

# the med

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How do glasses and contacts work? Which is better?

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What are cataracts?

**All about  
ophthalmology!**



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# EDITOR'S NOTE

Dear Medical Journal Readers,

If you're new, thanks for checking us out, but if you're a grizzled veteran, then welcome back to the FIS Med Journal.

First, our thanks to everyone who contributed to this issue of the Med Journal for their fantastic work, the second issue produced by the current team.

As a dedicated team of students here at the FIS Medical Journal, we aim to provide a light-hearted magazine-style journal exploring medical issues for all FIS students. We wish to create inspiration for our readers to further research and hopefully increase awareness of medical issues within the FIS community. Given the team's own interest and ambitions we also hope to spark incentive for other students to pursue medical studies and so provide Medical School guidance and advice.

In this issue, we will be focusing on the medical field of ophthalmology, an area of medicine that focuses on our eyes - how they work, how to care for them and how we can cure their diseases. We will ask what's the deal with eyecare before rolling through a series of eye-popping articles. One of FIS's most dedicated and inspiring teachers, Mr. Wines has shared his experience of living with colour blindness and the biology behind it. Now, if life has got a bit blurry for you maybe it's time to read our *Diagnosis of the Month* on cataracts featured on page 12. Don't forget to take a peek at our FIS survey discussing whether or not screens cause eye damage, the results might intrigue you. Finally, if you want to be an ophthalmologist, then run your eyes over our *University Guidance* article, we think you'll gain some insight.

Anyway, enjoy this latest issue and we hope it brings you some clarity until the next edition. Merry Christmas from all the team!

Robin Lacoste and Archibald Davies



# PREFACE

## Colour Blindness

BY MR WINES

Colour Blindness; a nuisance but not an affliction. I do not blame my mother.

The biologists, and anyone who has researched this condition, will know that the condition occurs predominantly in males (Caucasian males seem to have greater prevalence). Why? Because we are the weaker sex perhaps!? That MIGHT be the reason, but the scientific reason is that we “boys” only have one gene available to us for “normal” colour vision (girls have two available genes in a pair) and that single gene comes to males from our mothers on the “X” chromosome. We receive our other sex chromosome, a “Y” chromosome, from our father.

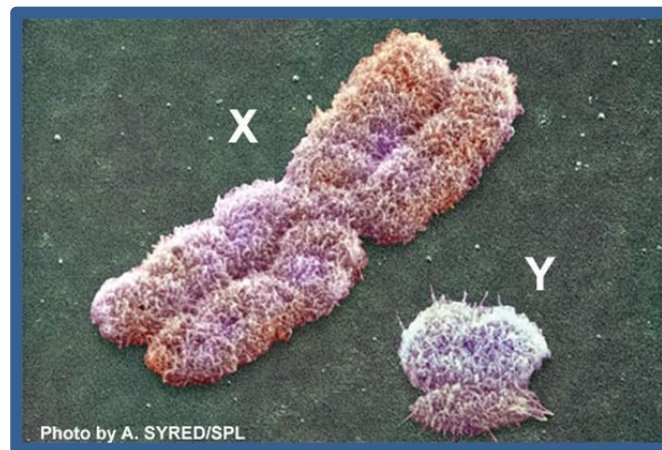


Fig. 1: Illustration of the scale of the “X” versus the much smaller “Y” chromosome.

Males were “short-changed” a little at the genetics “roulette” table, as the “Y” Chromosome is shorter than its partner “X” and the “colour sight” gene does not exist on the Y partner. Colour blindness, like haemophilia and male-pattern baldness, is a sex-linked, recessive trait that is inherited when an “X” chromosome, that is deficient in some way, is passed on to the child from one of the parents. For girls, they have an “X” chromosome inherited from their father as well as one from their mother and have two chances of receiving a “healthy X” (with fully functioning gene for colour sight). Such a “healthy gene” will dominate any “deficient” gene on the other X chromosome. Boys have only the

one chance to receive a functioning colour sight gene and that comes from their mother. In the case of one of the mother's genes being deficient of colour sight gene, the mother is called a "carrier" for the condition (genotype), even without exhibiting this colour blindness in her phenotype (outward appearance).

When I tell people that I am colour blind I get mixed reactions, some people will start with "you poor thing". Others, either have no idea what I am talking about or are quite interested in what it must be like and how I came to be like that! "How do you see the world?". I try to explain the little I understand of the genetics, depending on the person's patience and level of general science/anatomical knowledge, but it invariably comes down to me saying that they need to imagine the world with a lot less red! Most colour blindness comes from a deficiency of the red receivers (cone cells) in the retina. Try purple without red = blue, brown without red = green. Nevertheless, colour-blindness comes on a continuum and it would be rare to have no red receptors at all; for example, I am "moderately severely" colour blind... I see red when there is enough of it to fire enough receptors.

The problem did prevent me from becoming a pilot or an electrician (colour-blind electricians have a lower life expectancy I believe) but, on an everyday scale, I hardly think about the condition and it rarely causes me too much grief. There was only the one small traffic accident living in a land of red/orange/green traffic lights and a couple of embarrassing choices of clothes, easily overcome, of course, by taking a 'normal' person shopping with me! Anyway, it can have its advantages, the world is still a very colourful place and I don't have a problem of judging others on the colour of their skin when I don't know what colour it is. If you are interested in genetic traits, like I am, I urge you to do some research on inheritance. Start with a genetic sex-linked characteristics and you will see that there are a lot worse conditions than mine that can be inherited... so, I am blessed.



# THE TEAM

## BEHIND THE MED



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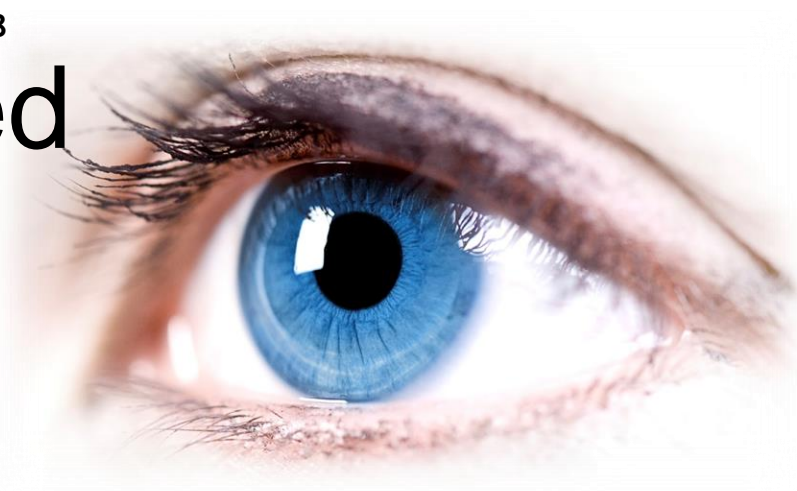
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# Eyecare

## What is it?

Haruto Iguchi (Y10)

Eye care or Optometry is a profession which involves examining the eyes and search defects and/or abnormalities. Optometry began primarily by using spectacles to correct refractive errors. There are 9 different kinds of ECP which includes the following:

- **Ophthalmologist**
  - Ophthalmologist are medical and osteopathic doctors who provide eye care including optical surgery. An ophthalmologist can perform all the tests an optometrist can and is a fully qualified medical doctor and surgeon. They must complete a series of extensive and intensive medical and surgical exams to qualify. Not only that but they may receive additional training for specific areas of ophthalmology such as retina, cornea, glaucoma, laser correction, pediatric ophthalmology, uveitis, pathology and neuro-ophthalmology etc.
- **Ophthalmic Medical Practitioner**
  - An Ophthalmic Medical Practitioner is someone who specializes in ophthalmic conditions but has not completed a specialization in ophthalmology
- **Optometrist**
  - An Optometrist is the primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care. An optometrist normally attends 4 years of college and 4 years of optometry school.
- **Orthoptist**
  - Orthoptists specialize in diagnosis and management of eye movement and coordination problems, misalignment of the visual axis, convergence and accommodation problems. An example of these conditions are Amblyopia Strabismus and binocular vision disorder. Orthoptists may assist Ophthalmologists in surgery.

- **Amblyopia**

- Amblyopia also known as Lazy eye is a disorder of sight due to the eye and the brain not working together. This results in decreased vision. It is more common among children than adults. Amblyopia can be caused by conditions that interfere with focusing during early childhood. Amblyopia can be cured however the vision is not restored instantly, this is since the brain must adjust itself. Amblyopia is easier to cure in early detection and improves treatment success, so vision testing is recommended for all children around the ages of 4-5.

- **Strabismus**

- Strabismus or crossed eyes is a condition in which the eyes do not properly align. When the eye is focused on an object it can alternate and this may happen constantly or occasionally. If Strabismus is present since childhood, it may lead to amblyopia or loss of depth perception. If onset is during adulthood, it may result in double vision. Strabismus can occur due to muscle dysfunction, farsightedness, problems in the brain, trauma, or infections. The chances of Strabismus may increase during premature birth, Cerebral Palsy and inheritance. There are 3 types of Strabismus esotropia where the eyes are crossed, exotropia where the eyes diverge and hypertropia where they are vertically misaligned. Diagnoses can be made by observing the light reflection from the persons eyes and finding that it is not centered at the pupil. Another condition often mistook with Strabismus is Cranial Nerve Disease.

- **Double Vision**

- Double Vision, medically known as Diplopia is the simultaneous perception of two images of a single object. It may be displaced horizontally, vertically, diagonally or rotationally in relation to each other. It is usually due to the impairment of the Extraocular Muscles or EOMs where both eyes are functional but cannot focus on an object. Problems with EOMs is normally due to disorders of the neuromuscular junction, disorders of cranial nerves, disorders involving the supranuclear oculomotor pathways or ingestions of toxins

- α (go to symbol further down on the page to read more)

- **Cerebral Palsy**

- Cerebral Palsy or CP is a permanent movement disorders that appear in early childhood. Most of the time symptoms vary. The most common symptoms include poor coordination, stiff muscles, weak muscles and tremors. People with CP also have problems with sensation, vision, hearing, swallowing and speaking. Many people with CP experience seizures and problems with thinking and reasoning. Cerebral Palsy is caused by an abnormal development or damage to the parts of the brain that control movement, balance and posture. This normally occurs during pregnancy. However, it may also occur during childbirth and after birth. Certain infections such as toxoplasmosis or rubella, exposure to methylmercury, head trauma can cause CP. It is hypothesized that only 2% of CP is because of inheritance.

- β



- **Ocularist**
  - Ocularists specialize in the fabrication and fitting of ocular prostheses for people who lost eyes due to trauma or illness.
- **Optician**
  - Opticians specialize in the fabrication of ophthalmic lenses, spectacles, contact lenses, low vision aids and ocular prostheses. The prescription of any of these lenses must be supplied by an ophthalmologist, optometrist or sometimes an orthoptist.

α:

- **EOMs**
  - EOMS or the extraocular muscles are the six muscles that control movement of the eye, one of them being the eyelid elevation also known as the levator palpebrae.
- **Neuromuscular Junction**
  - A neuromuscular junction is a chemical synapse formed by the contact between a motor neuron and a muscle fiber

β:

- **Toxoplasmosis**
  - Toxoplasmosis is a parasitic disease caused by *Toxoplasma gondii*
- **Rubella**
  - A mild infection caused by the rubella virus.
- **Methylmercury**
  - Methylmercury is an organometallic cation. It is the major source of organic mercury for all humans. It is a bio accumulative environmental toxicant.
    - **Bioaccumulation**
      - Bioaccumulation is the accumulation of substances such as pesticides or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a substance at a faster rate than at which the substance is lost by catabolism and excretion. This means that the longer the biological half-life of the substance, the greater the chance of chronic poisoning.
        - **Catabolism**
          - Catabolism is the set of metabolic pathways that breaks down molecules into smaller units by either oxidizing or releasing energy or used in an anabolic reaction.
            - **Anabolic**
              - Anabolic is the set of metabolic pathways that construct molecules from smaller units by using the energy released from catabolism.
- **Biological Half-life**
  - Like Chemistry Biological Half-Life is the time it takes for the substance to decay

(For more information on inheritance go to this link: <https://docs.google.com/document/d/1-ys7LcJG8op-o2xOU099s7mvgwjzeV4lvDmVHlCgwn8/edit?usp=sharing>)



BY MATTHEW DEI (Y12)

### Introduction

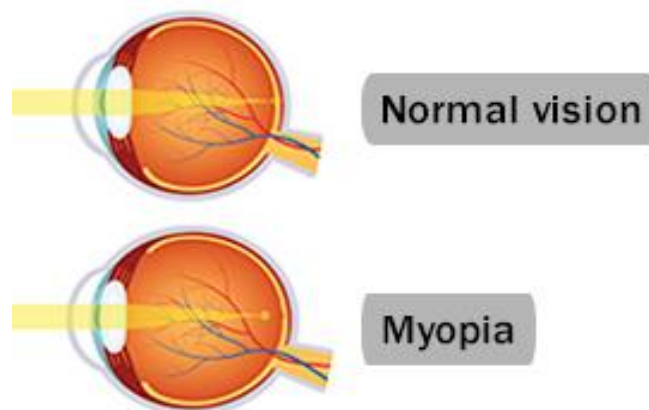
According to the American association of ophthalmology, Myopia is a refractive error, which means that the eye does not bend or refract light properly to a single focus to see images clearly. In myopia, close objects look clear but distant objects appear blurred. Myopia is a common condition that affects an estimated 25 percent of Americans. It is an eye focusing disorder, not an eye disease. Myopia is inherited, it is often discovered when children are between 8-12 years old. There is very little change between 20-40 years old. Myopia can also occur in adults. Myopia usually stabilises between the ages of 20-30.

### Myopia symptoms

Some symptoms of myopia would include a person sitting at the back of the class having trouble seeing the blackboard or having to squint to see objects at a distance.

### Causes of myopia

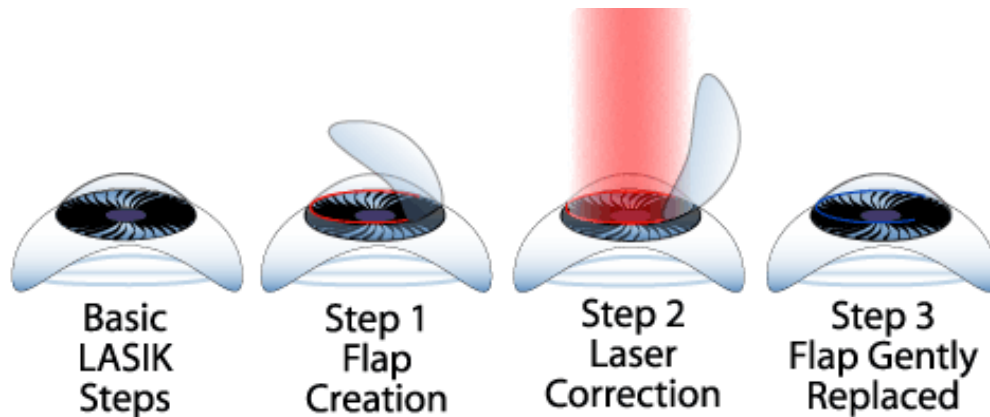
Myopia is caused when the light does not hit the retina. In a normal eye, the light that enters the eye would converge on the retina which would be picked up by the optic nerve and sent to the brain. However, with myopic people, the light rays do not converge on the retina to form an image. Therefore, this leads to blurred vision.



### Treatment for Myopia

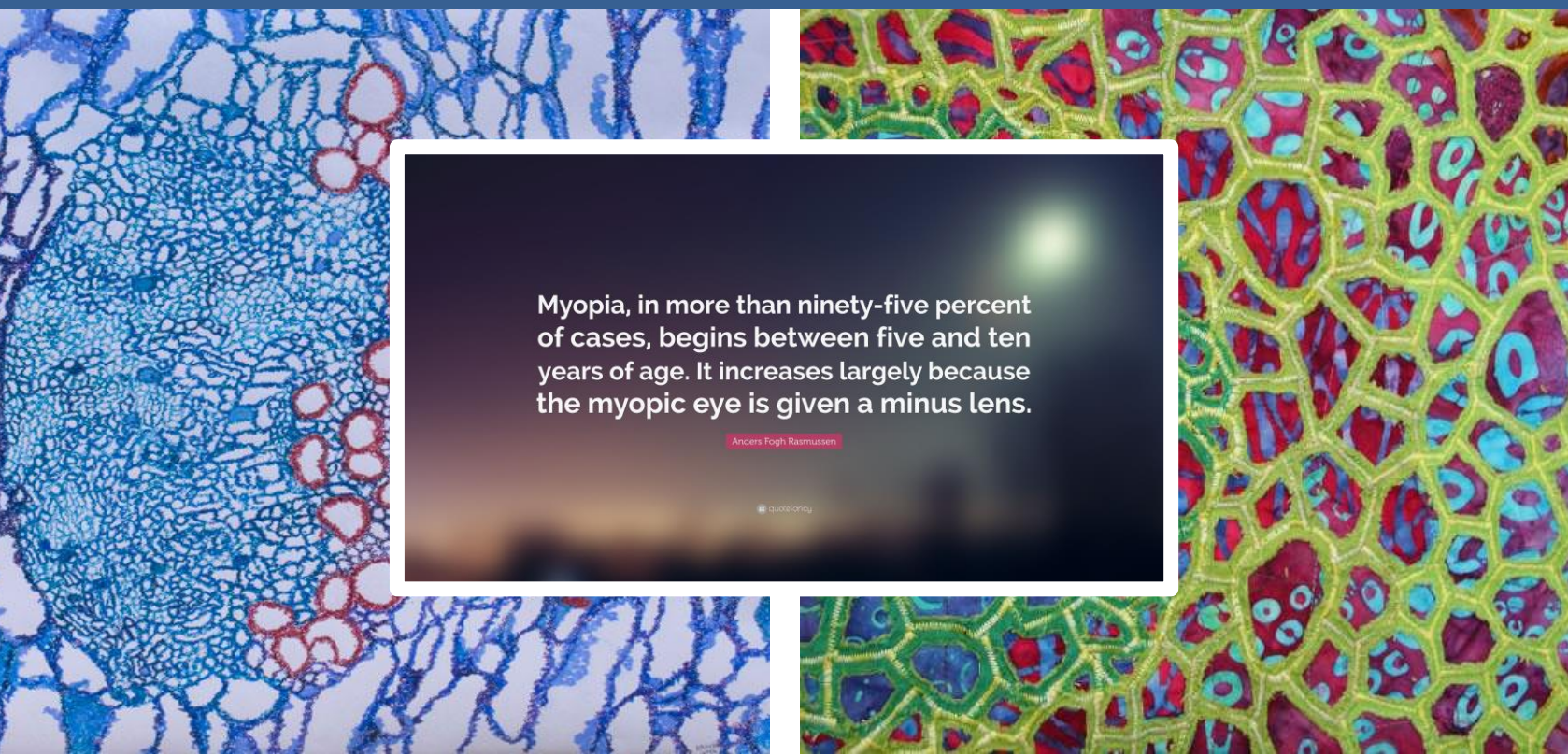
Treatment for myopia would include glasses and contact lenses. The spectacles and contact lenses can help correct myopia symptoms because they can help focus light on the retina. Some lenses have another benefit as it can help block out UV light.

Another popular treatment for myopia would be to go for Lasik surgery. This form of refractive surgery reshapes a person's retina allowing for greater focusing ability.



### Personal response to myopia

Myopia is clearly a horrible thing one has to deal with. Our vision is hindered, and we have to wear these things called glasses to correct it. I have been wearing it since primary 4 and it is quite uncomfortable. We need to take it off when showering/before sleep. Also, if you are a swimmer, our vision would be blur if we wear regular goggles. Luckily, there are goggles designed for short-sighted people. However, my general advice is to cherish your eyes and take good care of it. You only have one pair of eyes and you should use it wisely.





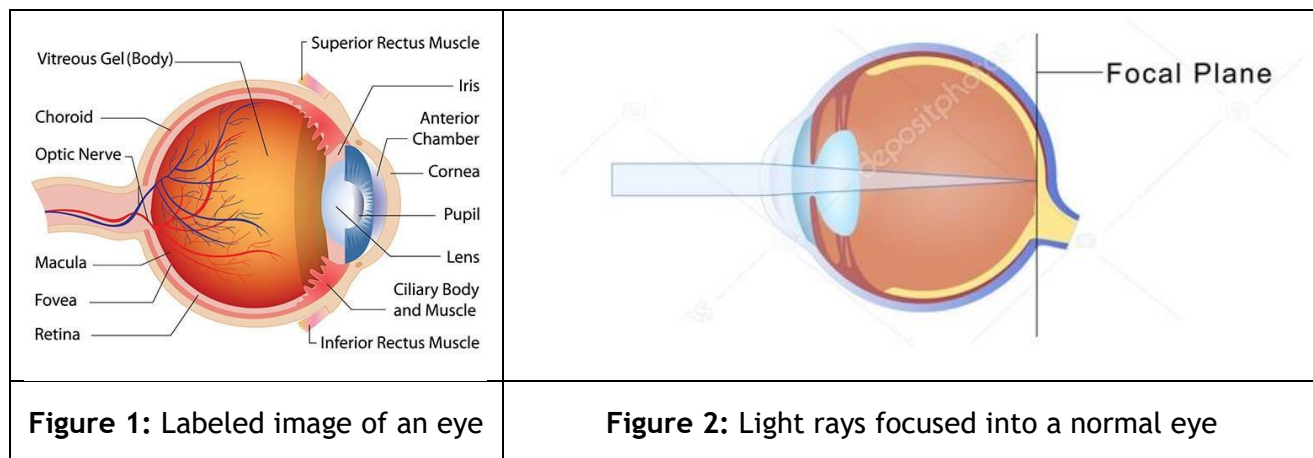
## How do glasses and contacts work? Which is better?

BY MADHAVI CHAKRAVORTY (Y10)

Eyeglasses or contact lenses are needed to correct so-called “refractive errors” of the eye.

### The What and Why of Refractive Errors

To understand refractive errors, we need to understand how a normal eye works. In a normal eye, light rays from objects are refracted (or “bent”) as they pass through the cornea and the eye-lens. The refraction takes place so that the light rays are focused on the retina. At the retina, light rays are converted into electrical signals that are carried through the optic nerve to the visual cortex in the brain.



Refractive errors are caused when the cornea and/or the eye-lens change their shape. The light entering the eye can no longer focus accurately on the retina, resulting in poor vision. You can tell that you have refractive errors if you need to squint to see clearly, have blurry or hazy vision, eye-strain and headaches.

### Four types of refractive errors

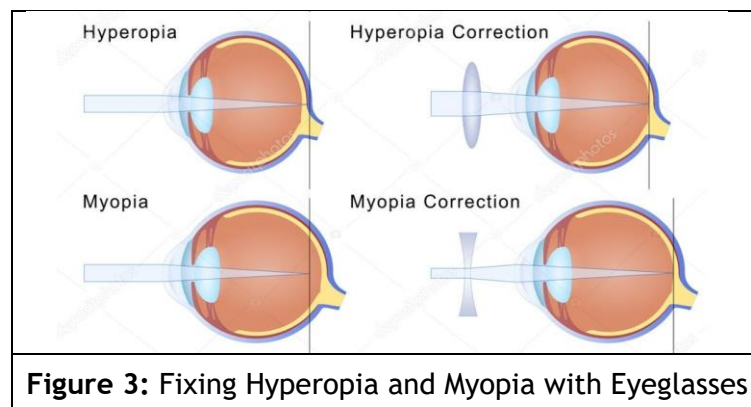
Refractive errors are typically of four types:

1. Hyperopia (far-sightedness): Light comes to focus behind the retina because the length of the eyeball is too short. Close objects appear blurry, but far objects appear clearly.

2. **Myopia (near-sightedness):** Light comes to focus in front of the retina because the length of the eyeball is too long. Close objects appear clearly, but distant objects appear blurry.
3. **Astigmatism:** Light does not focus at a point on the retina because the eyeball is of the wrong shape, resulting in objects appearing blurry or stretched.
4. **Presbyopia:** This is an age-related condition. The eye-lens ages and loses its ability to change shape flexibly. Close objects cannot be seen clearly. Presbyopia affects most adults over 35.

### Fixing the refractive errors: Eyeglasses and contact lenses

To fix the refractive error, a device that compensates for the distortion in refraction caused by the change in shape is needed. This could either be an eyeglass or a contact lens. A concave lens is required for fixing myopia, a convex lens for fixing hyperopia and a cylindrical lens for fixing astigmatism. Lenses can be designed to accommodate all these features. An optician determines the precise degree of concave, convex or astigmatism correction needed, called the eye “power” or “prescription”.



**Figure 3: Fixing Hyperopia and Myopia with Eyeglasses**

Eyeglasses are mainly made from a special kind of polycarbonate plastic. They are placed around 12mm from the surface of the eye. Contact lenses are made from silicone hydrogel and are placed on the surface of the eye.

### Which is better, eyeglasses or contact lenses?

Whether you wear eyeglasses or contact lenses is a matter of personal preference. It is not possible to conclude that one is better than the other. Each has its pros and cons. These are listed below:

Eyeglasses	Contact lenses
<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Restrict peripheral vision; they are placed 12mm from the eye surface - particularly impacts sports</li> <li><input checked="" type="checkbox"/> Can adjust the amount of light and block harmful UV light (for polychromatic lens)</li> <li><input checked="" type="checkbox"/> Easy to clean and maintain</li> <li><input checked="" type="checkbox"/> Do not cause dryness of the eye, you can safely fall asleep wearing them!</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Conform to the curvature of the eye: provide a wide and unrestricted vision field - good for sports</li> <li><input checked="" type="checkbox"/> Cannot block UV light</li> <li><input checked="" type="checkbox"/> Need to be kept extremely clean to prevent eye infection; need to be replaced frequently</li> <li><input checked="" type="checkbox"/> Can cause eye dryness because less oxygen reaches the eye surface. This is particularly bad if you fall asleep wearing them!</li> </ul>

So, the conclusion is, wear the one that you want and prefer, they both perform the same function - allowing you to see clearly.



# Ophthalmology as a Profession

BY MADHAVI CHAKRAVORTY (Y10)

## **Ophthalmology as a Profession**

Like many others, I have been wearing eyeglasses for a while, in fact since I was in Primary Six. Many of my friends wear contacts. I remember that I pay an annual visit to what I thought was an Ophthalmologist during my summer holidays. They make me look at pictures and letter boards on various machines, blow puffs of air at my eyes, put eye-drops to make my vision blurry, and then test my vision with different kinds of eyeglasses. Finally, they give me a printout, with a “prescription”, and I always get a new pair of glasses!

I thought, I would do some research for this article and find out what Ophthalmologists do, and how you can become one. Imagine my surprise, when I found out that they are NOT Ophthalmologists, they are OPTOMETRISTS.

## **So, who are Optometrists? How do they differ from Ophthalmologists?**

An Optometrist primarily performs eye exams and vision tests, prescribes and dispenses corrective lenses, detects certain eye abnormalities, and prescribes medications for certain eye diseases. An Optometrist is not a medical doctor. Most of us interact with Optometrists.

An Ophthalmologist on the other hand is a specialized medical doctor who diagnoses and treats all eye diseases, performs eye surgery and scientific research on the causes and cures for eye diseases and vision disorders.

## **How do you become an Optometrist? What are career prospects for Optometrists?**

You become an Optometrist by doing a specialist qualification and then registering as a professional Optometrist. For example, the Hong Kong Polytechnic University offers a 5 year Bachelors in Optometry. The program consists of basic sciences in the first year, specific training in optometric and visual sciences in the second year, clinical Optometry in the third year, and clinical training in the fourth and fifth year.



When you graduate, you are registered as a Part 1 Optometrist with the Optometrist Board of Hong Kong. In the U.K. and Australia, several universities offer a 4-year B.Sc. in Optometry. Optometrists have excellent career prospects in Hong Kong. As of March 2017, there were only 917 registered Part 1 Optometrists. According to the “Health Facts of Hong Kong”, 2018 edition, there was 1 Optometrist for 3,371 people, for example, compared to 1 Doctor for 519 people, or 1 Dentist for 2,964 people or 1 Nurse for 137 people. According to the Polytechnic University, more than 90% of their undergraduates started working in private practice immediately and had salaries of more than HK\$30,000 per month.

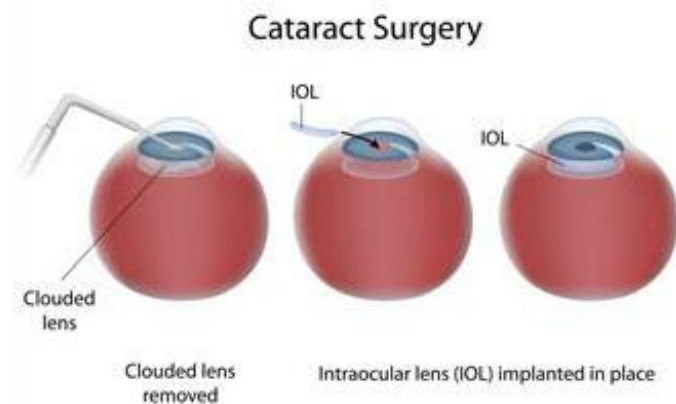
### What about Ophthalmology then?

As mentioned earlier, Ophthalmology is a specialty in Medicine. You first need to qualify as a Medical Doctor. If you study Medicine in Hong Kong or U.K., this takes 6 years and if you want to become a specialist, it would take at-least another 4 years of practice, specialty training and study. You would also need to successfully complete some form of Board examinations to complete your qualifications. Ophthalmology is a rare specialization - taking Hong Kong as an example, there were only 305 Fellows of the College of Ophthalmology registered with the Hong Kong Association of Medicine (HKAM), out of a total of 7,891 fellows, or less than 4% (these figures are for 2018).

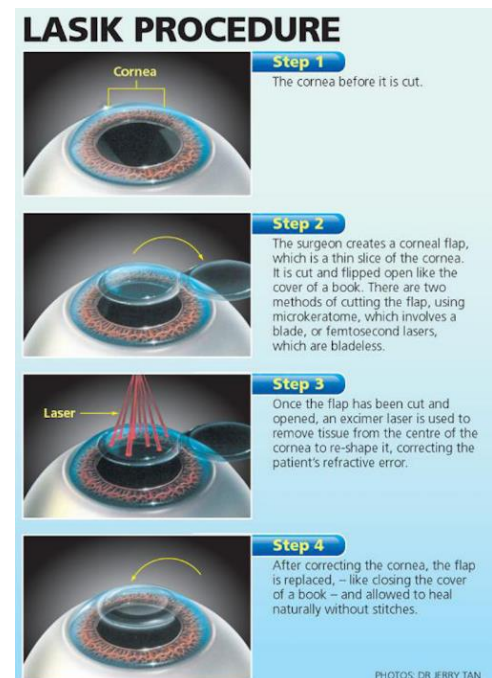
### What are common eye diseases treated by Ophthalmologists?

Since the eye is very small, eye surgery requires very fine motor skills and the ability to manipulate microscopic instruments, including lasers. Even a small deviation or error can lead to irreversible blindness. I’ve described two common procedures here.

**Cataract surgery:** This involves removing a clouded lens from the eye and replacing it with an artificial lens (IOL).



**Lasik surgery:** Surgery using lasers to correct the refractive errors of the eye such as myopia, so that you do not need eyeglasses any more.



## FEATURED ARTICLE 4



# Synthetic eyes

BY GAELLE LACOSTE (Y10)

### Who created the first synthetic, working eye?

Vanessa Restrepo-Schild, a 24-year-old student at Oxford University's Department of Chemistry, is the first to triumphantly use biological, synthetic tissues, developed in a laboratory environment to create the first ever working synthetic eye.

“The synthetic material can generate electrical signals, which stimulate the neurons at the back of our eye just like the original retina.” stated Vanessa.

### How do synthetic eyes work?

The company Enhance Your Eye, EYE has thought of creating 3 different types of eyes. Their hope is that users could choose between three different types of synthetic eyes: HEAL, ENHANCE, and ADVANCE. The notion would require a 3D bioprinter, which would use a needle to drop different types of cells inside the suitable alignment and structure.

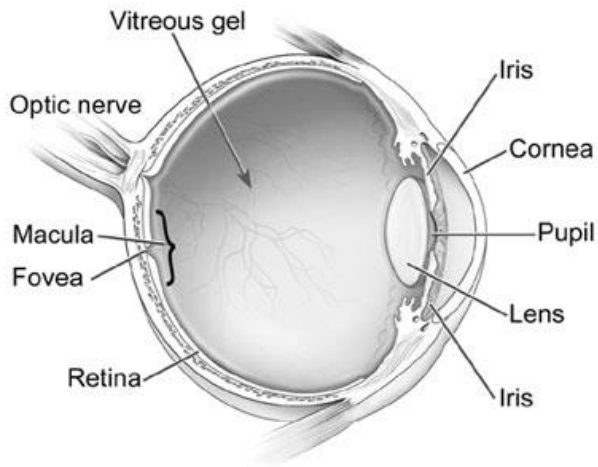
**HEAL:** This is a synthetic eye that works almost just like a normal one and could be used as a replacement for people who suffered from accidents, and who are left blind.

**ENHANCE:** Enhance attempts to improve the eye's natural functions by improving vision to 15/20 and is equipped with colour filters on direct vision like those on editing apps. To turn on the filters, the individual using it can take a pill.



**ADVANCE:** This synthetic eye functions as additional glands to capture or record what a person is seeing, as well as a Wi-Fi connection to share those images on your device. If a user wants to use an EYE (Enhance Your Eye) system, people would need to get their natural eyes removed through surgery and replaced with the Deck, a somewhat artificial retina that would connect to the brain and would allow the users to change their eyes into what they prefer.

### Difference between a real eye and a synthetic eye



*Vanessa Restrepo-Schild, who created the first ever working synthetic eye*

## Cataracts

BY MAYUMI WONG (Y12)

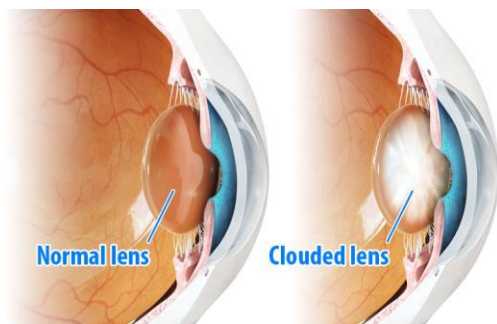
### What are cataracts?

A cataract is a clouding of the lens in the eye that affects vision.

### Causes

The lens is made of mostly water and protein. In normal eyes, the proteins are arranged in a way that allows light to pass through, so we can see clearly. However, with cataracts, the proteins clump together and cause clouding in the lens, causing less light to reach the retina. This usually develops with age.

At the beginning, there is only slight clouding in the lens causing a small blur. However, overtime, a cataract can grow and even become slightly brown in colour, creating a brown tint in one's vision. The brownish tint won't affect the sharpness of the image developed in one's lens, however it may affect your colour vision - you may be less able to identify between colours.



Normal eye



Cataract eye



The scene a person with normal vision sees:



The scene a person with cataracts sees:



## Types of cataracts

1. **Secondary cataract**
  - Post-surgery for other eye conditions
  - Related to health problems
2. **Traumatic cataract**
  - Develop after eye injury
3. **Congenital cataract**
  - Some are born with cataracts - usually this does not affect vision because of its size, but if it does, the lenses may need to be removed
4. **Radiation cataract**
  - Develop after exposure to radiation

## **Symptoms**

- Blurry vision
- Double vision
- Frequent prescription changes in glasses
- Fading colours in vision

## Treatment

**Surgery** - Around 90% success rate.

- Involves removing the cloudy lens with the cataract and replacing it with a new artificial lens

## How does the surgery work?

**Before surgery:** Measuring curve of cornea and shape and size of eye for preparation of the artificial lens

**During surgery:** Dilation of pupil and replacement of lens

- Surgeries usually last for an hour
- Some people choose to stay awake during surgeries
- Anesthetic is given so the surgery is painless

**After surgery:** Eyedrops used for a few weeks after surgery to prevent infection in the eye

- Usually, healing of the eye after the surgery will take around 8 weeks

## **Potential post-surgical problems**

- Infection
- Swelling
- Vision loss
- Double vision

If you encounter any of these issues after surgery, you should seek medical attention.

## **Risk factors**

The below risk factors increase one's chance of developing cataracts.

- Certain diseases (e.g. diabetes)
- Lifestyle
  - Smoking
  - Drinking alcohol
- Prolonged exposure to UV light
- Age



# FIS SURVEY ANALYSIS

BY AUDREY CORNO (Y12)

## Do screens cause eye damage?

“Audrey, get off your phone, it’s bad for your eyes! Do you want to get glasses like me?”

I hear those sentences way more often than I’d like to, and I’m sure (or hoping) that I’m not the only one who identifies with this. I’ve heard my entire life that screens are evil inventions that ruin eyes, but is that actually true? It’s about time we debunk this.

### How do screens affect our vision?

In a survey conducted with FIS students, it was found that the students experience the symptoms of computer vision syndrome to varying degrees, as seen below.

Which of these symptoms do you experience when using your phone/tablet/computer? (Tick all that apply)

80 responses

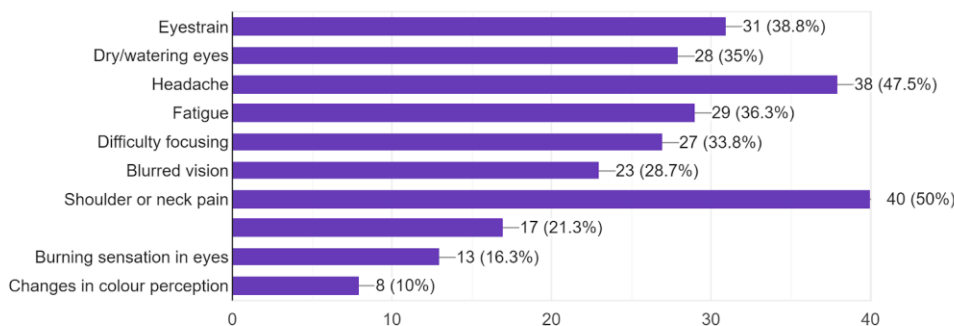


Fig. 1

This could be especially worrying seeing as two thirds of respondents spend over three hours a day on screens on average, as can be observed below.

How many hours a day do you spend on screens (phone/tablet/computer)?

91 responses

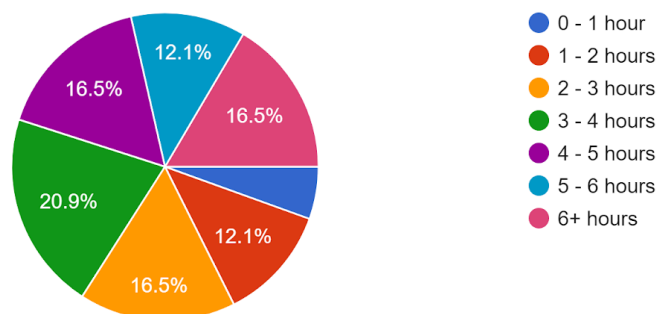


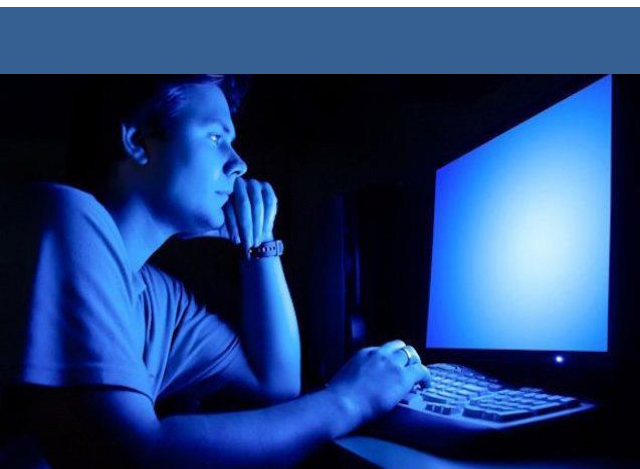
Fig. 2

Computer vision syndrome occurs when your eyes follow the same path over and over, have to focus and refocus a lot, need to react to changing images on your screen, etc. This requires a lot of effort from eye muscles. What sets screens apart from books is that unlike paper, screens add contrast, flicker and glare.

The symptoms of computer vision syndrome, or just of excessive usage of screen devices, are, but not limited to: eyestrain, dry/watering eyes, headaches, fatigue, difficulty focusing, blurred vision, shoulder and neck pain, discomfort (itchiness etc), burning sensations in eyes, changes in colour perception and double vision. However, these typically go away after you're finished using the device and is usually caused by the environment *around* your computer/phone/tablet instead of the screen itself. Dr Blakeney, an optometric adviser at the College of Optometrists, says computers will **not** permanently damage eyes but can cause strain or worsen existing eye conditions. It must be noted, though, that since we've only recently been using screens this extensively, there may not be enough research at the moment to prove the absence of permanent damage.

### How do you optimize your working conditions?

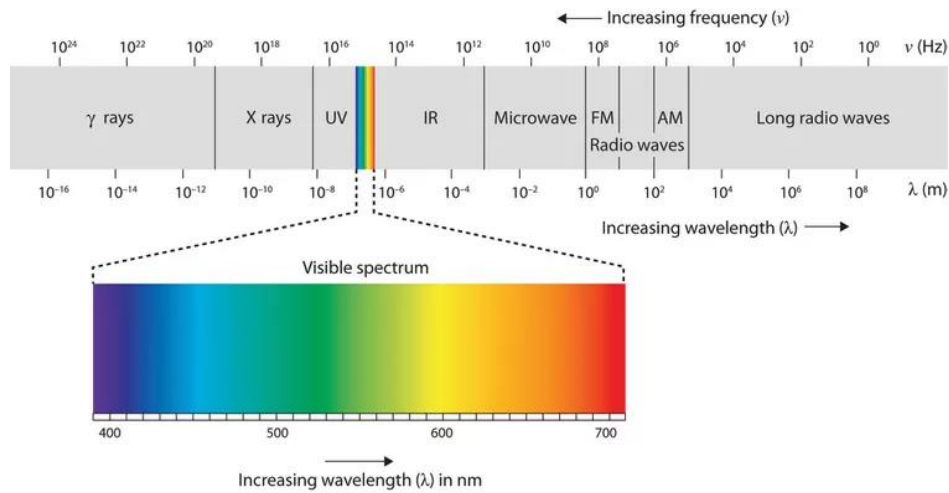
1. **Take regular breaks** - closing eyes or focusing on a distant object for a few minutes or focus on a task that doesn't require a screen. One easy way to remember this is to think of 20-20-20. This reminds you that every 20 minutes you should try to look at something 20 feet away for a minimum of 20 seconds.
2. **Position the computer screen properly** - shouldn't be closer than 20 inches to your face and make sure you're looking down at your computer to reduce strain on eyes - eyes are naturally positioned to look straight ahead or slightly down, if they look in a different direction then eye muscles need to work harder to keep that position.
3. **Use eye drops to prevent dry eyes** - screens have been shown to reduce the amount of times you blink, so make a conscious effort to blink more or use eye drops - consult a doctor before deciding which kind
4. **Adequate lighting** - the brighter your surroundings, the better it is for your eyes. Try and make sure that there aren't any lights reflecting off the screen and make sure computer isn't too bright or too dark; this creates glare in eyes which leads to muscle fatigue and the eyes have to struggle to make out images on the screen.



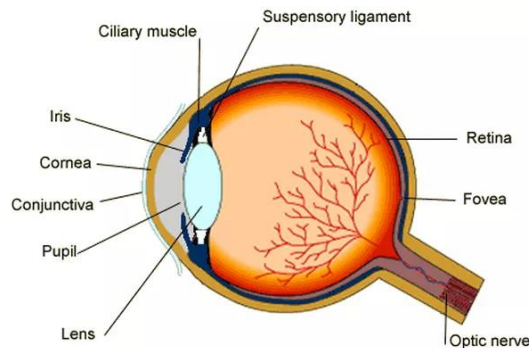
### How do you reduce glare on your computer?

**Use f.lux.** Computer are designed to look like the sun which makes it very comfortable to look at it during the day - however, at night it can be quite painful for the eyes. At night, when you're on your screen, it tricks your brain into thinking it's still daytime and it keeps your brain awake. This program, however, adjusts your computer's visual settings (mostly by minimizing blue light) and adapts it to the time of day and the environment you seem to be in, so as to keep your sleep schedule (and your retinas) intact.

But what is blue light? Physics students, I'm looking at you. Sunlight is made up of red, orange, yellow, green, blue, indigo and violet light, which, combined, looks white. All of these different coloured lights have different intensities and wavelengths. The whiter the light looks, the more blue component there is.



Due to the wavelength of blue light, it passes through the cornea, lens and reaches the retina, which could have repercussions on vision and prematurely age the eyes by damaging the retina, and ultimately potentially leading to macular degeneration. Biology students, I'm looking at you.



But this isn't an FIS Medical Journal article if we don't give you the tools to prevent the damage. Quick tips to protect your eyes from too much blue light:

- Limit your screen time!
- Use screen filters! F.lux!
- Nag your parents for some computer glasses! They have anti-reflective lenses to reduce glare and increase contrast and block blue light!

But could looking at screens even be good for eyesight? Blue light has been shown to boost alertness, memory and cognitive function. Grumpy ones maybe use your phone a little more; blue light has also been shown to improve your mood. If you expose yourself to blue light at the right times of day, you could use it to regulate your circadian rhythm (your body's natural wake and sleep cycle). Also, blue light deficiencies seem to correlate with an increase in myopia/nearsightedness. US research says video games can improve vision - improves players' contrast sensitivity (how faded an object can be before it is impossible to differentiate it from the same field of view, affected by ageing).

With your truck load full of new information, go forth and use your electronics somewhat guiltlessly and take care of yourself.



# Applying for an Ophthalmology Degree

By Jenny Kam (Y12)



For students looking to pursue a degree in ophthalmology in the near future, there are a number of aspects to consider, which will be broken down into sections in this article. It is a relatively broad field which involves both surgical practice as well as experience in medicine.

## General Information

The high respect that accompanies this job as well as the bountiful pay that being an ophthalmologist offers is overall very rewarding experience-wise, but the pathway one must take comes with responsibility and plenty of commitment in terms of learning and attaining goals.

Ophthalmologists are essentially physicians who specialize in eye care, treating patients with eye problems, diagnosing their conditions as well as being capable of operating upon the patient's eye. Besides from this, they also prescribe appropriate medication or corrective lenses, or even conduct high-advanced clinical studies. These numerous jobs indicate the potential for an ophthalmologist-to-be that there will most certainly be specialization available, which will be explained further down this article.



## Education Requirements - US vs the UK

On the other hand, in the UK, applicants undergo extensive training and the typical training route for would-be ophthalmologists is five years at medical school leading to a degree in medicine, two years as a newly-qualified doctor and seven years of ophthalmic specialist training.

In the US, applicants need to have the bare minimum of a bachelor's degree (4 years) as well as other advanced degrees. When studying at medical school after four years of university, it is recommended that students should have a rather science-heavy bachelor's degree if they want to pursue a career in ophthalmology. This 4-year medical school program must be completed before doing an internship and residency, lasting up from 4 to 8 years. Respectively, the internship is for 1 year while the residency is for 3 years or more.

## Options for Specialization

With the great variety of jobs that an ophthalmologist can take up, it goes without saying that the option of specialization will be offered.

Below are the four general types of positions applicants can choose to specialize within with brief explanations provided, in a table. For more details, you can visit the link for the Royal College of Ophthalmologists to find out more about the other roles people can choose to fulfil as being part of an ophthalmologist team and what it takes to become an ophthalmologist in the future.

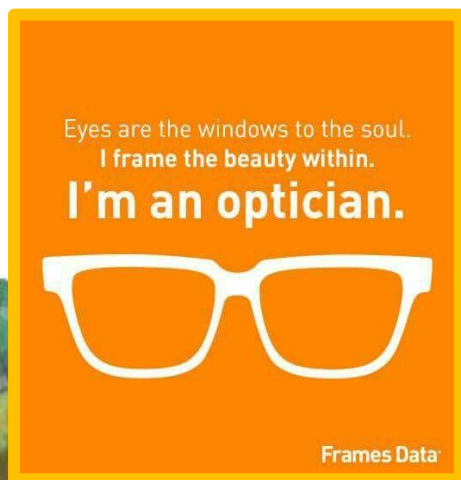
Role / Position	Specification
Hospital Doctors + General Practitioners	<p>Ophthalmologists work alongside neurologists, rheumatologists, diabetologists and endocrinologists.</p> <p>GPs will work at the front line, receiving the patients in need of help with eye disease.</p>
Ophthalmic Nurses	<p>They are trained and have experience in ophthalmology and provide specialist support for the following locations:</p> <ul style="list-style-type: none"> <li>• Eye clinics</li> <li>• Wards</li> <li>• Operating theatres</li> </ul> <p>Some nurses may choose to extend their training to become nurse practitioners. They will work with casualties and assess patients who suffer from ophthalmic issues.</p>
Orthoptists	<p>Orthoptists will undergo professional training in working in the field of ocular movement, binocular vision and children's sight. It can be said for their job that they can work within teams of the eye unit or independently, as community orthoptists.</p>
Optometrists (commonly known as Opticians)	<p>Optometrists will also receive professional training. Many will help patients in prescription and provision of appropriate spectacles. Screening, examination to detect conditions (e.g.: diabetes, glaucoma) will also be part of their position.</p>

## Skills and Work Experience

Entry to medical school is competitive and so it is also worth considering that many employers will request work experience when hiring. This could be through work or volunteering at your local hospital, GP surgery or nursing home, or through work shadowing a doctor. This experience shows your commitment to becoming a doctor and provides insight into the physical and emotional demands of working in ophthalmology.

Feedback shows that most universities around the world will assess applicants using the following criteria especially if interested in pursuing ophthalmology:

- Communication skills, including empathy and sensitivity
- Practical hand skills and good hand-eye coordination
- Problem-solving and high-level decision-making skills
- The ability to work as part of a multidisciplinary team
- Leadership skills
- The ability to work under pressure
- Organizational, time management and planning skills.



<b>E</b>	1	20/200
<b>F P</b>	2	20/100
<b>T O Z</b>	3	20/70
<b>L P E D</b>	4	20/50
<b>P E C F D</b>	5	20/40
<b>E D F C Z P</b>	6	20/30
<b>F E L O P Z D</b>	7	20/25
<b>D E F P O T E C</b>	8	20/20
<b>L E F O D P C T</b>	9	
<b>F D P L T C E O</b>	10	
<b>P E Z O L C F T D</b>	11	

