SCIENTIFIC CORRESPONDENCE

Effect of a patient training video on visual field test reliability

H Sherafat, P G D Spry, A Waldock, J M Sparrow, J P Diamond

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Aims: To evaluate the effect of a visual field test educational video on the reliability of the first automated visual field test of new patients.
Methods: A prospective, randomised, controlled trial of an educational video on visual field test reliability of patients referred to the hospital eye service for suspected glaucoma was undertaken. Patients were randomised to either watch an educational video or a control group with no video. The video group was shown a 4.5 minute audiovisual presentation to familiarise them with the various aspects of visual field examination with particular emphasis on sources of unreliability. Reliability was determined using standard criteria of fixation loss rate less than 20%, false positive responses less than 33%, and false negative responses less than 33%.
Results: 244 patients were recruited; 112 in the video group and 132 in the control group with no significant between group difference in age, sex, and density of field defects. A significant improvement in reliability (p=0.015) was observed in the group exposed to the video with 85 (75.9%) patients having reliable results compared to 81 (61.4%) in the control group. The difference was not significant for the right (first tested) eye with 93 (83.0%) of the visual fields reliable in the video group compared to 106 (80.0%) in the control group (p = 0.583), but was significant for the left (second tested) eye with 97 (86.6 %) of the video group reliable versus 97 (73.5%) of the control group (p = 0.011).
Conclusions: The use of a brief, audiovisual patient information guide on taking the visual field test produced an improvement in patient reliability for individuals tested for the first time. In this trial the use of the video had most of its impact by reducing the number of unreliable fields from the second tested eye.

The validity of information obtained from a visual field test depends on the ability of the patient to reliably perform the test. Standardised reliability criteria have been adopted and consist of fixation loss rate less than 20%, false positive response rate (FP) less than 33%, and false negative (FN) response rate less than 33% of test catch trials.[1]

A number of studies have shown that 29–45%[2–4] of full threshold SAP test results are unreliable using these standardised reliability indices, with most of the unreliable fields attributable to fixation losses.[2–6] Katz *et al* found that 19% of normals, 28% of ocular hypertensives, and 37% of glaucoma patients were unreliable on their first C30–2 full threshold field.[7]

Studies of continuous patient monitoring during testing have shown either no significant difference[8] or a positive group effect, with no effect on individual reliability indices in a more recent study.[9]

It is also possible that test duration may influence reliability and, in particular, fatigue has been shown to influence reliability in glaucomatous subjects.[10–12]

The importance of adequate and careful patient instruction both directly and indirectly by training of technicians has frequently been emphasised as a factor playing a major part in obtaining a reliable result.[5 6 13] Moreover, perimetrists' instructions have been shown to significantly affect obtained automated perimetry thresholds.[14]

The aim of this study was to evaluate the effect of a patient information video on visual field test result reliability. The video was designed for patients who had not previously performed a visual field test and provided information on the objective of the test, instrumentation, procedure, and what would be expected of them.

MATERIALS AND METHODS

The study was performed in a hospital eye service "new patient" glaucoma clinic. The inclusion criteria were new referral, no previous threshold visual field tests, absence of hearing or cognitive impairment, understanding of English language, and best corrected visual acuity of 6/36 or better in both eyes.

After informed consent consecutive, eligible patients attending the clinic were randomised in to either a control or "video" group. The control group proceeded normally through the clinic, which involved a routine visual field test and a subsequent consultation with the clinician. The video group were individually shown the standard information video and then preceded in the same manner as the control group. All patients having field tests would receive instruction from the technician monitoring the test. The level of monitoring was at the discretion of the technician. Technicians performing the visual field tests were masked to each patient's randomisation status and patients were instructed not to disclose whether they had been shown the video.

The audiovisual patient information video was produced in house by the audiovisual unit and was 4.5 minutes in duration. It explained the purpose, rationale, and events surrounding a standard automated visual field test, with emphasis on the sources of unreliable visual field results and a visual representation of the perimeter bowl as perceived by the patient, including the fixation target and test stimuli.

Visual fields were performed by one of seven technicians, who supervised tests on both eyes of the patient. The following data were recorded for all the patients: age, sex, whether or not a visual field test were performed by a referring optometrist, technician ID, best corrected visual acuity (BCVA), diagnosis, duration of visual field test, fixation loss rate (FL), false positive response rate (FP), false negative response rate (FN), mean deviation (MD), pattern standard deviation (PSD), and glaucoma hemifield test (GHT) result. Standard reliability criteria were employed: fixation loss rate less than 20%, false positive response rate less than 33%, and false negative response rate less than 33%.[1]

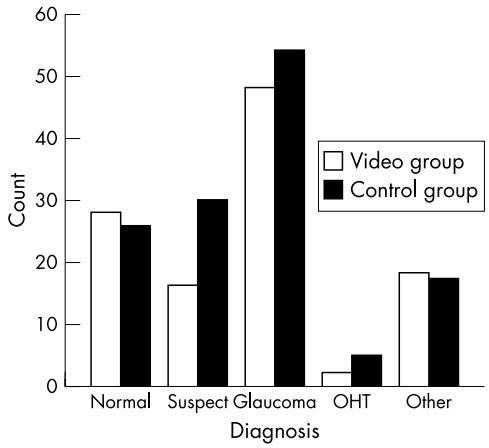

Figure 1 Patient diagnosis within the glaucoma and video group.

Patient diagnosis was recorded under five categories: normal ocular examination; glaucoma suspect; glaucoma, including primary open angle and normal tension glaucomas; ocular hypertension. The fifth category labelled "other" included all miscellaneous diagnoses such as cataract, age related maculopathy, congenital disc anomalies, amblyopia, and other unconfirmed diagnosis.

Ethical approval for the study was obtained from the United Bristol Healthcare research and ethics committee.

Statistical analysis

The demographics of the video and control groups were compared using the unpaired two sample *t* test for continuous variables and the Pearson χ^2 test for nominal variables where proportions were compared. The paired *t* test was used to compare field parameters of the patients' right and left eyes.

RESULTS

Of the 306 consecutive patients attending the new patient clinic, 244 patients were eligible for inclusion. One hundred and thirty two patients were randomised to the control group and 112 to the video group. Summary data for the video and control groups are provided in Table 1. No significant differences were found between these groups for age, sex and BCVA. Furthermore, there was no significant difference ($p = 0.356$) in the proportion of diagnoses in either group (Fig 1).

There was a considerable spread of visual field defect magnitudes in both groups (Table 1). The MD or PSD for the right and left eye were not significantly different between the groups.

The reliability results are shown in Table 2. Because the results of reliability of either eye has a direct impact upon the management of the patient, reliability was expressed by eye and whether a patient had reliable visual fields in both eyes. In the control group 81 (61.4%) patients had reliable fields in both eyes. In the video group 85 (75.9%) patients had reliable fields in both eyes. The difference in reliability in the two groups was significant ($p = 0.015$).

When only the right (first tested) eye was considered, 93 (83.0%) of the eyes in the video group were reliable compared to 106 (80.3%) in the control group. The difference was not statistically significant ($p = 0.583$). When the left (second tested) eye was considered, 97 (86.6%) fields were reliable compared to 97 (73.5%) in the control group. This difference was statistically significant ($p = 0.011$).

Table 1 The demographic data on the video and control group. Note that no significant differences existed between groups for any of the variables

	Control	Video	Significance
Number	132	112	NA
Age (years)	62.6 (14.4)	62.7 (13.2)	0.963*
Sex			
Male	70 (53%)	57 (50.9%)	0.739†
Female	62 (47%)	55 (49.1%)	
Optician fields	106 (80.3%)	96 (86.5%)	0.200†
Right eye			
BCVA ⩾20/80	104 (92.0%)	125 (94.7%)	0.551†
MD (SD) dB	–2.98 (5.24)	–2.52 (4.06)	0.460*
PSD (SD) dB	3.22 (2.71)	2.89 (2.30)	0.304*
Left eye			
BCVA ⩾20/80	103 (92%)	122 (92.4%)	0.894†
MD (SD) dB	–2.77 (4.58)	–2.57 (3.80)	0.704*
PSD (SD) dB	3.26 (2.82)	3.12 (2.61)	0.698*

BCVA = best corrected visual acuity, MD = mean deviation, PSD = pattern standard deviation, NA = non-applicable.
*Unpaired *t* test.
†Two tailed Pearson χ^2 test.

Table 2 The number and percentage of patients in the video and control groups who had a reliable field test in both eyes and in each eye separately

	Reliable	Unreliable	Significance*
Both eyes			
Video	85 (75.9%)	27 (24.2%)	0.015
Control	81 (61.4%)	51 (38.6%)	
Right eye			
Video	93 (83.0%)	19 (17.0%)	0.583
Control	106 (80.3%)	26 (19.7%)	
Left eye			
Video	97 (86.6%)	15 (13.4%)	0.011
Control	97 (73.5%)	35 (26.5%)	

*Two tailed Pearson χ^2 test for significance of difference in reliability between the control and video group.

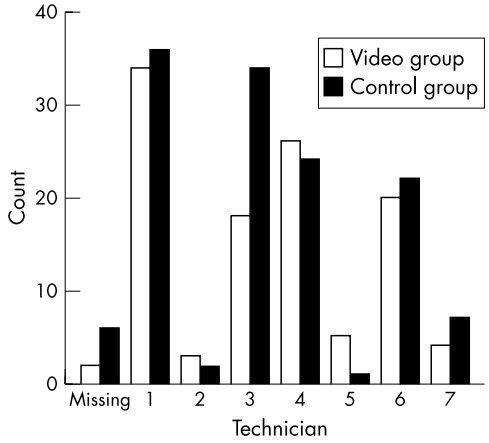

Figure 2 Number of technicians performing the visual field in each of the video (open bars) and control group (solid bars). Technicians 1, 3, 4, and 6 performed the fields on 214 (87.7%) patients. There were no significant differences between video and control groups for any of the technicians.

The majority of the visual field tests, 214 (87.7%), were supervised by four of the technicians (Fig 2). There was no significant difference between the proportion of visual fields performed by each technician within the video and control group (p=0.254).

DISCUSSION

This study has demonstrated that 75.9% of patients watching an educational video had reliable visual fields in both eyes on their first attempt, which represented a significant improvement in reliability compared to the control group, of whom 61.4% had reliable fields in both eyes. Assessment of reliability of visual fields by patient, rather than by eye has practical implications for patient management, as this is likely to be affected by the either eye's reliability.

The introduction of a standardised information video ensures that key points are brought to the attention of every patient and serves to reinforce technician instructions. The video aimed to clearly explain to the patient how to correctly perform the visual field test. This would entail emphasising the importance of maintaining fixation, not guessing a response, and resisting the tendency to be "trigger happy" with responses. Another aim was to clarify some of the ambiguities arising during the first visual field test, such as reminding the patient that although they should maintain fixation, they are allowed to blink during the test, that a response immediately following the disappearance of a presented stimulus is acceptable and should be independent of the brightness of the stimulus and only based on whether a given stimulus is seen or unseen. The final aim of the video was to reassure the patient of some of the sources of stress and anxiety associated with the unfamiliarity of the patient with SAP such as the experience of transient darkening and subjective loss of sensitivity to the perimeter bowl.[15]

It is of interest that the impact of the information video on the reliability of the visual field of the right (first tested) eye was not significant. This would suggest that the video achieves its effect by reducing the rate of unreliable fields in the second tested (left) eye. It is likely that familiarity with SAP achieved by performing a field test cannot be adequately substituted by other means. It may be postulated that information provided by the video reinforces the learning experience gained with the first tested eye. It is also possible that the video may reduce any fatigue effect.

The design of this study may have produced some "work up" bias, whereby technicians' awareness of the project may have artefactually improved their testing standard, albeit unintentionally. A historical cohort of fields performed by the same technicians may have enabled a quantification of this effect.

During the design of the study it was recognised that the lack of standardisation of the technician instructions may introduce differences between the control and video group and arguably weaken the strength of conclusions. In anticipation of this, the randomised, control study design was employed to minimise such effects and also the effects of any unanticipated confounding variables. A rigid standardisation of technicians' instructions, although possible, was not considered representative of typical hospital eye service clinics. It is acknowledged that some variability in the quality of instructions and supervision provided by technicians would be inevitable, but the absence of any significant difference in the proportion of fields performed by each technician within the two groups ($p = 0.254$) makes this unlikely.

The level of the perimetric experience before recruitment into the study may also have produced an element of learning effect for future field tests. Eighty two per cent of referred patients were reported to have had a field test by the referring optometrist. For the purpose of this study it was acceptable for patients to have been exposed to a single field test not performed in an ophthalmic clinic, as most UK optometrists use suprathreshold screening strategies, rather than thresholding algorthims.[16] The video and control group did not significantly differ in the proportion of patients in each group who had performed a visual field test at the referring optometrist's practice.

The benefits of careful patient instruction by technicians performing visual field tests is not a novel idea and has been repeatedly and frequently advocated. The constraints of time and resources, however, limit the extent and quality of information delivered to patients during routine visual field testing. The incorporation of a video guiding and reassuring the patient on taking the visual field test is an effective way of using available clinic time. A reduction in the number of patients requiring attendance for a "repeat visual field" can reduce demand on this frequently used service.

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Authors' affiliations

H Sherafat, P G D Spry, A Waldock, J M Sparrow, J P Diamond, Bristol Eye Hospital, Lower Maudlin Street, Bristol BS1 2LX, UK

Correspondence to: Mr Hooman Sherafat, Royal Eye Unit, Kingston Hospital, Galsworthy Road, Kingston upon Thames, Surrey KT2 7QB, UK; hsherafat@doctors.net.uk

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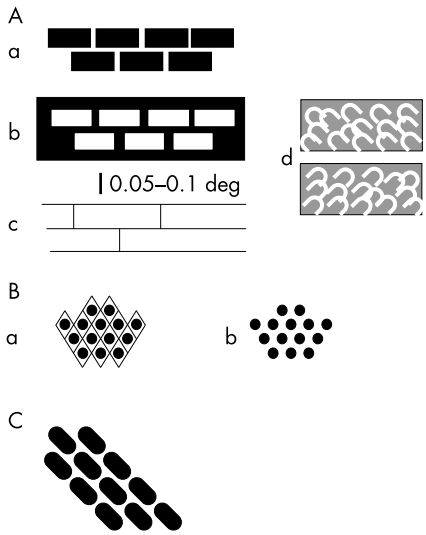
REFERENCES

1 **Heijl A**, Lindgren G, Olsson J. Reliability parameters in computerised perimetry. Seventh international visual field symposium, Amsterdam, 1986.
2 **Katz J**, Sommer A. Reliability indexes of automated perimetric tests. *Arch Ophthalmol* 1988;**106**:1252–4.
3 **Bickler-Bluth M**, Trick GL, Kolker AE, *et al*. Assessing the utility of reliability indices for automated visual fields. Testing ocular hypertensives. *Ophthalmology* 1989;**96**:616–9.
4 **Nelson-Quigg J**, Twelker JD, Johnson CA. Response properties of normal observers and patients during automated perimetry. *Arch Ophthalmol* 1989;**107**:1612–15.
5 **Johnson CA**, Nelson-Quigg M. A prospective three-year study of response properties of normal subjects and patients during automated perimetry. *Ophthalmology* 1993;**100**:269–74.
6 **Sanabria O**, Feuer WJ, Anderson DR. Pseudo-loss of fixation in automated perimetry. *Ophthalmology* 1991;**98**:76–8.
7 **Katz J**, Sommer A, Witt K. Reliability of visual field results over repeated testing. *Ophthalmology* 1991;**98**:70–5.
8 **Johnson LN**, Aminlari A, Sassani JW. Effect of intermittent versus continuous patient monitoring on reliability indices during automated perimetry. *Ophthalmology* 1993;**100**:76–84.

9 **Van Coevorden RE**, Mills RP, Chen YY, *et al*. Continuous visual field test supervision may not always be necessary. *Ophthalmology* 1999;**106**:178–81.
10 **Heijl A**, Drance SM. Changes in differential threshold in patients with glaucoma during prolonged perimetry. *Br J Ophthalmol* 1983;**67**:512–16.
11 **Katz J**, Sommer A. Asymmetry and variation in the normal hill of vision. *Arch Ophthalmol* 1986;**104**:65–8.
12 **Hudson C**, Wild JM, O'Neill EC. Fatigue effects during a single session of automated static threshold perimetry. *Invest Ophthalmol Vis Sci* 1994;**35**:268–80.
13 **Hardage L**, Stamper RL. Reliability indices for automated visual fields. *Ophthalmology* 1989;**96**:1810.
14 **Kutzko KE**, Brito CF, Wall M. Effect of instructions on conventional automated perimetry. *Invest Ophthalmol Vis Sci* 2000;**41**:2006–13.
15 **Spry PGD**, Furber JE, Harrad RA. The effect of ocular dominance on visual field testing. *Optom Vis Sci* 2002;**79**:93–7.
16 **Wood JM**, Wilde JM, Hussey MK, *et al*. Serial examination of the normal visual field using Octopus automated projection perimetry. Evidence for learning effect. *Acta Ophthalmol Scand* 1987;**65**:326–32.

ECHO

Hyperactive neurones conjure up hallucinations



Sketched parts of Charles Bonnet hallucinations seen by the author. Scale bar applies to all sketches.

An Australian professor has put forward a hypothesis for the origin of hallucinations which, if correct, would help their diagnosis and possible treatment. His thinking stems from personal experience of simple Charles Bonnet hallucinations.

These were brought about by the development of a macular hole <400 μm in the left eye four years after one >400 μm in the right. Hallucinations started 11 weeks afterwards, when acuity in the left eye was 6/12–6/18. They were simple black and white, non-evoked, geometric arrays. The first looked like "brickwork" (fig A:a-c) within an area $<1^0$. Later came arrays of arches angled at 45^0. Then after seven days groups of dark spots appeared (fig B:a, b) and then lozenges angled at 45^0 (fig C). Finally, all but the arches and previously seen "flashes" faded about 10–12 days after the hallucinations first began. Faint hallucinations returned about 38 days later and lasted 10 days or so. Brickwork reappeared briefly during an episode of macular cystoid oedema in the left eye.

Professor Burke extends current thinking that links particular hallucinations with particular areas of the brain, deducing that they result from "deafferentation" of visual structures in the brain or silencing of the principal afferents to them. This induces changes leading to increased excitability of affected neurones and spontaneous activity—perceived as hallucinations. As the neurones gradually become reactivated the hallucinations fade and vanish.

Charles Bonnet hallucinations occur after injury to the brain or other parts of the visual system, most commonly after age related macular degeneration.

▲ *Journal of Neurology, Neurosurgery, and Psychiatry* 2002;**73**:535–541.

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