Educating teachers and parents about the visual system and how problems with vision can affect a child's ability to read

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Educating teachers and parents about the visual system and how problems with vision can affect a child's ability to read

Abstract
In order to properly identify and therefore treat those children with visually related reading problems, an educational presentation was developed to help educate teachers and parents about this problem. Appropriate topics on the visual system were included to give a thorough educational background on this subject. This presentation and CD are included in the appendix section of this document and is available for anyone's use. Our hope is that by educating teachers and parents about this issue, children with visually related reading problems will be properly referred to optometrist's who can treat such conditions so that these children will be able to reach their full potential in school and later in the work environment.

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EDUCATING TEACHERS AND PARENTS ABOUT THE VISUAL SYSTEM AND HOW PROBLEMS WITH VISION CAN AFFECT A CHILD'S ABILITY TO READ

PRESENTED BY:

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In partial fulfillment for the Master of Education – Visual Function in Learning at Pacific University

December 2002

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ABSTRACT

In order to properly identify and therefore treat those children with visually related reading problems, an educational presentation was developed to help educate teachers and parents about this problem. Appropriate topics on the visual system were included to give a thorough educational background on this subject. This presentation and CD are included in the appendix section of this document and is available for anyone's use.

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Educating Teachers and Parents About the Visual System and How Problems With Vision Can Affect a Child’s Ability to Read

INTRODUCTION

It is important to educate teachers and parents about the visual system so that they are aware of how deficits in this area can affect a child’s ability to read. Furthermore, they need to know how to identify those children with visually related reading problems so that they can refer them to trained optometrists. Early identification will give these children the opportunity to learn to read efficiently. These are the goals of this educational presentation. Through education and awareness, children with these types of problems should not “fall through the cracks” of the school system, but will enjoy those opportunities that other children take for granted. Finally, these children should be given the chance to enjoy reading for pleasure as well as being able to read successfully in school and later in the work environment. This presentation is found in the appendix section of this document along with the CD version. We are making this product available for anyone’s use.
Educating Teachers and Parents About the Visual System and How Problems With Vision Can Affect a Child’s Ability to Read

LITERATURE REVIEW

It is not uncommon for children to present with vision problems that directly affect their learning. Their teachers and/or parents will have identified them as struggling in school (Richman 24-25). Furthermore, when these educators and parents are concerned about this sort of problem they will probably schedule these children to see an eye care specialist. For clinicians, there are three major objectives to consider whenever examining these patients. They are as follows:

1. To find out what learning tasks are deficient,
2. To determine if there is a visual component exacerbating or contributing to the learning dysfunction, and
3. If there is a vision and learning relationship, to provide appropriate treatment, management or referral for the problem.

First one needs to define the nature of the child’s learning problem. A thorough case history will help to determine what types of learning difficulties the child is experiencing. According to Shaywitz, the most frequently studied learning disabilities are the reading disabilities (Shaywitz 998). Therefore, assume that the teacher or parent reports that the child is having reading problems. The next step would be to determine what type of reading problem they are experiencing. One may ask the child to respond to
certain optometric tests. Depending upon their responses, one can determine if the deficiencies are due to or in combination with reduced comprehension, mechanics of reading, word order, or recognition of letters.

Suppose two patients are examined. Assume they are both 12-year-old boys whose teacher and parents have reported they exhibit poor reading comprehension. The first child is able to correctly pronounce words that are familiar of children his age. Furthermore, he shows no signs of visual fatigue, eyestrain or discomfort while reading. Even though he can read for long periods of time, he cannot understand what he just read. When asked questions about the reading, he is only able to repeat back the exact words that were found in the text and cannot provide any insight or alternative phrases that indicate he understands what he just read. Moreover, his comprehension does not improve when he is read to. Would you suppose, given his case history, that his reading problem was due to a visual dysfunction?

It would seem that there are additional factors that enter into the picture other than vision. For instance, maybe he has a language deficiency that is contributing to his reading comprehension problem.

Now consider the second little boy. This child can also identify and decode words that are familiar to him. However, in contrast to the first child, he shows decreased performance when required to read for long periods of time. His reading comprehension further declines when he is asked to read books with small print size. Frequently he omits words or inserts the wrong word, rereads the same line, or skips lines altogether. Now, given this case history, would you suppose that a visual dysfunction is contributing to his reading problem? With this little boy, we would suspect that he has
some problems with his visual system. The eye care specialist should specifically examine the sensory and motor aspects of eye movement and accommodation/vergence skills to help identify where in the visual system this child is having difficulties. These two examples demonstrate how a careful case history can help differentiate visually based learning problems from learning problems caused by other factors.

According to Flax, there are several distinctions between learning to read and reading to learn. These two aspects of reading have different characteristics and visual demands. Let us first consider some of the features in learning to read. In the beginning years of school, the books have large print with few words per page. There may even be pictures that depict what is going on in the story. Furthermore, the reading activity usually lasts for only a short period of time (Flax 367-368).

When learning to read, there are important visual factors that need consideration. At this age, the child should possess accurate oculomotor control. They should also have adequate visual form discrimination and directional orientation. When first learning to read, however, accommodation and vergence skills are of less importance.

In contrast, reading to learn requires longer reading sessions using books with smaller print. There is less dependence on form perception because context, phonic and linguistic cues are used to help these children recognize words. At this point in their education, typically about third grade, the emphasis shifts from the mechanics of reading to comprehension and speed. Because of this, accommodation and vergence skills become much more important. While form perception becomes less important, oculomotor control becomes more important. This aspect of the visual system helps the
student maintain their place while reading as well as preserving what they have just read (Flax 368-371).

Some children may not have any difficulty learning to read because the visual system is not sufficiently taxed to produce signs and symptoms. When the emphasis shifts to reading to learn, those children with fragile or dysfunctional visual systems may begin to exhibit learning problems, in addition to specific signs and symptoms related to these deficiencies (Birnbaum 488).

Oculomotor control, accommodation, binocular vision, and visual perception can affect different subject areas. First, consider oculomotor control. When a student is just beginning to learn to read, precise oculomotor control is necessary in maintaining attention to fine detail and sequential inspection of words. With reading experience, oculomotor control becomes more important for maintaining their place while reading. With inaccurate control, omissions, substitutions and careless errors may result. Poor oculomotor control may also adversely affect reading comprehension. To avoid such errors, students may compensate by drastically slowing their reading rate (Scheiman 137).

Even in subjects like math, oculomotor control is important. Careless errors such as miscopying the numbers or shifting the numbers to the wrong column when adding or subtracting are examples of problems that appear with poor oculomotor control.

Now relate accommodation to learning. Deficiencies in accommodation begin to appear when we transition to more advanced levels of reading, somewhere around third or fourth grade. Here the emphasis in reading shifts from merely decoding words to
speed and comprehension. Books with smaller print compounded with longer reading periods tend to accentuate reading problems. As a result, fatigue will generally appear as one of the primary signs and symptoms experienced by these students. In addition, headaches and blurriness are common. Major problems such as asthenopia or localized eye discomfort, distance blur or slowness of near-far clarity as well as accommodative spasm may also develop. Therefore, the suspicion of accommodative dysfunctions should be heightened for those children in grades three and beyond who are having reading problems (Flax 368-369).

The results from research by Simons and Grisham suggest that binocular vision also affects learning (Simons 585), but primarily for older students. Rarely does it occur when children are just beginning to read. This is probably because sustainability is more important when reading emphasis moves towards speed and comprehension and is usually not a factor when decoding. As the homework level increases, binocular dysfunctions become more identifiable, especially when reading efficiency and comprehension decline. Intense headaches occurring in the occipital lobe as well as in the frontal and temporal lobes are commonly seen when binocular vision is deficient.

Visual perception seems to affect most aspects of learning. In the beginning, word recognition is a major component of reading, as is recalling, matching of shapes, and directional orientation of the letters. When reading shifts to speed and comprehension, visual perception decreases in importance and students are often able to compensate for most visual perception deficits (Flax 371).

Visual spatial abilities are also important to the development of numbers as
quantities. Visualization assists students in understanding spatial relationships in subjects such as geometry and trigonometry. Some students need to visualize the words in order to spell them correctly. Errors occur when these students are unable to do this and instead base the correct spelling on the sound of the words rather than on the perception of the words. Visual perception deficiencies may also appear in writing. However, we must be careful because some of these problems may be due to faulty fine motor control or developmental delays.

It is apparent from this discussion that many visual factors can affect learning. If there is a coexisting learning disorder, these visual difficulties are likely to compound their frustration and become barriers to progress. Since deficiencies can result in obvious learning difficulties for students, it is necessary for the eye care professional to properly diagnose, treat and manage or refer these patients. Before this can be done, however, there are certain signs and symptoms that would cue the parent, teacher or eye care professional into identifying those children who have visual dysfunctions that may affect learning. For organizational purposes, these are grouped into three broad categories: signs and symptoms that are physical in nature, those that result from the visual condition, and those that result from adaptive mechanisms from the visual condition.

The first category is the most frequently observed and causes the patient considerable discomfort or even pain. The three most commonly reported physical signs and symptoms include headaches (eye-ache), fatigue or eyestrain while reading, and double vision that may manifest with a misaligned eye (Hennessey 177). Any of these
problems could interfere with learning because attention and effort is diverted from the reading material. Other physical responses include tearing of the eyes, nausea, dizziness, sensitivity to light, and blurred vision that is especially prevalent at near.

There is a lengthy list of signs and symptoms that result from the visual condition itself. All of those listed below cause considerable problems for the reader and could interfere with learning efficiency. The most common problem from this group is reduced or inefficient comprehension. The remaining signs and symptoms include: difficulty changing focus from near to far, errors in visual judgment, reduced stereopsis or depth perception, less efficient visual performance in sports, poor eye-hand coordination, short attention span, excessive rubbing of the eyes, frequent loss of place while reading, omission of words, and skipping lines. Any of these problems could hinder reading performance. The problems compound when the patient presents with more than one of these conditions.

The final category considers those signs and symptoms that are compensatory mechanisms from the deficient condition. Three of these problems occur most frequently in patients who present with visual dysfunctions that affect learning. These include: suppression of vision in a turned eye, covering one eye or turning one's head while reading or watching T.V., and finally, avoidance of near tasks, especially reading. These behaviors represent more of an indication of poor eye movements. Other examples of this include finger reading and excessive head movements while reading. Again, the body compensates to alleviate uncomfortable or painful physical signs and symptoms. These compensatory behaviors are only short term "cures" because when the condition is
further ignored or left untreated, the problem becomes worse.

Once a patient has been identified and diagnosed with a specific visual dysfunction, there are several therapies to consider that may help minimize or eliminate the problem. The two most commonly prescribed treatments are spectacle or contact lenses and vision therapy (Dwyer 224-225). Studies show that both of these methods achieve great success in patients presenting with many of these learning related visual dysfunctions (Gallaway 85 and Hellerstein 624-625). Other therapies that could complement the two mentioned above include the following: maintain the appropriate distances for reading and near work, 33 cm. for children and 40 cm. for adults, using the appropriate amount of light while reading which requires the light to be brighter on the reading material than the surrounding area, without glare. Other therapies include taking frequent rest breaks as needed, patching the eye as appropriately prescribed, educating the patient about the eye condition, and finally, allowing additional time to complete the reading or near point activity.

It is important that parents, teachers, and eye care professionals become aware that faulty vision can contribute to reading difficulties in children. There are several treatment options available, of which vision therapy is just one option. By properly identifying children who could benefit from such therapy, these children can learn to read more efficiently with better comprehension.
REFERENCES


APPENDIX

Educating Teachers and Parents About the Visual System and How Problems With Vision Can Affect a Child’s Ability to Read

(CD version is included on the back cover of this document)
Educating Teachers And Parents About The Visual System And How Problems With Vision Can Affect A Child's Ability To Read

Presentation specifically designed for elementary school level

Scott A. McPherson Janet K. Drakulich

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Helpful Facts
• Facts about Vision Disorders 1 • Facts about Vision Disorders 2 • Facts about Symptoms of Vision Disorders • Facts about Eye Exams on Children 1 • Facts about Eye Exams on Children 2 • Facts about Visual Development • Facts about When a Child Should Get an Eye Exam • Goal of the AOA • Table of Contents

Facts about Vision Disorders 1
• "By most sources, vision disorders are the fourth most prevalent disability in the United States."
• "Vision disorders are the leading cause of handicapping children in learning and school functioning."
• "An estimated 17-25% of school-aged children have vision problems. Many of these problems may interfere with children's abilities to reach their potential in school."

Facts about Vision Disorders 2
• Other than needing glasses (refractive error), the most prevalent condition of children falls into the category of trouble with the eye's focusing system (accommodation) and problems with the eyes working together (binocular vision anomalies).

Consider This:
• Your eyes are a very precious gift that must last you a lifetime.

Facts about Vision Disorders 2
• Other than needing glasses (refractive error), the most prevalent condition of children falls into the category of trouble with the eye's focusing system (accommodation) and problems with the eyes working together (binocular vision anomalies).
Facts about Symptoms of Vision Disorders
• These conditions may interfere with school performance, causing a number of problems including:
  • Eye strain
  • Blurred or double vision
  • Loss of place and/or skipped lines
  • Word movement on the page
  • Inability to sustain attention while reading
  • Decrease reading comprehension over time

Facts about Eye Exams on Children 1
• "Studies show that ONLY 31% of children between ages 6 and 16 are likely to have had an eye and vision examination within the past year, while below the age of 6, ONLY about 14% are likely to have had an eye and vision examination."
• "Many parents believe the screening performed by the child's primary care physician or school nurse is sufficient to rule out all significant visual disorders. However, that is not the case."

Facts about Eye Exams on Children 2
• "Screening off of a letter chart (visual acuity) alone generally detects only about 30% of children who would fail a professional examination."
• "Visual acuity screening often fails to detect those conditions that would be expected to affect learning."
• "Parents of children who pass the vision screening may incorrectly assume that their children do not require further professional examination."

Facts about Visual Development
• "Extensive research has demonstrated the importance of the first few years of life in the development of vision."
• "The visual system of the newborn is poorly developed. Within the first 6 months of life, rapid changes occur in the visual system."
• "Interference with development during this very critical phase may lead to serious lifelong effects on vision. Successful treatment can be obtained more quickly with early intervention."

Facts about When a Child Should Get an Eye Exam
• Preventative eye care is important and examinations should take place at:
  • 6 months
  • Age 3
  • Before entering first grade (age 6)
  • Periodically during the school years.

Goal of the AOA
• Goal of the American Optometric Association's Pediatric and Vision Examination Guidelines:
  • "To minimize or avoid the adverse effects of eye and vision problems in children through early identification, education and prevention."
Eye Care Professionals

• Optometrist: O.D.
  - After completing college prerequisites (usually a bachelor’s degree), then four years at an accredited Optometry school
  - Prescribe glasses/contact lenses
  - Diagnose & treat diseases of eye
  - Help the eyes function better

• Ophthalmologist: M.D.
  - Medical school and then residency in Ophthalmology & surgery
  - Prescribe glasses/contact lenses
  - Diagnosis & treat diseases of eye

• Optician:
  - Fit frames and in some states correct lenses
  - Grind glasses lenses and dispense contact lenses
  - Assist Optometrist/Ophthalmologist as needed

Who Provides Eye Care?

• Optometrist
• Ophthalmologist
• Optician

Who else is involved?

• Multi-Disciplinary Approach:
  - Education
  - Speech Pathologist
  - Occupational Therapist
  - Audiologist
  - Psychologist
  - Pediatrician
  - Anybody else?
  - We all work together for the child’s benefit

The Parts of the Eye

The Parts of the Eye (Front View)
The Parts of the Eye (Side View)
Cross Sections of the Eye
The Eye/Camera Analogy
Table of Contents
The Parts of the Eye (Side View)

Cross Sections of the Eye

The Eye/Camera Analogy

- The eyeball is somewhat similar to a camera:
  - Cornea vs. Filter
  - Pupil vs. Aperture
  - Lens of eye vs. lens of camera
  - Retina vs. Film

Eye Anatomy Glossary

Eye Anatomy Glossary A-C
Eye Anatomy Glossary C 1
Eye Anatomy Glossary C 2
Eye Anatomy Glossary E-I
Eye Anatomy Glossary L-O
Eye Anatomy Glossary O-R
Eye Anatomy Glossary R-S
Eye Anatomy Glossary U-Y
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Eye Anatomy Glossary A-C

- Aqueous: a water-like fluid which fills the front part of the eye between the lens and the cornea. This fluid is produced by the ciliary body and drains into blood vessels.
- Chamber Angle: the junction of the cornea, iris and sclera. It extends 360 degrees around the perimeter of the iris. Channels here allow aqueous fluid to drain into blood vessels and if blocked will cause increased pressure within the eye.

Eye Anatomy Glossary C 1

- Choroid: a layer full of blood vessels located between the sclera and the retina, and which serves to nourish the outer portions of the retina.
- Ciliary Body: a structure located behind the iris which produces aqueous fluid that nourishes the front part of the eye and maintains eye pressure. It also has the muscles which control the focusing system of the eye (the lens).
### Eye Anatomy Glossary C 2
- **Conjunctiva**: a thin lining over the white part of the eye (sclera) and also lines the inside of the eyelids. Cells here produce mucous, which helps to lubricate the eye.
- **Cornea**: the clear window, on the very front part of the eye, through which we see. This is a vital part of the eye’s focusing and the corneal curvature itself is responsible for about 80% of the focusing of the eye.

### Eye Anatomy Glossary E-I
- **Episciera**: a fibrous layer between the conjunctiva and sclera. Lumps, called pingueculum, sometimes form in this layer on the surface of the eye near the outside corners. These lumps are not harmful.
- **Extraocular Muscles**: six muscles around each eye control eye movements.
- **Iris**: the colored part of the eye. It contains muscles which open or close the pupil in response to surrounding light. A blue iris has less pigment than a brown one.

### Eye Anatomy Glossary L-O
- **Lens**: located behind the iris, and helps to focus light. When the lens becomes cloudy, it is termed cataract.
- **Macula**: the part of the retina which is most sensitive and is responsible for the central (or reading) vision and color vision. It is located near the blind spot (the optic nerve).
- **Optic Nerve**: the sheath around the optic nerve is continuous with that of the brain, and the nerve connects directly to the brain. It contains visual information from the eye, and contains about 1.2 million nerve fibers.

### Eye Anatomy Glossary O-R
- **Orbit**: the bony socket containing the eye, fat, extra ocular muscles, nerves, and blood vessels. Two walls, the floor and inside walls are thin and can be fractured by trauma.
- **Pupil**: the black center, a hole, in the iris. Its size is controlled by the iris muscles.
- **Retina**: this thin layer inside of the eye receives light rays, processes them, and sends those visual signals to the brain by way of the optic nerve. The retina may be thought of somewhat like the “film of a camera.”

### Eye Anatomy Glossary R-S
- **Retinal Pigment Epithelium (RPE)**: separates the retina from a layer with many blood vessels called the choroid. Sometimes breakdowns in the RPE allow macular degeneration.
- **Sclera**: the “whites” of the eyes. This tough layer is affected by few diseases. It is covered by the episclera and conjunctiva, and the eye muscles are connected to it.

### Eye Anatomy Glossary U-V
- **Uveal tract**: a group of similar structures including the iris, ciliary body and choroid which may get inflammatory conditions called uveitis or iritis.
- **Vitreous**: a jelly-like, clear fluid which fills (from the lens back) most of the eye. This tends to liquefy with age and is viewed as “floaters.” Its separation from the retina can lead to retinal tears and detachment.
Common Visual Conditions Requiring Glasses/Contact Lenses

How Light Is Focused by the Eye

What is Refractive Error?
- Definition: Images of objects at a far distance are not properly focused on the retina
  - Nearsightedness
  - Farsightedness
  - Astigmatism

Nearsightedness
- aka Myopia
  - Light from distant objects is focused in front of retina, hence the retina receives a blurry image
  - Due to:
    - The cornea or the lens bend the light too much.
    - Eyeball is too long for the eye's optical system

Nearsighted Eye Diagrams

How Someone Who Is Nearsighted Might See
- Images in the distance are blurry for nearsighted people

How Someone Who Is Nearsighted Might See
- Normal
  - aka Emmetropia
  - When a person does not need glasses or contact lenses to see objects at a far distance, light (images that we see) is focused exactly on the retina
Farsightedness
• aka Hyperopia
  • Light hitting the retina is not in focus and, if it were physically possible, the light would come to a focus behind the retina
  • Objects far away are easier to see than objects nearby
  • Due to:
    • Eyeball is too short
    • Cornea does not bend light enough
    • Distortion

How Someone Who is Farsighted Might See
• Images for a farsighted person are blurry at near or it may be blurry everywhere with near vision worse

Astigmatism
• Light coming into the eye is focused at two points. One of those points may or may not be in focus on the retina.
• Any image observed will be somewhat out of focus
• Due to:
  • The eye may be shaped like a football and be longer in one direction than the other direction, hence the light is focused at different locations
  • Or the the cornea and/or the lens may be irregularly shaped
What is the difference between SIGHT and VISION?

SIGHT
- Eyes ability to detect:
  - Light
  - Form
  - Motion
- Depends upon: Clear, accurate signals to brain

VISION 1
- Brains ability to:
  - Interpret visual information
  - Gain meaning from visual information
- Requires:
  - Sight Interpretation Skills
  - Association Skills
  - Memory Skills

How Someone With Astigmatism Might See
- Picture on Left: shows normal view of a stopwatch
- Picture on Right: shows possible view of watch for someone with astigmatism
  - Picture from: www.astigmatism.com
The Visual Pathway 2

Thoughts on Vision

- “Eyes don’t tell people what to see; people tell eyes what to look for.”
  - Dr. Larry McDonald
- “Vision is a function which enables the individual to gather, analyze, process, store, retrieve, and respond to light information.”
  - Dr. Arnie Sherman

Things to think about...

- “If you must use the eye/camera analogy—remember—there are TWO cameras.”
  - Unknown
- “Visual acuity (seeing 20/20) is like 98.6°F body temperature. You can have 98.6°F temperature and still be dying—you can have 20/20 visual acuity and still be a visual cripple.”
  - Unknown

VISION 2

- Vision allows us to obtain meaning and understanding from what we see.
- Vision is a set of skills and abilities of which 20/20 eyesight is only one skill.
- Other necessary skills include:
  - Two-eyed coordination (vergence)
  - Focusing (accommodation)
  - Tracking (eye movements)

Visual Skills Needed in the Classroom and Common Visual Inefficiencies

NOTE: This project only covers visual skills that often cause problems. It does not attempt to cover all visual problems, especially perceptual (brain processing) difficulties. (For instance, dyslexia)

Visual Skills Needed for the Classroom

Visual Skills Needed for the Classroom 1

Visual Skills Needed for the Classroom 2

Visual Skills Needed for the Classroom 3

Table of Contents
Visual Skills Needed for the Classroom 1
- Accommodation: ability to focus eyes accurately and easily at varying distances
- Convergence: ability of both eyes to move from a distant target to a near target and to aim eyes comfortably at a near target
- Divergence: ability of both eyes to move from a near target out to the distance

Visual Skills Needed for the Classroom 2
- Eye teaming (extra ocular muscle movements): both eyes working together and appropriately for the activity.
- Saccades and Pursuits: type of eye movements necessary for accurate and comfortable reading
- Depth Perception (Stereopsis): Use of both eyes to look at a target and have depth perception

Visual Skills Needed for the Classroom 3
- Eye-hand coordination: brain uses information from the eyes to guide body movements
- Object location: ability of brain to use visual information to gage where an object is in space
- Visual discrimination: ability of brain to decipher one visual target from another (Example: recognizing differences between p, q, d, & b)

Common Visual Inefficiencies
- Includes descriptions of visual skills needed in the classroom as necessary

Common Visual Inefficiencies
- Accommodation
- Accommodative Insufficiency
- Convergence
- Convergence Insufficiency
- Convergence Excess
- Divergence
- Divergence Insufficiency
- Divergence Excess
- Strabismus
- Amblyopia
- Suppression
- Oculomotor Dysfunction
- Binocular Vision
- Binocular Dysfunction
- Table of Contents

How can Vision Therapy help?
- Improve focusing skills
- Improve eye-teaming
- Improve reading and comprehension
- Improve ability to read for longer periods of time
Accommodation

The ability to focus one’s vision in order to view objects clearly at varying distances

Normally, this happens accurately and instantly as one shifts attention from one distance to another

Example: child looking from the chalkboard to a notebook on their desk

Accommodative Insufficiency

The term used when one’s focusing skills are inadequate.

This can be caused by general fatigue, stress, uncorrected far or near sightedness, eye aiming problems or may be a normal variation in the population.

Other causes include excessive near-point work, age, factors related to eye or whole body diseases/conditions, drugs, medications, and emotional problems.
Accommodative Insufficiency 2

- C. With accommodative insufficiency, the ability to accommodate is not adequate to have or sustain a clear focus
- D. Reading glasses can bring the target into sharp focus to be seen clearly

Accommodative Insufficiency Effects

- If untreated, this lack of focusing ability can be more than just uncomfortable or visually tiring.
- Difficulty sustaining near vision may:
  - Decrease the amount of time a child can perform near tasks
  - Increase in the time needed to complete a task
  - May challenge his/her motivation to learn
  - School performance and achievement potential may be affected

Accommodative Insufficiency Symptoms

- Symptoms of a child with a focusing problem may include:
  - Complaints of blurred vision, especially after near work
  - Headaches
  - Fatigue and/or eyestrain while reading
  - Avoidance of near tasks, such as reading

Accommodative Insufficiency Treatment 1

- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
- Treatment may include:
  - Reading Glasses (Plus Lenses)
  - Vision Therapy
  - A combination of the two

Accommodative Insufficiency Treatment 2

- Plus lenses can help relax the eyes by decreasing the focusing demand.
- Vision therapy involves a training program with daily exercises designed to increase and strengthen the child’s ability to focus.
- It is very important for the child to follow the instructions provided by the doctor.

Accommodative Insufficiency Treatment 3

- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing any prescribed lenses
  - Doing any prescribed vision therapy
  - Maintain an appropriate reading distance (~33cm for children, ~40cm for adults)
**Convergence**

- Good convergence skills help maintain a comfortable visual posture, decreasing fatigue and the effort needed to read or do near work for extended periods of time.

**Convergence 1**

- The ability of both eyes to turn inward simultaneously in order to view a near target.
- Allows for quick and accurate aiming of the eyes from distant to near targets providing comfortable vision without seeing double.
- Example: Looking from the chalkboard to a book.

**Convergence Insufficiency**

- The term used when the inward aiming skill of the eyes up close are inadequate and below expected norms.
- Some causes of this are visual stress, fatigue, illness, drugs, aging and genetic factors. Often the cause is unknown.

- At a normal reading distance, one with convergence insufficiency may be able to maintain appropriate eye alignment, but often requires additional effort and strain.
- B. The eyes are unable to converge and one eye drifts out when the target is moved closer.
**Convergence Insufficiency Symptoms**
- Symptoms of a child with inadequate inward aiming ability are:
  - Double vision (especially at reading distance)
  - Headache or eye ache
  - Fatigue or eyestrain
  - Avoidance of near work
  - Covering one eye or turning one’s head while reading
  - Reduced reading comprehension

**Convergence Insufficiency Effects**
- If untreated, this lack of inward eye aiming ability may:
  - Decrease the time a child is able to read or do other near work
  - Increase in the time needed to complete a task
  - May challenge the child’s motivation to learn
  - School performance and achievement may be affected

**Convergence Insufficiency Treatment 1**
- If you suspect a child is experiencing the symptoms this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
- Treatment may include:
  - Therapy to increase convergence ability
  - Reading glasses with base-in prism

**Convergence Insufficiency Treatment 2**
- Near-point therapy activities very effectively increase one’s convergence ability
- This vision therapy helps the eyes easily maintain a single image of targets at close distances
- Reading glasses with base-in prism may be helpful for those unable to do vision therapy or who, in rare instances, have limited improvement with therapy

**Convergence Insufficiency Treatment 3**
- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing any prescribed lenses
  - Doing any prescribed vision therapy
  - Using good lighting when reading
  - Allowing additional time, if necessary, to complete reading and/or near activities

**Convergence Excess**
- Convergence Excess 1
- Convergence Excess 2
- Convergence Excess 3
- Convergence Excess 4
- Convergence Excess Symptoms
- Convergence Excess Effects
- Convergence Excess Treatment 1
- Convergence Excess Treatment 2
- Convergence Excess Treatment 3
- Table of Contents
Convergence Excess 1

- This term is used when outward aiming skills of the eyes up close are inadequate and below expected norms.
- The eyes tend to aim inward in an excessive amount in front of the near target on which one is focusing.
- This is caused by an imbalance in the relationship between convergence and accommodation (ability to focus).

Convergence Excess 2

- A. One with convergence excess may be able to keep appropriate eye alignment at a normal reading distance.
- B. When the target is moved closer or the eyes are fatigued, then the eyes may turn excessively inward and will be unable to maintain proper alignment.

Convergence Excess 3

- Normally, when one focuses on a near target, the eyes naturally aim inward an appropriate amount to see it clearly and single, thus avoiding double vision.
- In CE, the same amount of accommodation used to see the near target causes the eyes to aim inward to a greater extent, beyond expected norms.
- Associated factors may be: visual stress or uncorrected farsightedness.

Convergence Excess 4

- CE can also be caused by a condition called spasm of accommodation or convergence, which may be associated with a more serious underlying condition, such as local inflammation or central nervous system lesion (NOTE: Usually an acute onset and medical problems are present as well).
- Drugs can also be a causative factor.

Convergence Excess Symptoms

- Symptoms of a child with the tendency to over-aim their eyes include:
  - Blurred vision at near
  - Eyestrain
  - Headaches
  - Occasional double vision and/or eye turn
  - Poor reading comprehension
  - Loss of place when reading
  - Distance blur, fatigue and/or sleepiness after reading
  - Avoidance of near work
  - Tearing
  - Closing or covering one eye

Convergence Excess Effects

- With the exception of those few cases caused by a serious underlying disease, CE is considered to be a benign condition.
- With school children CE may:
  - Decrease the time a child is able to read or do other near work comfortably
  - Increase in the time needed to complete a task
  - This may challenge her/his ability and motivation to learn, potentially affecting school performance and achievement.
Convergence Excess
Treatment 1

- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment.
- Treatment may include:
  - Plus lenses
  - Base-out prism
  - Vision therapy

Convergence Excess
Treatment 2

- Plus lenses or base-out prism are often prescribed in spectacles for near to compensate for the over-aiming tendency of the eyes.
- Vision therapy can also improve the relationship between accommodation and convergence, but it requires high motivation, dedication, and, in some cases, continual maintenance over time.

Convergence Excess
Treatment 3

- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing of any prescribed lenses &/or performing the vision therapy plan
  - Keeping an appropriate visual distance from reading material (~33 cm for children, ~40 cm for adults)
  - Using good lighting when reading or doing near work
  - Allowing additional time, if necessary, to complete reading and/or near activities

Divergence

- Divergence is the ability of the eyes to turn outward simultaneously.
- This skill allows for quick and accurate aiming of the eyes from near to distant targets providing comfortable vision without seeing double.
- Example: shifting one’s attention from reading a book to the chalkboard.

Divergence 1

- Good divergence skills help maintain a comfortable and appropriate eye aiming by decreasing the energy required to keep the eyes aligned.
Divergence Insufficiency

- The term used when the outward aiming skill of the eyes in the distance is inadequate and below expected norms.
- Hence, the eyes tend to aim slightly inward when viewing a distant target requiring extra effort to be aligned appropriately.
- The cause this condition is uncertain. It often presents in childhood when the relationship between the accommodation (focusing) and vergence (alignment) skills is developing and fragile.

Divergence Insufficiency 1

- A. Appropriate alignment of the eyes on a distant target
- B. When an eye is covered, a normal posture would still be close to alignment. With divergence insufficiency, one eye tends to drift to an inward posture.

Divergence Insufficiency 2

- C. When no cover is present, added energy is required to align the eyes due to the inward posture of the eyes.
- D. When fatigued, the eyes may manifest an eye turn as one does not have the energy to regain or maintain alignment.

Divergence Insufficiency 3

- Symptoms of a child with a tendency for their eyes to over-aim at far are:
  - Headaches and/or eyestrain
  - Blurred vision at far
  - Occasional double vision, which worsens when tired
  - Suppression of vision of one eye (the brain ignores the information from one of the eyes)
  - Nausea and/or dizziness
  - Difficulty focusing from near to far
  - Sensitivity to light
  - An occasional noticeable eye turn

Divergence Insufficiency Effects 1

- If left untreated, often people with DI function with minimal symptoms
- This is because typically the visual posture is good at near and suppression (brain ignores visual information) of one eye occurs in the distance
- When symptoms are present they are usually associated with distance viewing
**Divergence Insufficiency**

**Effects 2**
- Optimal and comfortable distance vision may be compromised
- Depth perception may be compromised
- Both problems may increase with fatigue
- A noticeable eye turn may become more apparent and unacceptable

**Treatment 1**
- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
- Treatment may include:
  - Base-out prism
  - Vision therapy

**Treatment 2**
- Spectacles with base-out prism can compensate for eyes that tend to over-aim in the distance
- Vision therapy activities are designed to increase the eyes ability to aim accurately instead of over-aiming at far

**Divergence Excess**
- The term used when the eyes tend to aim outward (under-aim) when looking at a distance target beyond what is comfortable and in excess of established norms
- It is believed to sometimes arise from near-point stress during early infancy when a child's world is primarily within a near space. This is a time when the visual system is fragile and the relationship between focusing (accommodation) and eye alignment (vergence) skills are developing.
- It can also arise due to genetic factors

**Divergence Excess Symptom**
- The term used when the eyes tend to aim outward (under-aim) when looking at a distance target beyond what is comfortable and in excess of established norms
- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
- Treatment may include:
  - Base-out prism
  - Vision therapy

**Divergence Excess Treatment 1**
- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing any prescribed lenses
  - Doing any prescribed vision therapy
**Divergence Excess 2**

- A. Appropriate alignment on a distant target
- B. When one eye is covered, normal posture would still be close to alignment. With Divergence Excess, one eye tends to drift to an outward posture.

**Divergence Excess 3**

- C. When no cover is present, added energy is required to align the eyes from the resting outward posture.
- D. When fatigued, energy to regain alignment may be lacking and there is potential for an eye turn to manifest.

**Divergence Excess Symptoms**

- Headaches and/or eyestrain
- Blurred vision at far
- Occasional double vision, with greater difficulty at the end of the day
- Suppression of vision of the under-aiming eye (brain ignores the visual information from one eye)
- Occasional noticeable eye turn
- Occasional covering of one eye while watching television
- Light sensitivity

**Divergence Excess Effects**

- If untreated, visual performance at near is minimally affected
- Symptoms most often occur with distance viewing
- However accommodation may help the eyes alignment causing problems at near
- Optimal distance vision and depth perception may be compromised with fatigue
- Occasional noticeable eye turn may be unacceptable

**Divergence Excess Treatment 1**

- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
- Treatment may include:
  - Vision therapy in most cases
  - Added minus power in distance prescription often with added plus power in the near prescription
  - Compensating Base-in prism
  - Extra ocular muscle surgery

**Divergence Excess Treatment 2**

- Vision therapy activities to improve the under-aiming tendency of the eyes and that relationship to eye-focusing ability.
- Other cases necessitate added minus power in the distance spectacle prescription or added plus power at near
- Other available options are compensating base-in prism and/or extra ocular muscle surgery
Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
- Wearing any prescribed lenses
- Doing any prescribed vision therapy

The condition where the eyes do not align properly, such that one eye is "turning" in relation to the other.
- It may or may not be easily noticeable, depending on the degree and nature of the deviation.
- The turning may be in, out, up or down, or any combination
- The turning may be constant, intermittent (not all the time) and it may or may not alternate from one eye to the other

Proper alignment is essential for good depth perception, two-eye function and in some cases the development of sharp vision (Example: 20/20)
- When one eye is consistently not aligned, the fovea, where the most distinct vision occurs within the eye, may not reach its potential.
- This results in unequal sharpness of vision between the eyes which cannot be improved with lenses and is referred to as amblyopia or "lazy eye." There are other reasons to develop amblyopia as well.

There are many different causes of strabismus:
- Most often a result of genetic factors, developmental anomalies (deviations from normal), or trauma
- Developmental anomalies may be mechanical defects in the positioning of the eyes, irregularities nerve impulses to the eyes, or disturbances in other areas of the visual system causing an interference in function
Strabismus 5

• Causes of strabismus (continued):
  • At times, an imbalance in the sharpness of vision may also be a cause, making simultaneous two-eyed vision impossible or difficult and thus causing the eye to turn
  • Vascular disorders, tumors, inflammations and other conditions can also be causative

Strabismus Signs & Symptoms

• Misalignment of one eye
• Intermittent double vision
• Blurred vision
• Suppression of vision in one eye (brain ignores the signal from one eye)
• Eye strain and/or headaches
• Turns or tilts head
• Errors in visual judgment

Strabismus Effects

• If untreated, the potential of the two eyes functioning together is impeded and at risk
• Depth perception is decreased or absent
• Suppression of vision in the turned eye may develop
• A noticeable eye turn may also be unacceptable
• Often school children can read and adapt well with just one eye, but decreased depth perception and side (peripheral) vision may affect the child’s ability to excel in certain sports and other activities requiring good eye-hand coordination.
• Strabismus may also prevent one from entering certain occupations as well.

Strabismus Treatment 1

• If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment
• Treatment may include:
  • Lenses
  • Prisms
  • Eye-patching (Occlusion)
  • Vision therapy
  • Medication
  • Referral for eye muscle surgery
  • A combination of these

Strabismus Treatment 2

• Treatment for strabismus depends on the specific type of eye turn and its predicted outcome.
• Lenses, prisms, eye-patching, vision therapy, eye muscle surgery or a combination of these may be required for treatment
• Conservative strategies should be attempted first, followed by medication and surgery, if necessary

Strabismus Treatment 3

• Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  • Wearing of any prescribed lenses &/or patch, if indicated
  • Doing any prescribed vision therapy
  • Taking any prescribed eye drops, if indicated
  • Being aware of potential dangers/precautions associated with decreased side vision and depth perception
Amblyopia

Amblyopia Signs & Symptoms

- Signs and symptoms are relatively few because the person usually has good vision in the other eye.
- They may include:
  - Noticeable blur when the better eye is covered
  - Decreased depth perception
  - Less efficient vision performance in certain activities, such as with sports, near eye-hand coordination tasks, and driving.

Potential causes of amblyopia:
- A. Constant eye turn (strabismus)
- B. High uncorrected refractive condition (e.g., farsightedness), especially in just one eye
- C. Being born with a cataract preventing a clear image from focusing on the retina.

Amblyopia Effects

- If untreated, the potential for good two-eyed (binocular) function is at risk. Decreased depth perception may not only limit the efficiency of one's visual performance but may later contribute to an undesirable eye turn.
- Uncorrected amblyopia may limit one from entering certain occupations.
- Statistics show that individuals with amblyopia are at higher risk for losing vision in the better eye due to trauma or eye disease.

Amblyopia 1

- A condition where the sharpness of vision (visual acuity) is below normal in one or both eyes in the absence of ocular disease or any apparent structural deviations from normal.
- Sharpness of vision cannot be immediately normalized with lenses.
- This is commonly referred to as a "lazy eye." The sharpness of vision may range from slightly poorer than normal (20/20) to legally blind (20/200), or worse with a best correcting lens.

Amblyopia 2

Potential causes of amblyopia:
- A. Constant eye turn (strabismus)
- B. High uncorrected refractive condition (e.g., farsightedness), especially in just one eye
- C. Being born with a cataract preventing a clear image from focusing on the retina.

Amblyopia 3

- This is caused by form deprivation, abnormal two-eyed interaction (i.e., suppression of one eye), or both during early development (before 6-8 years of age).
- Such occurrences may be attributed to high uncompensated refractive conditions, especially farsightedness, constant unilateral eye-turn (strabismus), a cataract at birth (congenital), an unclear cornea (corneal opacity), and/or other causes.
- Less common variations may be due to psychogenic or organic causes such as high stress, malingering (faking it), or reduced visual sharpness (acuity) caused by nutritional deficiencies or drugs.
Amblyopia Treatment 1

- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment.
- Treatment may include:
  - Corrective lenses in conjunction with an active vision therapy program
  - Eye-patching the better eye (occlusion)
  - Eye drops to encourage the amblyopic eye to improve
  - Protection for the better eye

Amblyopia Treatment 2

- The treatment depends on the specific condition responsible for its development.
- Generally this includes corrective lenses in conjunction with active vision therapy.
- Patching the better eye is often prescribed but requires good compliance.
- For patients unwilling to comply, eye drops can be used to encourage the amblyopic eye to improve.
- Protection of the better eye with polycarbonate lenses to be worn full time are often prescribed.

Amblyopia Treatment 3

- Treatment is very successful in young children and for some people it can be effective even in adulthood.
- The length of the treatment period increases significantly the longer the condition has existed prior to therapy.

Amblyopia Treatment 4

- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing prescribed lenses full time and/or other protective eye wear as indicated
  - Patching the eye as prescribed
  - Doing any prescribed vision therapy
  - Being aware of precautions associated with decreased depth perception

Suppression

- Occurs when one eye does not perceive normally visible objects.
- It is a means of eliminating conflicting and/or confusing visual information from the two eyes, such as when seeing double.
- Suppression only occurs under two-eyed viewing conditions.
Potential causes of suppression:
A. Eye turn
B. Abnormally high refractive condition (farsightedness or less often nearsightedness) in only one eye
Also, unstable two-eyed coordination without an observable eye turn

Suppression is a defense mechanism of the brain to eliminate confusing perceptual images.
These confusing images are frequently caused by a turned eye (strabismus), lazy eye (amblyopia), or a refractive condition called anisometropia
Anisometropia is where there is significant difference in the refractive power of each eye (i.e. The prescription for one eye is quite different from the one for the other eye)
Amblyopia is present when the best visual sharpness (acuity) of an eye is reduced in the absence of any apparent structural abnormality or eye disease.

Suppression is not always obvious to the individual. Often patients come to an awareness of the suppression during testing, or indirectly, due to a noticing a decrease in depth perception.
One suppressing vision may be asymptomatic because the visual world looks similar (no blur or double vision) to those with normal two-eyed vision.

If untreated, the potential for good two-eyed function is at risk. Decreased depth perception may not only limit the efficiency of the child's visual performance, but may contribute to an undesirable eye turn (strabismus).
Statistics have shown that individuals with suppression associated with amblyopia are at a higher risk for losing vision in the better eye due to trauma or eye disease.
This may prevent one from entering certain occupations as well.
If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment. Treatment may include:
- Address underlying cause
- Compensatory lenses in conjunction with vision therapy
- Anti-suppression training

Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
- Wearing any prescribed lenses
- Patching the eye as requested if prescribed
- Doing any prescribed vision therapy

The condition where the quality of eye movements is poor.
Deficiencies in one or more of the following areas:
- Ability to keep eyes on target (Fixation maintenance)
- Fast eye movements (saccades)
- Eye movements following a slow moving target (pursuits)

Fixation maintenance: ability to fixate (or keep eyes on) a target while maintaining a steady focus. This allows one to direct special attention to a given point of interest, such as a word or a picture in a book.
- Saccades: eye movements that carry the eyes quickly from one point of interest to another. This is especially important in reading.
- Pursuits: eye movements that allow the eyes to smoothly track a moving target which is valuable in many ways, especially in sports, games, and other activities.
Oculomotor Dysfunction 3

• In most cases it is a functional disorder with no significant underlying problem.
• May be caused by poor visual sharpness (acuity), fatigue, lack of attention or motivation, emotional stress, drug effects, excessive muscular movement (hyperkinesis) like a spasm, or skills were never learned adequately during development.
• Often associated with left-right confusion and with delay in some aspects of visual perceptual development as well.
• Must be differentiated from other serious conditions like lesions in the neurological pathway to the brain, blood vessel disease, or tumors. These are accompanied by other signs of disease as well.

Oculomotor Dysfunction Effects

• If untreated, there is a greater risk that reading and performance in other visual tasks will be compromised.
• Increase in the time needed to complete a task.
• In addition to affecting the child's ability to learn, this may discourage him/her from entering certain fields or occupations requiring a lot of reading or skills involving good eye-hand coordination.
• Certain sports and driving may be more difficult as well.

Oculomotor Dysfunction Signs and Symptoms

• Signs and Symptoms may include:
  - Inefficiency and/or poor comprehension in reading
  - Omission of works
  - Skipping lines
  - Frequent loss of place
  - Finger reading
  - Head movement when reading
  - Short attention span
  - Problems in sports

Oculomotor Dysfunction Treatment 1

• If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment.
• Treatment may include:
  - Vision Therapy
  - Possible prescription for glasses

Oculomotor Dysfunction Treatment 2

• To have accurate eye movements, one must have adequate visual sharpness (acuity) and so a glasses prescription should be given, if needed.
• Reading glasses (plus lenses) may be beneficial if there is an associated focusing (accommodative) or two-eyed (binocular) problem.
• Lenses and vision therapy are often used together.
• Vision therapy treatment includes specific instruments, targets and techniques to train and strengthen the deficient eye movements and visual system as a whole.

Oculomotor Dysfunction Treatment 3

• Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing any prescribed lenses
  - Doing any prescribed vision therapy
Binocular Vision

In some cases, eye-teaming problems are believed to arise from visual stress during development when the relationship between focusing and eye-teaming is fragile.

Adults may develop binocular dysfunction of vision with prolonged or repetitive computer use.

Other less common factors related to binocular dysfunction may involve eye or whole body disease, drugs, medications, and/or emotional problems.

Binocular Dysfunction

- In some cases, eye-teaming problems are believed to arise from visual stress during development when the relationship between focusing and eye-teaming is fragile.
- Adults may develop binocular dysfunction of vision with prolonged or repetitive computer use.
- Other less common factors related to binocular dysfunction may involve eye or whole body disease, drugs, medications, and/or emotional problems.

Binocular Dysfunction 2

- Generic term used when the eye's focusing system and/or eye-teaming system are not functioning efficiently and perform below expected norms.
- The cause depends on the specific area of deficiency.
- Common causes of focusing dysfunction may be due to general fatigue, not wearing a needed glasses prescription, associated eye-teaming problems, and/or a normal variation in the population.
- Causes for eye-teaming dysfunctions are often less clear or uncertain (see next slide).

Binocular Dysfunction 1

- Condition where both eyes work simultaneously to provide clear, single, comfortable vision.
- Efficient binocular vision requires a highly integrated relationship between focusing (accommodation) and eye-teaming (vergence).
- Accommodation is the ability which allows one to obtain a clear focus of an object quickly and efficiently.
- Vergence refers to the eyes' ability to work together to align appropriately and accurately to comfortably view an object singly.

Binocular Dysfunction

- Condition where both eyes work simultaneously to provide clear, single, comfortable vision.
- Efficient binocular vision requires a highly integrated relationship between focusing (accommodation) and eye-teaming (vergence).
- Accommodation is the ability which allows one to obtain a clear focus of an object quickly and efficiently.
- Vergence refers to the eyes' ability to work together to align appropriately and accurately to comfortably view an object singly.

Binocular Dysfunction 3

- Normal two-eyed function: appropriate focus and both eyes properly aligned on target.
- Binocular dysfunction: inappropriate alignment and/or focus of an object.
**Binocular Dysfunction Signs & Symptoms**

- Signs and Symptoms may include:
  - Blurred vision
  - Headaches
  - Fatigue and/or eyestrain while reading
  - Excessive rubbing of the eyes
  - Difficulty focusing
  - Poor reading comprehension
  - Avoidance of near tasks
  - Occasional double vision and/or noticeable eye turn
  - Covering one eye or turning one's head while reading

**Binocular Dysfunction Effects**

- If untreated, the consequences are determined by the specific deficiencies present and the degree to which the visual symptoms affect the patient.
  - A loss of visual efficiency may decrease the time a child is able to read or do other near work.
  - Increase in the time needed to complete a task
  - This may challenge his/her ability and motivation to learn, thus potentially affecting performance in school, as well as other areas
  - In addition, a noticeable eye turn may become more apparent.

**Binocular Dysfunction Treatment 1**

- If you suspect a child is experiencing the symptoms of this condition, a complete vision exam by an optometrist can determine any areas of deficiency and appropriate treatment.
- Treatment may include:
  - Lenses
  - Vision Therapy
  - and/or Prisms

**Binocular Dysfunction Treatment 2**

- Plus lenses and/or prism are often prescribed in glasses to compensate for inefficient focusing and/or eye-teaming skills.
- Vision therapy is effective in strengthening focusing and eye-teaming deficiencies and the efficient interaction of these two closely interconnected systems.

**Binocular Dysfunction Treatment 3**

- Parents and teachers play a key role in ensuring good compliance with the child by encouraging the following:
  - Wearing of any prescribed lenses
  - Doing any prescribed vision therapy
  - Using good lighting
  - Keeping an appropriate reading distance (33cm for children, 40cm for adults)
  - Allowing additional time to complete reading and/or near tasks as needed
  - Rest breaks with computers and video games (2 minute break for every 20 minutes)

**Helpful Checklists**

- Keep in mind
  - Symptoms of Visual Problems
  - Physical Signs of Visual Problems
  - Table of Contents
KEEP IN MIND

• There are many factors that can affect human performance and vision is just ONE aspect of human performance, both in school and in athletics.
  • Alan Reichow, O.D., MEd

Therefore, a child may exhibit some of these signs and symptoms and vision may be just fine OR vision may be a contributing factor for a struggling student.

Symptoms of Visual Problems

• Common signs of visually-related problems are:
  • Distractibility
  • Avoiding near tasks
  • Emotional outbursts
  • Poor self-image
  • Aggressive behavior
  • Low comprehension
  • Frequent loss of place
  • Decreased concentration
  • Frustration with school activities

Physical Signs of Visual Problems

• Exaggerated head movements
• Sub vocalization
• Very close reading distance
• Motor overflow
• Reduced voice inflection
• Rapid fatigue during reading activities

More Specific Checklists

• Visually-Related Learning Problems Checklist
• Delayed or Incomplete Vision Development Checklist
• Two-eyed Coordination and Focusing Problems Checklist
• Avoidance Behavior Checklist
• Physical Adaptations Checklist
• Symptoms of Poor Eye Movement and Tracking Skills Checklist
• Signs and Symptoms of Amblyopia and Strabismus
• Table of Contents

Visually-Related Learning Problems Checklist

• Child becomes easily distracted
• Avoids near tasks
• Has emotional outbursts
• Poor self-image
• Shows aggressive behaviors
• Low comprehension
• Poor concentration
• Fails to complete assignments

• Frustrated with school
• Exaggerated head movements
• Sub-vocalizes
• Loses place and skips lines
• Very close reading distance
• Has no voice inflection with reading
• Rapidly fatigues when reading
• Motor overflow

Delayed or Incomplete Vision Development Checklist

• Lack of reading readiness
• Immaturity
• Poor coordination
• Poor Visual Attention
• Inappropriate behavior
• Poor peer relationships

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### Common Eye Diseases in Children

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#### Common Eye Diseases in Children 1

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<tbody>
<tr>
<td>Pink Eye (Bacterial Conjunctivitis)</td>
<td>Redness, crusted eyelids, discharge</td>
<td>Antibiotics and wash hands to avoid spread</td>
</tr>
<tr>
<td>Lid Inflammation (Chalazion)</td>
<td>Lid, preseb, blinks, redness, tearing</td>
<td>Lid hygiene, antibiotics</td>
</tr>
<tr>
<td>Stye (External/Infection)</td>
<td>Painful, red, swollen eyelid in vicinity; red, inflamed.</td>
<td>Injection: surgery</td>
</tr>
<tr>
<td>Dry Eye</td>
<td>Scratching, stringy mucus</td>
<td>Artificial tears</td>
</tr>
<tr>
<td>Bleeding below top layer of skin surrounding eye</td>
<td>Cold compress</td>
<td></td>
</tr>
<tr>
<td>Lid swelling, redness, pain</td>
<td>Warm compress, antibiotic</td>
<td></td>
</tr>
<tr>
<td>Sensitivity to light, blurred vision, small pupil</td>
<td>Anti-inflammatory drugs</td>
<td></td>
</tr>
</tbody>
</table>

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#### Common Eye Diseases in Children 2

<table>
<thead>
<tr>
<th>DISEASES:</th>
<th>SYMPTOMS:</th>
<th>TREATMENT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Eye</td>
<td>Scratching, burning</td>
<td>Artificial tears</td>
</tr>
<tr>
<td>Black Eye (Eyehemorrhage)</td>
<td>Bleeding below top layer of skin surrounding eye</td>
<td>Cold compress</td>
</tr>
<tr>
<td>Eyelid (Internal/External Hemorrhage)</td>
<td>Painful, red eye</td>
<td>Warm compress, antibiotic</td>
</tr>
<tr>
<td>Inflammation of the iris (Uveitis)</td>
<td>Sensitivity to light, blurred vision, small pupil</td>
<td>Anti-inflammatory drugs</td>
</tr>
</tbody>
</table>

---

#### Common Eye Diseases in Children 3

<table>
<thead>
<tr>
<th>DISEASES:</th>
<th>SYMPTOMS:</th>
<th>TREATMENT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meibomitis</td>
<td>Foamy tears; crusting, itching, redness</td>
<td>Hot compress; massage; antibiotics</td>
</tr>
<tr>
<td>Uveitis</td>
<td>Inflammation of iris; light sensitivity, small pupil; blurring of vision; painless pain to eye; redness</td>
<td>Eye drops, oral medications, injections</td>
</tr>
</tbody>
</table>

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#### Common Eye Emergencies & Prevention

**Eye Safety**

- Eye safety, especially sports related eye safety is crucial.

- "Sports and recreational activities accounted for nearly 40,000 of the eye injuries reported in 1991. Baseball injuries were the most frequent cause of eye injuries among children 5-14 years of age."

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Common Eye Emergencies 1

<table>
<thead>
<tr>
<th>Problem</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blow to the eye</td>
<td>Cold compress; cover loosely, seek medical attention</td>
</tr>
<tr>
<td>Chemicals in the eye</td>
<td>Immediately flood the eye with water, don't bandage eye, seek medical attention</td>
</tr>
<tr>
<td>Contact lens lost in eye</td>
<td>Massage eye through upper lid, see eye doctor</td>
</tr>
<tr>
<td>Cut or puncture wound</td>
<td>Seek medical attention as soon as possible!</td>
</tr>
</tbody>
</table>

Common Eye Emergencies 2

<table>
<thead>
<tr>
<th>Problem</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black eye</td>
<td>Apply ice, see eye doctor</td>
</tr>
<tr>
<td>Foreign body in eye (e.g. dust)</td>
<td>Flood eye with water, see eye doctor</td>
</tr>
<tr>
<td>Penetrating eyeball wound</td>
<td>Very serious, seek immediate attention</td>
</tr>
<tr>
<td>Thermal burn of eye/eyelid</td>
<td>Cold compress, seek medical attention</td>
</tr>
</tbody>
</table>

How to Prevent Eye Injuires

- Wear approved safety goggles with side shields
- Wear properly fitted contact lenses
- Use common sense around chemicals, hazardous substances

Environmental Factors and Lighting Considerations

- UV Radiation
- Light Sources and Illuminance
- Glare and Contrast
- Lighting for the Partially Sighted
- Ergonomics 1
- Who looks comfortable?
- Ergonomics 2
- Computer Work Stations
- Computer Ergonomic Visual Guidelines
- Overall Computer Ergonomic Guidelines
- Table of Contents

UV Radiation

- Just as adults need UV protection, children should wear sunglasses when they are outside as well.
- Quality sunglasses will not lose their UV protection over time as will cheap sunglasses.

Light Sources and Illuminance

- Light sources: traditional ceiling lights (indirect) in a classroom vs. near point desk lights (direct)
- Illuminance: amount of light
- Often overhead lighting is inadequate in classrooms for students to read efficiently
- Guidelines are available
**Glare and Contrast**
- Glare: disabling or uncomfortable light reflections, can occur off of objects such as white t-shirts, computer screens and printed materials
  - Definitely affects visual comfort
  - E.g. direct sunlight reflecting off white paper
  - Could wear a dark shirt to increase comfort
- Contrast: the amount of color brightness difference between target of interest
  - Can affect visual comfort
  - E.g. white on black vs. black on white

**Lighting for the Partially Sighted**
- Amount of light
- Disability glare and discomfort glare
- Contrast
- Optical aids: Telemicroscopes, stand magnifiers
- Preferences vary with the individual.
  - Can dramatically take away from or improve seeing ability.
  - Individual should be allowed to use what makes it easiest for them to see

**Ergonomics 1**
- Engineers say: “Change the machines, not man, for man is least adaptable.”
- Goal: best environment in which to function

**Who looks comfortable?**

**Ergonomics 2**
- Environmental factors to a work station include:
  - Comfort
  - Posture
  - Body function
  - Lighting
  - Seating

**Computer Work Stations**
- Some examples of effects upon the body:
  - Stiff or sore wrists
  - Neck pain into shoulders
  - Hand cramps
- Symptoms of visual stress:
  - Blurry vision
  - Headaches
  - Fatigue
  - Eye aches
  - Eye irritation
Computer Ergonomic Visual Guidelines

• A simple 2 minute break of looking in the distance every 20 minutes of work may decrease the eye strain
• A comprehensive eye exam will provide one with a proper glasses prescription to reduce symptoms. In some cases, a separate pair of computer glasses may be needed.

The End!

• Thank you to:
  • Anita McClain, Ed.D.
    • Pacific University College of Education Professor
  • Scott Cooper, O.D., M.Ed.
    • Pacific University College of Optometry Associate Professor