

# **Vision Screening Training Manual**

**MINNESOTA DEPARTMENT OF HEALTH**

01/2022

## VISION SCREENING TRAINING MANUAL

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**Revisions and procedures in this manual are based on:**

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## **Background and Overview**

## Purpose and Rationale

Vision screening is a set of procedures performed by properly trained persons for the purpose of early identification of children who may have vision problems and referral to appropriate medical professionals for further evaluation.

The procedures in this manual were developed based on recommendations put forward by a panel of Minnesota-based vision screening experts who came from a cross-section of screening programs and professional organizations. The Expert Panel on Childhood Vision Screening was convened by the MDH Community and Family Health Division and met four times between April and June 2015. The expert panel reviewed national vision screening recommendations from the American Association of Pediatric Ophthalmology and Strabismus (AAPOS) and others, revised the vision screening procedures, and developed a guideline document. The expert panel and other contributors are identified in the section titled Minnesota Expert Panel on Childhood Vision Screening near the end of the manual.

Impaired vision in children can contribute to the development of learning problems which may be prevented or alleviated through early identification and intervention. Children with impaired vision often are not aware of their impairment; therefore, they do not complain or seek help. If they have always seen things in a blurred or distorted way, they accept the imperfect image without question. It is up to adults responsible for children's health care and education to assure that children have their vision screened on a regular basis.

## Minnesota's Vision Screening Programs

This vision screening training manual provides the screener with instructional information to conduct vision screenings in schools or clinics. The screening procedures herein serve as guidelines for Child and Teen Checkups (C&TC), Head Start, Early Childhood Screening, and school programs.

### Child and Teen Checkups (C&TC)

Federally titled Early Periodic Screening Diagnosis and Treatment (EPSDT) is a program administered by the Minnesota Department of Human Services for children and teens enrolled in Medical Assistance under Minnesota Statute MS 256B.04-256B.0625. The Minnesota Department of Health provides health recommendations to the program. For more information refer to the [Minnesota Child and Teen Checkups Provider Guide \(www.mn.gov/dhs\)](http://www.mn.gov/dhs).

### Head Start

Head Start and Early Head Start are comprehensive child development programs which serve children from birth to age 5. They are child-focused programs and have the overall goal of increasing the school readiness of young children in low-income families. Minnesota Head Start follows Child and Teen Checkup guidelines. For more information refer to the [Minnesota Head Start Page \(www.mnheadstart.org\)](http://www.mnheadstart.org).

### Early Childhood

Early Childhood Screening or evidence of a comparable screening by a non-school provider (e.g., Head Start, Child and Teen Checkups/EPSDT or a health care provider) is required for

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entrance in Minnesota's public schools or within 30 days of enrollment into kindergarten (MS 121A.16-121A.17). Early Childhood Screening is offered throughout the year by local school districts. For more information go to the [Minnesota Early Childhood Screening \(www.education.state.mn.us\)](http://www.education.state.mn.us).

## **Pediatric Eye Screening or Evaluation**

## Professional Academy Recommendations

The American Association for Pediatric Ophthalmology and Strabismus, the American Academy of Ophthalmology, the American Academy of Pediatrics, the American Academy of Family Physicians, and the American Association of Certified Orthoptists all recommend early vision screening. A pediatrician, family physician, nurse practitioner, or physician assistant should examine a newborn's eyes for general eye health including a red reflex test in the nursery. An ophthalmologist or other appropriate eye care professional should be asked to examine all high-risk infants.

## Minnesota Department of Health Recommendations

According to Minnesota Department of Health (MDH) guidelines, a child's vision should be screened at the following intervals:

### Child and Teen Checkups (C&TC)

Screening is done according to the C&TC Schedule of Age-Related Screening Standards:

- Subjective screening: A complete or updated Child and Family Vision History and Risk Assessment form is required until objective visual acuity screening can be completed at age three years.
- Objective screening: All other objective vision screenings and procedures are done at every well child visit for children ages 3 through 10 years and then once between the ages of 11 through 14 years, once between the ages of 15 through 17 years and once between the ages of 18 through 20 years. Acuity screening is in addition to the physical assessment of ocular health performed by the C&TC provider.

### Head Start

Programs serving children in Early Head Start and Head Start programs must either obtain or perform evidence-based screening for vision on all children within 45 days of calendar enrollment. Follow the vision screening schedule for the state's EPSDT program (in Minnesota, this is C&TC); refer to the [C&TC Periodicity Schedule \(www.mn.gov/dhs\)](http://www.mn.gov/dhs).

### Early Childhood

Minnesota school districts are required to offer Early Childhood Screening to young children before kindergarten entrance, targeting children 3 to 4 years of age. Children must be screened at least once before kindergarten entry.

### School Setting

Children in grades Kindergarten (males screened for color blindness), 1, 3, 5, 7, and 10 should be screened. In addition, a screening should be done when there are parent or teacher concerns and for any new students.

Any child with a diagnosed eye condition should be screened in accordance with the doctor's recommendations. Prior to placement in a special education program, a child's risk factors should be reviewed to determine if there is a need for an exam by an eye specialist. When a

shortage of time, space, or personnel does not permit implementation of the full frequency of screening in a school, emphasis should be placed on the lower grades.

## Facility

The room selected for mass vision screenings should be well-lit and at least 12 feet long. Additionally, rooms should be free from direct sun glare and distractions. When more than one visual acuity screening station is being used, they should be separated by a minimum distance of 8-10 feet. Muscle balance stations must be arranged to avoid interfering with each other.

## Equipment

### Equipment for Required Procedures

- Occluder: Specially purchased or constructed sunglasses, adhesive temporary occlusion eye patches, 2 inch Micro-pore adhesive paper tape, plastic occlude, or spectacle occluders for children 10 years and older.
- Penlight
- Toy (1/2 inch in size) as a target object
- LEA SYMBOLS<sup>®</sup> and/or HOTV wall chart (50% rectangle) or MASS Vat LEA SYMBOLS<sup>®</sup> and/or HOTV flip charts (including lines from 10/40 to 10/8), response card, and conditioning flashcards
- LEA SYMBOLS<sup>®</sup> Puzzle may be a useful tool for children who have a hard time focusing
- Sloan letter Chart
- Plus Lens: +2.50 lenses
- Ishihara, Good Light Color Vision Plates, or Waggoner Color Vision Made Easy
- Vision Screening Worksheet
- Antimicrobial hand gel and appropriate antimicrobial cleaner for occluder

### Equipment for Optional Procedure

- Random Dot E Test Kit or Stereo Butterfly Stereopsis test

### Vision Screening Occlusion Equipment

Occlusion equipment temporarily obstructs vision in the eye not being screened during vision screening. It is never recommended at any age to use a hand to cover the eye. Kids peek. Peeking can be a factor for children who PASS when they can't see, known as a false negative. The ability of a child to peek is impressive, even with constant vigilance.

## Specialty Constructed Occluder Glasses

One pair of glasses for the right eye and one for the left eye is recommended for visual acuity screening for children younger than 10 years of age.

- Occluder glasses can be purchased online.
- An alternate cost-effective way to make occluder glasses is to use inexpensive child-sized wraparound sunglasses.
  - Pop the right lens out and occlude the left lens with duct tape or a large sticker making sure there are no gaps left open.
  - Do the same with the other pair but pop the left lens out and occlude the right lens.
  - Because children come in all shapes and sizes, it is recommended that various sizes of children's sunglasses are purchased to ensure a proper fit
- Plastic occluders with lips or spectacle occluders can be purchased online.
  - They are to be used during the Unilateral Cover Tests and Monocular Visual Acuity.
  - They can be used for screening children 10 years of age and older.
  - Plastic occluders can also be used to cover an eye for other tests where a child is unable to wear occluder glasses (e.g., already wearing glasses, refuses to wear them, etc.). Be sure the child is not peeking around the occluder and that it is held in the proper position. The small raised area should be positioned to the inside of the child's eye and aligned with the bridge of the nose and under prescription glasses. It may be helpful in these situations to have one person holding the occluder over the eye and monitoring the child for peeking and ability to tolerate the occluder while another person administers the test. Kids peek.
- Adhesive temporary occlusion eye patches or 2 inch micro-pore paper tape can be helpful for children who will not wear occluder glasses. They can be used in cases where other forms of occlusion are not effective. These patches and tape may be purchased online or at medical supply stores.

## Care of Vision Equipment

- The equipment should be kept clean and in good repair.
- Occluder glasses, stereo acuity glasses and plus lenses should be routinely cleaned and cased when not in use.
- Color vision books should be kept closed when not in use to prevent fading.
- Do not touch the color plates with fingers as the oil on the skin can damage the plates. Use a paintbrush or long cotton-tipped applicator for tracing trails on the color plates.
- Clean visual acuity charts periodically with mild warm, soapy water to prevent distortion of chart letters from dirty smudges.
- A much more frequent cleaning will be necessary for the child's HOTV or LEA SYMBOLS® response cards since the children handle them.

- Discard chipped or torn charts.
- The charts should be laid flat and away from heat when stored to prevent curling.
- Any flashlights used in screening should be stored with batteries removed.
- Replacement flashlight bulbs and batteries should be readily available.

## Infection Control Considerations for Vision Screening

1. Wash hands with soap and water before the screening session begins. If a sink is not available use antimicrobial hand gel.
2. Wash occluders and plus lenses with soap and water, rinse and wipe dry before starting the screening program.
3. Ideally, the occluders and plus lenses should be disinfected after each student is screened. This can be done by using an appropriate anti-microbial agent. Additionally, the cloth covers used to cover the ear phones on headsets for audiometers may be used to cover the occluder-head that comes in contact with the child's eye. If neither of these cloths is available, an alcohol wipe may be used.
4. Children whose eyes are red or draining should not be screened but instead referred immediately to their primary care provider.

For more information, refer to the [Child and Teen Checkups Training Descriptions \(www.health.state.mn.us\)](http://www.health.state.mn.us) which provides training and consultations to C&TC, Head Start, Schools and C&TC providers.

## **Vision Screening Preparation**

## General Considerations: C&TC Setting

### Frequency

Refer to the [C&TC Periodicity Schedule \(www.mn.gov/dhs\)](http://www.mn.gov/dhs).

### Facility

The room selected for vision screening should be at least 12-feet long, well-lit, and free from distractions and direct sunlight glare.

### Provider Roles in C&TC Clinics

#### Primary Care Provider

Usually updates history and performs the ophthalmoscope evaluation and tests muscle balance (Binocular Fix and Follow, Unilateral Cover Test, and Corneal Light Reflex) as part of the physical exam.

#### Medical Assistant or Nurse

Usually performs visual acuity screening, for near and distance.

*Note: A child who wears glasses and is under the care of an eye care professional needs an age-appropriate visual acuity screening performed with their glasses on. They do not need Plus Lens screening performed.*

## Preparing For Mass Vision Screening

Head Start, Early Childhood, and School Screenings

### Planning Meeting

- Arrange a planning meeting for those persons who will be involved in the technical and administrative aspects of the screening process; determine the number of students to be screened and the number of staff and volunteers needed.
- Reserve appropriate space for the screening site. Size determination should be based on which visual acuity charts will be used and how many stations will be necessary for the screening.
- Identify the organization or schools' policies & procedures to address data privacy in a mass screening in order to maintain compliance with FERPA/HIPAA regulations.
- Set calendar for volunteer recruitment and training dates and screening and re-screening dates.

### Notification Letter to Parents

- Prior to the screening date, send out an informational letter with the details of the screening event including date, time, location, and what to expect; include a copy of the parent version of the Child Vision History Questionnaire for parent/caregiver to fill out and return to school.
- Advise them there will be a second screening for children who have difficulty with any part of the first screening.
- If after the second screening a child continues to be unable to meet passing criteria, parent/caregiver will be notified with a referral and strongly encouraged to have their child seen by an eye professional for further evaluation.
- Any parent/caregiver who does not want their child screened should be advised as to the importance of the screening but when desired, the procedure they should follow so that their child will be excluded from the screening.
- ESC students may be given sample HOTV or LEA SYMBOLS<sup>®</sup> for practice opportunities prior to screening, if desired. There is also a LEA SYMBOLS<sup>®</sup> puzzle to assist the child in preparation for the LEA chart.

### Designate a Vision Screening Coordinator

#### Responsibilities:

- Complete training recommended by MDH on vision and hearing, or equivalent.
- Serve as primary person responsible for the smooth operation of the screening.
- Recruit, schedule, and orient volunteers.
- Train volunteers using resources available from MDH.

- Assign volunteer tasks. It is best to make a volunteer an expert at one area instead of rotating that volunteer to different screening stations.
- Provide on-site supervision.
- Arrange for and maintain needed equipment and supplies.
- Carry out or designate a person(s) to work in collaboration with the referral professional and be responsible for sending out referral letters, follow-up, and record keeping.

## Referral/Follow-up Professional

A currently licensed (in Minnesota) professional nurse with MDH training in vision screening.

### Responsibilities:

- Determine which children need further professional evaluation based on MDH criteria.
- Contact parent/caregiver if follow-up information about the referral is not received and explain the screening results as needed.
- Communicate with appropriate staff regarding referrals and follow-up information.
- Monitor child's vision and treatment as appropriate.
- Maintain screening and follow-up information on the child's health record.
- Evaluate the screening program.

## Prescreening Activities

Two weeks prior to the intended screening date

- Determine the number of children to be screened and their ages or grade level.
- Determine the number of staff needed to provide mass screening.
- Recruit volunteers and schedule dates and times for volunteer training and orientation, and the screening and re-screening sessions.
- Screening facilities should be examined and reserved for the screening dates.
- Copies should be made of the Teacher and Child Vision Pre-Screening Worksheet and distributed to classroom teachers to be filled out with the child's name/age/grade and comments, if any.
- Copies should be made of the Vision Referral Letter.
- Determine the type and quantity of equipment needed and ensure that it is in working order.

## Screening Day Activities

- The vision screening coordinator will set up the vision stations in the screening area.
- The stations should be arranged so children cannot hear and repeat the answers of other children being screened.
- Visual acuity stations should be at least eight to ten feet apart from one another.
- Volunteer training is done immediately prior to the screening on the clinic day; a minimum of one hour should be scheduled for this training.
- Each volunteer is assigned his/her specific task.
- Each volunteer must have an opportunity to practice before screening begins.
- Children should have their completed vision screening worksheets (Teacher and Child Vision Pre-Screening Worksheet and Child Vision History Questionnaire for Parent/Caregiver) with them.
- Any child with a diagnosed eye condition should be screened in accordance with the doctor's recommendations. An age-appropriate visual acuity screening may be performed with glasses on, if they wear them.

## Organize Screening Clinic into “Stations”

An efficient ratio for the stations is:

- 3:1 (3)-visual acuity to (1)-muscle balance (i.e., corneal light, unilateral cover) station.

When the color vision procedures are included the ratio is:

- 3:2 (3)-visual acuity stations to (2)-muscle balance/color vision stations.

## Number of Staff Per Station

### **Pre-school through first grade:**

- Visual acuity screening may require two persons per station.

### **Older children:**

- Muscle balance/color vision screening requires one person per station.
- Visual Acuity Station: Approximately 20 children per hour can be screened.
- A few additional volunteers will be needed to help with traffic flow.

**Example based on the previous guide:**

To screen 300 children in 1 to 1-1/2 days, including color vision:

- 4 - (Two muscle balance/color vision stations using two volunteers each [2X2])
- 6 - (Three acuity stations using two volunteers each [3X2])
- 1 - (One volunteer to bring the children to the clinic from the classroom, direct traffic flow to and from the various stations and to sort worksheets and record the results)
- 11 Volunteers Total

## Post Screening Activities

- Sort screening worksheets into pass/re-screen groups to determine the number of children to be re-screened.
- Screening results should be reviewed and documented on the child's individual permanent health record by the Referral/Follow-up Professional.
- The above guidelines for organizing the screening and determining numbers of volunteers, vision stations, etc., can also be used in planning and preparing for the re-screening to take place 10-14 days after the initial screening

## Rescreening, Referral, Follow-Up, and Program Evaluation

Head Start, Early Childhood Screening, School Screening

### Rescreening Untestable Children

Rescreening is indicated for the child who did not PASS any part of the initial screening and did not have a condition requiring referral. Rescreening should be performed if a child was unable to follow instructions, was overly distracted during the testing, or was unable to complete the initial screening.

### Children with the following should be referred directly for evaluation by an eye care professional:

- Family or personal history of associated conditions or syndromes or concerns about visual behaviors are reported.
- Observed eye abnormalities noted on the visual inspection, Corneal Light Reflex, Pupillary Light Response, or Red Reflex procedures.
- Abnormal eye movements noted on the Binocular Fix and Follow or the Unilateral Uncover tests.
- Children who resist having their eyes covered should always be suspected of having a visual deficit in the eye not being covered.

The purpose of a rescreen is to eliminate from referral those children who did not PASS the initial screening because of such factors as illness, anxiety, misunderstanding, etc.

For children who lack an understanding of visual acuity screening, spend a few moments conditioning them to match the letters or symbols used on the acuity chart.

### Rescreen at the Following Intervals:

- Rescreen children 3 through 6 years of age the same day if at all possible. If not, rescreen within 6 months.
- Rescreen children 6 years and older within 30 days.

Rescreening procedures are the same as those followed for the initial screening.

If still untestable after rescreening, REFER as soon as possible to be examined by an optometrist or ophthalmologist.

### Considerations For Children with Cognitive Impairments

If a child does not know the alphabet or is developmentally unable to perform the Sloan Letters test of visual acuity, then screen with the LEA SYMBOLS<sup>®</sup> or HOTV chart.

## Next Steps

Depending on their role and practice site policy, screener identifies next steps, to ensure follow up occurs for positive screen results.

## Referral

- A referral is indicated if the child does not pass any portion of the re-screening except the color vision test.
- The referral should be made by mailing a Referral Letter to the parent/caregiver within one week after the re-screening.
- The Referral Letter **should not be hand carried by the child.**
- A phone call to the parent/caregiver soon after the referral is mailed improves follow-up results and is important with any family where English is a second language. In addition, an interpreter fluent in the family's language should be utilized for all phone calls to the parent/caregiver.

## Follow-up and Tracking

- A tracking system is essential to follow-up those who are referred to assure the child receives the appropriate evaluation, treatment, and other services.
- If the information about the referral is not received in 3-4 weeks, a phone call should be made to the child's home. In some cases a home visit might be appropriate.
- All pertinent information regarding the screening results, referral, parent/caregiver comments, and results of the professional evaluation and recommendations must be documented in the child's health record.
- It may be determined by the professional examiner that a child does not presently need glasses or other specific treatment, but this would not invalidate the referral if a problem was not confirmed.

Following professional diagnosis and treatment, further planning may be needed for the child whose vision status cannot be brought to within normal limits. In this case, the special education director should be notified so special programming can be implemented as needed.

## **Vision Screening Procedures**

## Child and Family Vision History and Risk Assessment

### Ages

One month through 20 years: most important to fill out before the child can reliably be screened with visual acuity charts typically at three years of age.

### Purpose

Identify a child/family history of any medical condition that may be associated with eye disorders.

### Description

For initial interviews review risk factors that can indicate potential vision conditions recognized by the American Academy of Pediatrics and [National Center for Children's Vision & Eye Health \(nationalcenter.preventblindness.org\)](http://nationalcenter.preventblindness.org), and the parent /caregiver's/ teacher's observation of their child's complaints or unusual visual behavior that may indicate a vision concern. Refer to Child and Family Vision History and Risk Assessment form for a succinct list of concerns and questions that the parent or caregiver can respond to.

Factors that are noted to potentially change in the interim such as caregiver concerns or observations should be reviewed at subsequent child and teen checkups/well child visits or screenings.

Risk factors that can indicate potential vision conditions Include:

- Prematurity <32 weeks
- Family history of:
  - Congenital cataracts
  - Retinoblastoma
  - Metabolic or genetic diseases\*
  - Amblyopia
  - Wearing glasses before 6 years of age\*
- Significant developmental delay
- Neurological difficulties such as seizure disorders
- Systemic diseases associated with eye abnormalities

If needed caregiver or provider can review a list of Diseases and Conditions associated with vision and eye abnormalities

\*\*If appropriate caregiver or provider can review the list of diseases and conditions associated with vision and eye abnormalities in Forms section.

## **Screener Qualifications**

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

In the C&TC clinic setting a positive risk factor should be reviewed by the medical provider.

## **Forms**

- Child and Family Vision Risk Assessment and History for C&TC clinic settings and other screening settings as indicated.
- Teacher and Child Vision Prescreening Worksheet for educational settings as indicated.
- Diseases and Conditions Associated with Vision and Eye Abnormalities.

## **Procedure**

Parent/caregiver is given the forms to complete, and answers are reviewed and flagged if there is a significant history of conditions, syndromes, risk factors for vision conditions, or concerning behaviors reported.

If parent/caregiver has questions regarding the form, a contact number for referral/follow-up should be given.

## **PASS**

No child or family history of associated conditions, syndromes or concerning vision behaviors is identified.

## **REFER**

A positive family history, positive parental or caregiver concern or a newly diagnosed condition is an indication for referral to an eye care professional.

Parental/ caregiver concern about specific behaviors may indicate a need for referral to an eye care professional. Concerns should be assessed at every visit.

## External Inspection and Observation

### Ages

Post newborn through 20 years.

### Purpose

To check for signs of external eye disease or abnormalities.

### Description

A systematic inspection of observable parts of the eye and surrounding tissue.

### Equipment

None

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Well-lit room, free of distractions.

### Procedure

1. If the child is wearing glasses, the glasses may be removed in order to give the screener an unobstructed view of the area around the eyes.
2. The area around the eyes should be checked for swelling and/or discoloration, excessive tearing, or discharge.
3. Observe the child's eyes to see if one eye appears to turn in, out, up, or down in relation to the other. The eyes should hold steady, without excessive movement (nystagmus), while gazing straight ahead. The position of a persistent head tilt should also be noted.
4. The eyes themselves should be checked in the order suggested by the acronym "WIPL."
  - **Whites:** The sclera should be a shade of white. There should be no new discoloration or growths.
  - **Iris:** The iris should be a complete circle. Both should be the same color.
  - **Pupil:** The pupils should be clear and dark. There should be no cloudiness or white discoloration. The pupils should be of equal size and circular shape.
  - **Lids and Lashes:** The lids in their natural, open position should give a full view of the pupil. The lids should be free of lumps (chalazia). There should not be redness or signs of discharge along the margin or signs of a sty. The margin of the lid should be flush against the surface of the eye. The child should show normal blinking during observation period. Lashes should be present on the top and bottom lids of both eyes. Lashes should not turn in, causing them to come in contact with the eye.

## **PASS**

Normal appearance of all parts of the eye.

## **REFER**

Any noted abnormality:

- If a white pupil (leukocoria) is noted, an immediate referral to an ophthalmologist or optometrist is necessary.
- If one eye appears to turn in (eyes cross), out, up, or down in relation to the other, there is excessive movement (nystagmus), or a persistent abnormal head position, the child should be referred to an ophthalmologist or optometrist.
- Signs of excessive redness and/or discharge indicate the screening should be stopped and the child referred to their primary health care provider, ophthalmologist, or optometrist to reduce the risk of spreading a possible infection and/or falsely failing the screening.
- Screening should be rescheduled for the next available time.

## Binocular Fix and Follow

### Ages

4 months through 3 years or when visual acuity can be measured.

### Purpose

To check the movement of both eyes while following a continuously moving target.

### Description

Target is moved horizontally, then vertically, then obliquely in relation to a center point on a visual axis of each eye. Make sure the child's head does not move; the parent can help steady the child.

### Equipment

Penlight or interesting target.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

A well-lit room, free of distractions.

### Procedure

Perform the procedure in the following fields:

#### Horizontal

1. Hold the target 14-16 inches away, centered in front of the child's eyes (center point) and slowly move the target horizontally to your right until the child's eyes are in their extreme left viewing position.
2. Slowly move the target to your left, crossing the center point and continuing until the eyes are in the extreme right viewing position
3. Return target to center point.

#### Vertical

1. Start at the center point, raise the target until the eyes reach the extreme up viewing position.
2. Lower the target through the center point until the eyes reach the extreme down viewing position.
3. Return target to center point.

### **Oblique**

1. Start at the center point, raise the target until the eyes reach the extreme upper right viewing position.
2. Lower the target through the center point until the eyes reach the extreme lower left viewing position.
3. Return target to center point.
4. Repeat this procedure for the upper left to the lower right viewing position.
5. Return target to center point.

### **Convergence**

Defined as the simultaneous inward movement of both eyes to maintain binocular vision

1. Starting at the center point, move the target slowly toward the child to a distance of 4 inches.

### **PASS**

Both eyes follow the target easily and smoothly.

### **Re-screen/REFER**

Eyes do not follow in unison or movements are jerky, uneven, or "break" further than 4 inches from the bridge of the nose, or child uses head movements. Eye crossing is fixed and/or intermittent.

## Corneal Light Reflex

### Ages

Post newborn through 20 years.

### Purpose

To check for milder degrees of constant strabismus. To differentiate pseudo-strabismus in children with large epicanthal folds.

### Description

By noting the position of light being reflected in the pupils, the observer is able to check for a constant strabismus.

### Equipment

Penlight and target object.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Normal or lower light level. Minimize, if possible, the number of light sources (i.e. windows, overhead lights, etc.).

### Procedure

1. Position the child so that the target, the light source, and the examiner's line of vision is at the midline in front of the child's eyes at a distance of 14-16 inches.
2. Try to have the child sit with his/her back to any ceiling lights.
3. Shine the penlight at the center of the child's forehead directly above and between the child's eyes.
4. Make sure the child is focused on the target.
5. The screener then observes the reflected light in each pupil.
6. It is very important that good light is used. Ceiling lights are not sufficient.

### PASS

The reflection of the light appears to be in a symmetrical position in the pupil of each eye.

### REFER

The reflection of light appears to be in an asymmetrical position in one eye compared to the other.

Note: This test is very helpful to detect pseudostrabismus, the false appearance of strabismus. Sometimes a child's eyes may appear crossed when they actually are not. This is often due to the wide bridge of the nose or the epicanthal fold.

## Unilateral Cover Test - At Near

### Ages

6 months through 20 years.

### Purpose

To assess ocular alignment in primary gaze.

### Description

Observing the uncovered eye for movement while child fixates on a target.

### Equipment

- Handheld occluder
- Small single handheld target (i.e. a sticker on a tongue depressor or Popsicle stick, not a pen light).

### Screen Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facility

A well-lit room, free of distractions.

### Procedure

1. Have the child seated in front of examiner, while the examiner holds a fixation target 15 inches in front of child; ensure the child acquires fixation.
2. Cover the child's left eye with the occluder, watch the uncovered eye (right eye) for movement.
3. Uncover both eyes and have child reacquire fixation.
4. Cover the child's right eye with the occluder, watch the uncovered (left eye) for movement.
5. This procedure should be repeated 2 or 3 times.

### PASS

No detection of movement in the uncovered eye.

### REFER

Repeatable movement of the uncovered eye or resistance to occlusion by child for one eye but not the other.

## Unilateral Cover Test - At Distance

### Ages

3 years through 20 years.

### Purpose

To assess ocular alignment in primary gaze.

### Description

Observing the uncovered eye for movement while the child fixates on target.

### Equipment

- Handheld occluder
- Small single target at 10 feet (i.e. visual acuity chart).

### Screeener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facility

A well-lit room, free of distractions.

### Procedure

1. Have child seated in front of examiner and fixate on the target 10 feet away.
2. Cover the child's left eye with the occluder, watch the eye not being covered (right eye) for any movement.
3. Uncover both eyes and have child reacquire fixation.
4. Cover the child's right eye with the occluder, watch the eye not being covered (left eye) for any movement.
5. This procedure should be repeated 2 or 3 times.

### PASS

No detection of movement in the uncovered eye.

### REFER

Repeatable movement of the uncovered eye or resistance to occlusion by the child for one eye but not the other.

## Visual Acuity

### Definition

Visual acuity is the sharpness or clarity of a person's vision.

Visual acuity is written as a fraction:

- **Numerator** - the number of feet at which screening is done (the appropriate screening distance is noted at the top of the vision chart).
- **Denominator** - the smallest line on which the majority of the optotypes (standardized letters or symbols for testing visual acuity) are correctly identified (line size is indicated on the chart as 10, 15, 20, 30, 40, 50, 70, 100, and 200).

### For Example

If one's vision is "20/70" it means:

- At 20 feet away, the smallest line that person can see is the 20/70 line
- A person with 20/20 vision could read that same line at 70 feet away

If one's vision is "20/20" it means:

- At 20 feet away, the smallest line that person can see is the 20/20 line

Results of screening done at 20 feet distance are written: 20/20, 20/25, 20/30, 20/40, 20/50, etc.

Results of screening done at 10 feet distance are written: 10/10, 10/15, 10/20, 10/30, 10/40, etc.

The American Academy of Pediatrics recommends visual acuity screening at 10 feet for all children. Record visual acuity for each eye as 10/XX (20/XX).

## Distance Visual Acuity Screening - LEA SYMBOLS® or HOTV Wall Charts

### Ages

3 through 5 years.

### Purpose

To screen for clarity of vision when looking in the distance; to detect myopia, amblyopia, astigmatism, and/or anisometropia.

### Description

Visual acuity is checked using a standardized LEA SYMBOLS® or HOTV chart with 50% spaced rectangle boxes around each line.

### Equipment

- LEA SYMBOLS® or HOTV wall chart (10 foot); positioned at the child's eye level.
- LEA SYMBOLS®/HOTV response card or individual flash cards.
- Measuring tool for marking a 10-foot distance between the vision chart and the child.
- Age appropriate occluders.
- Table and chairs (optional).

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Room at least 12 feet long or greater, well-lit, and without glare or distractions.

### Notes

- LEA SYMBOLS® or HOTV wall charts and flip charts have either **shapes or letters** which are referred to generally as **optotypes** in this procedure.
- If a child requires assistance knowing which optotype to identify, the screener should point briefly beneath the optotype and quickly remove the pointer.
- Depending on the LEA SYMBOLS® or HOTV chart used, the lines split into two columns towards the bottom half of the chart. Use the right column for screening the right eye and the left column for screening the left eye.
- To get credit for a line with 5 optotypes, the child must correctly identify ANY 4 of 5 letters or shapes. To get credit for a line that has less than 5 optotypes, the child must correctly identify each optotype on that line.

## Procedure

1. Pre-condition the child to the process of screening by pointing to several optotypes on the wall chart and having the child say or match the optotypes on the response card.
2. Position the child with their eyes at a 10 foot distance from the chart (foot arches should be positioned on the 10 foot line if standing; the child's eyes should be positioned on the 10 foot line if sitting).
3. If the child wears corrective lenses or contacts, these should be clean and worn during the screening procedure. Position the occluder over the eyeglasses.
4. Screen the **RIGHT** eye first, with the **LEFT** eye occluded.
  - Start from the top line, ask the child to identify the first optotype on the RIGHT side of the chart moving down the lines until an optotype is missed.
  - Return to the line above the missed optotype and ask the child to identify each letter or shape on that line, reading left to right.
  - If the child correctly identifies 4 of the 5 optotypes on the line, move down to the next line and ask the child to identify the optotypes.
  - Continue to move down the lines on the right side of the chart until the child is unable to identify 4 out of 5 optotypes on a line.
5. To screen the **LEFT** eye, occlude the **RIGHT** eye.
  - Repeat the procedure using the optotypes on the LEFT side of the chart.
6. Record the visual acuity for each eye as 10/XX (20/XX) for the lowest line the child was able to correctly identify ANY 4 out of the 5 optotypes, or all the optotypes on a line that has less than 5 letters or shapes.

## PASS

Must be able to correctly identify ANY 4 out of the 5 optotypes on the critical passing line for age or better without a difference of two lines or more between the eyes in the PASS range.

### Age 3 years

- 10/25 (20/50) or better in each eye without a difference of two lines or more between the eyes.

### Age 4 years

- 10/20 (20/40) or better in each eye without a difference of two lines or more between the eyes.

### Age 5 years

- 10/16 (20/32) or better in each eye without a difference of two lines or more between the eyes.

## Rescreen/REFER criteria

The majority of children who do not meet passing criteria will be referred.

Some children may need rescreening. Rescreening should be performed if a child was unable to follow instructions, was overly distracted during the screening or was unable to complete the initial screening. Rescreening should occur as soon as possible but in no case later than 6 months from the initial screening date.

For more information on rescreening criteria, refer to the section on Rescreening Untestable Children.

Please note: children who resist having their eye covered during the screening phase should be suspected of having vision loss in the uncovered eye, rather than being uncooperative, and should be referred.

## REFER

### Age 3 years

- 10/32 (20/60) or worse in either eye or a difference of two lines or more between the eyes in the PASS range.

### Age 4 years

- 10/25 (20/50) or worse in either eye or a difference of two lines or more between the eyes in the PASS range.

### Age 5 years

- 10/20 (20/40) or worse in either eye or a difference of two lines or more between the eyes in the PASS range.

## Considerations for Screening Special Populations

The matching of the LEA SYMBOLS® or HOTV letters may be practiced before the screening. A practice sheet that can be duplicated is in the Appendix A of this manual. For some children with special needs, it may be useful to reproduce the response card, cut and space optotypes to allow for larger movements when matching the symbol.

## Distance Visual Acuity Screening - LEA SYMBOLS®/HOTV Flip Chart

### Ages

3 years through 5 years.

### Purpose

To check the visual acuity of children who do not know the alphabet or have difficulty with the LEA SYMBOLS® or HOTV wall chart.

### Description

Visual acuity is screened at a distance of 10-feet using the Massachusetts Visual Acuity Flip Chart with age-appropriate optotypes (symbols or letters) and a response card. The child can point to an optotype on the response card matching the one the screener is indicating on the flip chart. The child need not know the names of the optotypes.

### Equipment

- LEA SYMBOLS® or HOTV Massachusetts Visual Acuity Flip Chart.
- LEA SYMBOLS®/HOTV Response Key Card and LEA SYMBOLS®/HOTV Flash Cards.
- Occluder glasses for right and left eyes.
- Table and chairs (optional).

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Room at least 12 feet long or greater, well-lit, without glare and free of distractions.

### Procedure

1. Pre-condition the child to the process of screening by pointing to several optotypes on the flip chart and having the child say or match the optotypes on the response card.
2. Position the child with their eyes at a 10 foot distance from the card (foot arches should be positioned on the 10 foot line if standing; the child's eyes should be positioned on the 10 foot line if sitting).
3. If the child wears corrective lenses or contacts, these should be clean and worn during the screening procedure. Position the occluder over the eyeglasses.
4. Screen the **RIGHT** eye first, occlude the **LEFT** eye.
  - Start with the 10/40 page and proceed to the 10/32, 10/25, 10/20 and 10/16, 10/12.5, 10/10, 10/8 pages as long as the child is able to match one optotype on each page.

- If the child misses an optotype, go to the preceding page and point to one optotype at a time. If the child matches four of them correctly, proceed to the next page.
  - To receive credit for a page, the child must correctly match any 4 out of 5 optotypes.
5. To screen the **LEFT** eye, occlude the **RIGHT** eye.
    - Repeat the procedure.
  6. Record the visual acuity number as the last page that the child can correctly identify any 4 of 5 optotypes.

## **PASS**

Must be able to correctly identify any 4 out of the 5 optotypes on the critical passing line for age or better without a difference of two lines or more between the eyes in the PASS range.

### **Age 3 years**

- 10/25 (20/50) or better in each eye without a difference of two lines or more between the eyes.

### **Age 4 years**

- 10/20 (20/40) or better in each eye without a difference of two lines or more between the eyes.

### **Age 5 years**

- 10/16 (20/32) or better in each eye without a difference of two lines or more between the eyes.

## **REFER/Rescreen Criteria**

The majority of children who do not meet passing criteria will be referred.

Some children may need rescreening. Rescreening should be performed if a child was unable to follow instructions, was overly distracted during the screening or was unable to complete the initial screening. Rescreening should occur as soon as possible but in no case later than 6 months from the initial screening date.

For more information on rescreening criteria, refer to the section on Rescreening Untestable Children.

Please note: children who resist having their eye covered during screening should be suspected of having vision loss in the uncovered eye, rather than being uncooperative, and should be referred.

## REFER

### Age 3 years

- 10/32 (20/60) or worse in either eye or a difference of 2 lines or more between the eyes in the PASS range.

### Age 4 years

- 10/25 (20/50) or worse in either eye or a difference of 2 lines or more between the eyes in the PASS range.

### Age 5 years

- 10/20 (20/40) or worse in either eye or a difference of 2 lines or more between the eyes in the PASS range.

## Considerations for Screening Special Populations

The matching of the LEA SYMBOLS® or HOTV letters may be practiced before the screening. A practice sheet that can be duplicated is in the Appendix A of this manual. For some children with special needs, it may be useful to reproduce the response card, cut and space optotypes to allow for larger movements when matching the symbol.

## Distance Visual Acuity Screening - Sloan Letters

### Ages

6 years and older.

### Purpose

Screen for clarity of vision when looking in the distance; to detect myopia, amblyopia, astigmatism, and/or anisometropia.

### Description

Visual acuity is checked using a standardized 10-foot Sloan Letters chart proportionally spaced (LogMAR).

### Equipment

- Sloan Letters Chart (10 foot); positioned at the child's eye level.
- Measuring tool for marking a 10 foot distance between the vision chart and the child.
- Age appropriate occluders.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Room at least 12 feet long or greater, well-lit, and without glare or distractions.

### Notes

- If a child requires assistance knowing which letter to identify, the screener should point briefly beneath the letter and quickly remove the pointer.
- Depending on the Sloan Letters chart used, the lines split into two or three columns toward the bottom half of the chart. Use the right column for screening the right eye and the left column for screening the left eye.
- To get credit for a line with 5 letters, the child must correctly identify 4 of 5 letters. To get credit for a line that has less than 5 letters, the child must correctly identify each letter on that line.

## Procedure

1. Explain the screening process to the child.
2. Position the child with their eyes at a 10 foot distance from the chart (foot arches should be positioned on the 10 foot line if standing; the child's eyes should be positioned on the 10 foot line if sitting).
3. If the child wears corrective lenses or contacts, these should be clean and worn during the screening procedure. Position the occluder over the eyeglasses.
4. Screen the **RIGHT** eye first, with the **LEFT** eye occluded.
  - Start from the top line, ask the child to identify the first letter on the RIGHT side of the chart moving down the lines until a letter is missed.
  - Return to the line above the missed letter and ask the child to identify each letter on that line, reading left to right.
  - If the child correctly identifies 4 of the 5 letters on the line, move down to the next line and ask the child to identify the letters.
  - Continue to move down the lines on the right side of the chart until the child is unable to identify 4 out of 5 letters on a line.
5. To screen the **LEFT** eye, occlude the **RIGHT** eye.
  - Repeat the procedure using the LEFT side of the chart.
6. Record the visual acuity for each eye as 10/XX (20/XX) for the lowest line the child was able to correctly identify 4 (or 5) out of 5 letters, or all the letters on a line that has less than 5 letters.

## PASS

10/16 (20/32) or better in each eye without a difference of two lines or more between the eyes in the PASS range.

## REFER

10/20 (20/40) or worse in either eye or a difference of two lines or more between the eyes in the PASS range.

## Considerations for Screening Special Populations

If a child does not know the alphabet or is developmentally unable to perform the Sloan Letters test of visual acuity, then screen with the LEA SYMBOLS® or HOTV chart instead. If the child is still unable to perform the screening, refer to the Rescreening Untestable Children section of this manual for more information.

## Plus Lens Screening (Near Visual Acuity Screening)

Once a child (who does not wear glasses) has passed the monocular distance visual acuity screening, a plus lens procedure is performed to screen for difficulties with near vision. The plus lens procedure is a required component of a C&TC vision screening exam.

### Ages

5 years and older.

### Purpose

To check for hyperopia (farsightedness or near visual acuity problems).

### Description

Near visual acuity is checked at the same 10-foot distance as for distance visual acuity.

### Equipment

- A pair of +2.50 glasses.
- Visual acuity chart.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

Room at least 12 feet long or greater, well-lit, and without glare or distractions.

### Procedure

A pair of +2.50 glasses are placed over the child's eyes without occluding either eye. The child is asked to read the line (or the higher of the two lines) they passed on the eye chart at the 10 foot distance.

### PASS

Blurring of vision with the +2.50 glasses.

### REFER

Clear vision with +2.50 lens glasses.

This indicates the child has a high amount of farsightedness and needs to be referred for evaluation.

## Color Vision

### Age/Gender

Kindergarten males.

### Purpose

To check for color vision deficiency.

### Description

Color vision deficiency is checked by having the child read numbers or follow lines on specially designed color plates.

### Equipment

- Ishihara Pseudo-Isochromatic Plates, Color Vision Testing Made Easy, or Good-Lite Book of Color Plates.
- Fluorescent desk lamp, if enough natural daylight is not available.

### Facilities

A well-lit room, free of glare.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Procedure

#### **Follow the manufacturer's instructions.**

The test book should be positioned to eliminate glare and at a normal reading distance from the child's eyes. It should never be in direct sunlight. Instruct the child to read the numbers or trace the image on each page using a paintbrush or cotton-tipped applicator.

### PASS

#### **Follow the manufacturer's instructions.**

Generally, able to correctly identify numbers or follow lines on testing plates.

### REFER

#### **Follow the manufacturer's instructions.**

Generally, inability to identify a number on any one or more plates or inability to follow the line on any one or more plates. Refer to the Color Vision Advisory Letter in this manual.

## **Considerations for Screening Special Populations**

- If the person being tested does not know numbers, the plates with lines can be used.
- Do not use a pointer, such as a pencil, eraser, or finger that would mark up or deface the color plates. A clean, dry, paintbrush or cotton-tipped applicator works best for tracing.

Note: Children, other than kindergarten males, should be screened on request.

## Stereo Acuity Test: Random Dot E (Optional)

Stereopsis measurement should be performed before the eyes are dissociated by tests such as the cover test.

### Ages

3 years through 8 years.

### Purpose

To check for problems with stereo acuity or depth perception.

### Description

Stereo acuity is checked by noting if the child is able to see the raised E while wearing polarized glasses.

### Equipment

- Random Dot E stereo card.
- Blank stereo card.
- Model E card.
- Polarized glasses.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

A well-lit room, free of glare and distractions.

## Procedure

1. Place the polarized glasses on the child. Do not remove prescription glasses if the child wears them. If the polarized glasses are too large for the child, put a short piece of masking tape on the top of the glasses and use the other end of the tape to hold the glasses on the child's forehead.
2. When showing the child the test targets, be sure he/she keeps his/her head straight up, as tilting to one side or allowing the glasses to tilt on the nose will interfere with the test.
3. At 20 inches away from the child, hold the sample model E card with the long sides on the top and bottom. Ask the child what the figure is. If the child cannot name it or has difficulty, point at the E figure on the card and say "that's an E."
4. With the polarized glasses still on, practice using the sample card and blank together by mixing up the cards behind your back and presenting the cards to the child. Have the child point to the card with the "E" on it. Do this four to five times.
5. Substitute the model E card with the stereo E card. Tell the child, "Sometimes, while wearing the magic glasses, you may see a 'picture' appear on the card." Mix the blank card and stereo E card behind your back and present the cards to the child. Have the child identify the card they see a picture in. Do this five times.
6. Move back to 40 inches from the child and repeat step 4.

Note: Slightly move cards up and down (don't tilt) to give optimal viewing of the stereo image.

## PASS

Student is able to point to the correct stereo E card at least 4 times at 20 inches and 40 inches.

## Rescreen/REFER

The child cannot distinguish the E figure in the stereo E card at all or can only see it when the card is approximately 20 inches or closer.

## Stereo Acuity Test: Stereo Butterfly (Optional)

Stereopsis measurement should be performed before the eyes are dissociated by tests such as the cover test.

### Ages

3 years through 8 years.

### Purpose

To check for problems with stereo acuity or depth perception.

### Description

By noting if the child is able to see the raised “butterfly” while wearing polarized glasses, the observer is able to check for stereo acuity problems.

### Equipment

Stereo butterfly card and polarized glasses.

### Screener Qualifications

Can be performed by screeners who have received the recommended training by the Minnesota Department of Health or equivalent. Refer to Assessment Tools on the MDH Vision Screening Forms, Tools and Materials webpage.

### Facilities

A well-lit room, free of glare and distractions.

### Procedure

1. Place the polarized glasses on the child. Do not remove prescription glasses if the child wears them. If the polarized glasses are too large for the child, put a short piece of masking tape on the top of the glasses and use the other end of the tape to hold the glasses on the child’s forehead.
2. When showing the child the test targets, be sure he/she keeps his/her head straight up, as tilting to one side or allowing the glasses to tilt on the nose will interfere with the test.
3. At normal reading distance from the child, hold the stereo butterfly page upright. Ask the child what the figure is that they see. If the child cannot name it or has difficulty, point at the butterfly figure on the page and say, “That’s a butterfly.” Ask the child to touch the butterfly wings.

Note: Move the book up and down slightly (don’t tilt) to give optimal viewing of the stereo image.

**PASS**

Child is able to point to the butterfly wings above the page.

**REFER**

The child cannot distinguish the butterfly figure in the stereo butterfly card or touches the page when trying to touch the wings.

## Procedures for Health Care Personnel

### Instructions

After completion of MDH or equivalent training, the following two procedures can be performed by health care personnel, including:

- Nurses, including public health and school nurses.
- Ophthalmic or optometric staff.
- Other trained medical personnel.

These procedures should be performed routinely by nurses approved to perform C&TC screenings. These procedures are not included in general mass screenings, but can be performed as an additional screening for children who do not pass any component of the vision screening procedures.

## Pupillary Light Response

### Ages

Post newborn through 20 years.

### Purpose

To check for the pupils' reaction to changes in illumination.

### Description

Pupillary light response is checked as a light is briefly flashed into the eye.

### Equipment

- Penlight.
- Visual acuity chart at 10 feet from the child's eyes.

### Note

This test should be performed AFTER the visual acuity test, as the bright light creates dark afterimages that may have a negative impact on the visual acuity test.

### Facilities

Room at least 12 feet long with low light.

### Screener Qualifications

This test should be performed only by trained health care personnel, such as ophthalmic or optometric staff or nurses.

## Procedure

1. Dim the room lights.
2. Instruct the child to look at the largest figure on the eye chart across the room or another large target that keeps the attention of the child away from the light.
3. Observe the size and shape of the pupils (they should be round and equal in size).
4. Turn on the penlight and shine it directly into the child's right eye at a distance of approximately 3 inches from the eye.
5. Observe the pupil size quickly decrease (constrict) in both eyes.
6. Move the penlight away from the eyes.
7. Observe the increased size of both pupils (dilate) after the penlight is moved away.
8. Shine the penlight directly into the child's left eye at a distance of approximately 3 inches from the eye.
9. Observe the pupil size quickly decrease (constrict) in both eyes.
10. Shine the penlight into the right eye and observe the pupil size (it should stay small).
11. In a smooth motion, swing the penlight (still on) to the left eye and observe the pupil size (it should stay small).
12. Repeat the swinging motion between the two eyes 2 or 3 times.

## PASS

- Pupils dilate (get larger) when room light is dimmed.
- Pupils are round and equal in size, in both bright and dim light.
- Pupils quickly and symmetrically constrict to a bright light directed into either of the eyes and when the bright light swings between the two eyes.

## REFER

- Unequal or sluggish response to light.
- Pupils unequal in size or not round.

## Retinal (Red Light) Reflex

### Ages

Post newborn through 20 years.

### Purpose

To check for abnormalities that block light flow within the eye by observing the reflected light from the retina, which is red in color.

### Description

Check for symmetrical and equal intensity reflexes from the retina with an ophthalmoscope light.

### Equipment

Ophthalmoscope.

### Screener Qualifications

This test should be performed only by trained health care personnel, such as ophthalmic or optometric staff or nurses.

### Facilities

Lower light level/darkened room with a minimum number of light sources (windows, etc.).

### Procedure

1. With the ophthalmoscope positioned in front of your eye, focus the light on the palm of your hand, which should be positioned about 18 inches away from your eye.
2. Make sure the lens is focused so you can see the lines of your palm clearly.
3. Once the ophthalmoscope is properly focused, project the light into both eyes of the child at the same time, from a distance of 18 inches.
4. Looking through the ophthalmoscope, you should observe a glow in both pupils simultaneously.
  - Note whether this glow is the same intensity in both eyes or not.

### PASS

Retinal reflexes are equal in symmetry of pattern, color and intensity.

### REFER

A reflex that is asymmetric (one eye with a brighter reflex than the other), has dark spots or has an obviously decreased reflex.

In the presence of a leukocoria, one or both pupils may appear white instead of the normal red color expected and immediate referral is required.

For more Information refer to American Academy of Pediatrics Policy Statement [Red Reflex Examination in Neonates, Infants, and Children, December 2008](#) ([www.pediatrics.aappublications.org](http://www.pediatrics.aappublications.org)).

## **Instrument Based Vision Screening**

## Overview and Recommendations

Instrument-based vision screening using automated devices include photoscreeners and autorefractors. Photoscreening uses the eye's red reflex to estimate a refractive error as well as identify other factors that put a child at risk for developing amblyopia, such as media opacity, ocular alignment, and ptosis. Autorefraction uses automated technology to estimate the refractive error of each eye (American Academy of Pediatrics, 2012) (Neely & Bradford, 2015). Most auto-refractors measure one eye at time and, therefore, are limited in their ability to detect strabismus when the refractive error is normal. However, there are other autorefractors that can measure both eyes at the same time. While vision screening devices test for eye conditions or risk factors that may cause decreased vision or amblyopia, they do not test for visual acuity (American Association of Pediatric Ophthalmology and Strabismus).

Photoscreening and screening with handheld autorefractors may be electively performed on children as young as 6 months, allowing earlier detection of conditions that may lead to amblyopia.<sup>8</sup> These instruments can be used with children who are unable or unwilling to cooperate with routine visual acuity screening. Photoscreening and handheld autorefraction are recommended as an alternative to visual acuity screening with vision charts from 3 through 5 years of age. Currently, instrument-based vision screening is not recommended for children older than 6 years of age who can be screened using visual acuity charts. Automated photoscreening devices and handheld autorefractors have undergone extensive validation studies in pediatric ophthalmology offices (Matta, Singman, & Silbert, 2010) (Arnold, et al., 2013) (Singman, Matta, Tian, Brubaker, & Silbert, 2013) (Bloomberg & Suh, 2013) (Donahue G. , 2014) and in field settings. (Donahue, et al., 2006) (Rowatt, et al., 2007) (Longmir, et al., 2010) (Longmuir, et al., 2013) (Ransbarger, Dunbar, Choi, & Khazaeni, 2013) (Silbert, Matta, & Ely, 2014). The magnitude of refractive error and other risk factors for amblyopia development that should be detected using automated preschool vision screening devices has recently been updated and published (Ransbarger, Dunbar, Choi, & Khazaeni, 2013).

These recommendations are made with the expectation that vision screening will occur several times during a child's formative years and reflect a desire for high specificity in the youngest children and high sensitivity in older children. Screening with these devices must be combined with a unilateral cover test or stereo test to ensure the most reliable detection of amblyopia risk factors (Bloomberg & Suh, 2013) (Donahue, et al., 2013).

## Considerations

Autorefractors and photoscreeners have software and settings that are pre-installed. The software version appears on the startup screen when the device is turned on. The referral criteria settings should take into consideration (Neely & Bradford, 2015):

- The child's age - younger children have higher passing thresholds.
- Sensitivity - higher detection and referral rates.
- Specificity - fewer false positives but higher chance of missing at risk children.

Screening instrument settings vary from the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) refractive risk factor target numbers used by ophthalmologists to detect refractive errors in the eye care provider office setting.

Many photoscreeners permit the user to select age-specific referral criteria AFTER consulting with a local eye care professional. The settings and software should be kept up to date and can be updated with assistance for a nominal fee, per the manufacturer.

There are no recommendations to determine which method is better for mass screenings. Visual acuity screening with a chart should still be a priority as it may catch conditions not assessed by an automated device. It is ideal to screen for visual acuity as young as possible. It should be performed as soon as a child is able to be screened using a visual acuity chart, or at least by 5 to 6 years of age, in order to optimize treatment for amblyopia. Visual acuity screening should also be made available upon parent or teacher request or if the child is new to a location that employs instrument-based vision screening.

**MDH does not make brand/equipment specific recommendations.** This technology is rapidly evolving, and programs need to make careful decisions including staying up to date on current evidence before purchasing equipment.

## **Appendix A: Forms**

## Teacher and Child Vision Pre-Screening Worksheet

### Purpose:

To identify eye or vision problems throughout the year.

### Procedure:

Child is asked to report any complaint about his/her eyes. Teachers are asked to report any abnormal visual behaviors, or any visual complaints as expressed by the child whenever they occur and give report prior to screening.

Child's Name: \_\_\_\_\_ Grade \_\_\_\_\_ DOB/Age: \_\_\_\_\_/\_\_\_\_\_

Teacher's Name: \_\_\_\_\_ Date Completed \_\_\_\_\_

Other Comments \_\_\_\_\_

Teacher's Observations (Circle Yes or No as indicated)	YES	NO
Do you suspect anything is wrong with the child's eye(s)/vision	YES	NO
Has the child ever been diagnosed with an eye condition that you are aware of	YES	NO
Have you observed any problems or change in the whites, pupils, lids, lashes, or the area around the eyes	YES	NO
Has the child shown any signs of abnormal sensitivity to light or dizziness	YES	NO
Abnormally short attention span	YES	NO
Turning of one eye (in, out, up, or down)	YES	NO
Poking at the eyes or frequent rubbing	YES	NO
Excessive blinking	YES	NO
Unusual watering or discharge of the eye(s)	YES	NO
Poor eye contact or eye-hand coordination	YES	NO
Covering or closing an eye when looking at an item of interest	YES	NO
Abnormal head posture such as tilting the head to one side or moving forward or backward when viewing an item of interest	YES	NO
Squinting	YES	NO
Placing the head close to an item of interest	YES	NO
Inaccuracy in reaching for an item of interest	YES	NO
Avoiding close work	YES	NO
Frowning or scowl when reading	YES	NO
Using finger or other device to keep place while reading	YES	NO
Child's performance in school is less than expected	YES	NO

Child's Complaints:	YES	NO
Light Sensitivity	YES	NO
Burning or itching of eyes or lids	YES	NO
Blurred vision or seeing double images	YES	NO
Words or lines running together	YES	NO
Words or pictures jumping	YES	NO
Headache	YES	NO
Nausea or dizziness	YES	NO

## Child and Family Vision History and Risk Assessment

Child's Name: \_\_\_\_\_ Parent/Caregiver Name: \_\_\_\_\_

Age/DOB: \_\_\_\_\_ Date: \_\_\_\_\_

Risk Assessment questions for the initial visit for all children under 3 years of age. Note if something has changed at following visits

Child and Family Vision History: (Circle Yes or No as indicated)	YES	NO
Has your child ever been diagnosed with an eye condition, developmental delay, seizure disorder, syndrome, genetic, metabolic disorder, or any systemic disease associated with eye abnormalities?	YES	NO
Child's parents or siblings had eye/vision problems that required treatment at an early age (before age six years) such as amblyopia, cataracts, eye cancer or wearing glasses? **	YES	NO
Was your child born before 32 weeks of age?	YES	NO

Surveillance questions caregiver answers at every visit.

Description: Circle Yes or No in the appropriate box as it applies to your child	YES	NO
Do caregiver or teacher have any concerns about child's eye(s) or vision? **		
Have you noticed the child has any of the following behaviors? * <ul style="list-style-type: none"> <li>▪ Any problems or change in the eyes: whites, pupils, lids, lashes, or the area around the eyes?</li> <li>▪ Abnormal sensitivity to light?</li> <li>▪ Frequent headaches?</li> <li>▪ Turning of one eye in or out?</li> <li>▪ Frequent eye rubbing, blinking?</li> <li>▪ Unusual eye watering or discharge?</li> <li>▪ Poor eye contact?</li> <li>▪ Covering or closing of one eye when looking at an object?</li> <li>▪ Abnormal head posture such as tilting the head to one side or moving forward or backward when viewing an item of interest?</li> <li>▪ Placing the head close to an item of interest?</li> <li>▪ Inaccuracy in reaching for objects?</li> </ul>		
If yes to any of the above questions, please explain:		

\*\* A positive family history for eye conditions before the age of six years, positive parental or caregiver concern or a newly diagnosed condition is an indication for referral to an eye care professional.

\* Parental/ caregiver concern about specific behaviors may indicate a need for referral to an eye care professional. Concerns should be assessed at every visit.

## Diseases and Conditions Associated with Vision and Eye Abnormalities

*This list is intended as a reference.*

Conditions	YES	NO	If yes, who?
Albinism	YES	NO	
Amblyopia	YES	NO	
Aniridia/Ankylosing Spondylitis	YES	NO	
Autism	YES	NO	
Best Disease	YES	NO	
Coloboma	YES	NO	
Congenital cataract	YES	NO	
Congenital Glaucoma	YES	NO	
Diabetes Mellitus	YES	NO	
Trisomy 21 (also known as Down Syndrome)	YES	NO	
Fetal Alcohol Syndrome	YES	NO	
Juvenile Muscular Dystrophy	YES	NO	
Marfan Syndrome	YES	NO	
Myotonic Dystrophy	YES	NO	
Neurofibromatosis	YES	NO	
Optic Atrophy	YES	NO	
Pierre Robin Syndrome	YES	NO	
Prader-Willi Syndrome	YES	NO	
Retinoblastoma	YES	NO	
Retinitis Pigmentosa	YES	NO	
Rubella	YES	NO	
Sickle Cell Anemia	YES	NO	
Strabismus	YES	NO	
Sturge-Weber Disease	YES	NO	
Toxoplasmosis	YES	NO	
Turner Syndrome	YES	NO	
Usher Syndrome	YES	NO	
Wilson Disease	YES	NO	
Spondylo-Epiphyseal Dysplasia (SED) Congenita	YES	NO	
Kniest Syndrome (osteodysplasia)	YES	NO	
Bardet-Biedl Syndrome	YES	NO	
Idiopathic Carpotarsal Osteolysis, Francois Type (Also known as "Dystrophia Dermo-Chondro-Cornealis Familiaris")	YES	NO	
Hallermann-Streiff-Francois Syndrome (Also known as "Francois Dyscephalic Syndrome" or "Oculo-Mandibulo Dyscrania with Hypotrichosis")	YES	NO	
CHARGE Syndrome	YES	NO	
Rubinstein-Taybi Syndrome	YES	NO	
Stickler Syndrome	YES	NO	
Nystagmus	YES	NO	
Vision loss/blindness	YES	NO	

## Vision Screening Worksheet

Child's Name: \_\_\_\_\_ DOB: \_\_\_\_\_ Age (years and months): \_\_\_\_\_

Date of Initial Screening: \_\_\_\_\_ Name of Initial Screener: \_\_\_\_\_

Date of Re-Screening: \_\_\_\_\_ Name of Re-Screener: \_\_\_\_\_

### Complete the following screenings and document the results.

Screening procedures to be completed by screeners with recommended training. (Circle PASS or Rescreen for each procedure, as indicated).

Screening Procedure	PASS	Rescreen
Vision History and Risk Assessment (Post newborn through 5 years)	PASS	Rescreen
External Inspection and Observation (Post newborn through 20 years)	PASS	Rescreen
Binocular Fix and Follow (4 months through 3 years)	PASS	Rescreen
Corneal Light Reflex (post newborn through 20 years)	PASS	Rescreen
Unilateral Cover Test – At Near (6 months through 20 years)	PASS	Rescreen
Unilateral Cover Test – At Distance (3 years through 20 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using LEA SYMBOLS® or HOTV Charts (3 years through 5 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using LEA SYMBOLS® or HOTV Flip Charts (3 years through 5 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using Sloan Letters (6 years and older)	PASS	Rescreen
Color Vision Deficiency (Kindergarten males)	PASS	Rescreen

Screening procedure to be completed by medically trained professionals (Circle PASS or Rescreen for each test, as indicated).

Screening Procedure	PASS	Rescreen
Pupillary Light Response (Post newborn through 20 years)	PASS	Rescreen
Retinal (Red Light) Reflex (Post newborn through 20 years)	PASS	Rescreen

Visual Acuity Screen (Write in results and circle PASS or Rescreen, as indicated)

Right Eye	Left Eye	Chart	PASS	Rescreen
10/ 20/	10/ 20/		PASS	Rescreen

Plus Lens (Perform only if Visual Acuity Screen passed and child does not wear corrective lenses) (Circle PASS or Rescreen, as indicated).

Screening Procedure	PASS	Rescreen
Plus Lens (5 years and older)	PASS	Rescreen

Optional Test (circle PASS or Rescreen, as indicated)

Screening Procedure	PASS	Rescreen
Stereopsis Test (3 years through 8 years)	PASS	Rescreen

If a rescreen is performed for any of the above screenings, document results in tables below.

Screening procedures to be completed by screeners with recommended training. (Circle PASS or Rescreen for each procedure, as indicated)

Screening Procedure	PASS	Rescreen
Vision History and Risk Assessment (Post newborn through 5 years)	PASS	Rescreen
External Inspection and Observation (Post newborn through 20 years)	PASS	Rescreen
Binocular Fix and Follow (4 months through 3 years)	PASS	Rescreen
Corneal Light Reflex (post newborn through 20 years)	PASS	Rescreen
Unilateral Cover Test – At Near (6 months through 20 years)	PASS	Rescreen
Unilateral Cover Test – At Distance (3 years through 20 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using LEA SYMBOLS® or HOTV Charts (3 years through 5 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using LEA SYMBOLS® or HOTV Flip Charts (3 years through 5 years)	PASS	Rescreen
Monocular Visual Acuity – Distance visual acuity screening using Sloan Letters (6 years and older)	PASS	Rescreen
Color Vision Deficiency (Kindergarten males)	PASS	Rescreen

Screening procedure to be completed by medically trained professionals (Circle PASS or Rescreen for each test, as indicated).

Screening Procedure	PASS	Rescreen
Pupillary Light Response (Post newborn through 20 years)	PASS	Rescreen
Retinal (Red Light) Reflex (Post newborn through 20 years)	PASS	Rescreen

Visual Acuity Screen (Write in results and circle PASS or Rescreen, as indicated)

Right Eye	Left Eye	Chart	PASS	Rescreen
10/ 20/	10/ 20/		PASS	Rescreen

Plus Lens (Perform only if Visual Acuity Screen passed and child does not wear corrective lenses) (Circle PASS or Rescreen, as indicated).

Screening Procedure	PASS	Rescreen
Plus Lens (5 years and older)	PASS	Rescreen

Additional Questions (circle Yes or No, as indicated)

Questions	Initial Screening	Re-Screening
Do you question the validity of any of the tests today?	Yes/No	Yes/No
Is the behavior today typical for this child?	Yes/No	Yes/No

## Vision Referral Letter

Child's Name: \_\_\_\_\_ Age/DOB: \_\_\_\_\_

Dear Parent/Caregiver:

In keeping with the recommendations of the Minnesota Department of Health, your child was screened on \_\_\_\_/\_\_\_\_/\_\_\_\_ and re-screened on \_\_\_\_/\_\_\_\_/\_\_\_\_.

You are urged to take your child for a professional eye examination for the reason(s) checked below:

- Your child has had complaints about his/her vision
- Child/Family history of eye conditions
- External eye problems
- Possible eye muscle problems (noted by observation, corneal light reflex, binocular fix and follow, or unilateral uncover)
- Abnormal Retinal (Red Light) Reflex
- Possible stereopsis (depth perception) problems
- Plus lens screening
- Your child was unable to read lines on the chart appropriate for age group OR the difference between vision in each eye was greater than one line (with) (without) corrective lenses
- Right Eye 10/\_\_\_\_ (20/\_\_\_\_) Left Eye 10/\_\_\_\_ (20/\_\_\_\_)

Please have your eye care professional complete the **form on the backside** so that we can provide your child with the best care and support at school as possible.

**Dear Eye Care Provider, please complete this form.**

At your earliest convenience return to or have parent return to:

School nurse: Name \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

Address \_\_\_\_\_

Email \_\_\_\_\_

Provider comments:

I have examined \_\_\_\_\_

DOB \_\_\_\_\_ on \_\_\_\_/\_\_\_\_/\_\_\_\_

My findings are:

Right: 10/\_\_\_\_ (20/\_\_\_\_) Left: 10/\_\_\_\_ (20/\_\_\_\_) without corrective lenses

- |  |  |
|--|--|
| <input type="checkbox"/> Insufficient to require treatment | <input type="checkbox"/> Change in corrective lens                                 |
| <input checked="" type="checkbox"/> Muscular Condition:    | <input type="checkbox"/> External eye condition                                    |
| <input type="checkbox"/> Fully correctible myopia          | <input checked="" type="checkbox"/> Best correction:                               |
| <input type="checkbox"/> Partially correctible hyperopia   | <input type="checkbox"/> R ____/____   |
| <input type="checkbox"/> Not correctible astigmatism       | <input type="checkbox"/> L ____/____   |
| <input type="checkbox"/> Corrective lenses prescribed      | <input type="checkbox"/> No significant visual handicap to interfere with learning |
| <input type="checkbox"/> Suppression                       | <input type="checkbox"/> A visual handicap that may interfere with learning        |
| <input type="checkbox"/> Fusion condition                  |  |

Child should return for follow up examination on \_\_\_\_\_

Recommendations including any accommodations the school should make for the student

\_\_\_\_\_  
\_\_\_\_\_

Provider Signature \_\_\_\_\_

## Color Vision Advisory Letter

Child's Name \_\_\_\_\_ Age/DOB \_\_\_\_\_

Dear Parent/Caregiver,

During the recent vision screening conducted at your child's school, your child displayed some difficulty meeting passing criteria in distinguishing colors. This screening is not diagnostic but suggests your child may have some color vision deficiency. The following information may be helpful to you.

Color Vision Deficiency:

- Current literature suggests there is no significant difference in school achievement between students with normal color vision and those with color deficiencies.
- Children use different clues to identify colors so the condition generally is not problematic.
- Referrals for professional evaluation of this condition are usually not made since there is no widely accepted treatment for color vision problems at this time.
- A professional examination may be beneficial to determine if the problem exists and to accurately diagnose it.
- During the early years of school, the use of colors in conjunction with learning concepts in arithmetic and other materials is sometimes employed and may be a problem for children with vision color deficiency.
- Accommodations for this can easily be made and schools are required to do so by federal law if there is a properly documented diagnosis.
- Additionally, as your child gets older, informed decisions about career choices can be made when the exact nature and scope of the visual problem is known since some occupations require the ability to distinguish colors.

School Nurse \_\_\_\_\_ Date \_\_\_\_\_

## LEA SYMBOLS<sup>®</sup> Prescreening Practice Sheet

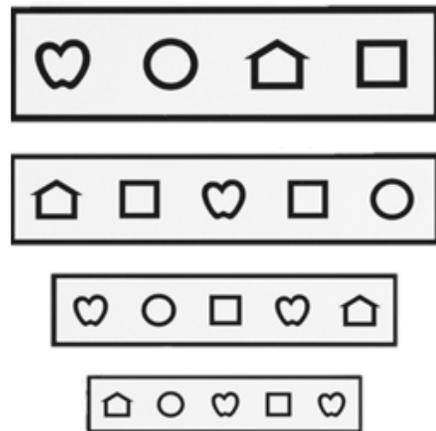
In order for us to check your child's vision he/she must be able to play a matching game.

1. Cut the paper along the dotted lines.
2. Place Chart 1 with the four large shapes in front of your child.
3. Point to a shape on Chart 2 and have your child touch the shape on Chart 1 that looks the same. start with the larger shapes and move downward to the smaller.
4. Play the game until your child responds correctly and consistently.

Chart 1



Chart 2



## HOVT Prescreening Practice Sheet

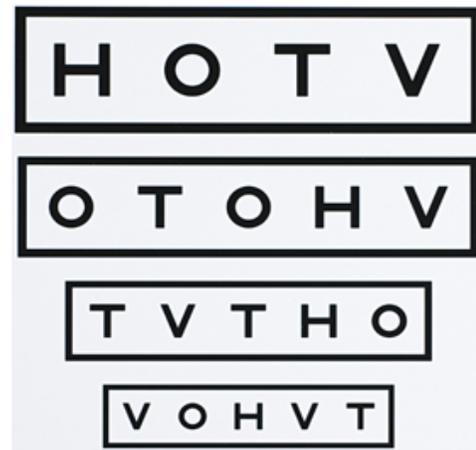
In order for us to check your child's vision he/she must be able to play a matching game.

1. Cut the paper along the dotted lines.
2. Place Chart 1 with the four large letters in front of your child.
3. Point to a letter on Chart 2 and have your child touch the letter that looks the same on Chart 1. Start with the larger letters and move downward to the smaller.
4. Play the game until your child responds correctly and consistently

Chart 1



Chart 2



## **Appendix B: Minnesota Expert Panel and Staff**

## Minnesota Expert Panel on Childhood Vision Screening

### Expert Panel - 2015

Cheryl Anderson, RN, BSN, PHN: CAPRW Head Start

Leigh Arbes: Head Start Screener

Michael S Floyd, MD: Phillips Early Youth Eyecare (E.Y.E)

David Griffin, MD: Associate Medical Director, Medical Management and Government Programs, Health Partners, Minnesota Council of Health Plans

Rhonda Hjelle, RN BS, Education: Horizon Public Health

Shao Chyi Lee, MD, CCFP (EM): Rural Emergency Medicine, Minnesota Academy of Family Practice

Dr. Tina McCarty, OD, FAAO: Diplomat, American Board of Optometry, American Academy of Optometry, MN Chapter

Susan Nokleby, MS, RN, LSN, NCSN: ISD #287 School Nurse, School Nurse Organization of Minnesota

Kristin Oien: Specialist for the blind/visually impaired, Minnesota Department of Education (MDE)

Lisa Rovick, MHSc, CO, COMT: Assistant professor, St. Catherine's University, American Association of Certified Orthoptists (AAO)

Susan Scholoff, MD, F.A.A.P: Pediatric Ophthalmology and Adult Strabismus, Minnesota Academy of Ophthalmology

Mike Severson, MD, F.A.A.P: General Pediatrician, American Academy of Pediatrics, MN Chapter

Joel Sollom, OD; Minnesota Optometric Association

Julie Streitz, RN, LSN: Early Childhood Screening, Minneapolis Public Schools

Kelly Ward, M.Ed., BA: Low vision teacher, Anoka Hennepin School District

Kathryn J. Webb: Executive Director, Sight & Hearing Association

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Special thanks to Kira Baldonado and P. Kay Nottingham Chaplin, EdD for their technical assistance and review of the guidelines on behalf of the National Center for Children's Vision and Eye Health at Prevent Blindness (NCCVEH).

## **Appendix C: References, Resources, and Glossary**

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## Resources

### Online Vision Resources

- [American Academy of Ophthalmology \(www.aao.org\)](http://www.aao.org)
- [Minnesota Academy of Ophthalmology \(www.mneyemd.org\)](http://www.mneyemd.org)
- [American Association for Pediatric Ophthalmology & Strabismus \(www.aapos.org\)](http://www.aapos.org)
- [American Optometric Association \(www.aoa.org\)](http://www.aoa.org)
- [American Academy of Pediatrics \(www.aap.org\)](http://www.aap.org)
- [American Academy of Family Physicians \(www.aafp.org\)](http://www.aafp.org)
- [Canadian Ophthalmology Association \(www.cos-sco.ca\)](http://www.cos-sco.ca)
- [National Center for Children's Vision and Eye Health \(nationalcenter.preventblindness.org\)](http://nationalcenter.preventblindness.org)
- [National Eye Institute \(www.nei.nih.gov\)](http://www.nei.nih.gov)
- [Sight & Hearing Association \(www.sightandhearing.org\)](http://www.sightandhearing.org)
- [Vision in Preschoolers VIP Study \(www.journals.lww.com\)](http://www.journals.lww.com)

### Minnesota Department of Health (MDH)

- [C&TC Vision Screening Materials \(www.health.state.mn.us\)](http://www.health.state.mn.us)
- [C&TC Online Vision Screening E-Learning Module \(www.health.state.mn.us\)](http://www.health.state.mn.us)

### Minnesota Department of Education (MDE)

- [Early Childhood Screening \(www.education.state.mn.us\)](http://www.education.state.mn.us)

### Minnesota Department of Human Services (DHS)

- [C&TC Periodicity Schedule \(www.health.state.mn.us\)](http://www.health.state.mn.us)

## Glossary

**Accommodation** - the adjustment of the lens to focus at different distances through action of the ciliary muscle

**Amblyopia** - poor vision in one or both eyes not due to organic defect

**Anisometropia** - inequality in the refractive power of the two eyes of considerable degree

**Anterior chamber** - the space between the cornea and the iris

**Aqueous humor** - the clear fluid which fills the anterior and posterior chambers of the eye

**Astigmatism** - a refractive error in which a defect of curvature on one of the refractive surfaces of the eye prevents a clear image from being focused on the retina

**Binocular vision** - the ability to use both eyes simultaneously to focus on the same object and fuse the two images into one with the correct interpretation of solidity and position in space

**Blepharitis** - inflammation of the glands and lash follicles along the margin of the eyelids

**Blindness** - legal blindness is a visual acuity of 20/200 and or the ability to see only 20% or less of the visual field after best correction in the better eye

**Blind spot** - area where retinal nerve fibers converge (optic disc) to form the optic nerve. Corresponds to the area of non-vision in the visual field

**Cataract** - a defect in the transparency or opacity of the lens or its capsule

**Chalazion** - a lump on the eyelid that results from chronic inflammation of meibomian gland

**Choroid** - the vascular layer located between the sclera and the retina

**Cilia** - of the eye refers to eyelashes

**Ciliary body** - the portion of the uveal tract between the iris and the choroid that contains the muscles of accommodation and secretes aqueous

**Coloboma** - absence or defect of some ocular tissue, usually a congenital fissure of any part of the eye, such as an incomplete iris

**Color deficiency** - inability to perceive differences in color, usually for red-green, rarely for blue-yellow. It can range from mild to severe in degree. It is more common in males than females

**Concave lens** - a lens having the power to diverge parallel rays of light. It is used to correct myopia

**Cones** - one of two types of light-sensitive cells on the retina. Cones are more numerous in the area of the macula and are responsible for seeing color and fine detail

**Conjunctiva** - delicate membrane that lines the eyelids and the exposed part of the sclera

**Conjunctivitis** - inflammation of the conjunctiva

**Convergence** - simultaneous turning of the eyes toward each other

**Convex lens** - a lens having the power to converge parallel light rays to bring an image to focus. It is used to correct hyperopia or presbyopia

**Cornea** - the clear transparent membrane that covers the iris and pupil and joins the conjunctiva

**Crystalline lens** - a transparent colorless body suspended in the anterior portion of the eyeball between the aqueous and vitreous chambers. Its function is to help bring light rays into focus.

**Dacryocystitis** - inflammation of the tear sac, usually due to blockage

**Depth perception** - the ability to perceive the solidity of objects and their relative position in space. Stereopsis

**Diopter** - unit of measurement expressing the strength or refractive power of a lens at one meter

**Diplopia** - double vision

**Divergence** - simultaneous turning of the eyes away from each other

**Emmetropia** - absence of refractive error

**Epicanthus** - congenital skin fold overlying the inner portion of the upper lid and the inner canthus; simulates the appearance of esotropia. Tends to recede as the bridge of the nose narrows in early childhood

**Esophoria** - a latent tendency of the eye to turn inward

**Esotropia** - a manifest inward deviation of the eye

**Exophoria** - a latent tendency of the eye to turn outward

**Exotropia** - a manifest outward deviation of the eye

**Farsightedness** - a lay term for hyperopia

**Field of Vision** - the entire area which can be seen at one time without shifting the head or eyes

**Floater** - opacities within the vitreous space that cast moving shadows on the retina

**Focus** - adjustment of the lens to produce a clear picture

**Fovea** - small depression in the retina at the back of the eye; part of the macula adapted for the most acute vision

**Fusion** - the integration of two separate images into a single mental picture

**Glaucoma** - a disease marked by increased intra-ocular pressure, which can cause blindness if not treated

**Hyperopia** - the refractive condition of the eye at rest such that light rays from a distant object are focused behind the retina

**Hypertropia** - a tendency of one eye to deviate upward

**Iris** - the colored circular membrane surrounding the pupil

**Iritis** - inflammation of the iris

**Lacrimal apparatus** - the system responsible for the formation, secretion, and drainage of tears

**Lazy eye** - lay term for amblyopia

**Lens** - the transparent body, convex on both surfaces, lying directly behind the iris and serves to focus light rays on the retina

**Lids** - the outermost covering of the eye

**Macula** - a small depressed area in the retina where sharpest vision occurs

**Monocular** - pertaining to or having one eye

**Myopia** - a refractive error in which the eyeball is too long from front to back or the refractive power so strong so that parallel rays of light are focused in front of the retina

**Near point of accommodation** - the nearest point at which the eye can see an object distinctly. It varies according to the power of accommodation in the individual

**Near point of convergence** - the nearest point at which two eyes can direct their gaze simultaneously, normally about three inches from the nose

**Nearsighted** - lay term for myopia

**Night blindness** - a condition in which the sight is good by day, but deficient at night or in faint light

**Nystagmus** - an involuntary rapid movement of the eyeball; it may be lateral, vertical, rotary or mixed

**Occluder** - a device used to cover one eye during vision screening

**Oculus dexter (O.D.)** - right eye

**Oculus sinister (O.S.)** - left eye

**Oculi uterque (O.U.)** - both eyes

**Ophthalmologist** - an MD who specializes in medical and surgical diagnosis and treatment of defects and diseases of the eye, prescribes drugs, eyeglasses, contact lenses and optical aids

**Ophthalmoscope** - an instrument used in examining the interior of the eye

**Optic nerve** - nerve by which visual impulses are transmitted from the retina to the brain

**Optician** - a person who grinds lenses, fits them into frames, and adjusts the frames to the wearer

**Optometrist (OD)** - a doctor of optometry who specializes in the diagnosis and treatment of functional vision problems, prescribes corrective lenses, contact lenses, or visual therapy and examines for eye disease or ocular signs of systemic disease

**Orthophoria** - straight eyes

**Peripheral vision** - ability to perceive presence, motion or color of objects to the side

**Phoria** - a root word denoting a latent tendency of one eye to deviate up, down, left or right

**Photophobia** - eyes having an abnormal sensitivity or discomfort in light

**Plus lens** - a convex lens used for screening farsightedness by checking the eyes' ability to accommodate at distance

**Posterior chamber** - space between the posterior surface of the iris and anterior surface of the lens filled with aqueous fluid

**Presbyopia** - physiological change in the eye characterized by the lens becoming less elastic and therefore not able to focus up close

**Ptosis** - drooping of the upper eyelid

**Pupil** - the opening at the center of the iris that adjusts to allow light to enter the eye

**Refraction** - determination of refractive errors of the eye and correction by glasses

**Retina** - the innermost light sensitive layer of the eye; contains the rods and cones

**Rods** - vision cells that are not color sensitive; used for perception of motion, in low illumination, and in night vision

**Sclera** - the white part of the eye, which with the cornea, forms the external protective coat of the eye

**Stereopsis** - binocular depth perception

**Strabismus** - eyes that are out of alignment

**Sty** - infection of a gland in the margin of the eyelid

**Suppression** - a condition in which the image from one eye is ignored (suppressed) by the brain. Suppression that exists for a period of time could lead to amblyopia

**Tropia** - a root word denoting a manifest turning in, out, up or down of one eye in relation the other

**Uvea** - vascular and pigmented layer of the eye, includes the choroid, ciliary body and the iris

**Visual acuity** - the ability of the eye to distinguish detail as an object is placed farther away or as it becomes smaller in size

**Vitreous humor** - transparent gelatinous substance that fills the space behind the lens and keeps the eyeball expanded and in shape