



CHILDREN'S EYE HEALTH

REFRACTIVE ERRORS IN CHILDREN (INCLUDING PROGRESSIVE MYOPIA)

By Dr Christolyn Raj

How does the eye focus?

The visual system works much like a camera. Light rays from an object enter the eye through the cornea (the clear, curved surface that protects the front of the eye). The cornea bends (refracts) these light rays through to the eye's natural lens, where they are bent again to focus at a sharp point on the retina (back layer of the eye containing light-sensitive cells).

Refractive errors occur when the eye is imperfectly shaped in such a way that light rays are not focused on the retina correctly, preventing a clear image from forming.

There are three types of refractive errors (Figure 1):

- **Myopia (near- or short-sightedness):** occurs when light rays focus in front of the retina instead of on it. This occurs either because the eyeball is too long, or it has excessive focusing power. Objects in the distance appear blurry and objects closer to the eye appear more clear

- **Hyperopia (far- or long-sightedness):** Hyperopia occurs when light rays focus behind the retina, because the eye is either too short or has too little focusing power. Distant objects can be seen clearly, whereas objects closer to the eye appear blurry. Sometimes, a high amount of hyperopia may be associated with esotropia (inward turning of the eye)
- **Astigmatism:** occurs when the cornea is curved more in one direction than in the other (e.g., shaped more like a rugby ball than a soccer ball). This causes light rays that pass through the cornea to bend unevenly and focus on more than one point on the retina. This can affect near as well as distance vision.

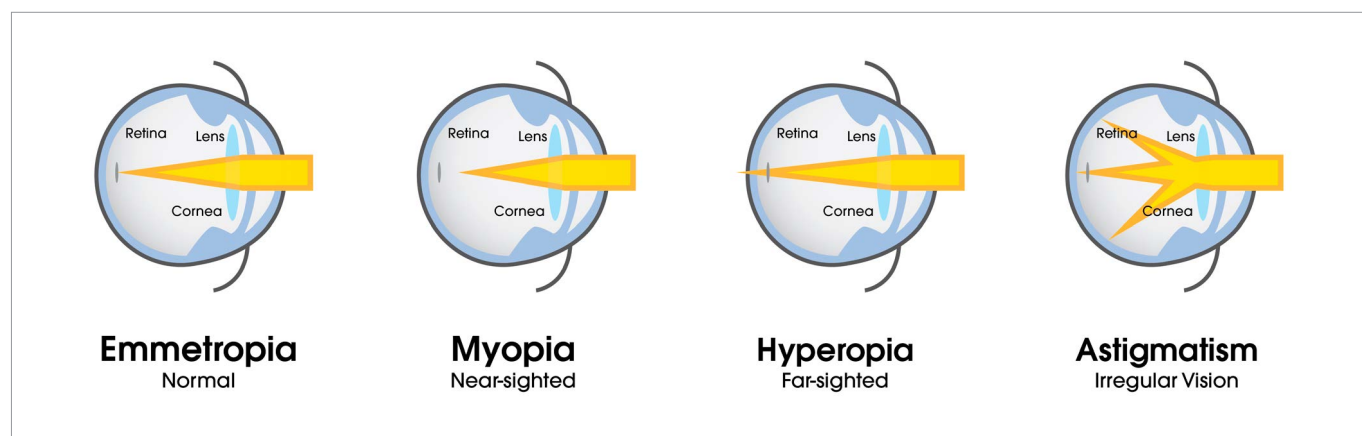


Figure 1: Types of refractive error

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What is the treatment for refractive error?

Glasses can be used initially to treat all refractive errors in children. At a later stage, contact lenses may be used. Once your child is over 18, laser refractive surgery may also be considered.

What is progressive high myopia?

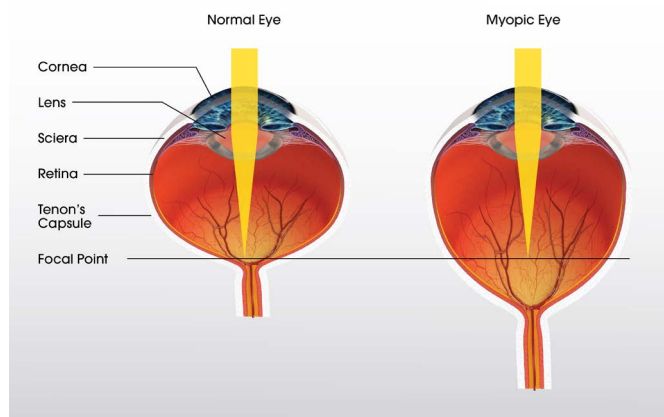


Figure 2: Axial length of a normal eye versus a myopic eye

High myopia is generally defined as refractive error of -6.00 diopters or higher. This results from the eye being very long, termed long 'axial length'.

High myopia generally begins in early childhood and may not stabilise until early adulthood. The prevalence of high myopia has been increasing over the last several decades, particularly in developed countries. Recent evidence suggests that long periods of focusing on near-vision tasks, such as reading and using electronic devices may increase the risk of near-sightedness in children.

Given the increase in myopic refractive error in our population, several techniques to attempt to slow the progression have been investigated, including:

- wearing hard or rigid contact lenses at night
- instillation of an eye drop (atropine 0.01%)

There is currently no widely accepted treatment to stop progression. Further research is still ongoing to investigate at the long-term effects of potential treatments, especially drop instillation. So far, these studies have shown positive results.

There is also good evidence to suggest that time spent outdoors during childhood may reduce the progression of myopia in children and adolescents.

Can myopic refractive error be dangerous?

Myopia, especially high myopia, may be associated with an increased risk of retinal tears or holes resulting in a retinal detachment. For this reason, it is important for patients with high myopia to receive regular dilated eye exams on a yearly basis.

As children become older they should be educated about the 'warning signs' of a retinal detachment including: flashing lights, floaters or shadows in their vision, or blurred vision.



Dr Christolyn Raj is an experienced ophthalmologist with considerable expertise in cataract surgery, retinal disease and paediatric ophthalmology. She treats paediatric patients at Vision Eye Institute Camberwell.