



## LOW VISION AIDS

### KEYWORDS

low vision aids

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**ABSTRACT** *A low vision aid is any non-visual device that enables the low vision patient to improve performance. A good knowledge of available tools and a thorough history to find out the daily needs and function ease the lifestyle for the people with low vision.*

A person with low vision is one who has an impairment of visual function for whom full remediation is not possible by conventional spectacles, contact lenses or medical intervention and which causes restriction in that person's everyday life.

The World Health Organisation defines low vision as visual acuity of less than 6/18, but equal to or better than 3/60 in the better eye with best possible correction<sup>1</sup>.

The patient's visual needs and wishes should be discussed and practical problems considered. A child who travels to school alone may have to read bus numbers and information signs then cope with different visual demands in the classroom. An elderly patient, living alone, may have to read medicine labels or food packets. Personal history of patient should be taken like reading, cooking, mobility & communication. Ask for any ocular symptoms e.g. glare, light and dark adaptation.

#### Assessment of visual function

**Distance and near visual acuity** - Traditional Snellen charts are not recommended for assessing low vision patients, because there are very few letters at low acuity levels and increments between lines are largest at poorer levels of acuity. Letters on lower lines are also more 'crowded' than those at the top, causing a variation in the task difficulty.

LogMAR Distance Visual Acuity Charts are very much more useful within the low vision context<sup>2</sup>. Every row has five letters, which is psychologically better for people with poor acuity as they will probably be able to read five letters if the chart is brought sufficiently close. The separation between each letter and each row is standardised and related to the size of letters. There is no variation in 'crowding' and results are legitimate at any distance. There is also uniform progression of letter sizes, increasing in a constant ratio of x1.25 or 0.1 log unit steps.

Traditional near charts do not have sufficiently large text for many low vision patients. Near acuity threshold charts have been developed with the needs of the low vision patient in mind. For example, the Bailey-Lovie near chart<sup>3</sup> incorporates print from N80 to N2.5.

**Contrast sensitivity** - The Pelli-Robson letter chart is easily understood and produces clinical results which are easy to interpret<sup>4</sup>.

**Visual fields** - Visual field testing in a patient with low vision can provide an understanding of functional visual problems. For example, orientation and mobility is most affected by overall constrictions to the visual field or by inferior or central scotomas<sup>5</sup>; hemianopias and central scotomas interfere with reading tasks.

**Amsler Grid** - It gives useful information in a small number of patients who are able to describe the size and location of a central scotoma or distortion.

There are four basic methods of providing magnification, all of which can be demonstrated or recommended in an optometric setting.

#### Relative size magnification

A linear relationship by doubling the size of the object makes the image on the retina twice as large, creating 2X magnification. This form of magnification is usually limited to about 2.5X because of the physical limitations of enlarging any object. Examples of this type of magnification are large print books, watches or timers.

#### Relative distance magnification

A linear relationship halves the distance of the object and the retinal 2X magnification. For example, watching the television from 2m rather than 4m gives 2X magnification. This type of magnification can also be used for near work, e.g. bringing print closer to the eye from 40cm to 10cm gives 4X magnification. Children and young adults can use accommodation to provide this form of magnification,

mainly for short duration near work. Myopic individuals who take off their glasses can achieve some magnification without accommodation.

### Convex (plus) lens magnification

A convex lens provides magnification by allowing the person a closer viewing distance. When the convex lens is placed so that the object viewed is at the anterior focal point of the lens, the object is focused clearly on the retina and accommodation can be relaxed. Most magnifiers work on this simple principle. It can be close to the eye, in a spectacle lens, or remote from it, in a hand or stand magnifier.

### Limitations of lens magnifiers

- **Field of view:** Patients ask for larger magnifiers, hoping that this will increase their field of view. However, as the power of a magnifier increases, the diameter of the lens decreases, due to the weight of the lens and physical constraints in manufacturing. Instead, they should be encouraged to hold the magnifier as close as possible to the eye, thereby increasing the field of view.
- **Short working distance:** Although the distance from the eye to the magnifier can be varied, the distance from the magnifier to the object is often very short, especially with stronger magnification. This makes it difficult to place implements such as a pen or screwdriver under stronger magnifiers, and directing adequate light on to the object can be problematic.

### Hand magnifiers

Hand magnifiers are useful for routine tasks such as looking at packets or fine details. Most people find them socially acceptable and they are easy to carry in a pocket or handbag. There are countless designs available at low cost in a wide range of powers, and many are internally illuminated. People with tremors or grip problems may, however, find them impossible to use.

### Stand magnifiers

Stand magnifiers allow the maintenance of a precise magnifier-to-object distance, which is advantageous because of the small depth of focus of plus lens magnifiers. This means they are particularly useful for sustained tasks or where there are physical difficulties, such as tremor. The most commonly prescribed stand magnifiers are internally illuminated because the stand can obstruct light from getting to the object. Some lower-powered stand magnifiers allow tools, such as a pen, to be used. The disadvantage is that they are very bulky.

### Spectacle-mounted plus lens magnifiers

The best optical solution to the difficulties of plus lens magnifiers is to mount them in spectacles. This gives the best magnification and greatest field. For people who are able to accept shorter working distances, spectacle-mounted plus lenses are sometimes tolerated because they give the best magnification and field of view, and allow their hands to be free. Spectacle-mounted low vision aids can be prescribed monocular or binocular if prisms are incorporated to help convergence. Over +10D, the person is unlikely to maintain binocularity. As well as providing magnification, some allow for the correction of refractive errors; high powered bifocal near additions are also available.

### Real image magnification

Optical magnifying systems are limited to a magnification of about 20X. Real image magnification produced elec-

tronically is available in much larger magnifications of 50X and over.

### Closed circuit televisions (CCTVs)

These produce real image magnification electronically using a camera to create a magnified image on a monitor screen. They are usually used for near or intermediate tasks. In theory, CCTVs should be the solution to all the frustrations of low vision aid users. They can produce high degrees of magnification, contrast reversal and enhancement, zoom facilities and binocularity of the image with none of the postural difficulties of many other magnifiers. In practice, however, they are expensive, quite difficult to use and often bulky. Only a small proportion of the low vision population use CCTV, and most do so for longer, sustained reading tasks while they use optical low vision aids for short, survival tasks. The magnification is limited, often fixed at one value and dependent on the size of the television screen.

### Flat field magnifiers

These are single lenses of hemi-cylindrical or hemispherical form, designed to be put flat onto the text. The thicker the magnifier is in relation to its radius of curvature, the higher its magnification. This is unlikely to exceed 3X because of size and weight. Flat field magnifiers are very useful for children with a visual impairment as they look like a paper weight or 'crystal ball'.

### Angular (or telescopic) magnification

Telescopes and binoculars are very effective in producing magnification for distance, while allowing the person to stay at their chosen distance from a task, such as viewing a street sign or blackboard. They can also be used for near tasks. Their main disadvantage is restricted field of view. Also, distortion of space and movement perception prohibits walking around while using the telescope. Their use requires considerable skill and practice, particularly to follow moving objects.

### Other Measures to support daily activities

#### Reducing Glare

**Visors and shields** - Visors and shields protect from glare sources while not obstructing the rays of light from the object being viewed. Patients may wear sports peaks or a hat with a brim. Side shields are also useful if permanently attached to spectacles.

**Tints** - Prescribing tints for people with low vision is not easy. Many patients ask for a dark tint because they find bright lights outside distressing. However, the same people often need more light for near tasks and getting about safely. For most, the best solution is a cheap plano sun spectacle or overspectacle that has side and top shields and can be removed or put on quickly.

The patient should be given the opportunity to choose the depth of a neutral density tint they like best – it may be helpful if they try different tints while walking around outside. To reduce disability glare, and hence improve the retinal image contrast, a tint needs to absorb the light scattered in the eye, whilst ensuring un-scattered light is same.

**Typoscopes** - A typoscope is a rectangular black card with a central slit. In some cases reflected light from page acts as a glare source, and is scattered in the eye thus reducing the contrast of the retinal image. A typoscope reduces the amount of light from the background, reduces scatter and thus increases the retinal image contrast.

### Hearing and Touch

Many items are available which use sound and texture to assist people with a visual impairment with daily living tasks. These include:

- A liquid level indicator, which beeps, so that cups or jugs are not over-filled.
- Audio-described videos and DVDs, which are now available in many popular books. The story is narrated over the original film.
- Talking microwaves, clocks, watches, thermometers and scales. Games with tactile counters, boards and cards.
- Bump-ons which can be used to mark dials on appliances so that positions can be seen and felt.

People may benefit from training which maximises the usefulness of low vision aids and daily life. Some rehabilitation workers are trained to provide low vision therapy, which may take place outdoors with distance aids or in the person's home environment.

Many people can learn to make better use of their low vision and can function efficiently with only small amounts of visual information. Essentially,

- **Effective use of residual vision** by teaching the patient visual skills such as eccentric viewing, tracking, scanning and pursuit movements.

- **Use of prescribed devices** especially telescopes and magnifiers.

The final advice and prescription need to conform to the client's needs, and should be culturally appropriate, affordable and accessible.

### REFERENCE

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