Children’s Vision:
A Guide for School Nurses & Teachers

Provided through the Kids Welcome Here® campaign

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Cornea
- Outer, clear part of eye
- Provides 65% of focusing power
- Highly sensitive, has more nerves than any other part of the body

Iris
- Colored part of eye
- Controls light – regulates size of pupil

Lens
- Colorless, no blood vessels
- Fine tunes focusing, especially for reading and close work
- Lens becomes larger, less elastic over time, decreases in focusing ability
- Some younger people have focusing difficulty because of less efficient function of the muscle that controls this lens

Conjunctiva
- Membrane over the white part of the eye and eyelids
- Inflammation of this tissue is “pink eye”
Retina
- Inner lining of the eyeball
- 100 million cells respond to visual stimuli, package it somewhat and send information to the brain

Optic Nerve
- Nerve pathway between eye and brain
- Carries visual messages to the brain
- The brain is truly where one sees

Vision & Learning
- Vision disorders are the fourth most common disability in the United States and the most prevalent handicapping condition in children
  

Vision & Learning
- As many as 2-5% of preschool children, amounting to nearly 1 million children nationwide, are estimated to have impaired vision
  
  Maternal and Child Health Improvements Project Summary, American Academy of Pediatrics, August 2001

Vision & Learning
- 80% of all learning during a child’s first 12 years is from vision
  

- About 90% of all information to the brain comes through the eyes
  
  Pennsylvania Department of Health, Procedures for the Vision Screening of Pennsylvania’s School Age Population, March 2001

Vision & Learning
- The National Eye Institute (NEI) states:
  In children, vision impairment is associated with developmental delays and the need for special education, vocational, and social services beyond childhood into adulthood.
  
Vision & Learning

It is reported that children with reading problems exhibit a greater than 50% prevalence of visual deficiencies in focusing or eye alignment as compared to normal achieving peers.

Grisham, JD, Computerized Visual Therapy – Year 1 Report, Palo Alto, American Institutes for Research, 1986

Vision & Learning

Among children who are reading disabled, as many as 80% show a deficiency in one or more basic vision skills.


Vision, Learning & Behavior

Children with vision related learning problems revealed that they were experiencing feelings such as a lack of direction, a sense of not belonging, an inadequate sense of self-assurance and a feeling of insecurity, inadequacy and inferiority.

Zaba, JN, Vision’s Relationship to Delinquency, Illiteracy and Learning Problems, 2001

Vision, Learning & Behavior

A study of juvenile delinquents found 74% failed at least one vision test.

Several studies examining the link between learning disabilities, delinquency and vision have found that significant numbers of juvenile offenders had one or more visual deficiencies.


Vision Is More Than 20/20

Efficient vision requires a number of critical visual skills:

- Acuity
  - Sharpness of near and far vision
- Functioning
  - Focusing, eye teaming and eye movement skills
- Visual perception
  - Eye-hand coordination, visualization, depth perception and understanding what is seen

Vision Disorders

- Incidence of refractive error (possible need for eyeglasses) – 8.9% at age 3; 10.8% at age 4, 12.0% at age 5; 18.7% at age 6
  - Results from Kentucky Optometric Association study
- Strabismus ("eye turn") – 2-4%
- Amblyopia ("lazy eye") – 3-5%
  - Composite of multiple studies
- Functional vision problems – as high as 20% by elementary school
  - Ciuffreda, KJ, Tannen, B, Eye Movement Basics for the Clinician, St. Louis, Mosby, 1994
Near Vision & Learning

- Vision is not just 20/20
- Academic performance is linked to vision performance at NEAR

Rosenbloom, AA, Morgan, MW, Principles and Practice of Pediatric Optometry, “What are the Relationships Between Vision Disorders and Reading Difficulty?” 1990, 527-535

Near Vision & Learning

- Hyperopia (farsightedness)
- Astigmatism
- Amblyopia
- Strabismus
- Convergence
- Eye focusing
- Eye teaming

Detection

- Of children aged 3-5 seen by pediatricians, only 66% received a “vision screening” (defined as spending 10 or more SECONDS trying to get the child to cooperate)
- A screening was NOT attempted on more than 60% of 3-year-olds


Detection

- The Vision In Preschoolers (VIP) Study found one third of children screened were missed for targeted visual problems EVEN WHEN THE TESTS WERE ADMINISTERED BY EYECARE PROFESSIONALS

The VIP Study was funded by a grant from the National Eye Institute/National Institutes of Health.

Detection

- Of children who failed a screening, 50% of the parents were unaware of the fact two months later


Detection – Exams and Screenings

- The need for comprehensive vision examinations should not be confused with the need for quality vision screening programs
- Each has a different purpose and generates different results

Detection - APHA Resolution

"Realizing that infant and early comprehensive childhood eyecare is a neglected area...[APHA] encourages a regular comprehensive eye examination schedule as opposed to just screening...so that all children have exams performed at approximately age 6 months, 2 years, and 4 years."

American Public Health Association, "Improving Early Childhood Eyecare," Policy Number 2001-1

Detection – Prevent Blindness America

Advocates professional eye exams for children, including those without any signs of eye trouble at birth, at six months of age, at six months of age, before entering school and periodically throughout the school years

Maurice F. Rabb, MD, Prevent Blindness America Medical Director, Chicago Sun Times Letter to the Editor, June 26, 2001

Detection

Of the 74 million children in America, only 14% have had an eye exam by the age of 6


AOA Guidelines

Infants should be seen by a doctor of optometry by age 6 months (or sooner if patient or family history suggests an earlier evaluation), age 3 years, and age 5 years (unless the doctor recommends a more frequent schedule)

American Optometric Association Clinical Care Guidelines

Vision Development

Babies

- Can focus at only near and in high contrast
- Immature muscle coordination (eye turn)
  - Should hold focus by 3-4 months
- Takes 3-6 months to develop "normal" (20/20) visual acuity (most infants born farsighted)
- Color vision by 3 months
- Consistent eye alignment by 4-6 months
- Stereo appreciation by 6-12 months
Myopia

- Nearsightedness (see better near than far)
- Most common problem in school-aged children
- Most common reason for referral from a school screening

Hyperopia

- Farsightedness (sees better far than near)
- Most babies are born with hyperopia
- Excessive hyperopia can create a cross-eyed condition

Impact of Hyperopia

- Near vision most important to learning
- Children’s ability to focus varies greatly
- 9 of 11 studies support the statistical relationship of uncorrected hyperopia and difficulty in reading

Astigmatism
- Irregularly shaped eyeball (like a football) produces multiple focal points
- Most common vision problem overall

Astigmatism Referral & Correction
- Causes a blur at distance and near
- May be difficult to detect in vision screenings
- Compensation with eye glasses or contact lenses

Color Vision
- Difficulty distinguishing colors
  - Red/Green defect most common
  - Yellow/Blue less common
- Color preferences by 3 months, starting with red/yellow/orange then blue/green
- Can indicate an ocular disease
- No treatment, but exam still beneficial

Amblyopia
- Also known as “Lazy Eye”
- Affects 3-5% of children
- Can lead to functional vision loss
- Early detection and treatment most effective
- Symptoms include squinting, closing one eye, overall poor acuity, head tilt, eyestrain, double vision, poor depth perception and headaches

Amblyopia Referral & Treatment
- Could be detected via near or distance acuity screening (two line difference)
- Treatment Options
  - Vision therapy/patching
  - Drops
  - Glasses or contact lens
  - Surgery (strabismus)

Vision Therapy
- Also known as vision training or orthoptics
- Individualized program of eye training
- Series of treatments to improve vision skills such as eye movement control, focusing, coordination and teamwork
Strabismus

- Eye turn, sometimes called crossed eyes
- Four types:
  - Esotropia (in, “crossed”)  
  - Exotropia (out)  
  - Hypertropia (up)  
  - Hypotropia (down)  
- Affects 2-4% of children

Strabismus

- 25% occur before 6 months
- May be hereditary
- Caused by poor coordination of eye muscles or paralysis of eye muscles
- Symptoms may include blurred vision, double vision, poor depth perception, eye-hand coordination delays and cosmetic eye turn

Strabismus

- Incidence is significantly higher in special needs populations  
  - Cerebral palsy  
  - Down’s syndrome  
  - Premature birth  
  - Traumatic brain injury

Strabismus Referral & Treatment

- Could be detected during near and distance vision screening
- Treatment options
  - Vision therapy/patching  
  - Drops  
  - Eyeglasses  
  - Surgery

Convergence Insufficiency

- One of several binocular vision problems
- Inability to effectively turn the eyes inward for near vision
- Statistically higher incidence in students with ADHD

Convergence Insufficiency Referral

- Optional test in new school vision screening procedures (in appendix)
  - Subjective diplopia (blurring or double vision)  
  - Objective diplopia (misalignment of the eyes)
- Treatment
  - Vision therapy  
  - Eyeglasses

Hendry, J., Reuters Health/Medical News, “Connection Possible Between Eye Disorder in Children and ADHD,” April 25, 2000
Binocular Vision Disorders

- Convergence excess (eso), convergence insufficiency (exo/near), divergence excess (exo/distance), vertical phoria
- Highly correlated with vision performance at near, such as reading, writing and computer use

Rosenbloom, AA, Morgan MW. Principles and Practice of Pediatric Optometry. "What Are the Relationships Between Vision Disorders and reading Difficulty?" 1990, 530-531

Binocular Vision Disorders

- Similar to strabismus but the eyes do not overtly turn; the two eyes “work” to maintain alignment
- This “work” may create eyestrain that may affect visual performance
- Treatment
  - Eyeglasses
  - Vision therapy

Conjunctivitis

- Often called “Pink Eye”
- Inflammation of membrane over the white part of the eye or eyelids
- Causes & treatment
  - Viral: no treatment
  - Bacterial: antibiotic eye drops
  - Allergic: drops (lubricants, antihistamines, mast cell stabilizers)

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