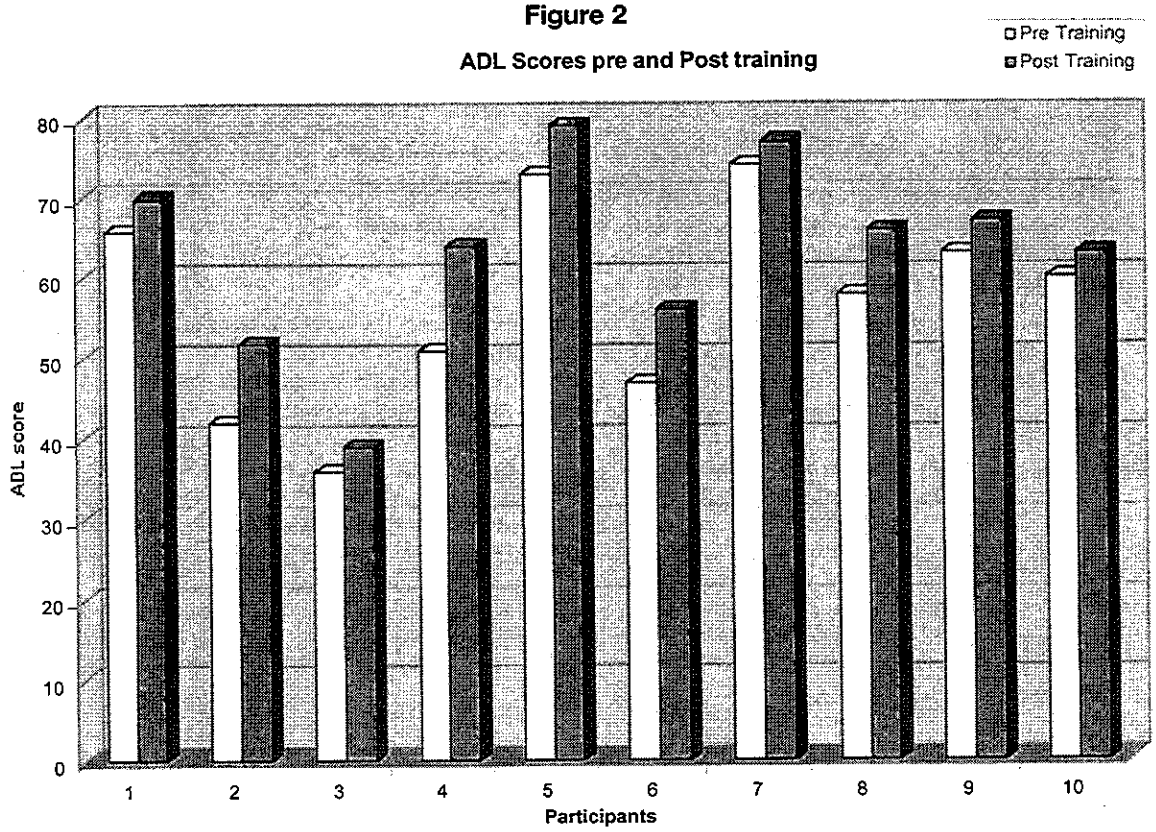
The pre and post near acuity and ADL scores for each group are outlined in Table 2. The variance between the two groups was analysed with a t-test. Results indicated no significant difference between

Table 2. Pre And Post Near Acuity and ADL Scores

	Near Vision pre Training	Near Vision post Training	ADL pre Training	ADL post Training
Home Kit	64.8 (SD = 17.97)	32 (SD = 19.79	53.6 (SD = 15.66)	60.8 (15.64)
EccVue	64 (SD = 16)	38.4 (SD = 23.59)	57 (SD = 12.79)	63.3 (11.88)

Near vision is expressed in points, as on the near acuity 'Logmar' chart.

Figure 2



the two groups. Analysis of pre-post acuity is significant as is the case with pre-post ADL skills. Therefore eccentric viewing probably ameliorated the effect of sight loss caused by AMD in relation to near acuity and ADL tasks.

During the course of the study, the researcher kept a diary of each client's responses and vision changes during training sessions. Diary recordings indicated that eccentric viewing training appeared to increase the participants' confidence to use their remaining vision. Evaluation of each individuals pre training goals also indicated their ability to more efficiently use remaining vision on a daily basis. For example, participant 4 stated her pre training objective was to "see faces more clearly and to be able to read a little bit". Post training she stated that she was "able to see print more clearly" especially her own personal notes such as telephone numbers and shopping lists. Participant 2 stated her goal as "to be able to read more easily". Once training was complete she was able to read more easily, especially newsletters from the hostel where she lives claiming this task was "very important" to her. Observation also indicated that motivation was a better indicator than age of a successful outcome to eccentric viewing training. This is supported by the average age of the participants being 82.5 years. The researcher found that time was also an important factor when training eccentric viewing. The participant must be committed to at least one training session per week for at least six weeks. Participant 4 had the greatest improvement in both near vision and ADL score. This participant also had the greatest number of training sessions. All participants demonstrated an initial decrease in print size of the eccentric viewing target at each session however at sessions four or five this progress ceased for several clients. In each case, persistence beyond this point resulted in further improvement. The research did not indicate any particular reason for this observation, however clinicians need to be aware of such fluctuations in training and must motivate the client to continue beyond this static stage for a more significant improvement to take effect. Participant 6 had no improvement in near vision yet significant improvement in ADL score, thus vision alone cannot be used a sole measure of the success of eccentric

viewing training. Participant progress is outlined in Table 3. Based on this research one or two training sessions do not provide sufficient training for a client to learn to efficiently use an eccentric viewing point. The eccentric viewing point had to be constantly reinforced and each participant was instructed to practice alone between sessions.

Observation indicated that providing motivation was important in supporting the client's confidence to continue training and to practice alone. Introduction of difficult tasks too early can diminish confidence.

Table 3. Participant Progress

	Training Weeks											
Participant	1	2	3	4	5	6	7	8	9	10	11	12
1	96	36	24	24	36	24	12					
2	96	96	48	36	36	36	36					
3	96	48	48	36	36	36						
4	96	48	36	72	48	36	24	24	24	24	24	24
5	96	36	24	24	36	24	24	24	24			
6	96	96	36	36	36	36	36	24				
7	36	36	24	36	36	24	24	16				
8	36	24	24	36	18	18						
9	36	24	24	14	14							
10	96	36	36	24	36	24	24					

The number indicates "Times New Roman" point size used during training.

CONCLUSION

This research supports the hypothesis that eccentric viewing can ameliorate the functional deficits resulting from central visual field loss. In addition observations made during the research training periods indicated the need for the clinician to be able to predict the clients responses and assess stamina at each session to ensure that the appropriate tasks are given. The length of training should be such that the client feels some achievement at the end of each session and the client can feel confidence with the technique and realise their set goals. This study supports eccentric viewing training as a valuable and important rehabilitation tool.

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