

A course in low vision practice

PART 3 – Low vision assessment

Barbara Ryan and Tom Margrain describe how to assess the requirements of a visually impaired patient and how best to assess their visual function prior to prescribing (CET Module C2263)

A LOW VISION assessment is a problem-solving exercise to which there is no one correct solution. It can be broken down into three main steps:

- ◆ In the case history you find out what the person needs and wants to do and set goals accordingly
- ◆ Then you assess the person's current visual functioning
- ◆ Once you know what the person wants to do and what they can see you try to find the most suitable way the person can achieve their goals, or modify the person's expectations accordingly.

STEP 1: CASE HISTORY AND GOAL SETTING

Case history

A case history in a low vision assessment is usually longer and more in-depth than a normal eye examination. It will normally take about 20 minutes, but it is not unusual for it to take longer and very occasionally you may need to spend all of the first appointment talking and listening to the person.

The success of a low vision assessment is often down to this important first discussion. You will need to encourage the person to open up and share their experiences and feelings, assess their motivation and find out how well they are functioning in all aspects of their lives.

Observation

The case history in a low vision assessment starts from the moment you meet the person. As you greet and escort them from the waiting room observe how they function in this unfamiliar environment.

You can get a lot of information by assessing:

- ◆ If they look straight at you or use eccentric fixation
- ◆ Sensitivity to light (wearing tints, a peaked hat or shielding their eyes)

- ◆ If they need you to guide them or can they orientate themselves independently.

Visual history

A more detailed visual history than practitioners usually take is required. It should include diagnosis (if known); onset of impairment; duration and circumstances; stability of vision; description of what they see or don't see; differences between eyes; knowledge of the condition; prognosis; current, past and future treatment; registration status; current spectacles and present use of low vision aids (LVAs).

General health

Details of systemic conditions which may lead to a visual impairment (such as diabetes or multiple sclerosis) should be determined. As well as the usual information about general health and medication, particular attention should be paid to any hearing impairment and non-visually-



Successful participation in each module of this approved series counts as two credits towards the GOC CET scheme administered by Vantage and one towards the AOI's scheme.



A COURSE IN LOW VISION PRACTICE

In this series of 12 articles, Barbara Ryan and Tom Margrain from the School of Optometry and Vision Sciences, Cardiff University outline some of the basic theory required for low vision practice. These articles are based on modules which were developed to train the optometrists and dispensing opticians who provide The Welsh Low Vision Service which has been developed and is funded by the Welsh Assembly Government



FIGURE 1. Reading assessment is essential

caused problems with mobility and dexterity (such as difficulties gripping things) which will impact on the solutions you prescribe.

Social situation

Knowing the person's home situation, such as whether they live alone, have family support or are in sheltered accommodation is essential to help prioritise goals. Younger people may be at school or college, working or unemployed.

Current support

Some of the people you encounter may have received support from other agencies. You should ask about social services visits; rehabilitation training; employment or education support; home helps; meals on wheels; contact with voluntary organisations – local and national; knowledge of eye condition support groups and hobby groups.

Reading

Most people with low vision will report difficulties reading (Figure 1). It is important to find out what the person can read and what they need and want to be able to read. 'Reading' encompasses a huge diversity of visual tasks and it is essential to be more specific.

Ensuring correspondence is read is vital. Some people may be happy for others to read letters and bills for them, but many will want to read these things for themselves. Gauging the person's knowledge of the availability of bills and statements in other formats (such as large print or tape) is also useful.

Other reading tasks to consider and discuss are instructions on packets, newspapers, television listings, magazines and books, black/white boards and computer text.

Cooking

For those who live alone, the ability to keep cooking for themselves may be one of their most important goals. Those who live with others may also still want to continue to be able to cook some or all meals, or simply make a snack and a cup of tea.

Honing in on specific aspects of preparing food that the person finds difficult will help in goal setting. Determine the person's ability to see dials on the cooker and microwave; read recipes; buy food; read instructions on packets; chop food and pour liquid.

Mobility

Not being able to get out and about can lead to isolation. Although optometrists and dispensing opticians do not specifically address difficulties with mobility, they should be able to refer to other agencies and prescribe low vision aids to assist. Knowledge of how often the person

can and wants to get out, where they go, how they get there and who accompanies them will help the process.

Communications

Ensuring a person maintains their ability to communicate with others is another important aspect of preventing isolation and loss of independence.

Things we take for granted, like using the telephone, can pose a major problem for someone with a visual impairment. Ask how often the person uses the telephone, what type of phone they have, how they manage seeing the dial, and how they get the correct telephone number.

Writing a letter, list or just signing their name can pose an enormous obstacle to someone with a visual impairment. Ask about how they manage with these, and the techniques they employ or have tried to assist.

This will be important to know not only because of magnifiers you may prescribe but also when advising about lighting and contrast.

Medication

Most people with a visual impairment take some form of medication and not taking the correct dose can have serious consequences, so a question about their use is important. Reading the name and dose, determining which tablet to take, breaking tablets, measuring injections and instilling eye drops can all pose problems to someone who has difficulty seeing.

Work/school

To determine solutions to assist a person you need to break down their daily tasks in school and work.

In school: What causes them most problems; what subjects do they take; what support have they had (personnel and equipment); how do they access information from the board or text books; how do they manage with sports and homework?

In work: What does their job consist of; what causes them most problems; have they had any training or equipment; are their employers supportive; how do they get to and from work?

Hobbies/pastimes

People with a visual impairment, like everyone else, want to continue to do the things they enjoy in life. Find out what the person likes to do once the essential chores are taken care of. Think about sewing, bingo, music, sports, looking at photographs, gardening and social clubs. Determine any problems they have and solutions they have tried themselves. When problems seeing the television are voiced, find out the type of television they have and where they sit in relation to it.

Lighting

Good lighting can often help someone with low vision as much as magnification.

Determine whether the person needs more or less light; what lighting conditions they prefer; what lighting causes them a problem; what effect poor lighting has for them and the lighting they have in their home. Any tints previously prescribed should also be recorded.

Goal setting

When the case history draws to a close you should have a good picture of the person in front of you: their character, their life, how their eye condition has affected them and what they most need and want to be able to do that they can't anymore.

Lots of areas of difficulty will have been highlighted, but you need to prioritise. Low vision aids are task-specific, so the task must be identified precisely. Then you need to decide two or three goals, which you, as an optometrist, are going to try to address in that session.

As well as the goals you will try to address given your expertise, those that need to be referred to others to address should also be recorded.

When you have decided what you think the priorities are, present them to the person for confirmation.

STEP 2: ASSESSMENT OF VISUAL FUNCTION

Distance vision and visual acuity

This should be recorded monocularly and binocularly. Give the person time and encourage them to use eccentric fixation. The chart should be held close enough so that the patient can read a line or two of letters but not all the lines on the chart.

Compensate for the closer working distance. If the chart is held at 2 metres you will need to change the distance prescription by 0.50D and 1D for a chart at 1 metre. Traditional Snellen charts should not be used with low vision patients.

- ◆ There are very few letters (optotypes) at poorer acuity levels (only one at 6/60), which is deflating for the person who has low vision
- ◆ There are unequal increments between each line and increments are largest at poorer levels of acuity. This means that accurate measurements of improvements in acuity measured at different distances or using telescopic magnification cannot be obtained
- ◆ Letters are not equal in their legibility
- ◆ There are different numbers of letters on each line (increasing in number with lower lines) so patients with poor acuity are required to read less letters than those with good acuity



FIGURE 2. LogMAR charts are preferable to Snellen charts for low vision patients

- ◆ Letters on lower lines are more ‘crowded’ than those at the top and ‘crowding’ increases the task difficulty so demand changes down the chart. This means that VA measured at six metres cannot be equated to equivalent VA measured at another distance
- ◆ The end point score is a whole line.

LogMAR distance visual acuity charts are very much more useful within the low vision context¹ (Figure 2).

- ◆ Every row has five letters which is great psychologically for people with poor acuity levels because they will almost always be able to read five letters if you bring the chart close enough. This also means crowding is the same and so results are legitimate whatever distance they are recorded at
- ◆ There are sufficient large letters to make assessment of visual acuity in low vision patients meaningful
- ◆ Letters used are of equal legibility
- ◆ There is a uniform progression of letter sizes; increasing in a constant ratio of X1.25 or 0.1 log unit steps
- ◆ The separation between each letter (optotype) and each row is standardised and related to the size of letters
- ◆ Scoring gives credit for individual letters read on each line.

Measurements of ‘count fingers’ are not useful for low vision rehabilitation. If the person cannot see any letters at 0.5 metres, check hand movements (HMs) and light perception (PL/NPL).

Projection charts are not as useful in LV work because they are not portable (so cannot be brought closer) and can have poor contrast.

For assessment of children and adults with learning difficulties with a visual impairment LogMAR Kay Picture test charts are available (Figure 3).



FIGURE 3. Kay Picture test charts for assessment of children and adults with learning difficulties



FIGURE 4. Example of a near chart with a logarithmic calibration

Near vision testing

Reading acuity as recorded in general practice often fails to correlate well with distance acuity and is not useful when calculating the required magnification in low vision work. Traditional near charts usually do not have text large enough for a large proportion of the low vision population.

Better, although not perfect, is the measurement of near acuity threshold using charts that use unrelated words. Near acuity threshold charts have been developed with the needs of the low vision patient in mind.

The best known and most used in UK low vision practice is the Bailey-Lovie near chart. It incorporates large print (N80 to N2.5) and uses unrelated words of equal complexity but of different sizes (two, three, or five words per line).

As well as N- notation it allows recording of M and LogMAR notation if used at 25cm².

It has some disadvantages, however: the spelling is American; some words are unusual, the level of difficulty of the words is high so children and people with learning difficulties could not read them; and some words are a little negative for the rehabilitation context (such as depression and disease).

Assessment with current LVAs

An assessment of any low vision aids the person may currently have is important. This can be done before the refraction, after the refraction or before you try new LVAs, depending on what the person reports, the state of their current spectacles and the use of the aids. When assessing current LVAs it is important to determine:

- ◆ Where the person got an aid from and when they got it

TABLE 1

Low vision patients are more likely to have high or changing prescriptions (Brilliant, 1999)³

Disorder	Commonly associated refractive error
Albinism	Moderate/high hyperopia or myopia Moderate/high astigmatism
Cataracts	Myopic shift
Cerebral palsy	Moderate to high hyperopia
Degenerative myopia	High myopia
Diabetes	Myopic and hyperopic shifts
Down's syndrome	Moderate to high myopia
Keratoconus	Moderate to high irregular astigmatism with myopic shifts
Microphthalmos	Moderate to high hyperopia
Monochromatism	High myopia and moderate astigmatism
Nystagmus	Moderate astigmatism
Retinopathy of prematurity	High myopia – hypermetropia

- ◆ What the use each LVA for
- ◆ How often they use them
- ◆ How effective they are/were for the task
- ◆ What spectacles they use with them
- ◆ Distance acuity or near acuity threshold with the aid, and
- ◆ How well the person uses the device for the desired task using similar material and observing the use.

Refraction

A phoropter is not recommended for use with low vision patients because it does not allow the person to use their habitual head posture or eye position and it is not easy to use the large incremental changes required in a low vision assessment.

Sometimes Halberg clips are used to over-refract if the person has a high prescription.

Retinoscopy

It is important to do retinoscopy on all low vision patients. High and shifting refractive errors are more common in the low vision population (Table 1). Subjective responses may be poor and there may be significant previously uncorrected refractive error. Autorefractors are not accurate because of difficulties with fixation, small pupils and media opacities.

Cloudy media, eccentric fixation and nystagmus all make retinoscopy difficult.

TABLE 2		
Visual requirement	Fluent reading (160 wpm)	Spot or survival reading (40 wpm)
Acuity reserve	3:1	1:1
Contrast reserve	10:1	3:1
Scotoma diameter	4°	30°
Field of view	4- 6 letters	1 letter

Don't be afraid to move closer, move the collar up and down and, if you are unsure about a reflex, use +/-10.00DS to make sure you are not missing a high refractive error.

Subjective refraction

Always be patient and take your time when refracting a patient with low vision. They invariably find it hard to notice changes and responses are often variable. The normal refraction technique needs to be adapted.

- ◆ Initially, a post-retinoscopy distance acuity should be recorded and the chart positioned close enough so that the person can read at least one full line. Try to ensure the chart is perpendicular to the patient and not sloping against the object it is propped against
- ◆ Throughout the refraction allow the person to adopt their habitual head and

eye position. For people with nystagmus it may be best to fog rather than block the eye not being refracted

- ◆ When checking the sphere you will need to use a bracketing technique and large steps to ensure the person can see a difference. Show the person plus and minus lenses of a specific power and if they do not notice any change increase the power by a dioptre or two until a difference is noticed. You should not be afraid to use +/-1.00, 3.00, 5.00 or 10.00D steps. If the responses are vague, it is usually because the practitioner is not using large enough steps
- ◆ When checking the cyl use +/-0.75 or +/-1.00 cross-cyls. If the person can't see any difference with the cross-cyls manually turn the cyl axis large meridian changes to determine the axis and use a bracketing technique with plus and minus cyls for the power. Use round letters as a target on a line a couple of lines better than their acuity

Perfection in Practice



Are your Slit Lamps as old as the Ark? It's time to change to a modern Keeler Slit Lamp

One of the most important diagnostic devices in ophthalmology and optometry is your slit lamp, yet it is surprising how many professionals have to put up with ancient devices with poor illumination, inferior optics and crude controls. Quality optics and illumination are fundamental to slit lamp examination and Keeler devices excel in these areas. Choose from Haag Streit types, Zeiss types, digital imaging, video and Kowa hand helds.

- ▶ Quality illumination & optics
- ▶ x6, x10, x16, x25, x33, x40 Mag.
- ▶ Comfortable 8.5" converging optics

- ▶ Illumination Control next to joystick
- ▶ Unbeatable value for money

Call now freephone: 0800 521 251 for more information and a free demonstration.

Email: info@keeler.co.uk www.keeler.co.uk

Keeler Ltd Claver Hill Road Windsor Berkshire SL4 4AA Tel: 01753 857177 Fax: 01753 827145



◆ At the end of the refraction, always measure the pinhole acuity. It is important to ensure you have not missed a large refractive error. Other confirmatory tests such as duochrome and +1.00 blur test are generally inappropriate.

Other tests

The content of the rest of the assessment depends on the individual, their eye condition and lifestyle. For example, you would assess:

- ◆ The Amsler grid for most people with a condition affecting central vision
- ◆ The peripheral visual fields on a person reporting mobility problems
- ◆ Colour vision on a child complaining of difficulties with map work in geography
- ◆ Contrast sensitivity on a person whose VA seems better than symptoms would suggest.

Binocular vision

Few low vision patients are binocular and detailed investigation is not always necessary.

Being aware of any tropias and understanding the dominance of the eyes can be useful. For example, it is not uncommon to find a person with a long standing tropia and more recent ocular pathology whose amblyopic eye has the best acuity.

Contrast sensitivity

Contrast sensitivity has found an important place in clinical low vision assessment for a number of reasons (Tables 2 and 3):

- ◆ It gives a better assessment of the patient's functional ability in the real world. A person with good visual acuity but reduced contrast sensitivity may report difficulty recognising faces or seeing the food on their plate
- ◆ It is useful when considering whether low vision aids would be of use .It can direct the information you and other



FIGURE 5. Pelli-Robson chart

professionals, such as rehabilitation workers, need to give about enhancing contrast

- ◆ It can provide useful information about when to refer someone who has lens opacities as a secondary pathology.

The Pelli-Robson letter chart is the contrast sensitivity chart of choice for low vision work (Figure 5). It is readily available in the UK, visible to people with quite low levels of visual acuity, easily understood as it is a familiar letter reading test and clinical results from people with low vision are easy to interpret⁴ (Table 3). The Pelli-Robson chart has letters of a fixed size and at the correct viewing distance (1 metre) the spatial frequency corresponds to peak sensitivity. The contrast of triplets of letters reduces so that a value for the threshold contrast at peak sensitivity is obtained.^{5,6}

Ophthalmoscopy

A detailed discussion of ophthalmoscopy is outside the scope of this article. People entering a low vision service may have had a recent eye examination. If you did not carry out the eye examination it is usually worth having a look at and drawing the ocular abnormality because it can provide useful information to the low vision practitioner about what the person is seeing, for example, the position of a macular scar may give clues to eccentric fixation.

Visual field testing

Visual field testing with low vision

patients is more a functional test than disease detection or monitoring. In most cases the disease causing the vision loss is known and, if progressive, being monitored by an ophthalmologist. The visual fields in a low vision assessment are required to give you an understanding of the field of view of the person and how this might affect their functioning.

You look for severe constrictions that might affect orientation and mobility and scotomas that may interfere with near tasks or the use of low vision aids (LVAs).

For most people, confrontation fields, performed monocularly with a large target, plus Amsler grid testing, will suffice. Perimetry should be used with patients who show peripheral restrictions with confrontation or who have pathology known to cause visual field loss.

For peripheral visual fields in low vision a kinetic perimeter (namely, Goldmann perimeter, arc perimetry or Bjerrum screen) using III4e targets is best. However, few services have these. If the visual field equipment you have does not have a peripheral visual field strategy then a central plot plus careful recording of confrontation fields will usually suffice.

Whatever the perimeter you have you may need to adapt the fixation target to one that the person can see and turn the fixation monitoring off. Patients should be allowed to adopt eccentric fixation as long as fixation is fairly static. If the concern for the patient is one of difficulty with mobility, binocular visual fields may be all that is required.

Referral for mobility training should be considered when the patient reports problems getting about, regardless of visual field defect.

Amsler

Although essentially a visual field test, in a low vision context the Amsler grid warrants a category on its own. Amsler grid testing can give useful information about the size and location of central

TABLE 3. Pelli-Robson chart contrast threshold values (from Brilliant, 1999)³

Level of function	Contrast threshold	Chart letters (triplets)	Contrast threshold
Severe loss consider non-optical devices	99 per cent	Top line left Top line right	63 per cent
	44 per cent	Second line left Second line right	31 per cent
Significant loss requires contrast enhancement	22 per cent	Third line left Third line right	15 per cent
	11 per cent	Fourth line left Fourth line right	7.8 per cent
Noticeable loss	5.6 per cent	Fifth line left Fifth line right	3.9 per cent
	2.8 per cent	Sixth line left Sixth line right	1.9 per cent
Normal	1.4 per cent	Seventh line left Seventh line right	1.0 per cent
	0.7 per cent	Eighth line left Eighth line right	0.5 per cent

MULTIPLE-CHOICE QUESTIONS

1 Which statement about Snellen charts is false?

- A There are unequal increments between each line
- B There are different numbers of letters on each line
- C The letters are of equal legibility
- D There are very few letters at lower levels of acuity

2 Which statement about LogMar distance charts is false?

- A Every row has five letters
- B Letters are of equal legibility
- C There is uniform progression of letter sizes
- D The end point is a whole line of letters

3 Which statement about near acuity threshold is false?

- A It correlates better with distance visual acuity than traditional near reading acuity
- B The Bailey-Lovie near chart can be used to measure near acuity threshold
- C Near acuity threshold can be used to evaluate acuity reserves
- D Charts used to measure near acuity threshold have sentences of text

4 Which piece of equipment is not recommended when refracting a low vision patient?

- A + /- 0.75 and + /-1.00 cross cyls
- B Projections charts
- C Halberg clips
- D Retinoscopes

5 Which of the following techniques is most often used to check the end point when refracting a low vision patient?

- A A pin hole
- B A +1.00 blur test
- C Duochrome
- D Humphries immediate contrast

6 Which of the following is the least important to find out about one of your low vision patients?

- A What social activities they attend
- B How they manage to dress themselves
- C How they manage taking medication
- D How they manage to prepare food

7 Which of the following is not a use for contrast sensitivity in low vision practice?

- A To determine how well the person functions in the real world
- B To direct advice about contrast changes in the home
- C To detect ocular pathology
- D To provide information about when to refer someone with a cataract

8 Which piece of visual field equipment is least useful in low vision work?

- A An automated central 50-degree screener
- B An Amsler grid
- C A Bjerrum screen
- D A Goldman perimeter

9 Which statement is true about the Pelli-Robson chart?

- A It is used to give an accurate measure of visual acuity
- B In low vision work you start by using it at 2m
- C It is used to measure contrast sensitivity
- D Triplets of letters increase in contrast as you go down the chart

10 Which of the following diseases is associated with a primarily hyperopic refractive error shift?

- A Down's
- B Poorly controlled diabetes
- C Cerebral palsy
- D Nucleosclerotic cataract

11 A patient reads the top 1.0 line of a 4m logMAR chart at 1m using the distance Rx +3.75/-0.50 x 180. What might be a sensible final Rx to prescribe?

- A +3.75/-0.50 x 180
- B +4.75/-0.50 x 180
- C +4.00/-0.50 x 180
- D +3.50DS

12 What might the acuity be recorded as?

- A 1.0
- B 1.3
- C 1.6
- D 1.02

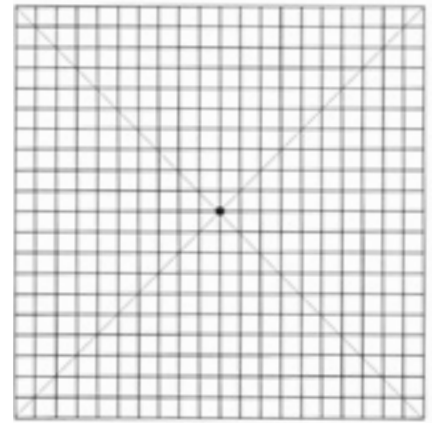


FIGURE 6. Amsler chart for central scotomas

scotoma or distortion. As with visual field testing in low vision work, in general, it is used to aid an understanding of the person's functioning. Most low vision patients will not be able to see the central fixation dot on the standard chart. The chart with intersecting lines that form a cross at the centre will help maintain fixation (Figure 6).

A vague response or a result that conflicts with ophthalmoscopy is not uncommon. Many scenarios, such as a very large central scotoma or unstable fixation, can make it difficult for the person to give a concise description using an Amsler grid. This in itself can provide useful clues about the person's awareness or their visual loss and use of residual vision.

Colour vision

Although colour vision is affected in a large number of people with low vision, it is not often assessed during a low vision assessment. This is mainly because there is not much that can be done to improve it. It is most commonly assessed in children and people of working age for whom teaching and work practice may need to be adapted.

References

- 1 Bailey IL and Lovie JE. New design principles for visual acuity letter charts. *Am J Optom Physiol Opt*, 1976; 53: 740- 745.
- 2 Bailey IL and Lovie JE. The design and use of a new near- vision chart. *Am J Optom Physiol Opt*, 1980; 57: 378- 387.
- 3 Brilliant, R. L. *Essentials of Low Vision Practice*. Butterworth-Heinemann 1999.
- 4 Whittaker SG and Lovie-Kitchin J. Visual requirements for reading. *Optom Vis Sci*, 1993; 70: 54- 65
- 5 Pelli DG, Robson JG and Wilkins AJ. The design of a new letter chart for measuring contrast sensitivity. *Clin Vis Sci*, 1988; 2: 187- 199.
- 6 Reeves B. The Pelli-Robson Low Contrast Letter Chart. *OPTICIAN*, 1991; 15 Marc: 18- 27.

◆ *Barbara Ryan and Tom Margrain work at the School of Optometry and Vision Sciences, Cardiff University*

The deadline for responses is Thursday, December 8, 2005

Module C2263 To take part in this CET module go to www.opticianonline.net and click on the Continuing Education section. Online participation allows participants to have an instant decision of success. Successful participation in each module of this series counts as two credits towards the GOC CET scheme administered by Vantage and one credit towards the Association of Optometrists Ireland's scheme.

