

# Demand on you CARE: Communication Challenges: Vision, Hearing and Speech

## Chapter 2: Visual Impairment and Communication in the Older Adults

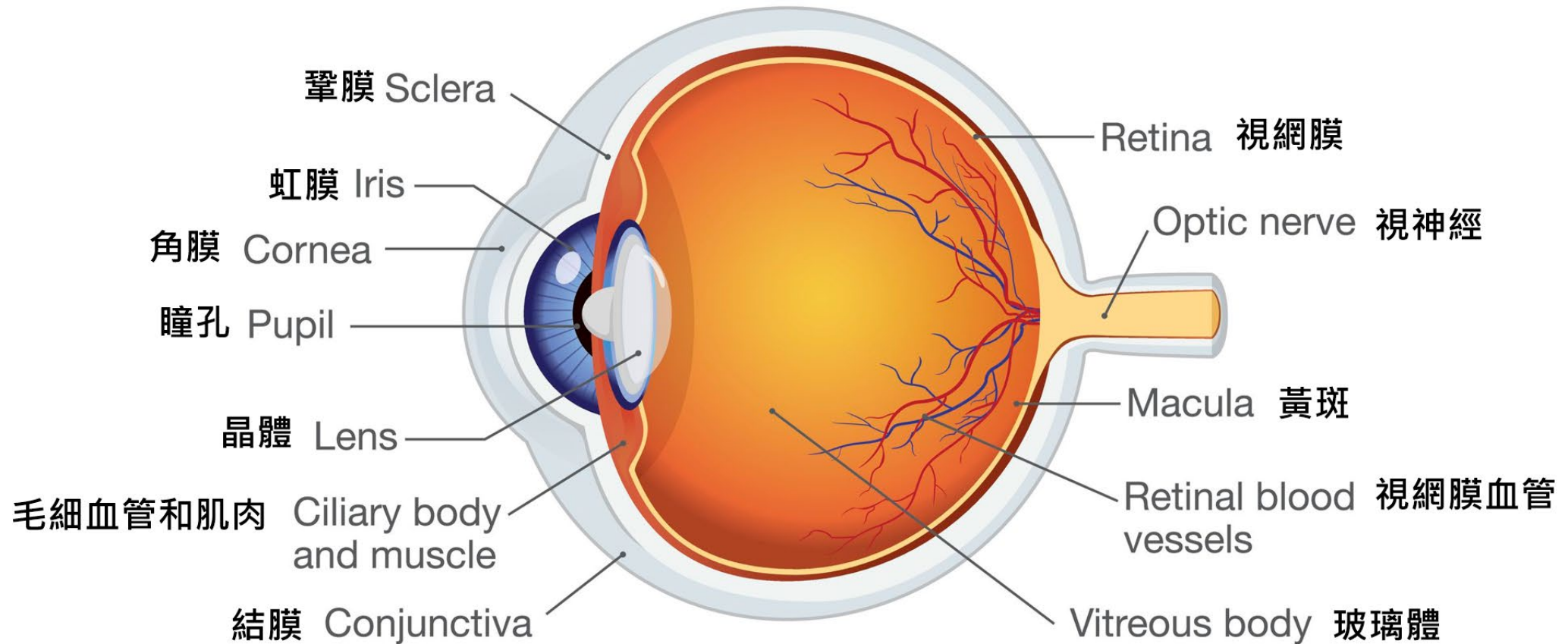
### ELDER009

# Overview

## In this chapter, we will discuss:

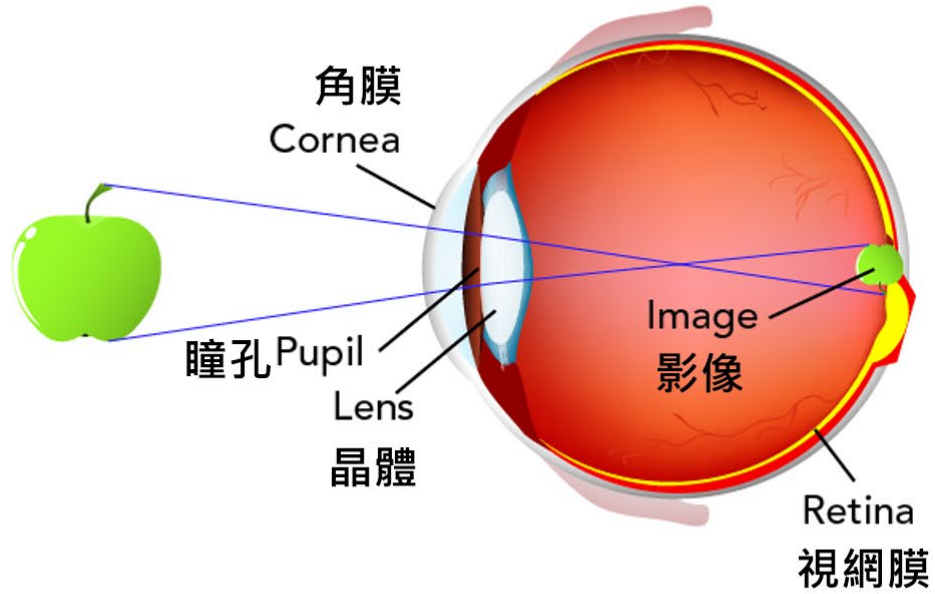
- Age-related changes in vision
- Warning signs of eye problems
- Eye problems, eye diseases and management in older adults
- Tips for eye protection in older adults
- Daily life advices for vision impairment

# Eye Anatomy

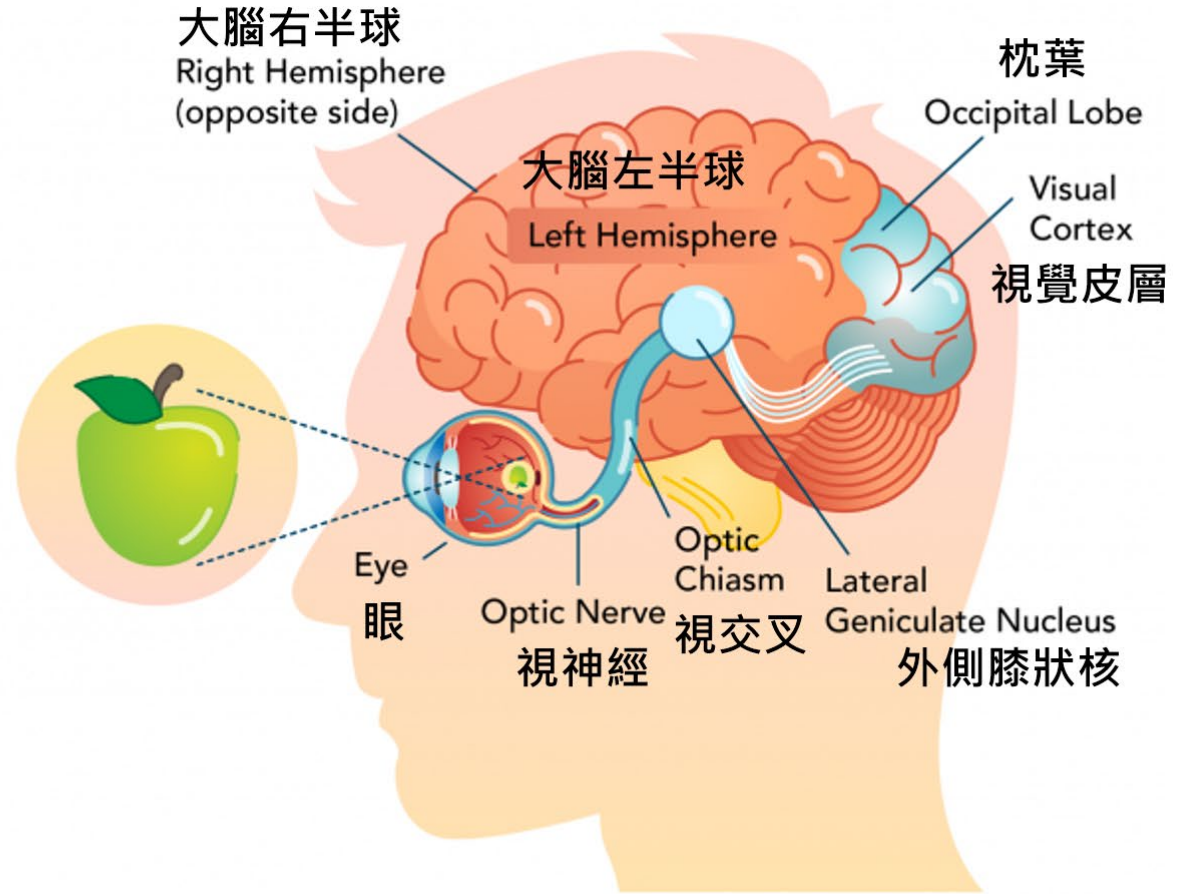


<https://www.thoughtco.com/how-the-human-eye-works-4155646>

# How do the eyes see?



正常視力  
Normal Vision

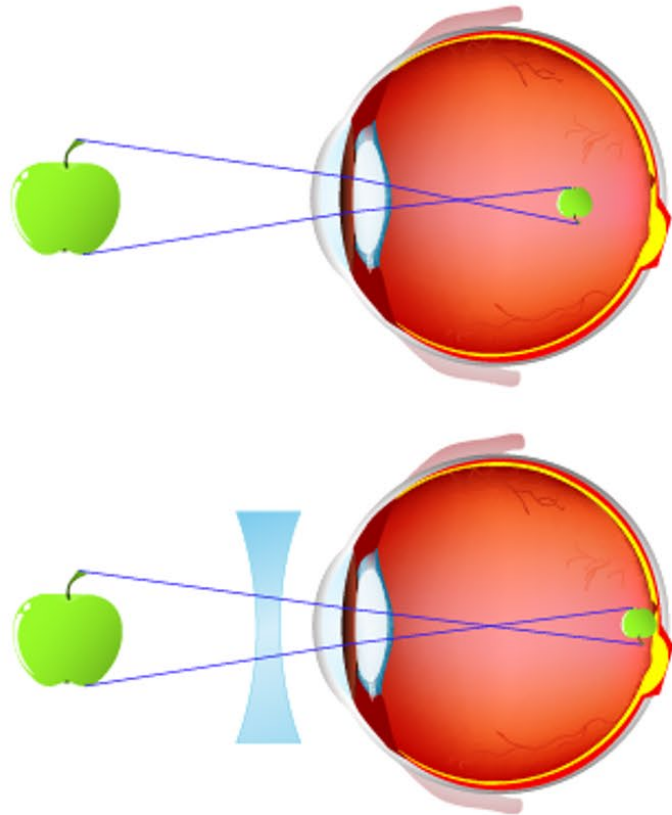


<https://letstalkscience.ca/educational-resources/backgrounders/how-we-see>

# Myopia

雙凹透鏡矯正近視和晶狀體的示意圖

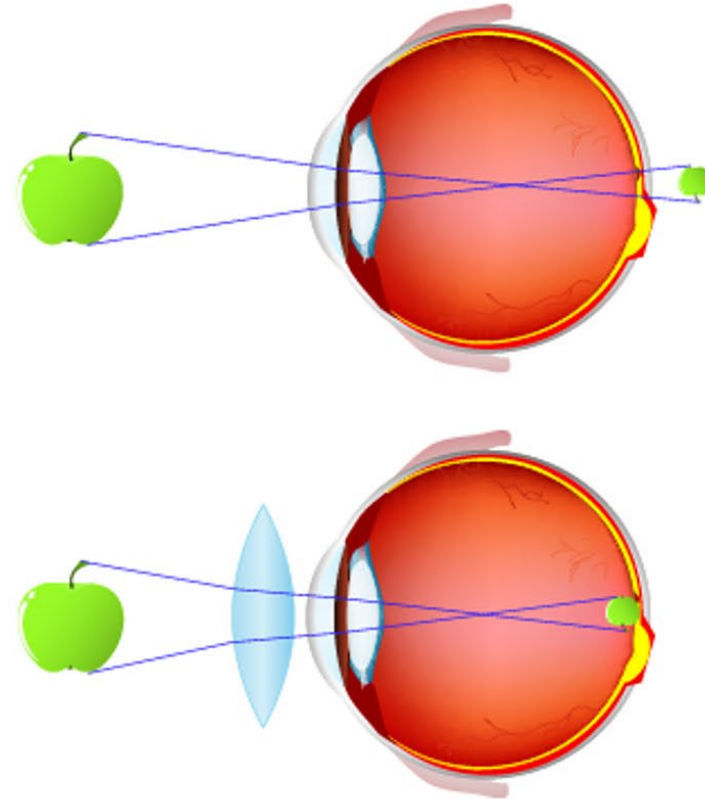
Diagram of myopia and lens correction with a biconcave lens



# Hyperopia

使用雙凸透鏡的遠視和晶狀體矯正圖

Diagram of hyperopia and lens correction using a biconvex lens



<https://letstalkscience.ca/educational-resources/backgrounders/how-we-see>

# Age-related Changes in Vision

Vision changes in older adults:

- Diminishing of vision
- Reduced visual field
- Slow adaptation to light and dark contrast

→ Increase the risk of falls in the elderly



Dual vision and hearing impairments are common among older adults.

# Age-related Changes in Vision

- Presbyopia
- Ectropion
- Entropion
- Dry eye syndrome
- Excessive tearing

# Presbyopia

Definition :

- A refractive error that increases with age

Symptoms:

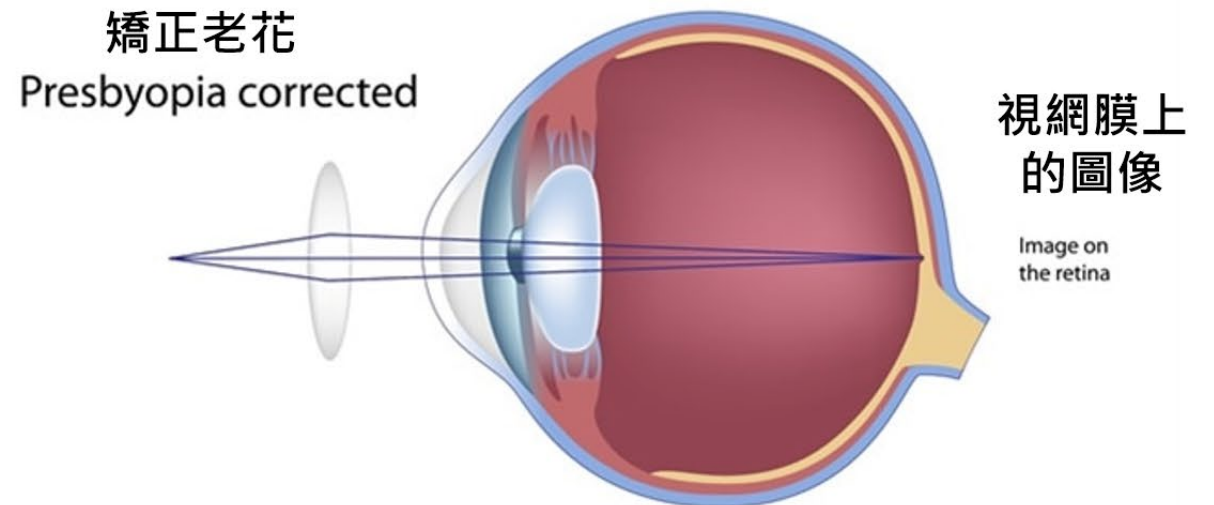
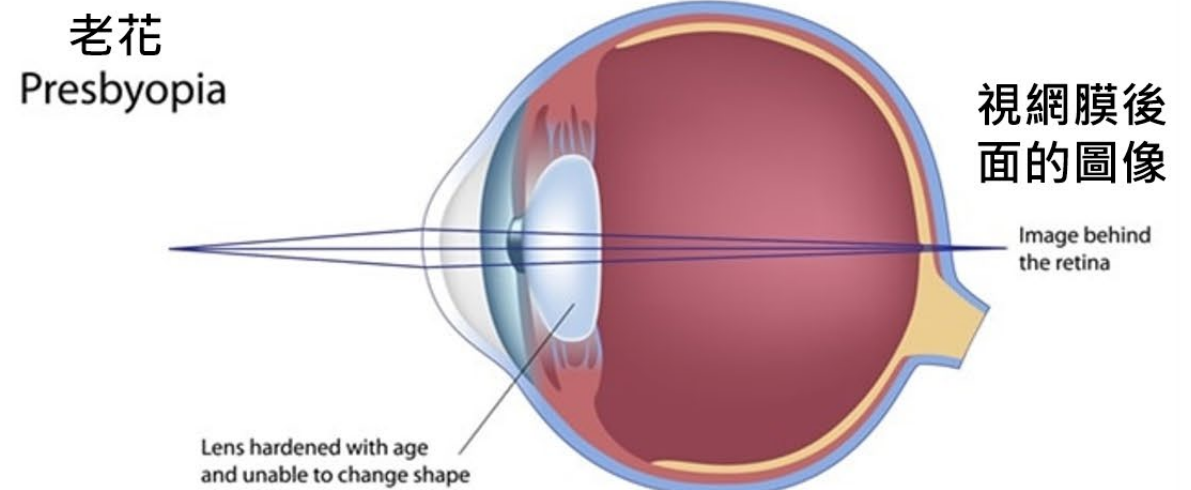
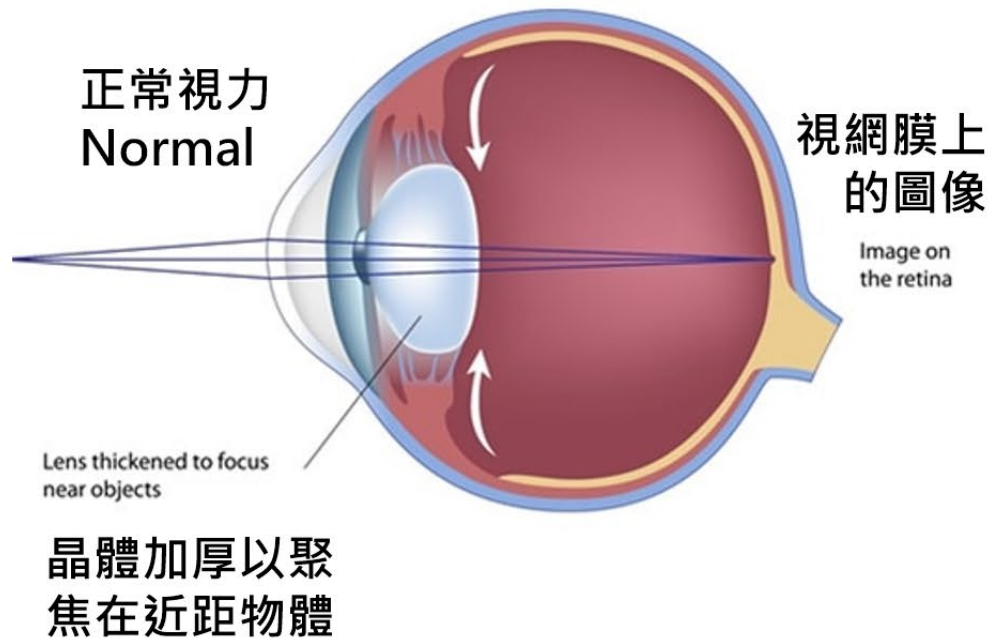
- Vision started to decline after 40 years old.
- Inability to focus and see close object (e.g. reading)

Causes:

- The degree of presbyopia depends on how much adjustment ability is left in the eyes.
- From age 40, the lens in the eye slowly loses its elasticity → which affects the adjustment ability of the eyes, and decreases the zoom capacity.
- At age 60 or older, insufficiency adjustment of the lens (accommodation) → necessary to rely on the reading glasses to look at close object.



# Presbyopia



<https://www.news-medical.net/health/Presbyopia-Age-Related-Farsightedness.aspx>

# Ectropion

## Definition:

- The edge of the eyelid turns outward, more common with the lower eyelid. This leaves the inner eyelid surface exposed and prone to irritation.

## Causes:

- Due to old age, the eyelid and its ligament tissue are loose.
- Eyelid scar, eyelid trauma or facial nerve palsy can also cause ectropion.

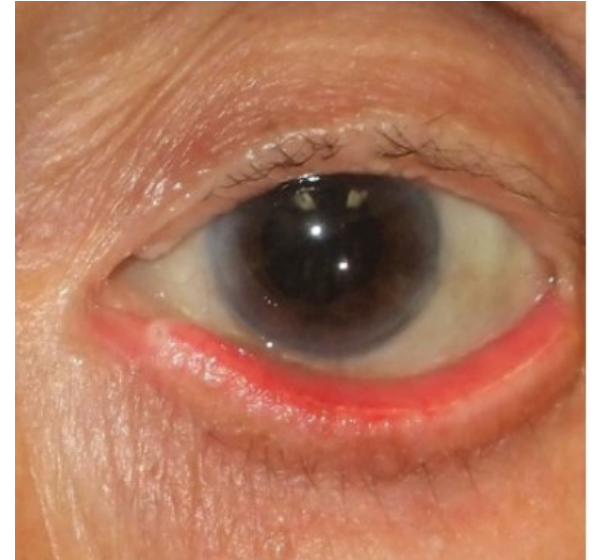


Photo source: Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong

# Ectropion

## Symptoms:

- Eyelid turns outward which leaves the conjunctiva exposed and even make the eyes unable to close completely
- Eyes overflowing with tears, excessive secretion from the eyes, and eyelid scar, which affect vision.

## Treatments:

- The optometrist will examine whether the cornea will be dry and damaged due to ectropion
- Use eye lubricant to keep the surface of the cornea moist
- Use adhesive tape to keep your eyelids closed at night
- If the symptoms are severe or the appearance is affected → Undergo surgical correction

# Entropion

## Definition:

- The eyelid edge turns inward, causing the eyelashes to constantly rub against the cornea and conjunctiva, making the eyes uncomfortable and even damaging the cornea and conjunctiva.
- The lower eyelid is more prone to turn inward than the upper eyelid.

## Causes:

- Ageing → The tissue supporting the lower eyelid is loose, causing the edge of the eyelid to turn inward
- Long-term eyelid inflammation, injury to the inner surface of the eyelid, or scar shrinkage due to chronic infection.

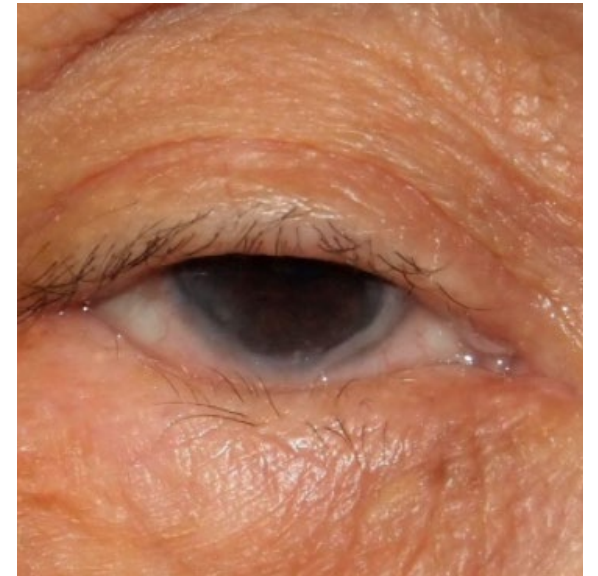


Photo source: Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong

# Entropion

## Symptoms:

- Inverted eyelids and lashes can rub the cornea and eyeball
- Red eyes, tingling pain, foreign body sensation, watery eyes, etc.
- Severe cases can cause corneal damage, causing keratitis and affecting vision

## Treatment:

- If the condition is not severe, artificial tears can relieve the symptoms.
- In severe cases of entropion, corrective surgery can be performed to improve the problem and restore the normal position of eyelid edges and eye lash.
- If entropion is caused by chronic inflammation (such as trachoma) or scab, mucosal transplantation can be performed to treat eyelid scars.

# Dry Eye Syndrome

Reasons why the older adults are more prone to having dry eye syndrome:

- Decreased lacrimal secretion
  - Old age
  - Immune diseases such as systemic lupus erythematosus and rheumatoid arthritis
  - Drug side effects such as the use of antihistamines, antidepressants, and hormone supplements due to menopausal symptoms
  - Other diseases such as diabetes and hyperthyroidism
- Unstable tear quality (mainly divided into three categories: evaporative, aqueous-deficient and mixed)
- Meibomian gland dysfunction (MGD)

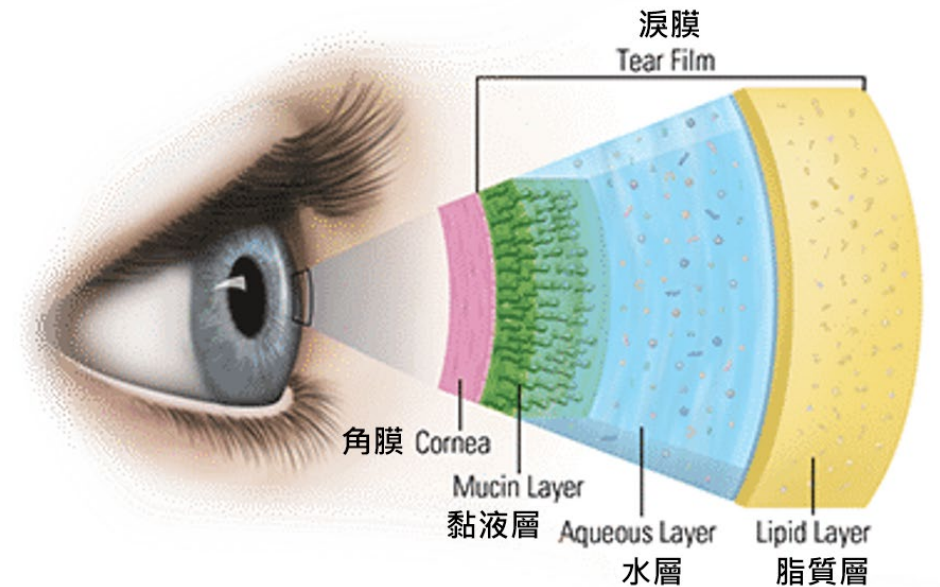
# Dry Eye Syndrome

Human tears have the following three layers, as long as one of them has problem, it can cause dry eye syndrome.

1. Lipid layer: Insufficient oil content makes tears easy to volatilize
2. Aqueous layer: Insufficient secretion of pure tears
3. Mucin layer: Poor ocular mucins, less tears

Symptoms: (Symptoms are the same as common dry eye)

- Dry eye
- Foreign body sensation
- Red eye
- Blurred vision



<https://www.adamscheinerm.com/new-advances-for-dry-eye-treatment>

# Dry Eye Syndrome

## Role of tears:

- There are strips of meibomian glands in the upper and lower eyelids that secrete oil and form a lipid layer in the tear film
- Oil in the tear → Slow down the volatilization of tears, keep ocular surface moist, reduce the chance of corneal damage or virus entering the eye

## Treatment recommendations:

1. Evaporative → Wear goggles to keep out the wind and avoid being blown directly by the wind
2. Meibomian gland dysfunction → Close your eyes and apply warm compress for 10-20 minutes every morning and evening with a hot pack or hot towel, to warm and liquefy the oil blocked in the eyelid gland, which is easier to discharge when blinking, and slow down the evaporation time of tears.



# Excessive tearing

Excessive tearing may cause annoyance and inconvenience.

Symptoms:

- Long-term watery eyes
- Red, sore and swollen eyes
- Pus & thick discharge from the eye if suffering from dacryocystitis

Causes of persistent watery eyes in the older adult:

- Eyelids are loose as we age. Tears cannot flow into the small holes that collect tears, then down into the throat.
- Obstruction in the tear ducts
- Inversed eyelash, eyelid inflammation and ectropion will stimulate the eyes to secrete tears
- People suffering from allergic rhinitis or allergic conjunctivitis
- Excessive tearing can also be one of the symptoms of dry eye

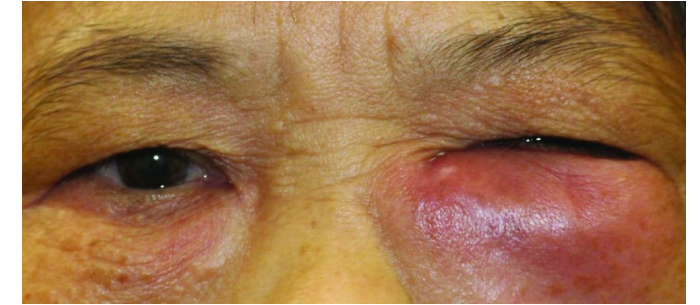


Photo source: Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong



# Warning Signs of Eye Problems

- Blurred vision not corrected by appropriate corrective glasses
- Persistent eye pain or acute sharp pain
- Over-sensitivity to light. Halo or rainbow is seen around lights
- Partial loss of visual field
- Red eyes or burning sensation experienced
- Sudden appearance of large amounts of floaters or black spots in the visual field
- Abnormal growth in the eye or on the eyelid
- The transparent part of the eye looks cloudy
- Eyes become watery, with persistent discharge or crust

**In addition to age-related changes in vision, older adults should also pay attention to the above warning signs. Seek medical advice immediately to avoid affecting vision if having any of the above sign.**

# Eye problems, eye diseases and management in older adults

- Cataract
- Glaucoma (chronic vs acute)
- Macular degeneration
- Diabetic retinopathy, also known as diabetic eye disease (DED),  
Hypertensive retinopathy

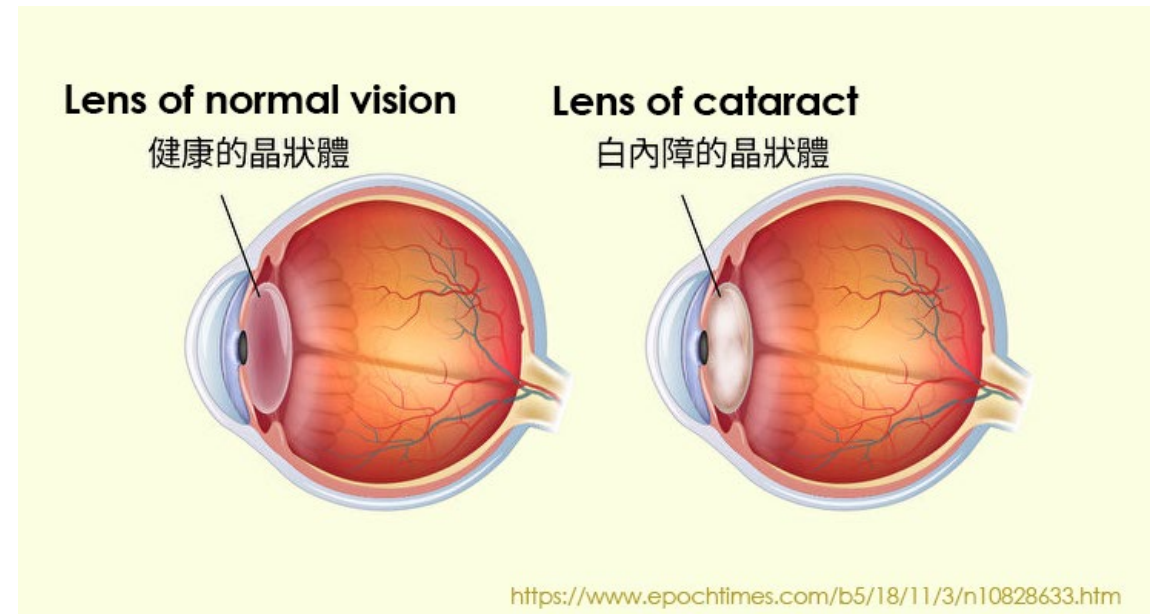
# Cataract

## Definition:

- As the lens becomes cloudy and opaque, the light cannot be concentrated, resulting in decreased vision
- Lens ages with aging; diabetes, trauma, steroids, and congenital factors can all cause cataract
- Cataracts are not regarded as presence or absence, but depend on the mature level (just like steamed eggs). Early cataracts will not have much impact on vision, and only need regular eye examinations.

## Causes:

- Old age
- Iritis
- Eye trauma
- Long-term use of steroid drugs
- Diabetes



# Cataract

Common symptoms of cataract:

- Blurred vision
- Sensitivity to light
- Change of color tone
- Decreased contrast sensitivity
- Even double image
- But the eyes will not be red, swollen, sore

# Cataract

**Simulate the vision of eyes without cataract**



**Simulate the vision of eyes having mild cataract that is able to cope with daily life**



**Simulate the vision that cataract began to affect daily life, such as looking at the bus number.**



**Simulate the vision of severe cataract**



# Cataract

## Treatment:

- At present, there is no clinical drug that can restore cataract
- Cataract surgery to implant an artificial lens to restore vision is the contemporary treatment.
- Since the cataract will get worse over time, surgery may be required when it starts to affect daily life. With current technology, it is best not to wait until the cataract is fully mature, as it is a minimally invasive surgery



## Hospital Authority Public-Private Partnership Programme- Cataract Surgeries Programme (CSP)

Patients on Hospital Authority clusters' routine cataract surgery waiting lists can join the programme, and receive cataract surgery performed by private ophthalmologists.

<https://www4.ha.org.hk/ppp/en/ppp-programmes/csp/programme-intro>

# Glaucoma (chronic vs acute)

Definition:

- progressive optic neuropathy and peripheral visual field loss
- Glaucoma is generally divided into acute and chronic

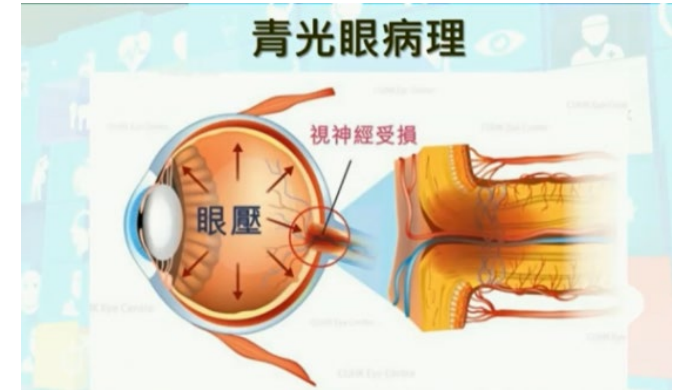


Photo source: Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong

	Acute glaucoma	Chronic glaucoma
Symptoms	<p>Blurred vision, headache, nausea, vomiting, and see a rainbow-colored circle</p> <p>The reason for the above symptoms is that the drainage angle is suddenly blocked, causing the circulation of the aqueous humor secreted by the ciliary body to be blocked, leading to an increase in intraocular pressure. If it cannot be treated in time, it may cause blindness in a short time.</p>	<p>The early stage of glaucoma affects the optic nerve cells which responsible for the peripheral visual field. The patient is less sensitive to the peripheral visual field. Therefore, apart from regular eye examinations, it is difficult to detect it earlier.</p>
Intraocular pressure	<p>Intraocular pressure is generally elevated.</p> <p>Although patients may feel pain, there are some older adults who feel no pain even when the intraocular pressure rises to 60 degrees (Normal intraocular pressure is 10-21).</p>	<p>Intraocular pressure is generally normal</p>



# Glaucoma (Chronic vs Acute)



**Simulate glaucoma vision**

# Glaucoma (chronic vs acute)

People who are more likely to develop glaucoma:

- Family history
  - Over 45 years old
  - Need to take steroids
  - Deep myopia (above 600 degrees)
  - Ocular hypertension
- Since glaucoma can occur without warning signs, it is important to regularly check for the health of intraocular nerve and intraocular pressure.

# Glaucoma (chronic vs acute)

## Treatment:

- There is no radical cure for glaucoma temporarily.
- The general treatment is to reduce the intraocular pressure as much as possible to avoid further degeneration of the optic nerve.
- According to research conducted by the HKU and PolyU, it was found that wolfberry can protect the retinal ganglion cell on the retina from glaucoma.



## **Hospital Authority Glaucoma Public-Private Partnership Programme**

Patients with glaucoma receiving treatment in the Hospital Authority will be invited for voluntary participation and receive private specialist medical services in the community.

<https://www4.ha.org.hk/ppp/ppp-programmes/glaucomappp/programme-intro>

# Macular Degeneration

## Definition:

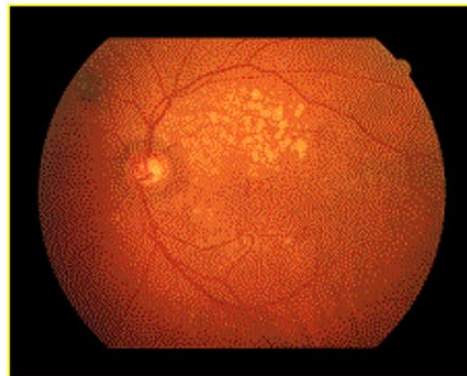
- Common eye diseases in the older adults, the number one killer of blindness among people over 60 years old.
- Everyone has macula lutea. The macula lutea is located in the center of the retina and is responsible for central vision. It is the most accurate position of vision.
- Therefore, macula lutea is an important structure of the eye, and macular degeneration can greatly affect vision and daily life.

# Macular Degeneration

Macular degeneration can be divided into dry and wet:

- Dry macular degeneration, accounting for about 90% of cases
- It does not affect the eyesight of the patient in the early stage, and the development is slow. There is no effective treatment for dry macular degeneration, only focusing on prevention and slowing down the deterioration.
- Once it deteriorates and turn into wet macular degeneration, the impact on vision will be greater.

**Dry macular degeneration**



**Wet macular degeneration**

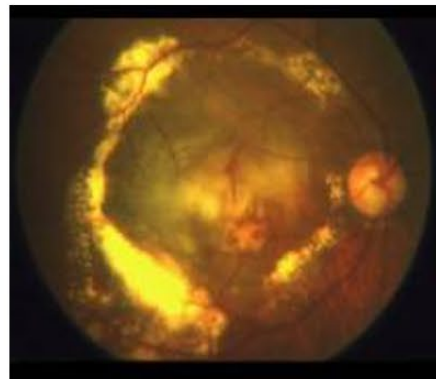


Photo source: Department of Ophthalmology and Visual Science, The Chinese University of Hong Kong

# Macular Degeneration

## Symptoms:

- Generally, "dry" age-related macular degeneration has no symptoms
- Symptoms of "wet" age-related macular degeneration include:
  - Deformation and bending appear when looking at a straight line
  - Deformation of the scene
  - Blurred central vision, difficulty in reading and recognition
  - In severe cases, a blind spot gradually forms in the center of vision



Simulated macular degraded vision

When reading, straight lines become wavy or the image becomes blurry and some area become blank

光線進入眼睛從而使我們看到物體。光線( )中黑點，由眼睛前部的角膜及線能聚在視網膜，而視網膜把物使我們能清晰地看到影象。

Photo source: Department of Ophthalmology and Visual Science, The Chinese University of Hong Kong

# Macular Degeneration

People who are more likely to develop macular degeneration:

- The older one gets, the greater the risk.

People aged 50-60: about 2%

>75 years old: about 30%

- People who spend a lot of time in the sun (ultraviolet light)
- Risk factors such as smoking, alcohol abuse, high cholesterol, and genetics

# Macular Degeneration

Community Resources



## 眼內注射藥物資助計劃 更新版

捉緊視網膜病變治療黃金期  
藥物資助即時幫到你

**最新資助安排**  
兩種眼內注射藥物可供選擇：

- 1 新一代眼內注射藥物，只適合適性老年黃斑病變的合資格人士，建議價每次港幣\$9,800\*
- 2 適合申請資格3的合資格人士，建議價每次港幣\$6,800\*

\*建議價包括藥物費用、注射費用及手術前檢查費用(如有需要)，並不包括醫生診金及其他費用。詳情請向參與此計劃的私家眼科醫生查詢，一切由醫生決定。

**眼內注射藥物資助計劃**  
查詢：3482 1976  
網站：www.healthtalk.hk  
辦公時間：星期一至五早上九時半至下午五時半，公眾假期除外

### 眼內注射藥物資助計劃 資助安排

視網膜病變的黃金治療時期為發病後1至3個月，若延誤治療，病人有機會視力受損，嚴重者可因此而永久失明，但不少病患者因轉換時間長及藥費貴而延誤治療。

香港視網膜病變協會聯同香港醫道聯盟，攜手推出「眼內注射藥物資助計劃」，致力為有需要的視網膜病變患者，提供實質的藥物經濟支援，讓病人及早接受治療，盡快阻止視力進一步下降。

**申請資格**

- 1 香港永久性居民
- 2 醫院管理局轄下病人
- 3 患者須被醫生確診為濕性老年黃斑病變、糖尿病水腫、增殖性糖尿病視網膜病變、視網膜靜脈阻塞或脈絡膜新生血管病變，並需要接受眼內注射藥物治療
- 4 患者必須備有醫院管理局發出之覆診證明以符合以上第3點的資格。
- 5 患者可在醫院覆診期間向眼科醫生提出有意參加本資助計劃並要求醫生轉介信
- 6 並未參與現時醫院管理局就黃斑病及視網膜黃斑水腫的特別資助計劃
- 7 未經受惠於其他眼內注射藥物資助計劃的人士
- 8 首次參加者或持有長者咭者優先參加

香港視網膜病變協會、香港醫護聯盟合辦-  
眼內注射藥物資助計劃 (Chinese version only)  
<http://www.projectconcern.org.hk/node/585>



## 黃斑病變治療援助計劃

計劃簡介  
由「保良局醫療資助基金」資助藥物費用及審批申請，並由眼睛健康基金聯繫眼科專科醫生作評估及治療，旨在為黃斑病變病人免費進行藥物注射。

計劃日期  
由2021年4月19日開始  
(額滿即止)

申請資格

- 註冊社工轉介
- 香港居民
- 由醫管局醫生確診患有黃斑病變
- 有切實經濟困難者
- 未曾受惠於其他黃斑病變藥物資助

申請方法

- 1 申請詳情請參閱本計劃申請指引(可於www.poleungkuk.org.hk下載)
- 2 填妥申請表(包括由政府/醫管局醫生填寫 Medical Assessment Form)
- 3 提交相關證明文件(詳列於申請表內)

服務包括

- 黃斑病變治療評估
- 最多3次黃斑病變藥物注射
- 每次注射後一次覆診跟進

遞交申請  
註冊社工將申請表格正本及所需文件遞交/郵寄到以下服務單位：  
保良局醫療資助基金辦事處  
地址：香港銅鑼灣禮頓道66號

查詢電話：2277 8333  
傳真：2890 2097  
電郵：charityfund@poleungkuk.org.hk

眼睛健康基金聯絡資料  
3429 0090 3421 1290 info@eye-fund.org www.eye-fund.org 九龍旺角彌敦道998號協成行旺角中心19樓C室 眼睛健康基金 Eye Fund

黃斑病變治療援助計劃(Chinese version only)  
<https://www.eye-fund.org/%e6%85%88%e5%96%84%e5%85%ac%e7%9b%8a/%e9%bb%83%e6%96%91%e7%97%85%e8%ae%8a%e6%b2%bb%e7%99%82%e6%8f%b4%e5%8a%a9%e8%a8%88%e5%8a%83/>



# Macular Degeneration

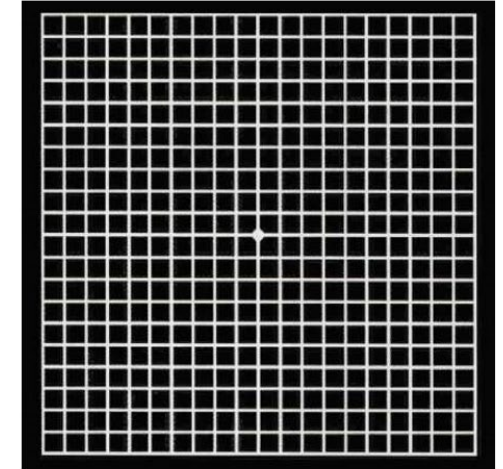
## Self-assessment method:

### Amsler grid

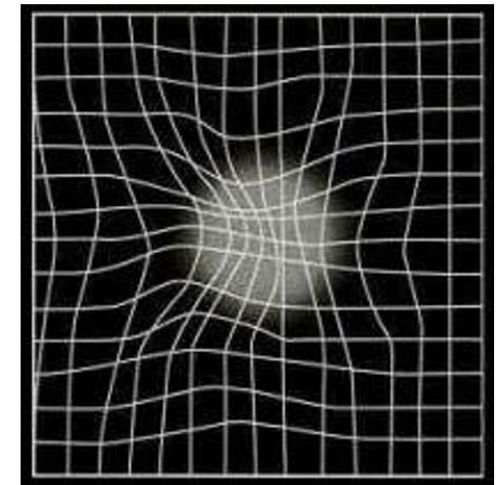
- It is a 10cm x 10cm grid drawn with thick white lines on a black background, with a white dot in the center.
- The grid helps to detect the early signs of macular degeneration, including wet age-related macular degeneration and macular bleeding or fluid accumulation caused by deep myopia (600 degrees).
- However, this cannot replace regular detailed eye examinations by an ophthalmologist.

### How to use the Amsler grid for self-assessment:

1. Place the grid table at a distance of 30 cm from the eye level, with sufficient and even light.
2. If the user wear glasses daily, they need to wear the original glasses for assessment. The older adult should also wear presbyopic glasses for examination.
3. Cover your left eye with your hand, and stare at the white spot in the center of the grid with your right eye.
4. When staring at the central white spot, if one finds that the white line in the center of the square table or other areas is curved, broken or distorted, or the position of the square part is blurred or vacant, which may be the problem of the macular area in the fundus, and it is necessary to seek an ophthalmologist for detailed examination as soon as possible.
5. Repeat the above steps for the left eye.



「Amsler」 grid



Simulate vision of macular degeneration

Photo source: Department of Ophthalmology and Visual Science, The Chinese University of Hong Kong

# Eye problems caused by chronic diseases- Diabetes/hypertensive retinopathy

## Definition:

- Both hypertension and diabetes affect the blood vessels in the eyes
- Continuous high blood pressure → blood vessels in the eyes have sclerosis, bleeding, and papillary edema, which are collectively referred to as “hypertensive retinopathy”.
- The disease is similar to the condition of diabetic eyes, it can also affect vision and cause permanent damage in severe cases.
- If one has diabetes, it will significantly increase the risk of retinopathy.
- Therefore, one cannot ignore the impact of blood pressure on the body and eye health. In addition to controlling blood sugar, attention must be paid to the problem of high blood pressure.

# Eye problems caused by chronic diseases- Diabetes/hypertensive retinopathy

## **Dietary recommendations for the prevention of diabetes/hypertension:**

- Balanced diet
  - Less salt
  - Less sugar
  - Low fat
  - Avoid foods with high cholesterol
  - Diabetic patients should avoid adding too much sugar in drinks, and try to replace with sweetener substitute
- Keep blood pressure and blood sugar at a stable level to reduce the burden on blood vessels in the eyes.

# Tips for Eye Protection in Older Adults

- Indoors
  - 20-20-20 rule
  - Balance the light around
- Outdoors
- Lifestyle and diet habits
- Eyelid cleaning care
- Regular eye test

# Indoors

## 20-20-20 rule

- Rest your eyes regularly
- Take a break every 20 minutes and look at an object 20 feet (six meters) away for at least 20 seconds
- If you can't take a break too frequently, you must take a break at least once an hour. You can go to the toilet, drink a glass of water, or have a snack

# Indoors

- **Balance the light around**

Suggestions for computer screen position:

- The screen should be placed in front of about an arm's length, 18-28 inches (45-70 cm) away
- The top of the screen is at the eye level, and the best angle is 10-20 degrees when looking down



# Indoors

- **Enough, balanced and stable light**

- The muscles that control the size of pupil and light response will lose some strength with age, causing the pupils gradually become smaller and less light enters the eyes, which affects visual performance.
- Rod cells dominate our vision in the dark environment. As rod cells begin to have a slower recovery of night vision, middle-aged and older adults are less able to adapt in the dark, leading to slower responses that may increase the risk of falls and traffic accidents at night.

# Outdoors

- UV light can cause cataracts and macular degeneration
- Use protective lenses against UV light when working outdoors for a long period of time
- Choose lenses that can filter light with a wavelength of 400nm or below
- Older adults can also choose color-changing lenses, to avoid the trouble of changing sunglasses when going in or out of the room
- Color-changing lenses can effectively block “strong light” (visible light) and “UV light” from entering the eyes
- The stronger the UV light exposed to the color-changing lens, the darker the color becomes



**The picture shows the same pair of glasses with color-changing lenses. When the intensity of the surrounding ultraviolet rays increases, the color of the lenses will change from transparent (left) to darker (right).**

(Provided by Dr. Bruce CHAN, a registered optometrist of Jockey Club Cadenza Hub)



# Lifestyle and diet habit

Food suggestions for eye care:

- Foods containing anthocyanin, such as red, purple, purple, blue and black vegetables and fruits, among which berries are particularly high in content. (e.g., eggplant, purple sweet potato, blueberry)
- Foods containing lutein, including dark green vegetables and yellow fruits. (e.g., spinach, corn, yellow/red/green pepper, carrot, kale, orange, mango)
- Foods containing omega-3, such as fresh fish
- Consume moderate amount of berries and nuts. Nuts have mineral zinc in the surface, which can delay the development of dry macular degeneration

Life style suggestions:

- Avoid smoking and drinking
- Aerobic exercise can delay vision deterioration

# Eyelid cleansing care

If excessive oil secretion in eyelid, coupled with improper eye care, it may cause eye dermatitis.

A simple and comfortable eye cleansing method can reduce the chance of developing eyelid dermatitis.

What you need: warm boiled water, cotton swabs, a small amount of neutral shampoo (or baby shampoo without astringent formula), mirror, cup

## Cleaning steps:

1. Wash your hands first to avoid bringing more bacteria into your eyes during cleaning.
2. First remove secretions, scales, loose eyelashes, etc.
3. Pour warm water into the cup. If excessive oil secretion in eyelid, you can add a drop of shampoo.
4. Facing the mirror, first pull down one eyelid and use a wet cotton swab to clean the eyelid from the inside of the canthus to the outside. Remember to also clean the roots of the eyelashes.
5. Each side of the cotton swab can only be used once. Use a new small cotton ball every time you clean your eyes, and wipe 3-5 times on one eye in total.
6. When you wipe upper eyelid, look downward slightly; When you wipe the lower eyelid, look upward slightly.
7. Repeat the above steps on the other eye.

## Precautions:

1. Recommended to clean 3 times a day when the eyes are inflamed or itchy; when the condition improves, clean once every morning and evening before freshening up.
2. If you have an allergic reaction to baby shampoo, including rash and swelling on the eyelids, stop using it immediately and seek medical advice.

# Regular Comprehensive Eye Examination

- Regular comprehensive eye examination can identify problems early and receive appropriate treatment
- Regular monitoring and treatment are required when suffering from chronic degenerative diseases, such as macular degeneration and glaucoma
- An ophthalmologist or optometrist can provide advice to patients with low vision and use assistive devices to help with daily activities



# Daily Life Advices for Vision Impairment

- Home Environment
- Assistive Devices

# Home Environment

- Have enough, balanced, stable and soft lighting or natural light.
- The color contrast between the door frame and the wall should be obvious.



# Home Environment

- Avoid color contrast of objects is too close, because it is difficult for older adults to judge the distance of the object (it is prone to having accidents for the bench on the right ).



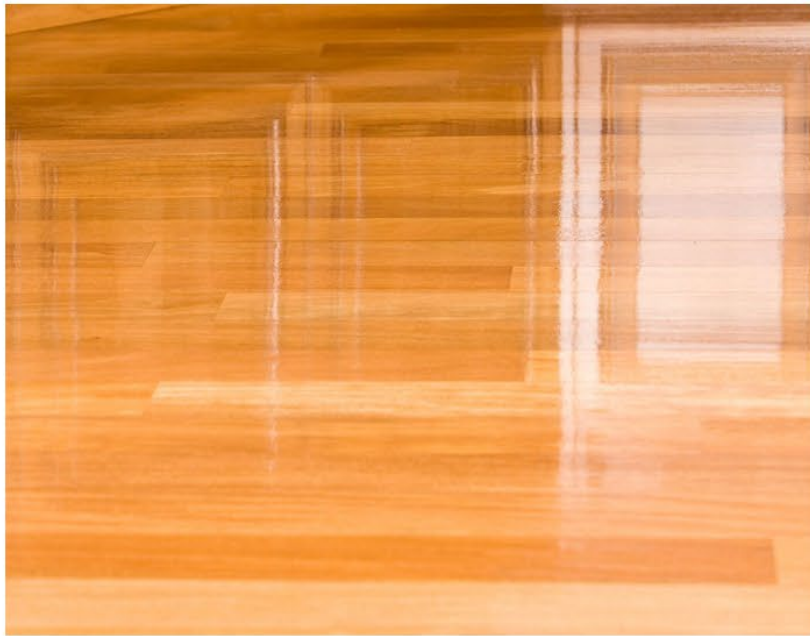
**Normal vision**



**Vision of visual  
impaired person**

# Home Environment

- Use non-reflective floors to reduce glare interference.
- Tape down the carpet and remove the wires from the aisle to reduce the risk of falls and injuries.



**Reflective floor**



**Non-reflective floor**

# Assistive Devices

- Fitted with proper visual aids; magnifying glass, binoculars or computer software with magnifying function can also be used.





# Assistive Devices

- Pay attention to home environment to facilitate their daily life.
- Add tactile marks on home appliance buttons.



# Assistive Devices

- Household items

For example: Simple TV remote controller, large key phone, magnifying nail clippers



- End of Chapter 2-

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