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## **EYE DEFECTS**

### **AMETROPIA**

The eye with normal refractive power is called emmetropic eye and the condition is called emmetropia. Any deviation in the refractive power from normal condition, resulting in inadequate focusing on retina is called ametropia and the eye is called ametropic eye. The defect is due to the change in shape of the eyeball.

Ametropia is of two types:

1. Myopia
2. Hypermetropia.

### **„ MYOPIA OR SHORT SIGHTEDNESS**

Myopia is the eye defect characterized by the inability to see the distant object. It is otherwise called short sightedness because the person can see near objects clearly but not the distant objects. In emmetropia, the far point is infinite. In myopia, the near vision is normal but the far point is not infinite, i.e. it is at a definite distance. In extreme conditions, it may be only a few centimetre away from the eye (myo = half closed; ops = eye).

### **Cause**

In myopia, the refractive power of lens is usually normal. But, the anteroposterior diameter of the eyeball is abnormally long. Therefore, the image is brought to focus a little in front of retina. Light rays, after coming to a focus, disperse again so, a blurred image is formed upon retina.

## **Correction**

In myopic eye, in order to form a clear image on the retina, the light rays entering the eye must be divergent and not parallel. Thus, the myopic eye is corrected by using a biconcave lens. Light rays are diverged by the concave lens before entering the eye.

## **„ HYPERMETROPIA OR LONG SIGHTEDNESS**

Hypermetropia is the eye defect characterized by the inability to see near object. It is otherwise known as long sightedness because the person can see the distant objects clearly but not the near objects. It is also called hyperopia. In this defect, distant vision is normal but, near vision is affected (metras = measure).

## **Cause**

Hypermetropia is due to decreased anteroposterior diameter of the eyeball. So, even though the refractive power of lens is normal, the light rays are not converged enough to form a clear image on retina, i.e. the light rays are brought to a focus behind retina. It causes a blurred image of near objects. Hypermetropia occurs in childhood, if the eyeballs fail to develop the correct size. It is common in old age also.

## **Correction**

Hypermetropia is corrected by using biconvex lens. Light rays are converged by convex lens before entering the eye.

## **ASTIGMATISM**

Astigmatism is the condition in which light rays are not brought to a sharp point upon retina. It is the common optical defect. This defect is present in all eyes. When it is moderate, it is known as physiological astigmatism. When it is well marked, it is considered abnormal. For example, the stars appear as small dots of light to a person with normal eye. But in astigmatism, the stars appear as radiating short lines of light (A = not; stigma = point).

## **CAUSE OF ASTIGMATISM**

Light rays pass through all meridians of a lens. In a normal eye, lens has approximately same curvature in all meridians. So, the light rays are refracted almost equally in all meridians and brought to a focus. If the curvature is different in different meridians, vertical, horizontal and oblique, the refractive power is also different in different meridians. The meridian with greater curvature refracts the light rays more strongly than the other meridians. So, these light rays are brought to a focus in front of the light rays, which pass through other meridians. Such irregularity of curvature of lens causes astigmatism.

## **TYPES OF ASTIGMATISM**

Astigmatism is of two types:

1. Regular astigmatism
2. Irregular astigmatism.

### **1. Regular Astigmatism**

In regular type of astigmatism, the refractive power is unequal in different meridians because of alteration of curvature in one meridian. But, it is uniform in all points throughout the affected meridian.

### **2. Irregular Astigmatism**

In irregular type of astigmatism, the refractive power is unequal not only in different meridians, but it is also unequal in different points of same meridian.

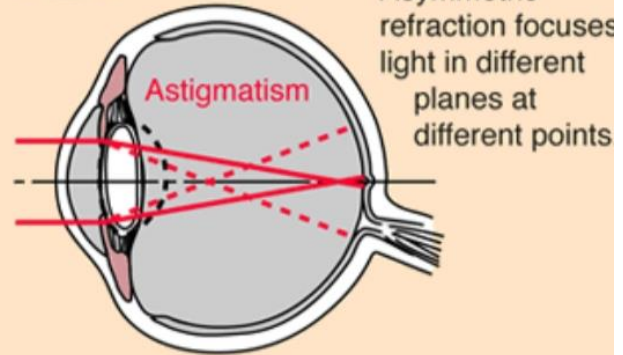
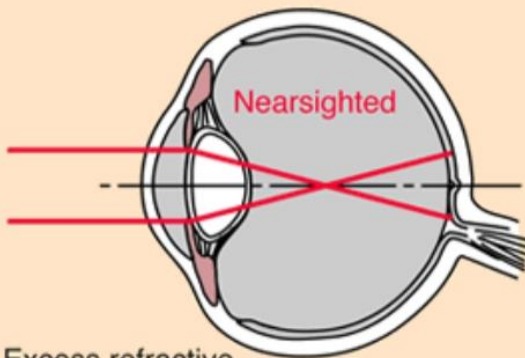
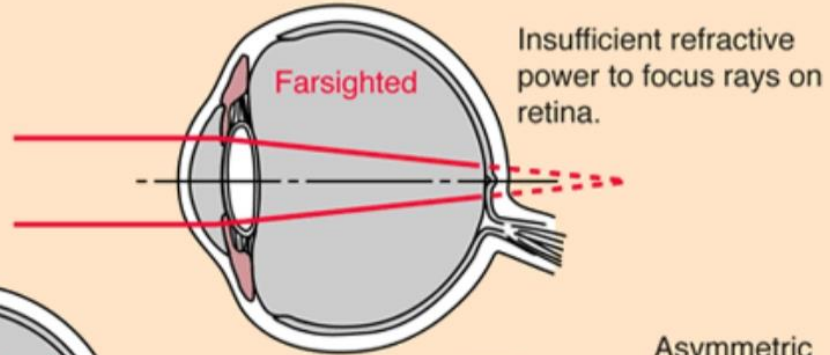
## **CORRECTION OF ASTIGMATISM**

Astigmatism is corrected by using cylindrical glass lens having the convexity in the meridians, corresponding to that of lens of eye having a lesser curvature, i.e. if the horizontal curvature of lens is less, the person should use cylindrical glass lens with the convexity in horizontal meridian.

# Common Vision Defects

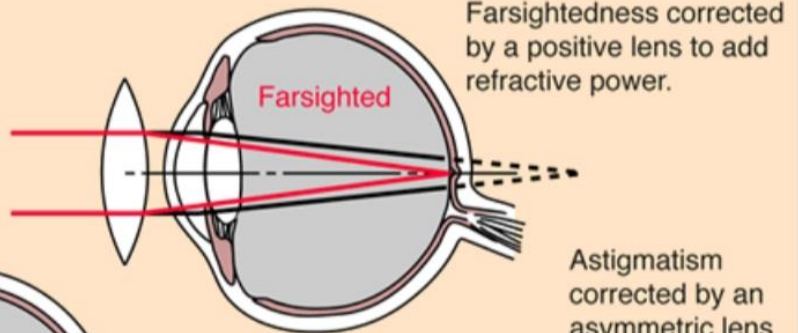
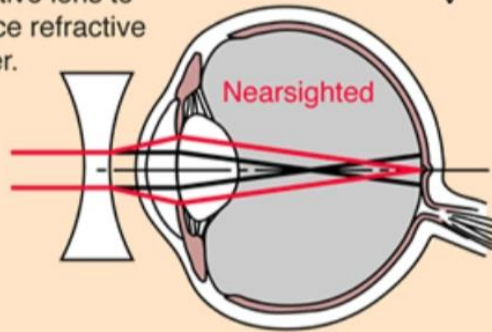
Active graphic: click for further details.

Common eye defects showing the handling of parallel input rays, as if from a very distant object. This diagram presumes a relaxed eye.



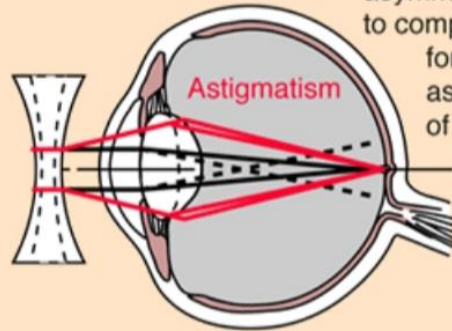
# Correction of Common Vision Defects

Nearsightedness corrected by a negative lens to reduce refractive power.

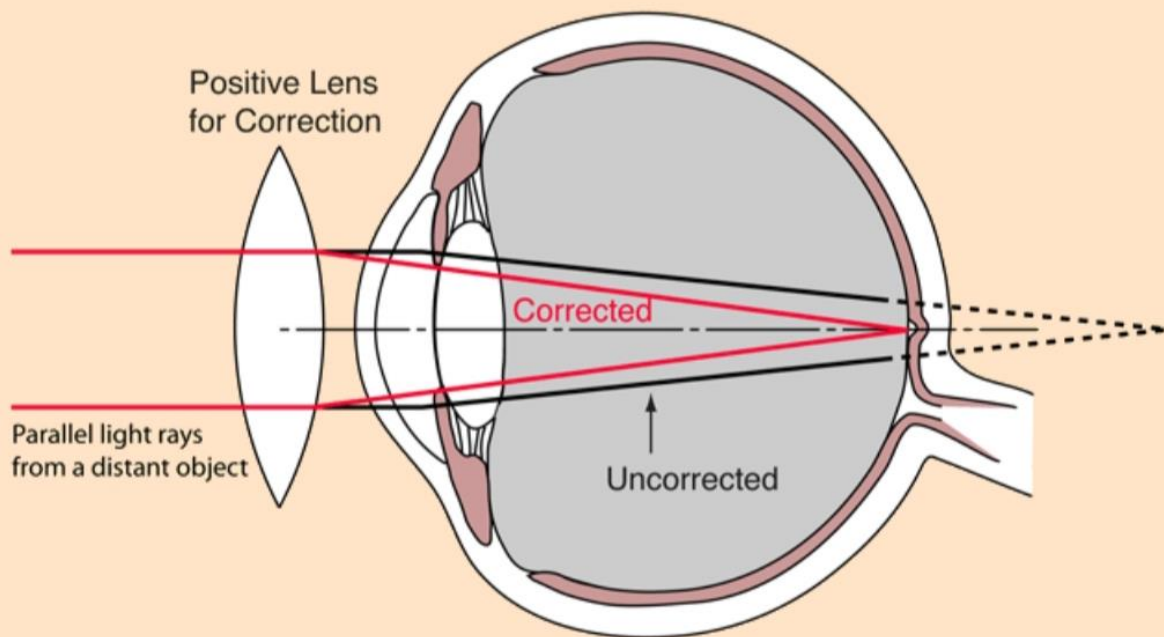


Farsightedness corrected by a positive lens to add refractive power.

Astigmatism corrected by an asymmetric lens to compensate for the asymmetry of the eye's lens.

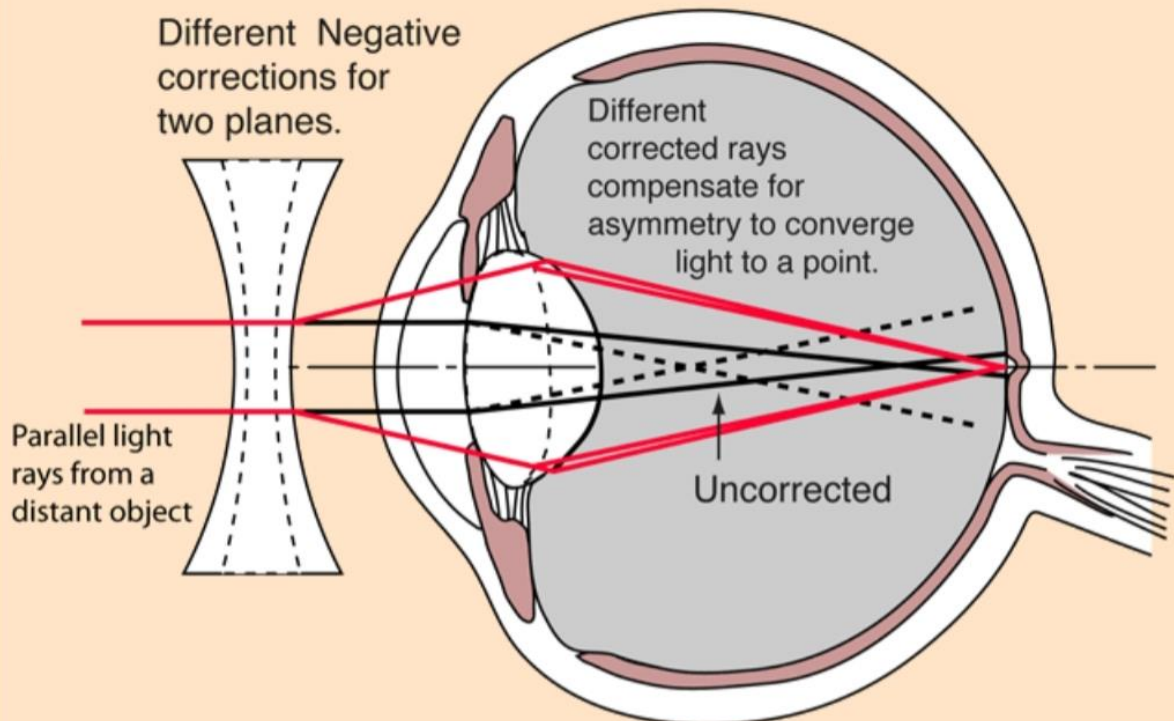


# Hyperopia (Farsightedness)

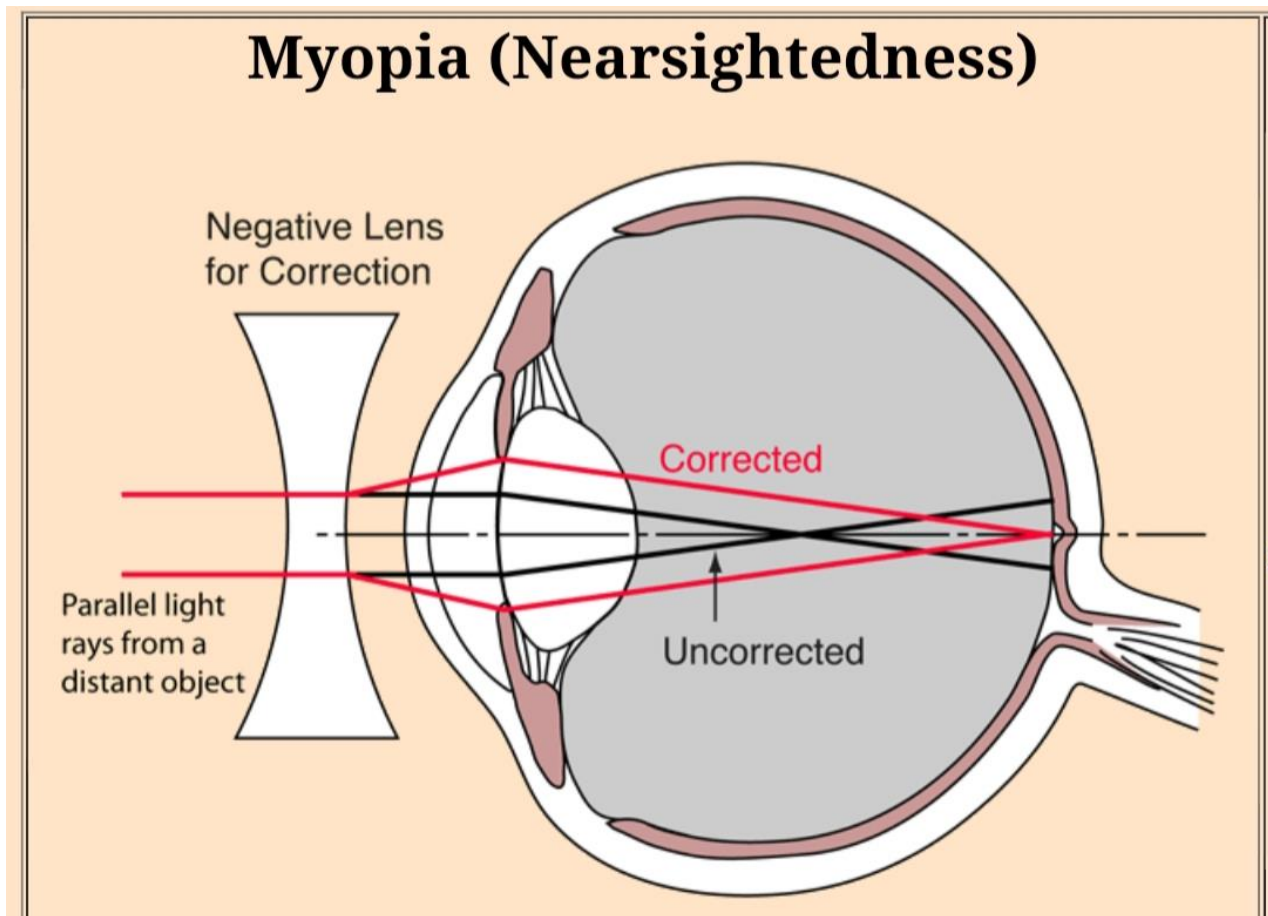


[Common vision defects](#)

# Astigmatism



## Myopia (Nearsightedness)



### **PRESBYOPIA**

Presbyopia is the condition characterized by progressive diminished ability of eyes to focus on near objects with age. It is due to the gradual reduction in the amplitude of accommodation. It progresses as the age advances (presbyos = old; ops = eye). Presbyopia starts developing after middle age. In presbyopia, the distant vision is unaffected. Only the near vision is affected. The near point is away from eye. In presbyopia, the anterior curvature of lens does not increase during near vision. So, the light rays from near objects are not brought to focus on retina.

### **„ CAUSES OF PRESBYOPIA**

1. Decreased elasticity of lens is because of the physical changes in lens and its capsule during old age. So, the anterior curvature is not increased during near vision.



2. Decreased convergence of eyeballs due to the concomitant weakness of ocular muscles in old age.

### **„ CORRECTION OF PRESBYOPIA**

Presbyopia is corrected by using biconvex lens.