



PRESBYOPIA

THINK

A 42 year old woman comes to see you and says, "I used to be able to see very well, but now when I sew I cannot see to thread my needle. I am afraid I am going blind."

Do you think she is going blind, or could there be another reason why she cannot see at near?

Have you noticed that older people sometimes have trouble seeing things close to them, but have less trouble seeing things that are far away?

AIM

This unit will explain why most people cannot see things close to them as they get older, and how spectacles can improve their near vision.

LEARNING OUTCOMES

When you have worked through this unit you should be able to:

- explain the cause of presbyopia
- recognise the symptoms of presbyopia
- explain how presbyopia affects people with different refractive errors at different ages
- state how presbyopia may be corrected
- explain the difference between a near addition and a prescription for reading spectacles.

REVIEW: PRESBYOPIA

PARTS OF THE EYE	<p>Cornea:</p> <ul style="list-style-type: none"> • Like the window of the eye. • Transparent, so that it can let light into the eye. • Helps to focus light that enters the eye. <p>Crystalline lens (or simply “lens”):</p> <ul style="list-style-type: none"> • Transparent in a normal eye. • Changes in the lens’ shape change the eye’s focus from distance to near. <p>Retina:</p> <ul style="list-style-type: none"> • The inside layer at the back of the eye. • Catches the light that comes into the eye and changes it into nerve messages that are sent to the brain.
HOW DOES THE NORMAL EYE RECEIVE LIGHT?	<ul style="list-style-type: none"> • Light from an object enters the eye in the form of light rays. • Light rays entering the eye pass through the tear film, cornea, anterior chamber, pupil, crystalline lens and vitreous, before they reach the retina. • Light rays are converged (focused) by the cornea and the crystalline lens. • If the light focuses correctly on the retina, a clear image will be formed. • Light is changed at the retina into electrical signals (nerve messages). • Information received by the retina is sent to the brain via the optic nerve.
FOCUSING LIGHT IN THE EYE	<ul style="list-style-type: none"> • In a normal eye, light that enters the eye is focused on the retina because: <ul style="list-style-type: none"> - the cornea and the lens are the correct shape, and - the eyeball is the correct length. • An eye that does not do one or both of these things is said to have refractive error.
WHAT IS ACCOMMODATION?	<ul style="list-style-type: none"> • Accommodation occurs when the ciliary muscle contracts and changes the shape of the crystalline lens (makes it thicker). • This changes the optical focus of the eye so that close objects can be seen clearly. • When accommodation in a normal eye (an eye without refractive error) is relaxed, objects in the distance are seen clearly. • Presbyopia is the natural aging change in the eye where the crystalline lens hardens with age. When this happens, the lens cannot change shape easily when the ciliary muscle contracts. This means that an older person cannot accommodate as easily as a younger person. • All people will become presbyopic when they get older. It is impossible for a child or a young adult in their 20s to have presbyopia. • If a normal eye cannot accommodate (if a person has presbyopia), close objects will appear blurry. • The amplitude of accommodation is the total amount of accommodation that is available to change the focus of the eye. • Amplitude of accommodation decreases with age. • Asthenopia (visual fatigue) happens when the ciliary muscle gets tired – when too much accommodation is being used. • To avoid asthenopic symptoms during long periods of near work, usually only half the amplitude of accommodation should be used.

REVIEW: PRESBYOPIA (cont.)

WHAT IS REFRACTIVE ERROR?	<ul style="list-style-type: none"> A person who has a refractive error will need to wear spectacles (glasses) or contact lenses so that they can see clearly and comfortably. This is because their eye is not the correct size and shape. There are four main types of refractive error: myopia, hyperopia, astigmatism and presbyopia. The amount of refractive error an eye has depends on: <ul style="list-style-type: none"> the steepness of the cornea, and/or the steepness of the crystalline lens, and/or the length of the eyeball. A person with a refractive error will have eyes that look normal, but they will not see well. An eye examination that tests for refractive error is called a refraction.
HYPEROPIA	<ul style="list-style-type: none"> In an unaccommodated hyperopic eye, light from a distant object focuses behind the retina. If the person has enough accommodation they can compensate for their hyperopia and make their vision clear. The symptoms of hyperopia vary depending on: <ul style="list-style-type: none"> how much accommodation can be used (how old the person is), and the amount of hyperopic refractive error a person has. The symptoms of hyperopia can include: <ul style="list-style-type: none"> blurred vision (near vision worse than distance vision) headaches asthenopia (eye-strain, sore eyes, tired eyes) poor concentration avoidance of near work. Because loss of accommodation makes it more difficult to compensate for hyperopia, the symptoms of hyperopia will get worse with age. Hyperopia is corrected with plus (convex) spherical lenses.
MYOPIA	<ul style="list-style-type: none"> In a myopic eye, light from a distant object focuses in front of the retina. Accommodation does not improve the vision of a myope. A person with myopia has blurry distance vision. A person with high myopia might also have blurry near vision (but their distance vision will always be worse than their near vision). Myopia is corrected with minus (concave) spherical lenses.
ASTIGMATISM	<ul style="list-style-type: none"> An eye with astigmatism has different powers in different meridians of the eye. This causes light entering the eye to focus in different places, rather than at one single point. Astigmatism may occur just by itself, or in an eye which also has another type of refractive error. An astigmatic eye does not have the same curvature in all meridians (directions). A person with astigmatism usually has blurry distance and near vision. Astigmatism is corrected with astigmatic lenses.
PRESBYOPIA	<ul style="list-style-type: none"> Presbyopia affects all people as they get older. Caused by the natural hardening of the crystalline lens that makes it more difficult to accommodate.

DEFINITION OF PRESBYOPIA

The gradual (slow) loss of accommodation as we get older is called presbyopia.

Everyone over the age of 40 to 45 years is affected by presbyopia. Some people, especially those living in the tropics, get presbyopia even earlier than this. This is because everybody loses the ability to accommodate as they age. The loss of accommodative ability and the subsequent onset of presbyopia happens to both eyes at the same rate.

People with presbyopia usually find it difficult to read or do any near task. Giving them spectacles for near vision helps them to again do the near tasks that they used to do previously.



Near tasks are sometimes referred to as close work, and include all work that requires good vision to see something that is within arm's reach of a person.

If a person can touch what they are looking at (if it is within arm's length of them), it is considered a near task or close work.

Sometimes an early presbyope (someone who is just starting to get presbyopia) will hold things further (and further!) away from their eyes so that they can see it more clearly.

This is because less accommodation is needed to see things that are further away from the eyes.

CAUSE OF PRESBYOPIA

Presbyopia is caused by the loss of accommodative ability that is associated with ageing.

As we get older, the crystalline lens gradually gets harder and cannot change shape easily when the ciliary muscle contracts. This is a normal, natural aging process. This means that an older person cannot accommodate as easily as a younger person.

If the eye does not accommodate when looking at a close object, the object will appear blurry or out of focus.

People often make the mistake of thinking that presbyopia is due to a weakness of the ciliary muscle, but this is not true. The ciliary muscle still works properly, but it has a more difficult job when it has to try to bend the inflexible crystalline lens.

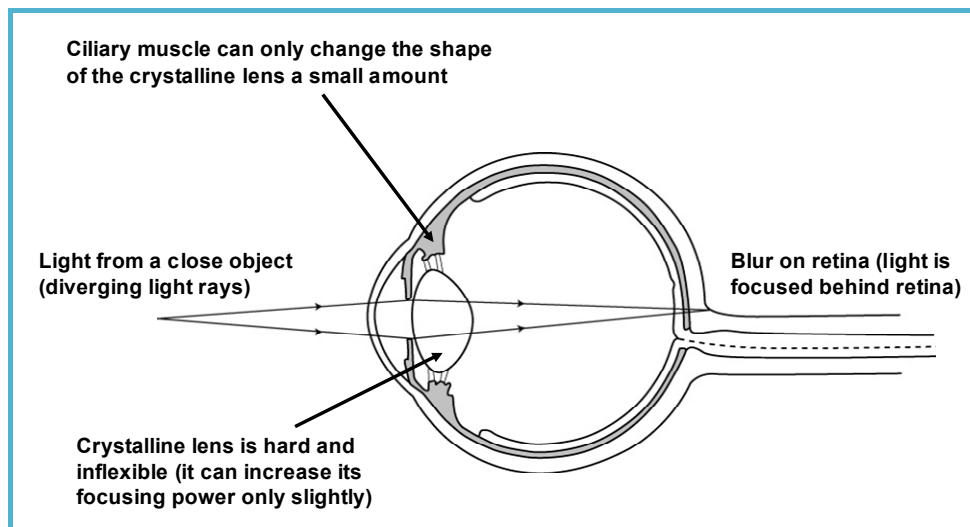


Figure 13.1: A presbyopic eye with some accommodation remaining.
Light from a close object does not focus on the retina.

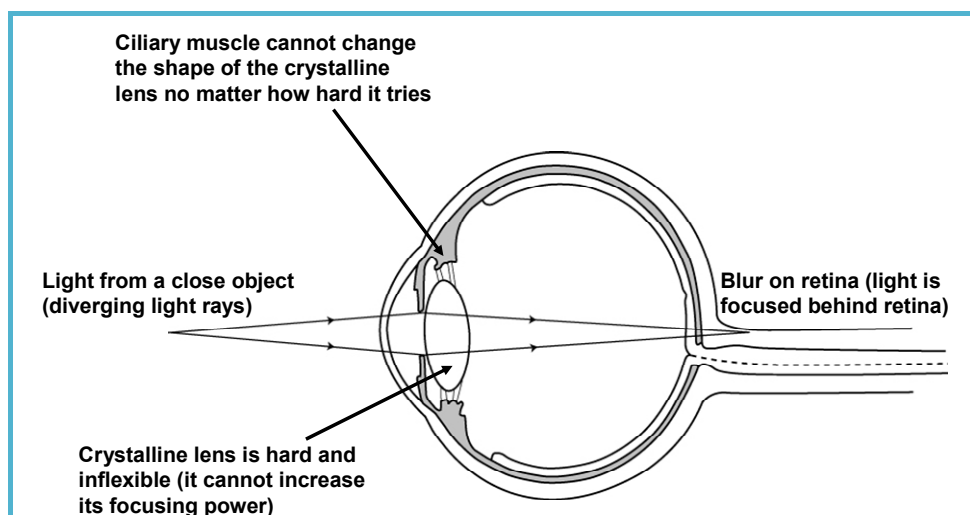


Figure 13.2: A presbyopic eye with no accommodation remaining.
Light from a close object does not focus on the retina.

SYMPTOMS OF UNCORRECTED PRESBYOPIA

People with presbyopia may have trouble with near tasks such as reading, sewing, and sorting rice. When presbyopia starts, they may say things like:

- “I can read in bright sunlight, but not in dim light”
- “My arms are not long enough!”
- “My eyes feel strained when I do a lot of sewing”
- “My eyes get tired when I read”
- “The writing in the newspaper is too small”
- “I find it difficult to thread a needle”
- “I find it hard to sort the stones from the rice when I’m cooking”
- “The distance looks blurred when I look up after I have been reading for a long time”.

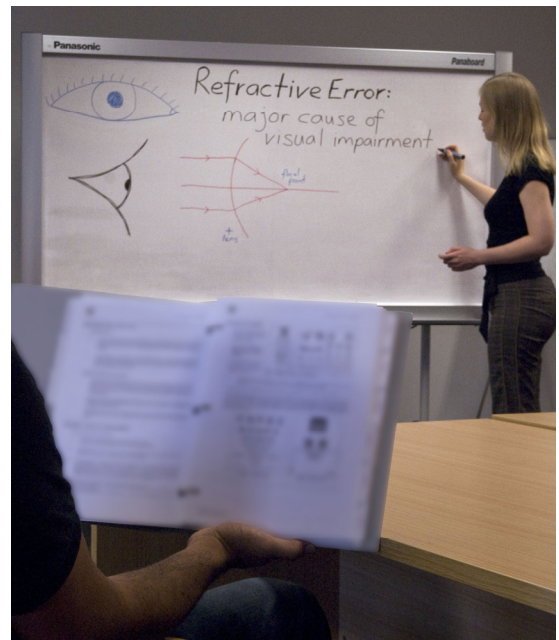
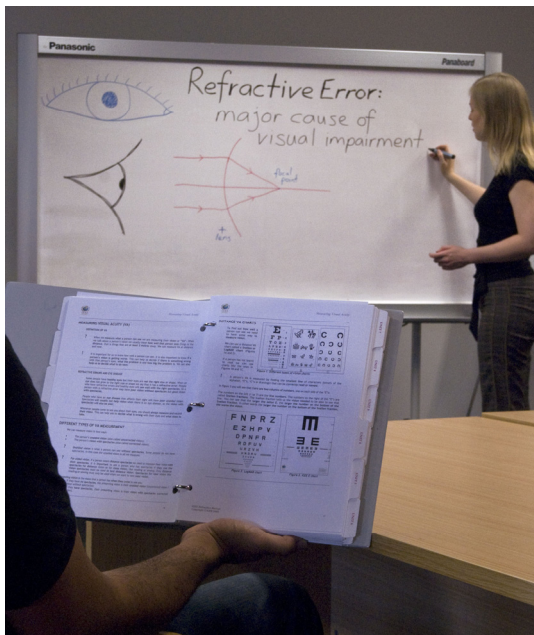


Figure 13.3: