

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), a focusing mechanism (the cornea and crystalline lens), and a light-sensing portion at the back (the retina). In order to see clearly, light rays from an object must focus onto the retina, the inner back layer of the eye. If light rays are not focused on the retina, a refractive error is present.

The refractive errors are: [myopia](#), hyperopia and [astigmatism](#) [See figures below].

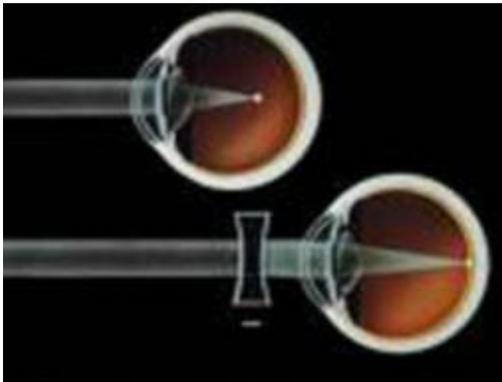


Fig. 1:

Myopia (or nearsightedness): light 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” lens

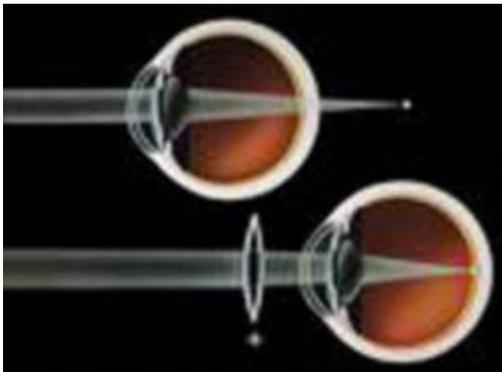


Fig. 2:

Hyperopia (or farsightedness): light 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” lens

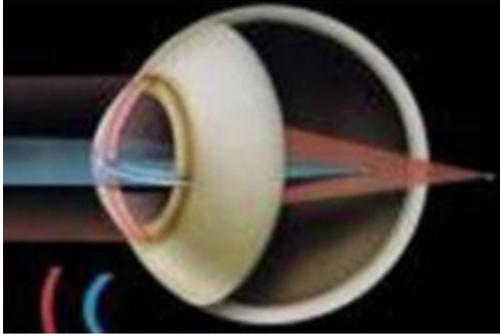


Fig. 3: Astigmatism: because the eye is more curved in one direction than the other, light focuses at different points in front of and behind the retina, distorting the vision; a cylindrical lens is used to improve vision

WHAT IS MYOPIA (NEARSIGHTEDNESS)?

Myopia occurs when light rays focus in front of the retina because the eye is too long or has excessive focusing power. Objects in the distance appear blurry, and become clearer the nearer they get to the eye. This condition may be inherited or associated with premature birth and can occur at any age. The prevalence of myopia is low in US children under the age of eight, but much higher in Asian countries. Diverging or minus (-) power glasses focus the light rays on the retina and improve vision.

Myopia usually progresses yearly and stabilizes by the late teens to early twenties. There is currently no widely accepted treatment to stop this progression, though there are some treatments being explored. Some recent epidemiological data suggest that more time spent outdoors was associated with less myopic progression. There is no specific evidence that excessive use of computers or handheld devices increases nearsightedness. Contact lenses may be used instead of glasses if children are old enough to take proper care of them. At the appropriate age, 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 near and distant objects to appear blurry. The signs and symptoms of farsightedness are more severe the closer one gets to the eye.

Some hyperopia is normal in childhood and correction is typically not required. This is because children can compensate for this on their own by using their natural focusing mechanism (accommodation). A large amount of hyperopia may require correction with converging or plus (+) power glasses, particularly when associated with crossed eyes ([accommodative esotropia](#)). Hyperopia usually increases in early childhood and then decreases during preteen to early teenage years. Contact lenses and laser surgery are alternatives to glasses at the appropriate age. Laser surgery is generally not recommended until 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. The shape of the eye is more similar to a football than a baseball. The prevalence of astigmatism is highest in infancy and childhood. Rays focus at several points (in front and/or behind the retina) instead of one, which distorts the vision in the distance and up close.

Cylindrical power glasses are prescribed for significant astigmatism to help the eyes make a more crisp, clear visual connection with the brain. If this is not done early enough, a child can be left with permanently blurred vision in adulthood. Contact lenses and laser surgery are alternatives to glasses at the appropriate age.

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