LOW VISION DEVICES FOR CHILDREN

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AIMS

This module aims to outline the low vision devices used for children via developing an understanding of:

- the range of devices available
- special considerations for prescribing low vision devices to children
- improving success of low vision devices with a team approach

LEARNING OUTCOMES

After completing this module, students should be able to:

- recognise the importance of early detection in cases of low vision in children
- list the range of most common low vision devices available
- describe important factors for successfully prescribing low vision devices
- describe what a team approach to prescribing low vision devices involves

INTRODUCTION

Children with low vision can have their visual function enhanced by environmental modification, use of optical and non-optical low vision devices, and necessary adaptation of any curriculum. However, the majority of children with low vision do not have access to low vision care and are often taught with tactile methods, ignoring the presence of residual vision.

According to various surveys carried out in schools for the blind, over 50% of children can be taught with sighted techniques if provided with appropriate low vision devices and training. The key constraints to provision of low vision care to children are:

- absence/lack of low vision services in many countries
- unavailability of suitable low vision devices for children and
- lack of coordination between education, rehabilitation and clinical services.

IMPORTANCE OF EARLY DETECTION OF LOW VISION

It is important to detect the presence of low vision as early as possible and to intervene with appropriate low vision devices (LVD).

Some congenital conditions such as cataract, nystagmus, albinism, etc. have obvious signs and symptoms for early identification of low vision children, and pre-school and school vision screening programs for children aged 2 to 5 years help to detect children with low vision.[1] However, in many countries it is difficult to set up programs for screening preschool children as there is a requirement for significant resources and trained personnel.

In preschool children, the focus is more on developing cognitive skills, vision stimulation and creating an environment which encourages the child to use his or her residual vision. In low-income settings, the use of low vision devices in this age group is very limited, however, it is important to remember that the earlier a child is exposed to the use of devices, the better adapted they would be to cope with these in the future.

Early intervention with LVDs not only helps the child with low vision to develop skills for successful use of LVDs, it also helps the child build confidence and not feel socially awkward in using LVDs as they grow up. It may also strengthen their visual ability by reducing visual deprivation at an early stage, and provide them with enriched and more accurate visual information for a better learning experience.

MOST COMMON TYPES OF LOW VISION DEVICES

Most children with low vision can significantly increase their near visual acuity by employing their strong ability to focus on nearby objects (accommodation). Children with low vision normally achieve the required magnification by the 'approach method', i.e. by moving their eyes closer to the object of interest to see more detail. The magnification gained in this way is called relative distance magnification.

Children who cannot see near objects well enough will need some type of magnifier.

Children accept LVDs more readily than adults and with a higher success rate.[4] The average number of LVDs prescribed per LV child varies from 1.3 to 2.3[4,5].

There are three types of LVDs:

- optical LVDs such as spectacles, magnifiers and telescopes
- non-optical LVDs such as lamps with control of direction of light projection, and
- electronic devices such as closed-circuit televisions (CCTV) with brightness and contrast enhancement controls.
    - Also, tablets and phones usually offer inbuilt accessibility features including zoom (enlargement) and speech output
    - These features can improve quality of students' access to text, worksheets, the internet, GPS, interactive whiteboards, etc.

Optical LVDs are the most commonly used by children with low vision as they have many different designs to suit different application purposes, and are small, portable, relatively economical, and easily available. When properly prescribed and with training, optical LVDs can significantly enhance the visual abilities of children with low vision in their daily living and learning tasks, allowing them to receive education in mainstream schools with their sighted peers.

Appropriate magnification systems should be determined for the patient with low vision. Based on the needs of the patient, magnification may be required for near or distance visual acuity improvement, or both. The required level of magnification is usually task-specific, in other words, it may vary for different activities.

Table 1 lists the types of optical LVDs most commonly used by LV children, and their pros and cons.

Table 1. Common LVDs used by children with low vision

Types of LVDs	Pros	Cons
Extra-short focus Monocular Telescope	• Can magnify target located at about 30cm to infinity from the user with simple manipulation • Spectacle-mounted or binocular designs are available • Can easily be modified to become a near telescope to provide longer working distance than spectacle magnifier for near	• Needs training to familiarize with the focus control and target searching technique • Occupies one or both hands • Needs good eye-hand coordination to find and track targets especially moving ones
Single-vision Spectacle Magnifier	• Large field of view • Stable image • Both hands free	• Fixed magnification and viewing distance • Short viewing and working distance
Hand-held Magnifier	• Variable field of view and magnification • Easily available and portable • Large range of magnification and strong powers are available • Can have built-in illumination	• Occupies one hand • Requires steady hand and good eye-hand coordination especially for high magnification
Stand Magnifier	• Large range of magnification and strong powers are available • Stable image and field of view • Easy to handle and use for beginner • Can have battery handle with light bulb to illuminate the target	• Occupies one hand • Relatively bulky in size • Fixed magnification except for those with adjustable height of stand • Requires a smooth surface for resting the stand
Dome Magnifier	• Special stand magnifier that can double the magnification for those who use relative distance magnification, spectacle and hand-held magnifiers • Easy to use	• Only 1.8x magnification • Relatively heavy

Other non-optical LVDs such as sun hat and light absorptive filters that reduce glare and improve contrast are also important.

Some disadvantages of optical LVDs can be compensated for by the use of non-optical devices such as table lamps and tables with an adjustable tilt (to improve the level of illumination and poor posture caused by short viewing distance and bending of body and neck over the table).

Less common in low-resource settings, but growing in importance, are both traditional CCTVs and more portable hand-held optical devices, which are becoming more economical and are now readily available. They provide a large

viewing area, more comfortable viewing distance and higher magnification than most optical magnifiers, and manipulation of the contrast and brightness of the image.

SPECIAL CONSIDERATIONS FOR PRESCRIBING LOW VISION DEVICES TO CHILDREN

Special considerations should be given to some characteristics of children with low vision. For example, there is often a tendency to use relative distance magnification or the approach method, i.e. move their eyes closer to the object of interest to see more details. The close working distance together with their short and flexible limbs make them favour the use of spectacle magnifier that can provide a large field of view while relieving eyestrain to prolong the viewing time. This can be in contrast to adults with acquired low vision, who may resist putting reading materials close to their faces.

The hand-held (HH) magnifier is also favoured by children with low vision[2] for its accessibility, variable magnifications and availability of strong powers for very small targets. Another favourite of children with low vision is the dome magnifier which is available up to a 1.8x magnification.

Knowing the properties of different LVDs provides the flexibility to combine them to improve the visual performance of LV children. For example, hand-held and dome magnifiers can be used in conjunction with a spectacle magnifier without the need to reduce the viewing distance. Another example is to use a spectacle magnifier for writing at intermediate distance and to apply the hand-held magnifier in front of the spectacle magnifier when there is a need to see very small targets such as dictionary print. For those with very poor visual acuity and limited experience with LVDs, a high power stand magnifier with stable view and internal light source to illuminate the target is a good alternative.

Many children with low vision are fond of using extra-short focus monocular telescope which can conveniently bring the image of distance object many times closer. A 4x telescope can make what is 20m away appear to be seen at 5m, and an 8x telescope can shorten the distance further to 2.5m. It can save time and effort for a child with low vision from having to walk 17.5m to the target in order to study it. A telescope offers obvious advantages to children in many daily activities: to see writing on the blackboard, identify signs and bus numbers on the streets, etc. However, the increased magnification comes at the cost of reduced field-of-view.

There are near telescopes that can lengthen the near working distance to more than double that of a spectacle magnifier of the same power to accommodate tasks that require more space between the eye and the target. However, the use of telescopes for near tasks is often not very effective and children often find it difficult to handle and use these telescopes.

Most children with low vision, especially those with retinitis pigmentosa and maculopathy, need more than average illumination.[3] LVDs with internal illumination and a desk lamp would be good choices for these children. Children with media opacities such as cataracts and corneal scarring are sensitive to glare. Special absorptive filters, preferably with side shields, are useful for filtering scattered and glare-producing light. Caps and hats are also advised for their outdoor activities.

IMPORTANT FACTORS FOR SUCCESSFULLY PRESCRIBING LOW VISION DEVICES

The successful prescription of LVDs for any child with low vision is dependent on good knowledge of the child's case history, diagnosis and prognosis for their eye disease and evaluation of task demands.

The use of age- and cognitive-appropriate techniques is required to obtain detailed information of the child's refractive errors, visual abilities such as visual acuity, visual field, amplitude of accommodation, contrast sensitivity, light adaptation ability, etc. A practitioner's good understanding of the functions and features of the various LVDs, and how to select and apply the most appropriate LVDs, is required for the child to accomplish their visual task.

TRAINING IN THE USE OF LVDS

Training in correct use of the devices is critical. The following issues should be addressed, as required, during the initial and subsequent training sessions:

- Name and type of optical device
- Advantages and limitations of device
- Most efficient use of optical devices
- Use of the device for target activities
- Care and maintenance of optical systems (such as changing batteries and bulbs)
- Any safety considerations

Home trial of LVDs is necessary and should be arranged immediately after the assessment. Before taking the device home, the patient should be able to use it adequately.

Children are advised to attend their first follow-up visit one or two months after the initial assessment, so they can have enough time to try the initial LVDs at home and at school. As visual requirements change with age, children are recommended to attend follow-up visits every three to six months, including those who have rejected LVDs at initial visits.

IMPROVING SUCCESS OF LOW VISION DEVICES WITH A TEAM APPROACH

INVOLVING PARENTS AND TEACHERS

Good communication with parents and teachers is important in maximizing the success rate of LVDs used by children with low vision. Parents and teachers should be encouraged to note any unsatisfactory performance of the children in using LVDs and any complaints made by the children when they use LVDs, especially during their first home trial:

- Head and neck pain after using LVDs for long period
- Difficult in finding the image and small field of view of the LVDs
- LVDs casting shadows on print
- Unusually close reading distance
- No improvement in viewing posture and/or reduction in frequency of fatigue

The information collected should be examined in the follow-up assessment for the practitioner to provide appropriate recommendations.

OTHER SERVICES

Care for children with low vision should also involve other groups, such as eye hospitals, schools, and community programs. This care should be comprehensive (i.e. structured and integrated).

In addition to these services, there may be other beneficial resources for evaluation, education, training, assistance, and support, or other tools available.

Referral for services might include, as appropriate:

- Visual rehabilitation services
- Vocational rehabilitation services
- Educational services
- Orientation and mobility services
- Occupational therapy
- Counselling services
- Technology evaluation for computer software and hardware needs and other assistive technology
- Additional medical or ocular services.

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