

Accommodation in the Eye

Accommodation is the process by which the eye changes its focus from distant to near objects, allowing us to see objects clearly at different distances. This process involves the eye's ability to adjust the lens shape to maintain a sharp image on the retina.

Structures Involved in Accommodation:

1.: Contains muscles that control the shape of the lens.
2.: The flexible, transparent structure that changes its curvature to focus light on the retina.
3. Iris and Pupil: Though primarily involved in controlling light intake, they also play a role in the overall focusing process.

Iris and Pupil:

Near Vision: When focusing on near objects, the iris tends to constrict, causing the pupil to become smaller (a phenomenon known as). This is known as the near reflex and serves to increase the depth of field, allowing more of the near object to be seen clearly and preventing blurred vision caused by light scattering. A smaller pupil allows for a larger depth of field, helping to focus on nearby objects.

Far Vision: For distant objects, the pupil tends to dilate (a phenomenon known as), as the eye no longer needs as much depth of field. It also helps in enhancing vision in low-light conditions.

How It Works:

When focusing on a near object, the contract, causing the zonular fibers to relax. This allows the lens to become and more convex, increasing its refractive power to focus light from close objects onto the retina. When focusing on distant objects, the muscles relax, and the lens becomes and flatter.

Near and Far points:

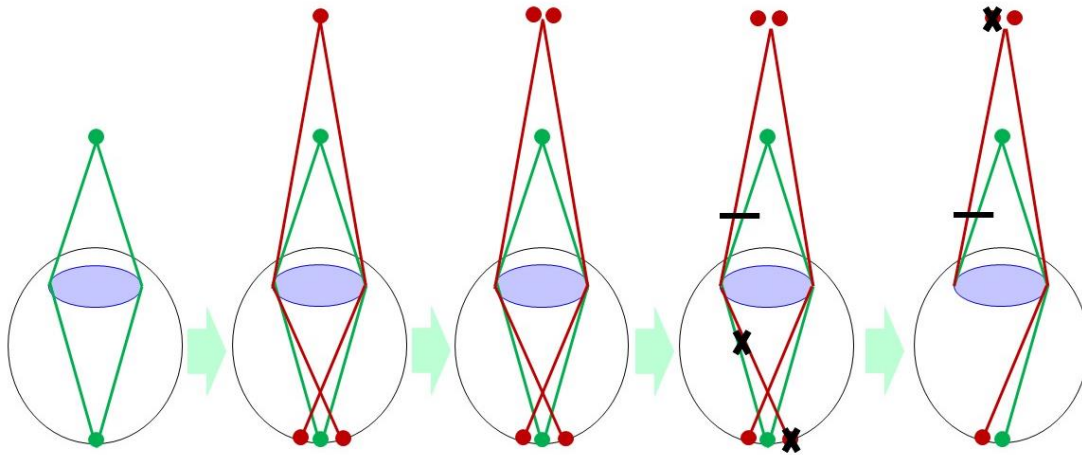
-: The nearest point at which the eye can focus clearly without strain (typically cm in a young, healthy eye).
-: The farthest point at which the eye can focus clearly without accommodation (at infinity in a relaxed eye).

Pathologies Related to Accommodation:

1. **Presbyopia:** Age-related loss of accommodation ability, where the lens becomes less flexible, making it difficult to focus on near objects (usually occurring after 40 years of age).
2. **Accommodation spasm:** An abnormal, prolonged contraction of the ciliary muscles, often resulting in blurred vision and headaches.

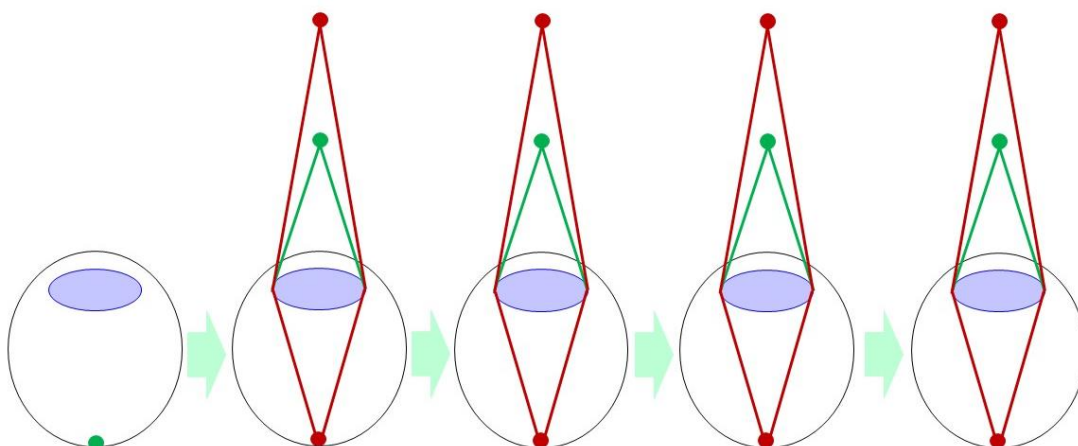
Scheiner's Experiment:

This experiment was devised by Johann Scheiner to demonstrate accommodation. It involves using two pinholes in a card placed in front of the eye. By adjusting the distance of the card, a person can observe that when they are focusing on a nearby object, the two images created by the pinholes are aligned, and the eye accommodates. If the eye is focused on a distant object, the images appear separated, confirming the eye's focusing mechanism.



When focusing on the punctum proximum, the ciliary muscles contract, allowing the lens to become thicker. Rays of light from the near point focus directly on the fovea centralis, enabling us to see the point clearly. Rays from the far point, however, also pass through the thicker lens and are refracted at the same angle as the rays from the near point. This causes the rays to cross before reaching the retina, creating a double projection of the far point on the retina. Due to this double projection, we can 'see' two images of the far point. In the Scheiner experiment, if one pinhole is closed, it cancels one side's rays and one side's projection, allowing us to see a single far point again.

Try to draw the projection rays and their refraction from the near point during far point accommodation.



**Please do not forget that the left visual field is registered by the right part of the retina, and vice versa.*