

DEFECTS OF VISION

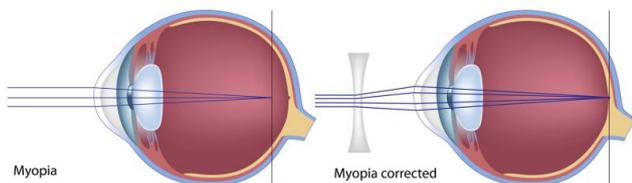
Human Eye, due to wear and tear or due to accidents develops defects. These defects are called defects of vision.

Here we cover four defects of vision

- (i) Myopia
- (ii) Hypermetropia
- (iii) Presbyopia
- (iv) Astigmatism

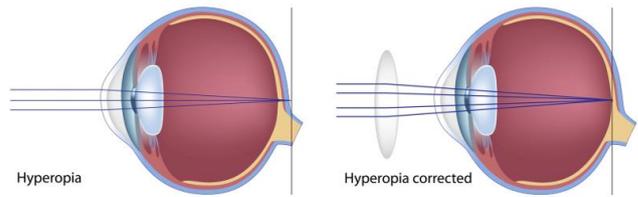
Myopia

1. Nearsightedness, also called **myopia** is common name for impaired vision in which a person sees near objects clearly while distant objects appear blurred.
2. A person with myopia:
 - (i) **can see nearby objects clearly**
 - (ii) **but cannot see distant objects distinctly.**
3. A person with this defect has the **far point nearer than infinity**. Such a person may see clearly upto a distance of a few metres. In a myopic eye, the **image** of a distant object is formed **in front of the retina and not at the retina** itself.
4. **Causes:** This defect may arise due to
 - (i) excessive curvature of the eye lens, or
 - (ii) elongation of the eyeball.
5. **Correction:** This defect can be **corrected** by using a **concave lens of suitable power**. A concave lens of suitable power will bring the image back on to the retina and thus the defect is corrected.



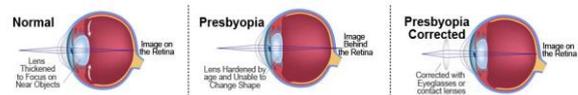
Hypermetropia

1. Farsightedness, also called **hypermetropia**, common name for a defect in vision in which a person sees near objects with blurred vision, while distant objects appear in sharp focus.
2. A person with hypermetropia
 - (i) can see distant objects clearly;
 - (ii) **but cannot see nearby objects distinctly.**
3. The **near point**, for the person, **is farther away from the normal near point** (25 cm). Such a person must keep a reading material much beyond 25 cm from the eye for comfortable reading. This is because the **light rays** from a close by object **are focussed at a point behind the retina**.
4. **Causes:** This defect arises either because:
 - (i) the focal length of the eye lens is too long, or
 - (ii) the eyeball has become too small, so that light rays from the nearby object cannot be brought to focus on the retina to give a distinct image.
5. **Correction:** This defect can be **corrected by using a convex lens of appropriate power**. Eye-glasses with converging lenses provide the additional focussing power required for forming the image on the retina.



Presbyopia

- ◇ **Presbyopia**, progressive form of farsightedness that affects most people by their early 60s. The power of accommodation of the eye usually decreases with ageing. For most people, the **near point gradually recedes away**.
- ◇ They find it difficult to see nearby objects comfortably and distinctly without corrective eye-glasses.
- ◇ **Causes:** It arises due to the
 - (i) gradual weakening of the ciliary muscles; and
 - (ii) diminishing flexibility of the eye lens.
- ◇ **Correction:** Simple reading eyeglasses with convex lenses correct most cases of presbyopia.
- ◇ Sometimes, a person may suffer from both *myopia* and *hypermetropia*. Such people often require *bi-focal lenses*. In the bi-focal lens, the upper portion of the bi-focal lens is a concave lens, used for distant vision. The lower part of the bi-focal lens is a convex lens, used for reading purposes.
- ◇ These days, it is possible to correct the refractive defects with contact lenses or through surgical interventions.



Astigmatism

- ◇ **Astigmatism**, a defect in the outer curvature on the surface of the eye that causes distorted vision. In *astigmatism*, a person cannot simultaneously focus on both horizontal and vertical lines.
- ◇ **Causes:** This defect is usually due to
 - (i) the cornea that is not perfectly spherical. Consequently, it has different curvatures in different directions in vertical and horizontal planes.
 - (ii) This results in objects in one direction being well-focused, while those in a perpendicular direction not well-focused.
- ◇ **Correction:** This defect can be corrected by using eyeglasses with *cylindrical lenses* oriented to compensate for the irregularities in the cornea.

