BrienHoldenVisionInstitute

LOW VISION MANAGEMENT IN CHILDREN WITH MULTIPLE DISABILITIES

AUTHOR

Barbara Chow

PEER REVIEWER

Kia Eldred

CHAPTER CONTENTS

INTRODUCTION 2
VISION ASSESSMENT IN CHILDREN WITH MULTIPLE DISABILITIES 2
LOW VISION DEVICE DEMONSTRATION 7
POST-ASSESSMENT MANAGEMENT 8
CONCLUSION 9

AIMS

This module aims to outline the low vision assessment and management of children with multiple disabilities via developing the following:

- Understanding of the impact of disabilities on vision
- Systematic approach to selecting the most appropriate testing procedures
- Protocol for implementing low vision services to children with multiple disabilities
- Need for an evaluation providing functional information

LEARNING OUTCOMES

After completing this module, students should be able to:

- Recognise the importance of modifying the examination procedure in cases of low vision in children with multiple disabilities
- Match the visual need with the most appropriate low vision device available
- Choose the most appropriate setting in which to demonstrate the low vision devices
- Successfully involve parents and teachers in the visual rehabilitation of the child
- Educate parents and teachers regarding functional information on vision.

INTRODUCTION

Vision assessment is important early in life, because the sense of vision develops rapidly and most visual functions reach a near-mature level by age one year. Visual deprivation during this time can potentially cause permanent underdevelopment of visual function at the cortical level. In addition, vision is the sense that provides the most quantitative and diverse information for learning among all the senses. It was found that children with visual disabilities alone had greater prevalence of learning disabilities, and it can be predicted that learning would be further affected in children with other additional disabilities.

Maximising visual development has a positive influence on children's learning potentials. This is why it is important to have prompt visual assessment and appropriate management early in life. However, visual problems of children with multiple disabilities might be easily overlooked. Reasons for that include:

- Presence of other systemic conditions that are more severe and require more urgent or intensive medical attention
- Assumption by caretakers and/or medical professionals that visual demand is limited due to observation of little visual interaction to the surroundings because of their intellectual and/or attention deficits
- Children unable to express their visual difficulties
- Physical difficulty in transportation of children to site of examination
- History of failure in obtaining meaningful results in previous vision examination due to cooperation problems and lack of understanding
- No access to eye care professionals specialised in examining children with special needs.

As visual information in the habitual surroundings is usually rapid, numerous and complex, children with lower overall ability may not be able to cope with the overwhelming signals, resulting in disuse of this sense. However, through appropriate step-by-step training programs, the habit in the use of vision awareness may be established in these children. But before a program can be designed, we first need to understand the children's existing visual ability and their mode of vision use.

VISION ASSESSMENT IN CHILDREN WITH MULTIPLE DISABILITIES

Children with multiple disabilities may present with more than one or any combination of the following disabilities: vision, hearing, motor, communication, behavioural and intellectual problems. Accurate diagnoses may be difficult when conventional vision tests are applied to these children. In fact, many parents felt confused with the inconclusive or negative results from their previous eye care professionals and stop bringing their children to have follow-up eye examinations. Special modification to the assessment method and tools can sometimes help to gain more meaningful results.

MODIFICATION OF THE CLINICAL EXAMINATION

If possible, conventional standard clinical tests should always be the first choice of assessment. Modified tests should only be used if the examiner observed that the child did not have the cognitive ability to understand or perform the test, or when there seemed to be great discrepancies between visual capability observed in daily living and results obtained from standard clinical tests.

The principle of modification is to make the test as close to a clinical standard as possible (or closest to threshold level of visual acuity), in which the child would be capable and willing to give the most consistent response. Sometimes daily living elements, such as food and toys can be incorporated into the assessment.

It is best that the modified tests be recorded as quantifiable data, so that results can be compared at a later time. For results that cannot be quantified, it is necessary to record a detailed description of the test modification and the visual behaviour observed. It is important to note that any modification means the results cannot be directly comparable to those done using a clinical standard test. Though the aim of modification is to yield more representative results and consistent responses, due to the limitation of the child's disabilities, variable and underestimated results are still possible.

To maximise results that could most reflect the child's true visual ability, a clinical examination might need to be modified in different aspects. Let us put these modifications into the 5-question perspective: who, what, how, when and where?

WHO?

The first questions we need to ask is, "who should be involved in the examination?" Except for the child and the examiner, it is best that people who work closely with the child in daily living attend or provide information for the examination. These include one or a combination of: parents; caretakers; teachers and therapists from the school. They can provide valuable information about the child to help in understanding the child's vision and to facilitate effective communication and cooperation with the child within the time constraints of the relatively short examination time.

Their role includes:

- Providing information about the child's daily visual behaviours and habits, as well as detailed ophthalmological and medical history
- Providing security and comfort to the child and minimising emotional stress caused by performing tests that require a high level of concentration, facing unfamiliar examiners, and being surrounded by an unfamiliar environment
- Helping provide more effective communication between the child and examiner, translating immature verbal language, body language and behavioural changes (e.g. breathing sound change)
- After the examination, communicating with the examiner regarding the recommendations that can be implemented into the daily lifestyle for better disability adaptation or to work out a more comprehensive training plan for potential improvement. The latter is of particular importance with teachers, nurses and therapists from the school.

WHAT AND HOW?

An assessment requires that the child give a response upon presentation of visual targets. The questions we need to answer are what tools should we use and administer? As capabilities can differ greatly among children with multiple disabilities, a variety of difficulty levels ranging from standard clinical test to objective testing methods that require minimal patient responses should be included. Especially when working with those with short attention span, utilizing tests which are rapid and rewards (e.g. praise, cuddle and candies) may help to maximize cooperation.

Characteristics of a modified assessment tool design:

- Simple and easy to understand
- Portable
- Interesting
- Can test in a play situation
- Large range of target size for different ability range of children
- Preparing some tests that can be assessed by objective method or require minimal patient response

Figure 1: Some commercially available and homemade tools used in modified vision assessment

MODIFIED LOW VISION ASSESSMENT IN CHILDREN WITH MULTIPLE DISABILITIES

Except for history-taking and recommendations, a comprehensive low vision examination should include, but not be limited to the following clinical assessments:

DISTANCE AND NEAR VISUAL ACUITY

It is important to obtain a value for visual acuity during a vision assessment. Though other visual properties such as contrast sensitivity and visual field also contribute to the levels of visual disabilities, visual acuity is still the essential data universally recognized to compare and judge how well the patient can see. The ability of children with multiple disabilities can range from developmentally normal to no response, and the tests attempted should be in a sequence of descending difficulty. However, comparing data obtained by different methods can help identify the areas of the child's visual difficulties and this can provide useful information for the design of a potential vision training program.

Difficulty	Testing Method	Presentation of Optotype	Required Patient Response	Visual Target
Descending Order ↓	Recognition	Crowded	Optotype Naming	Letters
	Resolution	Line	Symbol Template Matching	Numbers
	Detection	Single	Target Grabbing	Symbols
			Target Tracking / Shift of Fixation	Ball (controlled colour & size)
				Toy / Candy (uncontrolled colour & size)
				Light

Table 1: Methods of testing visual acuity in descending order of difficulty

METHODS AND TOOLS USED FOR VISUAL ACUITY MEASUREMENT

Recognition

- LogMAR Chart (Letter, Number, Symbol; by naming or template matching)
- Single Optotype Presentation (Letter, Number, Symbol)

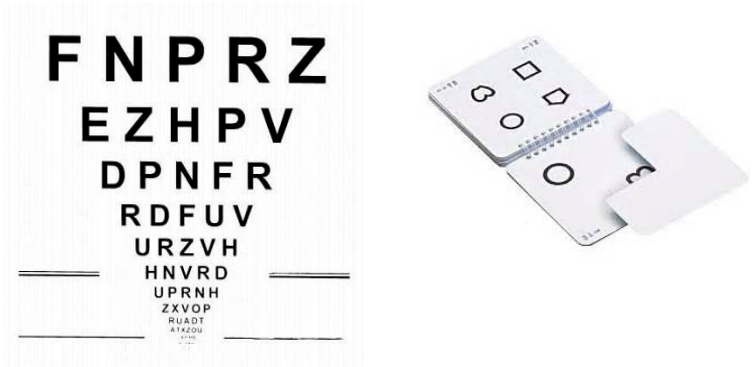

Figure 2: Recognition methods for testing visual acuity

Resolution

- E Chart
- Preferential Looking (Gratings)

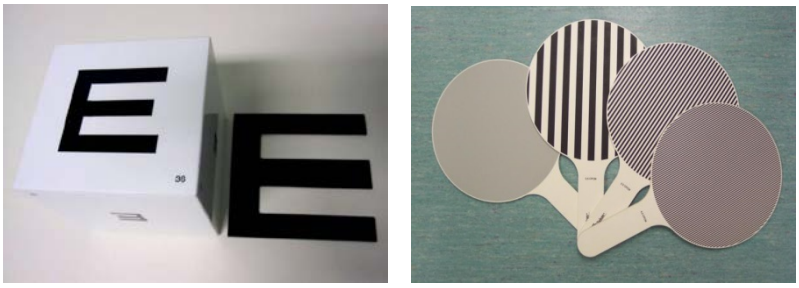

Figure 3: Resolution methods for testing visual acuity

Detection (Rolling ball, toys, lights, etc.)

- Grab and reach response
- Verbal response
- Observation of behavioural change (tracking, fixation, smile)

Figure 4: Detection methods for testing visual acuity

Due to the varying nature of visual acuity measurement with alternate methods, it has to be kept in mind that the data is not inter-convertible.

CONTRAST SENSITIVITY

Contrast sensitivity (CS) is an important piece of information to help assess visual difficulty for daily living. The same rules of modification apply as for visual acuity measurement; CS can be measured in the descending order of difficulty. Higher ability level tests include the Pelli-Robson Chart and the Lea CS Test (alphabets; numbers; symbols). The former uses only one testing distance of 1m, while the latter can be done in three different testing distances and allow a CS curve to be drawn. In children with greater disabilities, the Hiding Heidi CS Test can be used, it is a preferential looking test designed for CS measurement for non-verbal patients.

Figure 5: (left) Lea Symbol CS Test (right) Hiding Heidi CS Test

COLOUR VISION

The Ishihara Pseudo-isochromatic Plate Test can only detect red-green colour defects. Number or symbol naming, matching and finger tracing are the required responses. Colour arrangement tests such as the Farnsworth D15 and Precision Vision 16 Test (PV16) can check for any colour confusion including tritanopic colour deficiencies. The PV16 is similar to two sets of the Farnsworth D15 Test in a large block version, which was designed for low vision patients.

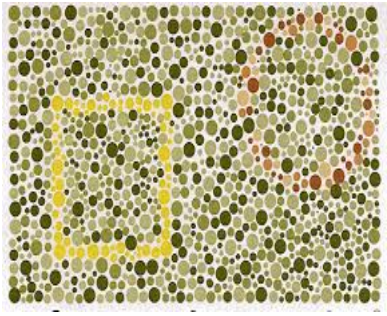

Figure 6: (left) Ishihara Pseudo-isochromatic Plate (Symbols) (right) Precision Vision 16 Colour Test

VISUAL FIELD

Visual field (VF) is an important vision property for navigation and target location. The visual field extent (isopter) is highly dependent on the property of the target and background. The current universal standard of visual field testing is with automated visual field analysers, which require a high level of understanding, attention, good maintenance of posture, and hand-eye coordination. Automated methods are often too challenging for most children with multiple disabilities.

Portable tools such as the hand-arc perimeter can be useful for children who cannot maintain their posture during testing. If visual field testing cannot be completed under a controlled background and target due to difficulty with fixation, then a play-like confrontation field using uncontrolled targets such as toys may yield better responses. Though it may not give rise to a quantitative plot of VF extent, it is useful to get a rough impression of the child's peripheral field awareness.

REFRACTIVE ERROR

As with typical patients, refractive error can first be measured by objective refraction techniques. Retinoscopy using a retinoscopy lens rack or trial lenses in a trial frame is preferable to auto-refraction, because the examiner can actively estimate the dynamic status of accommodation at the same time.

Cycloplegic refraction may be considered after assessment of accommodation to make a decision on the need for distance spectacles. Subjective refraction may be tried if possible. In cases where there is apprehension of the tests and inability of the practitioner to obtain useful results, examination under general anaesthesia may be necessary if significant refractive error is suspected.

BINOCULAR VISION AND OCULOMOTOR ASSESSMENT

Squint and oculomotor dysfunctions are common in children with multiple disabilities. Cover tests and ocular motility can be assessed using attractive targets. If fixation is unsatisfactory, the Hirschberg corneal reflex test may be used to assess for the presence of squint.

LOW VISION DEVICE DEMONSTRATION

The need for a low vision device depends on the child's visual demand. Those with the ability to read may benefit from the use of low vision devices. Motor control is a limitation to the use of many low vision devices. For those with motor impairment, we need to consider if they can hold the low vision device properly and smoothly move the device along a line of text, while maintaining the sight for reading. Therefore, some types of low vision devices are more appropriate than others:

- High addition spectacles with an adjustable tilt table/reading stand
- Dome magnifier
- Hand-held magnifier held by a clamp on an adjustable tilt table/reading stand
- CCTV for the high magnification

Figure 7: Magnifiers

WHEN?

Children with multiple disabilities may demonstrate fluctuation in performance when tested. The time of the examination is one of the crucial factors which may vary the results, and can increase attention levels and cooperation of the child.

Considerations of examination time include:

- Choose the time of the day with less fatigue (e.g. morning)
- Choose the time of the day with best mood
- Avoid long transportation time
- Avoid long waiting time

- Examiner should spend time to build up rapport with child before assessment
- Give a rest period between the tests

WHERE?

Children who are not yet used to using their sense of vision can be easily distracted by surrounding factors such as noise, overwhelming visual signals and emotions such as excitement and fear. It is best to complete the assessment in a controlled clinical setting for comparison with later test results, however if an unfamiliar environment causes poor cooperation and responses of the child, it may be worthwhile to change the location of examination to a familiar place (e.g. home or school). For the child to easily concentrate on performing the required visual tasks, the setting should be quiet, free of distractions and with minimal visual stimulation in the background.

POST-ASSESSMENT MANAGEMENT

After the assessment, the examiner should have recommendations on:

- The use of spectacles for specific activities, or why no spectacles are being prescribed
- The need for low vision devices
- What are the visual capabilities of the child
    - Any environmental adaptive modification needed?
    - Can the weaknesses potentially be improved by training?

Examiners should be aware that spectacle wear may be very difficult for children with multiple disabilities and it may be overwhelming for the parent to enforce the use of spectacles. Care should be taken to explain how to assist the child to adapt to spectacle wear (i.e. wear when in therapy and occupied or when at a meal, or using the glasses only at school, etc.).

Parents should not be made to feel as if they are failures if the child will not wear the glasses. When working with children with many health needs, the overall situation must be kept in mind and the priority of spectacle wear to be kept in perspective. In some cases, children must be presented with multiple opportunities to wear the glasses before they are accepted.

By providing an optimum testing condition, examiners can often educate the parents, caretakers, teachers and therapists from the school that the child can see better than was observed or reported. They can be encouraged to reproduce similar conditions in the child's habitual environment in an attempt to establish a more consistent habit in the use of vision, and hopefully initiate the cascade of learning. Communication and multi-disciplinary management is a key for helping the child's vision and overall development.

It is important that the practitioner present the information in a positive light and help families and professionals see the capabilities of the child. The emotional impact of vision loss cannot be underestimated.

Figure 8: On-site vision examination in school

CONCLUSION

Early vision assessment in children with multiple disabilities is important, although it can sometimes be a great challenge. Special modification of the assessment can help to gain more understanding of the children's visual abilities. Collaboration of parents, teachers and school-based therapists with eye care professionals during and beyond the examination can help explore and extend the capacity of the child's vision.