

# Role of Low Vision Devices in Childhood Blindness

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Low vision optical devices include a variety of gadgets, for example, stand and hand-held magnifiers, strong magnifying reading glasses, loupes, and small telescopes. Since these devices can significantly increase magnification power and prescription strengths, alongside higher-quality optics, they are different from regular spectacles

and commercially available magnifiers. Low-vision devices are designed to improve visual execution in children with low vision, in this way empowering scholarly and social adjustment and giving advancement of day by day encounters. They can be optical or optical and electronic.

## Optical Aids for Distance and Intermediate Distance

The telescopic system (TS) or telescope is an optical instrument that improves the resolution of an object by increasing the size of the image projected on the retina, making it closer. It is available for far, near, and middle distances

A telescope enables greater participation in daily and social activities such as watching television and reading whiteboards, street signs, house numbers, billboards, et cetera. However, its disadvantages are restriction of visual field and illumination, difficulty in locating and focusing on objects quickly, and limited focus depth, cost, difficulty in using the devices, and aesthetic considerations limit its use.

## Galilean Telescope

The Galilean telescope is a simple system consisting of 2 lenses, an objective lens which is a convex (plus) lens, close to the object and an ocular lens which is a minus lens, positioned near the eyes.

The difference in their focal lengths determines the distance between the two lenses. The image produced is real and erect. It is lighter, shorter, and cheaper than the Keplerian type, thus the first-choice prescription for children. It is also the first choice in cases of peripheral field loss; in these cases, the lens order is designed in reverse (plus lens closer to the eye), providing a wider visual field.

## Keplerian Telescope

Also known as astronomical or prismatic telescope, the Keplerian telescope is an optical system that uses two convex (plus) lenses, the objective lens of lesser dioptric power than the ocular. The distance between the two lenses is the sum of their focal lengths. The image formed is real and inverted and needs a prism to reverse the image, thus making it longer and more cumbersome. It produces greater visual field and better optical quality than Galilean telescope.

## Hand-Held, Spectacle-Mounted, or Clip-On Telescope

A hand-held telescope is simple to use, lighter, and cheaper than the Galilean and Keplerian telescopes. It is particularly indicated for short activities and could be the first prescription choice for children.

A spectacle-mounted telescope has the advantage of leaving the hands free. It is helpful for prolonged activities. However, they both weigh and cost more.

The clip-on model has the advantages of both: It is lighter than the spectacle-mounted model. However, it can scratch the lenses and reduce the visual field to further distances.

## Monocular or Binocular

A monocular telescope is better suited when there is a significant difference in visual acuity (VA) between the two eyes. It is more discreet, lighter, and cheaper. It may be used in the dominant or better-seeing eye. The binocular telescope is suitable when there is similar visual acuity in both eyes, to increase the visual field, and for nystagmus. The binocular style both weighs and costs more than monocular

## Fixed-Focus, Focusable, or Autofocus Telescope

A fixed-focus telescope is suitable for children with poor motor coordination. Nowadays it is rarely prescribed; a focusable telescope reaches far, near, and intermediate distance and is preferred for and by children. The autofocus telescope both weighs and costs more, and it does not constitute the first choice prescription for children.

## Optical Aids for Near Tasks

Children often do not complain about their difficulty with near work. With adequate accommodation by getting closer for the small print, they can read without a problem. However, as

school activities get more sophisticated and the fonts of reading material get smaller, more magnification is required, and objects are brought too close, making reading more fatiguing. When and if this becomes an issue, near aids can be beneficial.

#### Near low-vision aids:

- High-plus spectacles (microscopes)
- Hand-held magnifier
- Stand magnifier
- Telescope system for near (telemicroscope)

#### High-Plus Spectacles (Microscopes)

High-plus spectacles are convex (plus) lenses mounted in a spectacle frame. They provide maximum magnification when objects are positioned at or near the focal distance of the lens, producing parallel rays and the image forming at optical infinity

Its advantages are that it's hands-free, requires no additional training, greater visual field, comfortable for prolonged reading, and can be used alongside other aids

Disadvantages include Fixed optical center makes adaptation on peripheral vision difficult, reduces the visual field in high-power lenses and obstructs light at closer distances and are often not well-accepted in children with sufficient accommodation; however, it is a good option for patients with aphakia or pseudophakia.

#### Hand-Held Magnifier

Hand-held magnifiers are either convex (plus), convex sphere, or aspheric lenses with a handle that allows them to be held in various positions. They increase the size of a retinal image and bring the image into focus, producing a virtual and erect image located in a distance greater than the focal length of the lens. Hand-held magnifiers provide maximum magnification when an object is standing at or close to its focal distance, producing parallel rays and the image forming at infinity optically

#### Nonoptical

Non-optical aids are visual aids that do not use magnifying lenses to improve visual function. They can improve the other visual aid's function or even replace optical aids. They enhance visual function by

- Linear magnification
- Lighting control
- Enhanced contrast
- Reduction of glare

#### Benefits of low-vision aids

The prescription of low-vision devices gives the child

- Self-dependence
- Better adaptation to the daily activities materials
- Exposure to enriching experiences
- It constitutes an important factor for socioeconomic and cultural integration

#### When to Prescribe?

Optical aids for near vision is used when the reduction of the distance between the object and the eye does not allow the necessary range or when the accommodative effort is too large.

At school age, with visual acuity up to 20/200 (6/60), reducing the distance between the object and the eye is recommended until the second grade. From this stage, a stand magnifier or a hand magnifier is used for reading small-print books such as dictionaries.

For VA less than 20/200 (6/60) (0.1 logMar), optic aids should be prescribed earlier. If the VA is less than 20/400 (3/60) and the central scotoma greater than 30 degrees, a video magnifier is suitable.

For VA equal to or less than 20/1200 (1/60) aids such as Braille and computer sound systems should be included, with or without other resources. Orientation and mobility techniques should be encouraged at all low vision levels.

