

Refractive Errors in Children

HOW DOES THE EYE FOCUS LIGHT?

The eye works like a camera. It has an opening at the front (the pupil, the dark spot in the colored part of the eye), parts to help focus (the cornea, the clear shield that covers the front of the eye, and the lens, the round clear part in the middle of the eye), and a light-sensing portion at the back of the eye (the retina, the inner back layer of the eye). In order to see clearly, light rays coming from an object must focus onto the retina. If light rays are not focused well on the retina, a refractive error may be present.

There are three main types of refractive error: [myopia](#), hyperopia and [astigmatism](#) [See figures below].

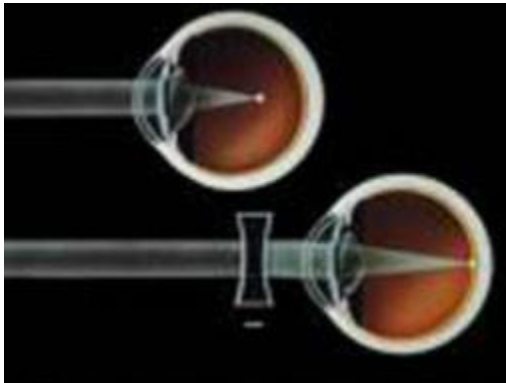


Figure. 1:

Myopia (or nearsightedness): Light entering the eye focuses in front of the retina due to a long eyeball or high focusing power of the lens or cornea. Vision can be improved by a concave, or divergent “minus power” glasses lens or contact lens.

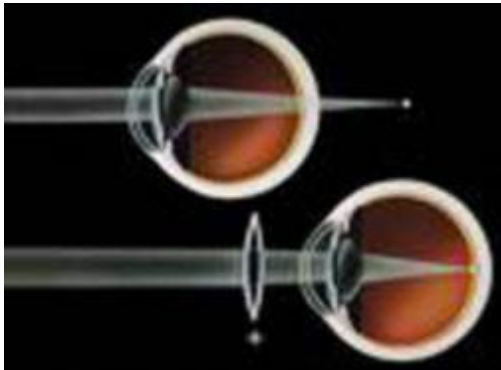


Figure. 2:

Hyperopia (or farsightedness): Light entering the eye focuses behind the retina due to a short eyeball or low focusing power of the lens or cornea. Vision can be improved by a convex, or convergent “plus power” glasses lens or contact lens.

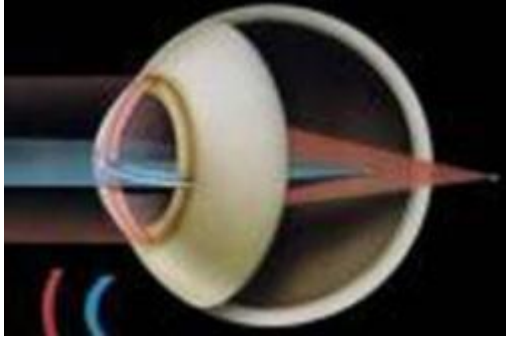


Figure. 3: Astigmatism: The front of the eye is more curved in one direction than the other, and light is focused at different points in front of and behind the retina, causing the vision to look stretched, wavy or distorted. A cylindrical lens in glasses or contacts is used to improve vision.

WHAT IS MYOPIA (NEARSIGHTEDNESS)?

Myopia occurs when light rays focus in front of the retina because the eye is too long or has too much focusing power. Objects far away look blurry and become clearer the closer they get to the eye. This condition may run in families or be linked with premature birth and can show up at any age. Myopia in children comes to attention when children start squinting to see objects far away but are much more comfortable seeing things up close.

Myopia is not very common in the US children under the age of eight, but is much more common in Asian countries.

Myopia usually gets worse each year and then stops by the late teens to early twenties. There are currently no FDA approved treatments to stop myopia from getting worse, though there are some [treatments](#) being explored in the form of daily eye drops, such as weak [atropine](#). Recent [studies](#) suggest that more time spent outdoors causes less myopic progression. More information can be found on myopia under its [eye term](#).

Myopia is most commonly treated with glasses in children. Diverging or minus (-) power glasses focus the light rays on the retina and improve vision. Contact lenses may be used instead of glasses if children are old enough to take good care of them. In young adulthood, laser surgery may be an alternative if the eyes are not still growing/changing.

More technical information on myopia may be found on the [EyeWiki](#) site.

WHAT IS HYPEROPIA (FARSIGHTEDNESS)?

Hyperopia occurs when light rays focus behind the retina (because the eye is either too short or has too little focusing power) and causes objects close up and far away to look blurry. The signs and symptoms of farsightedness are worse the closer one gets to the eye.

Hyperopia is more common in the first 7 years of life. Small to medium amounts of hyperopia can be normal in childhood and typically a child with this type of hyperopia does not need glasses. This is because children can compensate for this on their own by using their natural focusing power (accommodation). A large amount of hyperopia may need to be treated with converging or plus (+) power glasses. This is especially the case when the eyes are crossed ([accommodative esotropia](#)) or the vision is blurry. Hyperopia usually gets worse or bigger in early childhood up to 7-8 years of age and then gets smaller or goes away during preteen to early teenage years. Contact lenses and laser surgery can also help improve vision depending on the age of the person with hyperopia. Laser surgery is generally not recommended until young adulthood when the eye stops growing/changing.

WHAT IS ASTIGMATISM?

[Astigmatism](#) occurs when the cornea or the lens is curved more in one direction than in the other. In astigmatism, the shape of the eye is more similar to an American football than a baseball. Rays of light coming from objects focus at different points (in front and/or behind the retina) instead of one. This blurs the vision both far away and up close. Astigmatism is more common in young babies and childhood and may run in families. Astigmatism may be linked with other eye problems that can be seen during an eye exam.

Cylindrical power glasses are prescribed for astigmatism to help the eyes focus better. Contact lenses and laser surgery are alternatives to glasses at the right age.

MANAGEMENT OF REFRACTIVE ERRORS



Untreated refractive errors are one of the most common causes of vision loss in children in the US and across the world. If refractive errors are not treated with glasses or contact lenses early enough in life, a child can be left with permanently blurred vision in adulthood; this is called [amblyopia](#).

Children generally do not complain of blurry vision, especially if they see blurry out of only one eye. There are no specific signs or symptoms of an untreated refractive error. Parents and caregivers may not notice anything wrong just by looking at their children's eyes. The best way to diagnose a refractive error, whether it be myopia, hypermetropia or astigmatism, is with an eye exam. At the eye exam, dilating drops (which make the pupil bigger) are placed in both eyes of the child. This exam helps the ophthalmologist to understand if there is a refractive error and how bad it is. If needed, glasses can be prescribed to improve the vision of the child. If you have more questions about refractive errors, please speak with your child's ophthalmologist.

Updated 03/2023