Science Fair Log Book

By Brooklynn Dowd - Grade 6

My Science Fair Project is 'The Eye'

The next few slides are the process of brainstorming what my project will cover.

EYES - November 13

Vision

- Connection to the brain

Different Species

- How they see

How its affected

- Disabilities

Evolution

- Human eyes throughout life
- Human eyes now compared to past compared to future

How it works

How its made

- Parts of the eye

I may or may not do all of these. I am quite confident that I will cover the topic of vision because it is related to the brain making it seem more interesting to me

Vision - November 15

- What part of the brain is vision connected to?
  It's connected to the occipital lobe. That is the back part of the brain
- How does the brain communicate with the eye?
  Special cells turn light into electrical signals that travel through the optic nerve to the brain. The brain then processes those signals into what you are seeing.
- Does vision improve throughout the course of life?
  Vision does not tend to change throughout life though it is possible.

I have now decided that I will do my project entirely on vision. I will try to add the other topics within the eye into vision.

My new Science Fair Project is ‘Vision’

And how the eye works

Some Information from ‘Richard and Louise Spilsbury - The Science of the Senses’ - November 16

- We have two eyes because it allows us to see in 3D and judge distances.
- We can only see because of light.
- Light enters the eye through the pupil.
- Then it passes through the lens which changes shape to help the light focus on the retina clearly.
- The retina is at the back of the eye and is covered in two types of cells: rods and cones.
- The rods are more sensitive to light and darkness changes, shape, and movement while the cones are more sensitive to color.
- The retina sends signals to the brain through the optic nerve that are upside down and backwards.
- The brain can flip the image to interpret what we are seeing properly.

Some Information from ‘Susan B. Katz - The five Senses: Seeing’ - November 16

- The eye is an organ.
- The center of the retina is called the macula.
- The cornea is a clear layer that protects the front of the eye.
- The sclera is the white part of the eye outside of the iris.
- The iris controls how much light the eye lets in.

Some Information from ‘Esperanza Habinger - Your brain is amazing’ - November 16

- If you damage or lose your occipital lobe you can no longer see or you will have a harder time seeing.

Animal eyes - November 17

I may not add these to my project but I figured it would be a fun bonus just in case!

- Owl eyes do not move
- Sharks don't tend to blink
- Worms don't have eyes
- Scorpions can have up to 12 eyes
- Box jellyfish can have 24 eyes
- Owls are the only bird that can see the color blue
- Snakes have two sets of eyes
- Snakes can detect heat and movement as well as see
- Dolphins sleep with one eye open
- The ostrich eye is bigger than its brain
- Dogs don't know the difference between red and green
- Some mantis shrimp can see UV light

Summary of what some of the prior slides went over.

What happens when light hits the eye - November 18

Light enters the eye through the pupil which is controlled by the iris. It then goes through the lens which bends and changes shape to help the light focus on the retina which is at the back of the eye. The retina is covered in two types of special cells: Rods and cones. Rods help you to see light shape and movement while cones are used to help spot and identify color. The retina sends the light- which is now in the form of an electrical signal, through the optic nerve to the back of the brain also known as the occipital lobe. The brain then translates the electrical signals into an image of what you are seeing.

The occipital lobe - November 18

Ok- Sip- lt- uhl- lowb

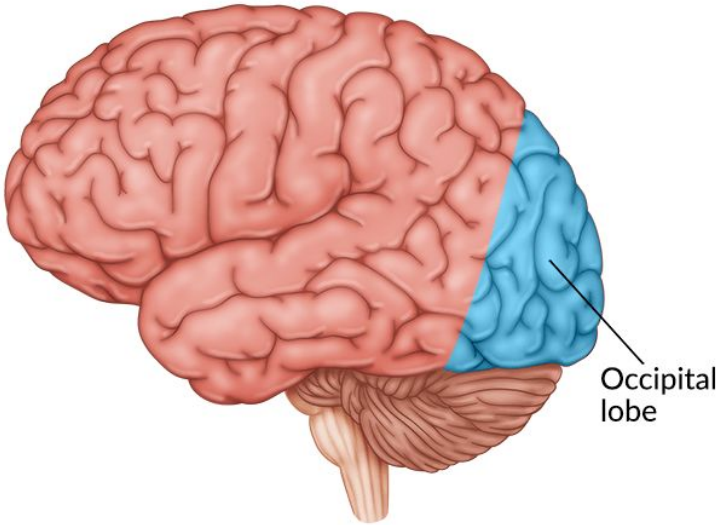


Image from
https://www.flintrehab.com/occipital-lobe-stroke/

Cataracts - November 19, 23

- A cataract clouds the lens of the eye which is usually clear
- Cataracts make it look like you are looking through a foggy window
- They can make it hard to read, drive, or see people's expressions
- They develop slowly
- Eyeglasses and strong lighting can help with cataracts at first
- Symptoms include: Blurred vision, Trouble seeing at night, sensitivity to light and\or glare, needing brighter light to read, seeing halos around lights, fading of colours, double vision in one eye
- They develop when aging or when an injury damages eye tissue

My topic is ‘Diseases that affect the eye’

Cataracts - November 23,26

- As you grow your lens becomes less flexible and less clear
- Aging and past medical surgery can cause the fibers and proteins in the lens to break down and clump together causing a cataract
- As it clouds the lens the light that travels to the retina is lessened causing the image to be blurry.
- They can be in both eyes
- Nuclear cataracts can make objects far away from the eye appear blurry while objects close up are easier to see. They may improve your reading vision. Eventually it may be difficult to tell colors apart. These affect the center of the lens which can turn yellow or brown.

Cataracts - November 26,27

- Cortical cataracts occur in the edges of the eye. They start as streaks in the edges of the lens and over time grow to the center of the lens.
- Posterior subcapsular cataracts start as a small spots at the back of the lens right in the path of light. These often affect your reading vision. It can also make you see halos around lights at night. These cataracts tend to grow faster than others.

I will call my topic...
I see, You see, We all see differently!

Narrowing down to my specific topic - November 29

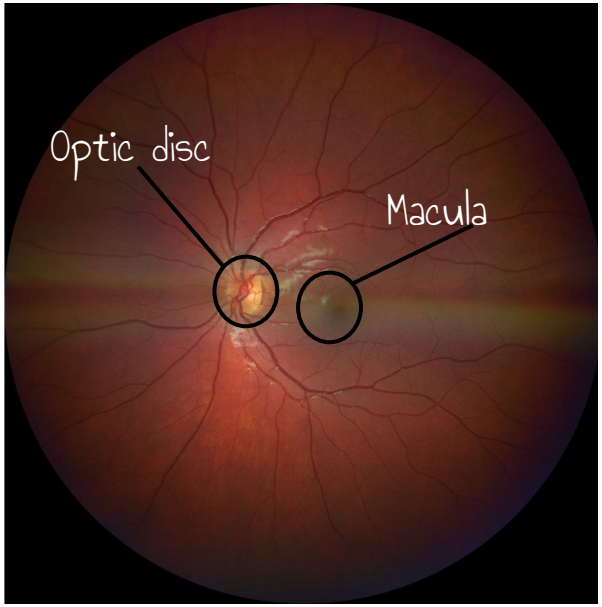
Diseases, illnesses, injuries, and disabilities that negatively impact the eye. The eye meaning the eye orbit (eye socket), the eye (cornea, lens, sclera, retina, macula, iris, pupil, vitreous body, etc), the optic nerve, and the occipital lobe.

The vitreous body is also known as the vitreous fluid and is a clear gel-like substance in the eye.

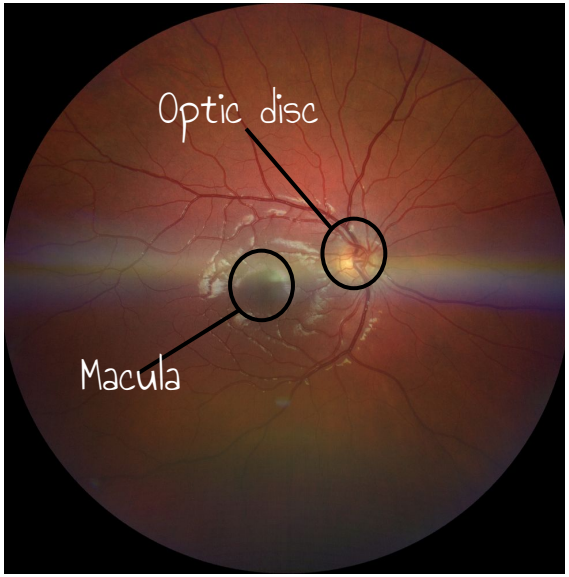
Cataracts - November 29

- Congenital cataracts are cataracts that you are born with or develop during childhood. They can be passed down from parents or may connected with a trauma or infection while in the womb. These cataracts usually don't affect vision and are usually removed after they have been discovered.
- Increasing age, diabetes, getting too much sunlight, smoking, family history of cataracts, previous eye injury or inflammation, previous eye surgery, and drinking excessive amounts of alcohol are all things that can contribute to cataracts.
- Some things that can prevent cataracts are regular eye exams, not smoking, fixing other health problems, choosing a healthy diet, wearing sunglasses, and reducing alcohol consumption.

My eyes - November 30



Left Eye



Right Eye

I can tell which eye is left and which eye is right because of where the optic disc is compared to the macula. If the optic disc is to the left of the macula than it is the left eye.

My sister's eyes - November 30

Right Eye

Left Eye

What is the optic disc + Retina - December 1,2

- The optic disc is where the retina and optic nerve connect
- The optic disc is also known as the optic nerve head
- There are two main areas in the retina, the macula and peripheral retina
- The macula is in the center of the eye and is responsible for seeing things that are directly in front of you
- The peripheral retina takes up the rest of the retina and is responsible to your peripheral vision
- Peripheral vision is the things that you see that are not right in front of you, for example if you were looking at your nose you would be using your peripheral vision
- Rods and cones are photoreceptors
- The optic disc is a round area at the border of the macula and peripheral retina

What is the optic disc + Retina - December 2

- The optic disc can be yellow, pink, or orange
- It is the only spot on the retina that is not covered in photoreceptors. This makes it a blind spot
- There is an indent in the center of the optic disc that is called the physiologic cup. This is where the optic nerve connects to the retina
- The photoreceptors turn light into electrical signals
- Those signals travel to the optic disc then go through the optic nerve to the occipital lobe

What really happens when light hits the eye - November 18 December 2

Light enters the eye through the pupil which is controlled by the iris. It then goes through the lens which bends and changes shape to help the light focus on the retina which is at the back of the eye. The retina is covered in two types of special cells: Rods and cones. Rods help you to see light shape and movement while cones are used to help spot and identify color. These cells are also known as photoreceptors and they turn the light that enters the eye into electrical signals. The retina sends the light through to the optic disc. The optic disc sends the electrical signals through the optic nerve to the back of the brain also known as the occipital lobe. The brain then translates the electrical signals into an image of what you are seeing.

A more accurate version of what happens when light hits the eye based off of the November 18 version

AMD (age related macular degeneration) - December 3

- Affects your ability to see straight
- Affects your macula which is why it is called *macular* degeneration
- Affects your ability to see fine detail
- Common cause of vision loss for people over 50
- It can also make it harder to see faces clearly and drive
- It degenerates the macula
- Degeneration is the process of something lowering in effectiveness
- The macula is tissue
- There are two types of AMD: wet and dry AMD

AMD (age related macular degeneration) - December 3

- Dry AMD is when the macula thins and proteins called drusen to form and gather around the macula
- Dry AMD is more common
- Wet AMD is where blood can leak from blood vessels that have abnormally grown under the retina
- Tissue damage occurs more rapidly and vision loss comes sooner
- Dry AMD has no treatment but it does less damage
- Wet AMD can be treated by slowing the growth of the abnormal blood vessels

Orbit (aka the eye socket) - December 4

- Size of a golf ball
- 7 bones: frontal, sphenoid, zygomatic, maxilla, lacrimal, ethmoid, and palatine
- There are lots of openings between the bones that allow veins and nerves to pass through
- Keeps the eye in place and shielded
- Surrounded by the forehead, temple, cheeks, and nose

Thyroid eye disease (TED) - December 4

- Causes inflammation that damages tissue, muscles, and skin around the eyes
- It is an autoimmune disease meaning that the immune system mistakenly attacks a healthy part of the body
- Cause the eyes to bulge which can cause double vision
- There are two phases: the active and inactive phases
- The active phase of TED symptoms get worse. This happens over the course of 6-30 months
- The inactive phase of TED is where the disease progress has stopped but symptoms and changes may still occur
- May occur with other thyroid diseases
- Your thyroid is at the front of your neck

Thyroid eye disease (TED) - December 4,7

- More common in women
- Other symptoms can include eyes popping out, eye redness or eyelid swelling, sensitivity to light, watery eyes or strabismus (crossed eyes)
- In more severe cases you may find yourself unable to move your eyes or you may be a victim to vision loss

Eyes and blue light - December 7,8

- Blue light has lots of energy
- Sunlight contains blue light
- When you are outside or under your house lights or on a device you are being exposed to blue light
- Eyes are not very good at filtering blue light. Almost all blue light that enters your eye gets through to the retina
- Blue light on its own can be harmful but full spectrum light might not
- Some photoreceptor cells that are known as RPE react negatively to blue light showing their decreases of successful work

Eyes and blue light - December 10,13,14

- RPE cells stands for retinal pigment epithelial cells
- Epithelial cells are cells that are on the outside of skin or other things
- Blue light has short wavelengths
- Could possibly be a factor in cataracts, dry eyes, and AMD
- MCs also known as muller cells are another type of cell that is on the retina. They do not react much when exposed to light.

Purpose of the eyelid - December 14

The purpose of the eyelid is to keep the eye clean. It does precisely that when it blinks. It also keeps the eye protected and to prevent foreign object from entering the eye.

Purpose of the eyelash - December 14

The eyelashes are here to prevent dust and other small things from blowing into the eye.

Purpose of the eyebrow - December 15

The eyebrow is here to prevent dust and things like sweat from sliding down and entering your eye.

Types of disease - December 15,16,21,27

There are lots of different types of disease, some of them include:

- Mental
- Physical
- Infectious
- Social
- Non-infectious
- Deficiency
- Degenerative -> AMD is a degenerative disease
- Self-inflicted
- Inherited -> Cataracts can sometimes be inherited diseases
- Autoimmune -> TED is an autoimmune disease
- Progressive -> Myopia is an example

Orbital Fractures - December 27

- When one or more of the bones that make up your eye socket break it is called an orbital fracture
- There are different types of orbital fractures
- The most common cause can be a car accident or getting hit or punched in the face near your eye
- A blowout fracture is the most common type of orbital fracture. It affects the floor or inner wall of your orbit
- An orbital rim fracture is where the outer rim of your orbit gets broken. The bone there is very thick so it takes more force to break it
- An orbital floor fracture is where the bones at the outer rim of the eye get pushed backwards and the bones that are at the floor of the orbit move down

Eye orbit diagram - December 27

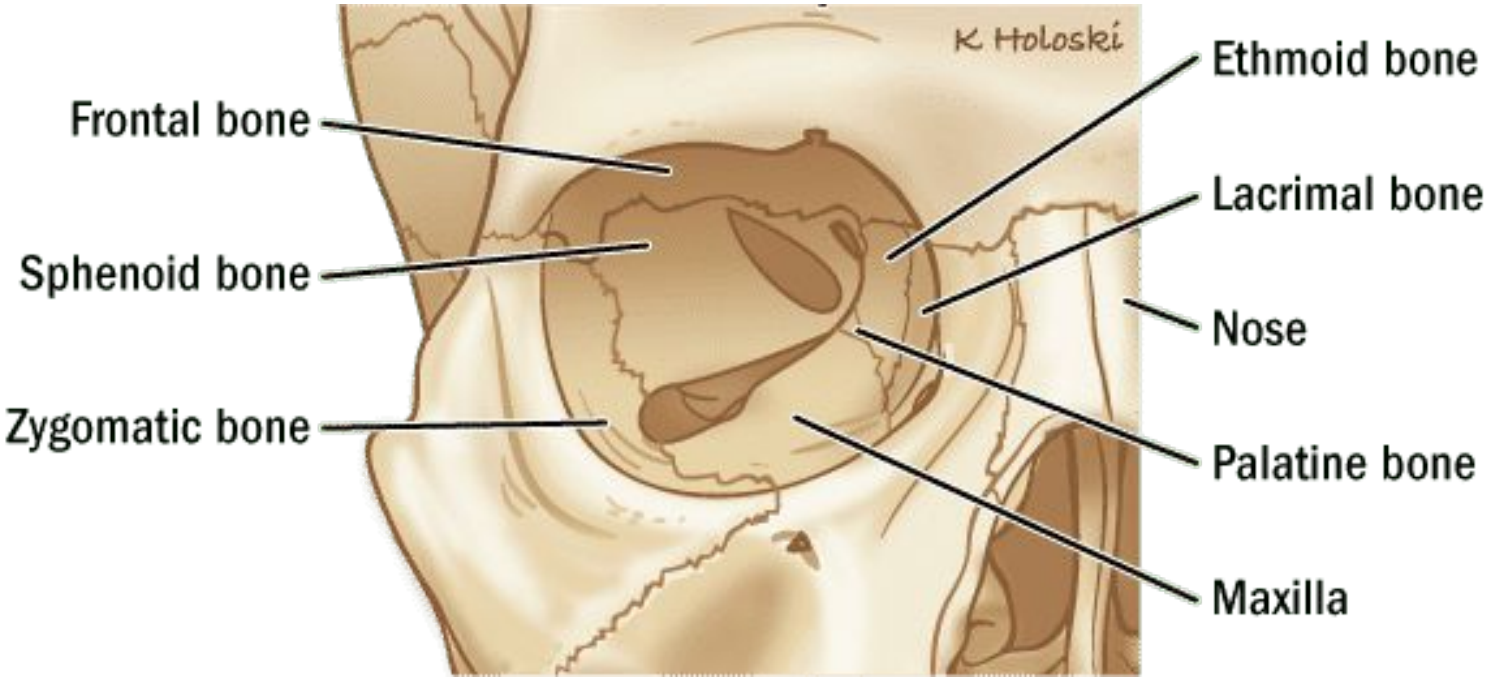


Image from
https://thancguide.org/cancer-types/orbital/anatomy/

Orbital Fractures - December 27

- Sometimes there can be symptoms but mostly it just really hurts
- Some possible symptoms include, double, blurred, or decreased vision, swelling, bruising, sunken or bulging eyes, and more
- A way to help protect yourself against orbital fractures is to wear safety gear like a helmet when you are biking or riding a motorcycle or a seatbelt in the car

Nearsightedness - December 27

- For people with nearsightedness it is easy to see things that are close up but people will really have to strain to try to see what is far away
- It is also known as myopia
- Could have been a childhood development or the cause of the lens and cornea being too close together
- It is a progressive disease meaning it can get worse
- Can lead to things like glaucoma or posterior subcapsular cataracts

Farsightedness - December 27

- Also called hyperopia or hypermetropia
- Allows you to see far objects easily but it is hard to see things that are up close
- This happens when light is focused behind the retina

Crossed eyes (Strabismus) - December 27

- This is what happens when the eyes do not have proper alignment
- It only affects one eye but the eyes might alternate being off center
- The brain ignores the misaligned eye which can cause lazy eye in the ignored eye
- When the fact that the eyes are misaligned and it is very obvious this is called large angle strabismus. This does not cause headaches or eye strain because the brain is not trying to realign the eyes
- Less noticeable strabismus is called small angle strabismus and it can cause pain when you read as well as shaky eyes or tiredness when reading

Crossed eyes (Strabismus) - December 28

- Your misaligned eye can be facing inward (esotropia), outward (exotropia), up (hypertropia), or down (hypotropia)
- Commonly starts at childhood
- Strabismus is caused when your extraocular muscles lose some of their control
- It may also run in the family

Extraocular muscles - December 28

- 6 muscles that control the eye movement and position
- For binocular vision they must work in perfect alignment with the extraocular muscles in the other eye

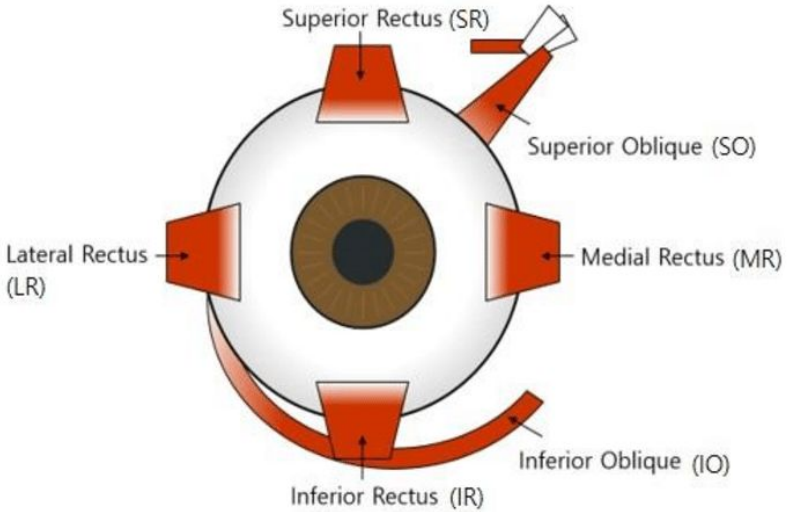


Image from https://www.researchgate.net/figure/Extraocular-muscles-8_fig1_340572016

Eye diagram - December 29

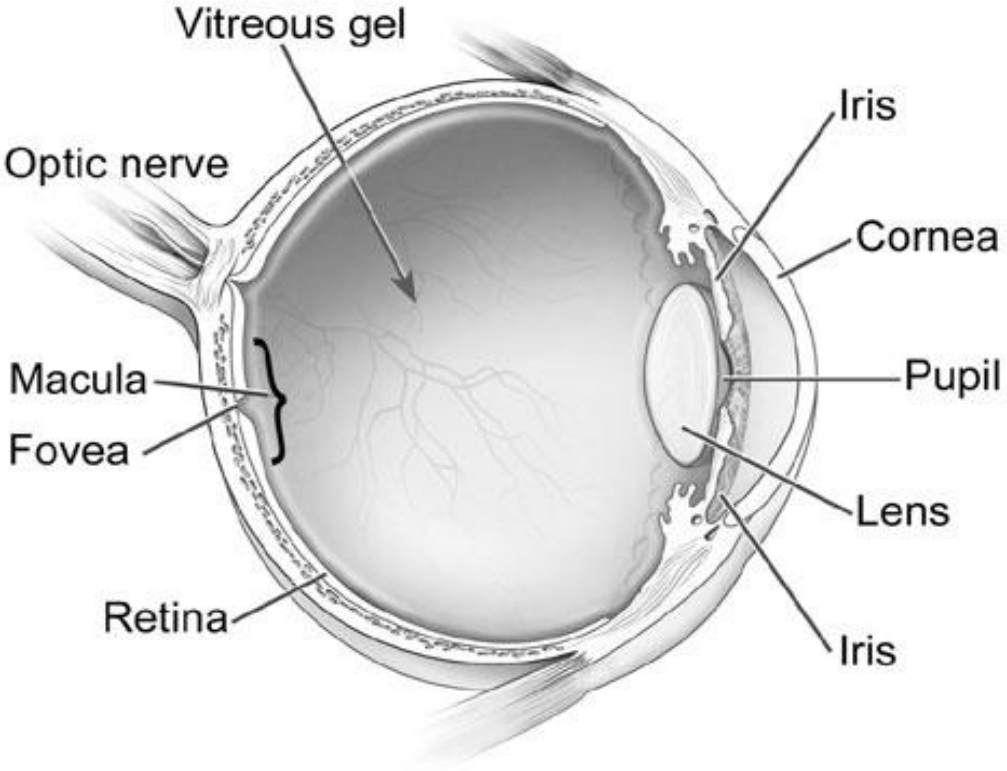


Image from
https://www.alberta-retina.com/patient-info/patient-education/eye-anatomy/

Docs - December 28, 29, January 3, 4, 5, 8, 9, 13, 15, 22, 26, 27 (more dates on future pages)

https://docs.google.com/document/d/1v2B1eH2V5z1XRBNT1DRHEKlBW73xryA88pVNBBzrEMA/edit?tab=t.0

This is the stuff that will go on my trifold.

Occipital lobe damage - January 25

Consequences of occipital lobe damage can include:

- Hard time locating objects
- Hard time with identifying colour
- Hallucinations
- Inaccurately seeing objects
- Inability to recognise words
- Hard time recognizing drawings
- Inability to recognize the movement of an object
- Difficulties with reading and writing

Glaucoma - January 26

- This damages the optic nerve
- A common risk factor is pressure in the eye putting too much stress on the optic disc
- To much pressure on the cells near here can damage or kill them
- Those cells with never recover or come back so vision loss is permanent
- Pressure may never be the reason. You can get it with no pressure or not get it with lots of pressure
- IOP (intraocular pressure) is one of the most common risk factors. Lots of types of glaucoma happen because IOP gets too high
- Things like the size and thickness of the eye wall can also contribute to causing glaucoma
- IOP is the amount of outward stress coming from the fluids inside your eye on its internal walls. These are huge contributors to maintaining the shape of the eye.

Glaucoma - January 26, 27

- Eyes are filled with 2 types of fluid, the vitreous and aqueous fluids. They both provide nutrients to the eye
- The vitreous humor fills the vitreous cavity which is the space between the eye and the lens. It helps with eye shape and retina support
- The aqueous humor fills the anterior chamber which is between the cornea and iris. This stuff is constantly being produced. It flows in and out of the front of the eye refreshing itself
- If the aqueous humors ability to drain is slowed pressure can build up in the eye
- If a doctor measures IOP they are measuring the pressure of your aqueous humor

Glaucoma - January 27

- Open-angle glaucoma is where outflow problems are farther along the drainage pathway
- Narrow-angle glaucoma is when the drainage is either narrow or closed
- Normal tension glaucoma is when outflow is completely normal
- Secondary glaucoma can be open or narrow angle but is the result of a previous injury

Blindness - January 29, 30

- You can't see
- Cannot correct vision
- Must seek help immediately
- Partial blindness is where you have some vision
- Complete blindness is where you can't see or detect light
- congenital blindness is where you have inherited retinal and eye conditions you are born with
- Sometimes preventable or curable
- Glasses and contacts will not help you
- Can be the result of a previous eye injury
- Can make you only see shapes

Blindness - January 31

- Nutritional blindness is where you get vision loss from a lack of vitamin A. It can damage the front surface of the eye and make it harder to see at night because retinal cells won't function as well
- Blindness is something that can happen to anyone
- Blindness can make your eyes hurt or see black spots in your vision
- Chemicals, fights, accidents, and crashes are all things that can cause blindness
- Some infectious diseases can also cause blindness but non infectious ones can too whether or not related to the eye

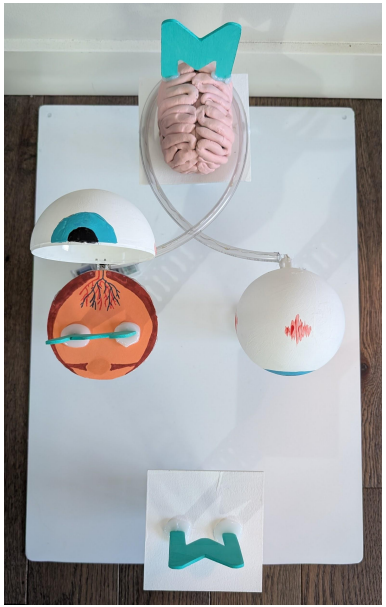
Blindness - January 31

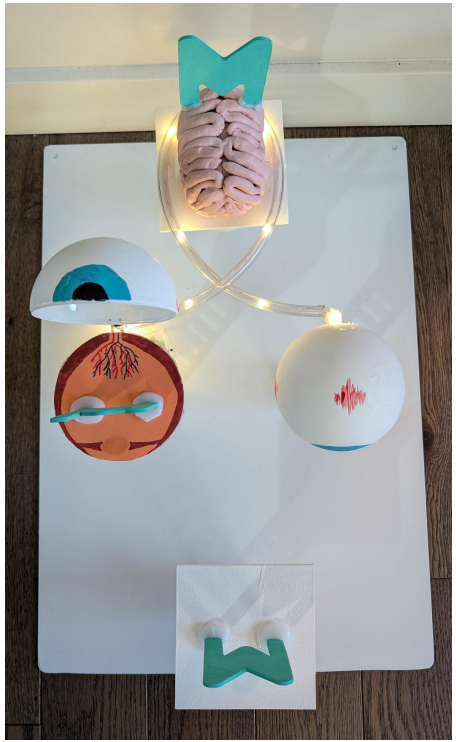
- To help prevent blindness try the following: regular eye exams, healthy diet, wear protective gear, stay fit, avoid eye infections, get other eye and health problems treated

Stye - January 31

- Painful red lump on the eyelid
- Forms when an oil gland is blocked and becomes infected
- They are very common
- Sometimes easy to manage but might need a doctor
- Can look like acne (pimple)
- Tender to touch
- Usually lasts for a few weeks
- If it lasts longer than a few weeks you may need to see a doctor so it can be drained

My eye diagram





Stye - February 1

- Styes can be confused with chalazions which are more painless bumps further up on the eyelid
- External styes are on the outside of your eyelid and are more common. They are usually caused by an infection in an eyelash follicle
- Internal styes occur on the inside of your eyelid (the side facing the eye)
- Styes are quite common
- More common in adults because oil in an adult's oil gland is thicker which gives it a higher chance to get blocked up

Stye - February 1

- Symptoms can include: eyelid swelling, crusting on your eyelid, sensitivity to light, itchiness, soreness, tears, and a feeling like there is something in your eye
- Styes are not contagious but bacteria from them can spread so don't touch a stye
- People who have had a stye before as well as people with diabetes or dry skin are more likely to develop a stye
- Using a warm compress is most likely to help you get rid of a stye
- Don't pop a stye because it can cause infection
- Other ways to help get rid of a stye includes: keeping your eyelid clean, not touching or rubbing your eyelid, and not wearing makeup

Color Blindness - February 4, 5

- Colors are harder to see
- Some cones (photoreceptors that help you see color) are missing, damaged, or working incorrectly
- Still able to see some colors but not as many as some other people
- Rarer cases of color blindness may result in not seeing color at all
- There are 3 types on cones: red sensing (L), blue sensing (S), and green sensing(M). Most people are born with all 3
- With color blindness one or more of those cells are not functioning
- Trichromacy is where all your cones are working properly

Color Blindness - February 5, 6

- Anomalous trichromacy is where you have all 3 cones but one is not as sensitive as it should be, meaning you may confuse pale colors or vibrant colors. These types have names ending with ‘anomaly’
- Dichromacy is where you are missing one of your cone types entirely. The two cones left are usually S (red sensing) and L (blue sensing) or S (red sensing) and M (green sensing). It is hard to tell the difference between fully saturated colors. These types have names ending with ‘anopia’
- Monochromacy is where you only have one type of cone or none at all. You can barely see any color and see the world in shades of gray

Red-Green color deficiency (Color Blind) - February 6,7

- Most common type of color blindness
- Makes it very hard to see red, green, and colors with red and green
- Protanopia is where your L cones are missing so you cannot see red light. You usually see colors in shades of blue and gold. Red may be confused with black. Dark brown may also be confused with other dark colors
- Deuteranopia is where your M cones are missing. You see mainly blues and golds. You can also confuse some reds and greens or yellows and greens
- Protanomaly is where you L cones are less sensitive to red light and you may confuse red with dark shades of gray. Colors containing red might be less bright

Red-Green color deficiency (Color Blind) - February 7

- Deuteranomaly is where you have all 3 cone types but you M cones are less sensitive to green light. You see blues yellows and more muted colors
- More common among men

Blue-Yellow color deficiency (Color Blind) - February 7

- Less common
- Tritanopia is where you have no M cells so you cannot see blue light. You usually see reds, light blues, pinks, and lavenders
- Tritanomaly is where your S cones are less sensitive to light. Blues look green and you see hardly any yellow
- Equally common in both women and men

Color Blindness - February 7, 8

- Blue cone monochromacy is the rarest type of color blindness and is where you don't have working L or M cones. It is hard to tell the difference between colors and you will see mostly in shades of gray. You might also have a sensitivity to light or nearsightedness
- Rod monochromacy is when most of your cones are missing or don't work properly. Everything looks gray and you also have other vision problems
- Either inherited or gotten later in life
- If it is gotten later in life it could be the result of exposure to nervous system damaging chemicals or other nerve damaging diseases

My eye Journey

I was prescribed glasses when I was young because my right eye would turn in. My eyes had to work hard to focus together as a team meaning I have Strabismus. My type of Strabismus is called Accommodative Esotropia.

I am also farsighted in both eyes therefore my eyes need to work harder to see up close. I wear glasses to correct my Hyperopia with a stronger prescription in my right eye hence my strabismus

When one eye does not see as well as the other, despite being healthy, the condition is called Amblyopia (AKA lazy eye). When I was younger I had to wear an eye patch on my left eye to try and strengthen my right eye. Now even though my right eye still isn't as strong as my left they are much more equal.

Despite my conditions, my eyes are very healthy and the structures of my eyes are normal.

Conclusion - February 10, 19

In conclusion there is a vast amount of diseases that can negatively impact the eye. Some symptoms can be terrible, but those ones tend to be less common. The severities differentiate between moderate and severe and depend on the condition. There are also lots of ways to help treat and cure these diseases although some heal on their own. I think it was very good for me to learn about this as my science fair topic as it benefits me and expands my knowledge. Up until I did this project I did not know I was farsighted or that I have strabismus but I am now aware and understand my conditions.

Occipital Lobe Damage - February 18

- Result of vehicle crashes, someone punching you, falls, and firearms
- To prevent wear a seatbelt, make sure children are safe in a car, wear helmets when biking, riding a motorcycle, etc, wearing a helmet when playing contact sports, remove tripping hazards in your own home use non slip things, and avoiding fights.

Cataract Surgery - February 19

- Remove the lens
- Replacement lens is artificial
- Don't always replaced
- Surgery is done by an ophthalmologist
- Common and generally safe
- Risks include: swelling, infection, bleeding, drooping eyelid, artificial lens moving out of place, retinal detachment, glaucoma, and vision loss
- First your pupil is dilated with eye drops and you may also be given a sedative
- Phacoemulsification is where your ophthalmologist makes a small cut in your cornea, inserts a thin probe into your lens. The probe uses ultrasound waves to break up the lens and suction out the fragments. The back of your lens is left intact so the artificial lens can still be implanted. Stitches close up the cut in the lens

Cataract Surgery - February 19

- Extracapsular cataract extraction is where the lens is removed whole and the implant is put in. This type of surgery requires a larger cut in the cornea and more stitches to close it
- After surgery vision may be blurry as you adjust to the new lens.
- Colors will look brighter after
- It is normal for your eye to feel itchy but don't push or rub your eye
- After surgery check in with your doctor to monitor healing

Macular Degeneration Treatment - February 19

Wet AMD

- Anti-vascular endothelial growth factor (anti-VEGF) injections are where opthamologists inject a medication to prevent the growth of abnormal blood vessels
- Photodynamic therapy is where your opthamologist injects you with a drug that interacts with light. Then they use lasers and cause a chemical reaction that destroy the abnormal blood vessels

Dry AMD

- Your doctor will recommend different vitamins and to quit smoking (if you smoke) as well as regular exercise

Thyroid eye disease Treatment - February 19

- Eye drops, selenium supplements, and drinking aloe vera juice are all things that can help you get rid of or reduce TED
- Anti-inflammatory drugs can also help
- Teprotumumab is a medicine that specifically treats TED
- Quit smoking
- Radiation therapy can also help get rid of TED
- Eyelid surgery: tight eyelids prevent your eyelids from coming over the cornea which can lead to corneal damage
- Your doctor might recommend eye muscle treatment to help correct double vision which may take more than one surgery

Thyroid eye disease Treatment - February 19

- Orbital decompression surgery is a way to relieve pressure on the optic nerve by making the orbit larger or taking away excess tissue. It lessens bulging of the eye and is usually done before other surgeries

Orbital Fracture Surgery - February 19

- May heal on its own
- Ice pack can help
- Your doctor may prescribe antibiotics or decongestants
- While injury heals avoid blowing nose because it can cause swelling
- If the fracture is severe you may need surgery
- After surgery you might have swelling or bruising for the a couple days. Your vision might also be blurry

Farsightedness Treatment - February 19

- Eyeglasses and contact lenses both change the way that the light focuses on your retina so you can see up close
- Some surgeries to cure hyperopia include LASIK eye surgery which uses a laser to reshape your cornea. There is also refractive lens exchange which switches out your lens for an artificial one

Nearsightedness Treatment - February 19

- Glasses and contacts help correct myopia to see distance clearer
- Ortho-K or CRT are temporary corneal refraction contact lenses you wear to bed that reshape your cornea so you can see daily
- LASIK also corrects myopia but cutting open a flap in the cornea , reshaping the corneal tissue, and closing the flap
- LASEK is like LASIK except the outer layers of the cornea are reshaped
- PRK is a surgery that cuts off the top layer of your cornea and uses a layer to reshape the surface so light can focus on the retina. The top layer of your cornea will grow back in a few weeks

Nearsightedness Treatment - February 19

- Phakic intraocular lenses are for people who have corneas that are too thin for PRK or LASIK. You get intraocular lenses placed in your eye in front of your real lens

Strabismus Treatment - February 19

- Eyeglasses and contacts can help your eyes focus
- Prism lenses are special lenses that bend light entering your eye to get rid of double vision
- Eye exercises can help you
- Some medications can weaken an overactive eye muscle
- Patching can help you strengthen your eyes if they have strabismus
- Eye muscle surgery can change the position of the extraocular muscles to realign your eyes correctly

TED Diagram

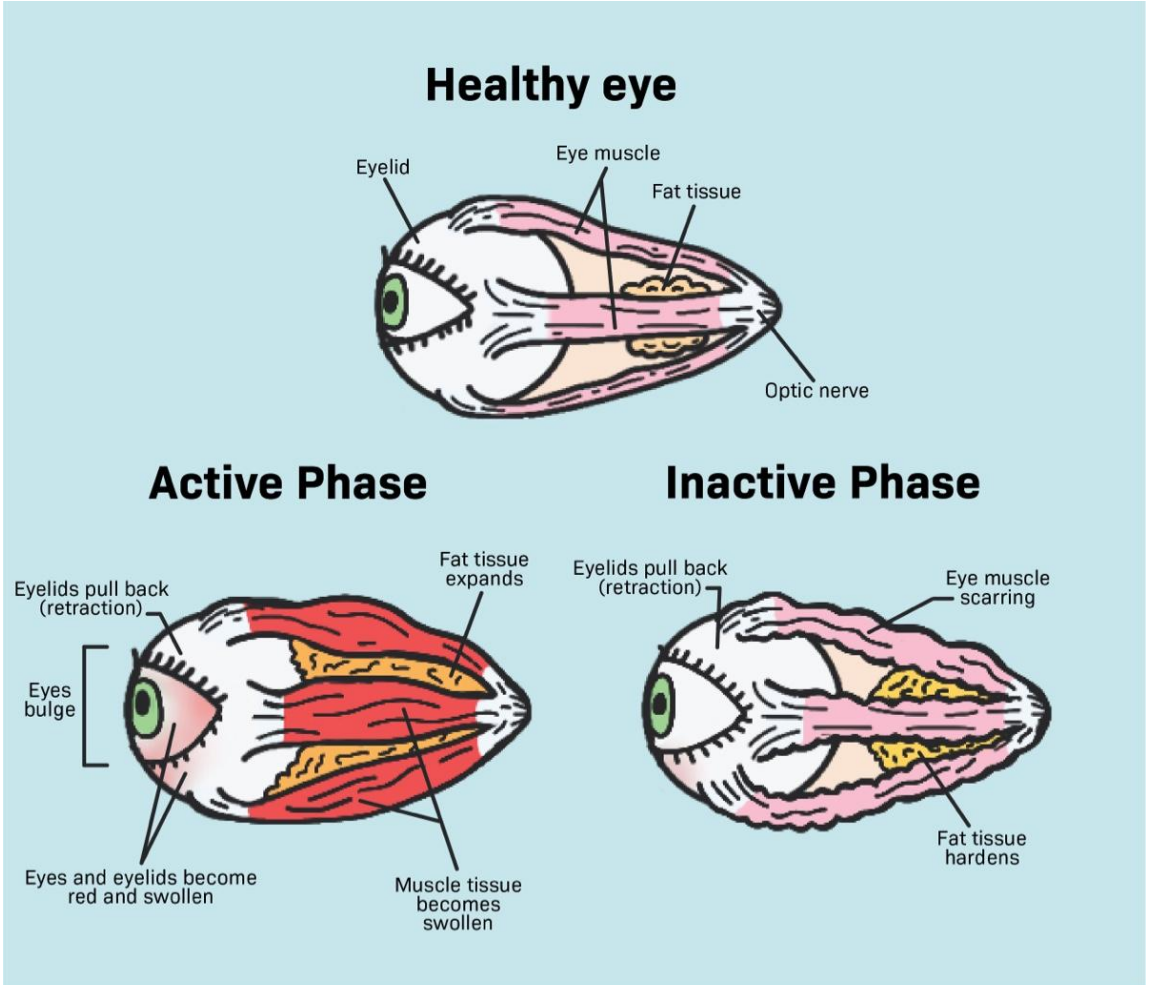


Image from:
https://thyroideyedisease.net/phases

Strabismus Diagram

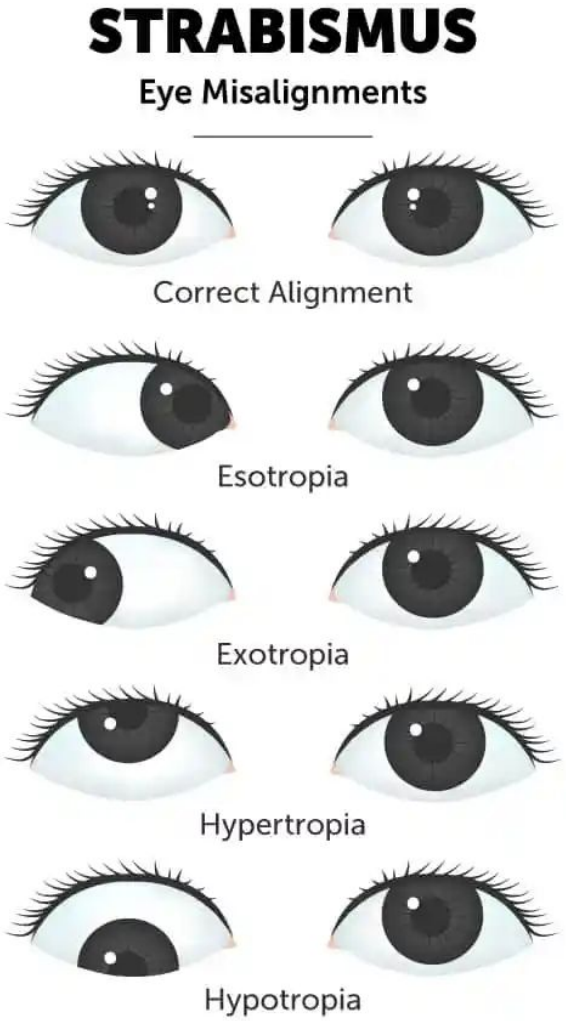


Image from:
https://theblindbibliophile.com/4-strabismus-considerations-for-parents-and-teachers/

Cataract Surgery Diagram

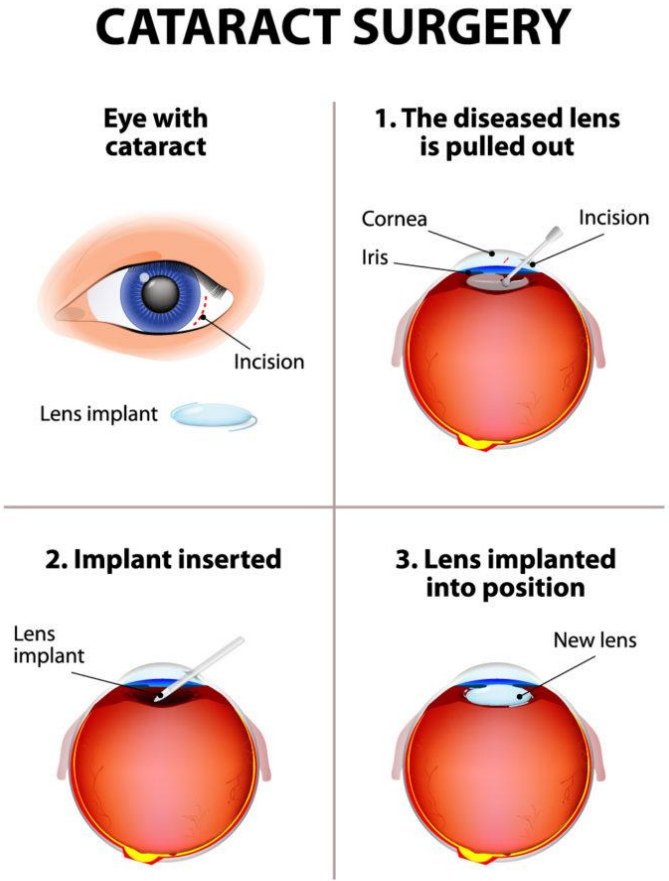


Image from:
https://pgheyemds.com/cataract-evaluation-and-surgery/

Colour blindness Diagram

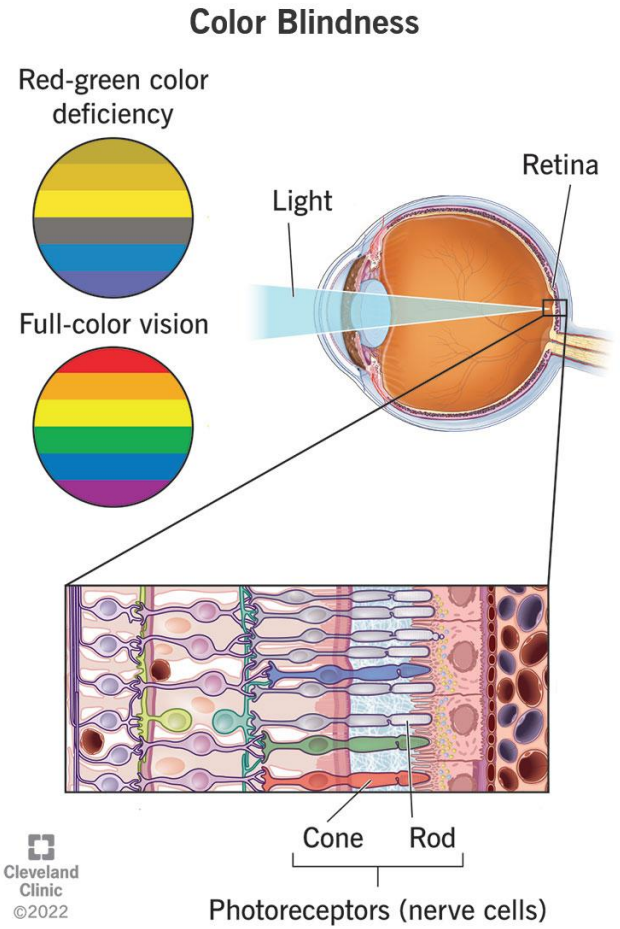


Image from:
https://my.clevelandclinic.org/health/diseases/11604-color-blindness

Colour blindness test

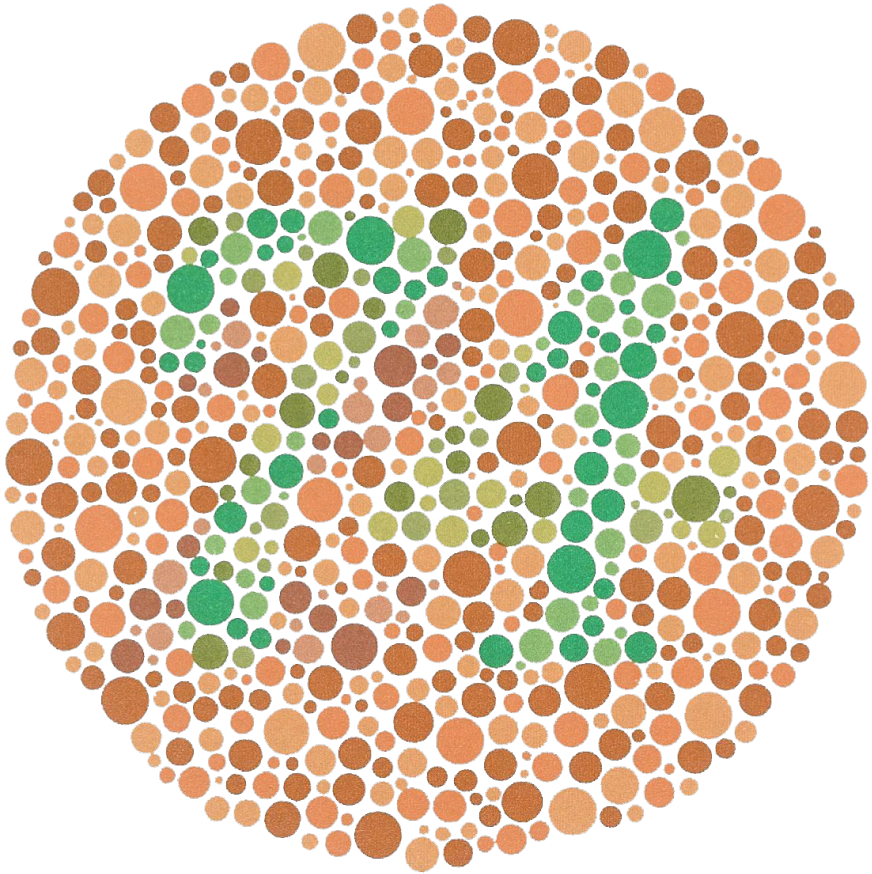
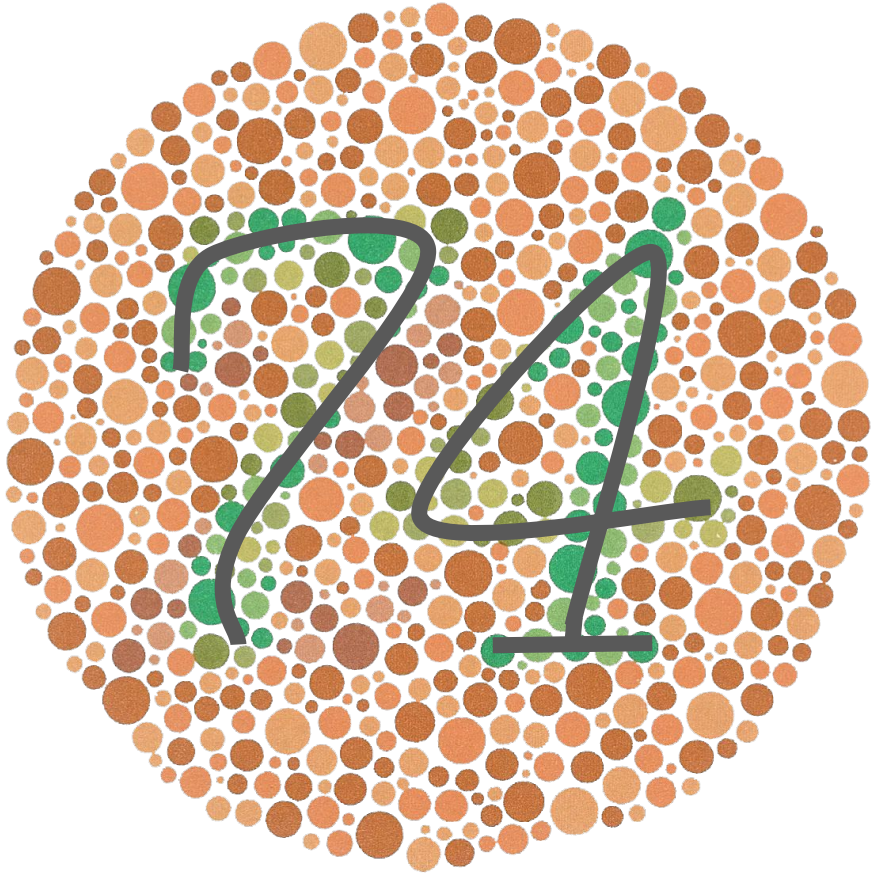


Image from:
https://psynso.com/color-blindness/


74

Stye

Light entering the eye diagram

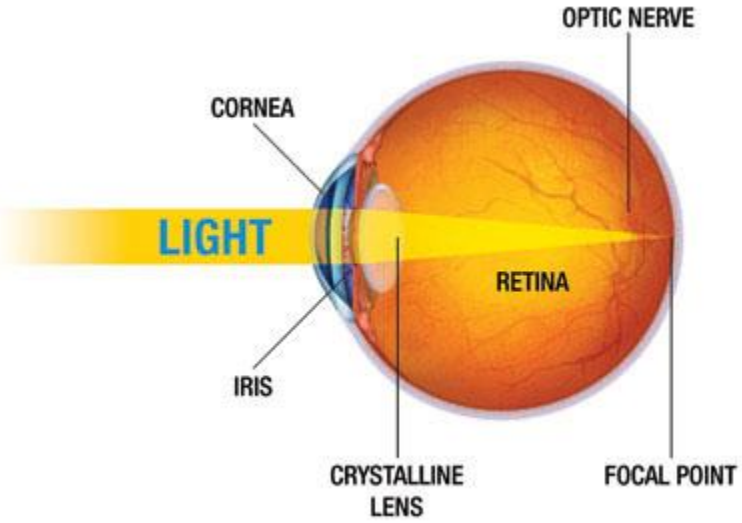
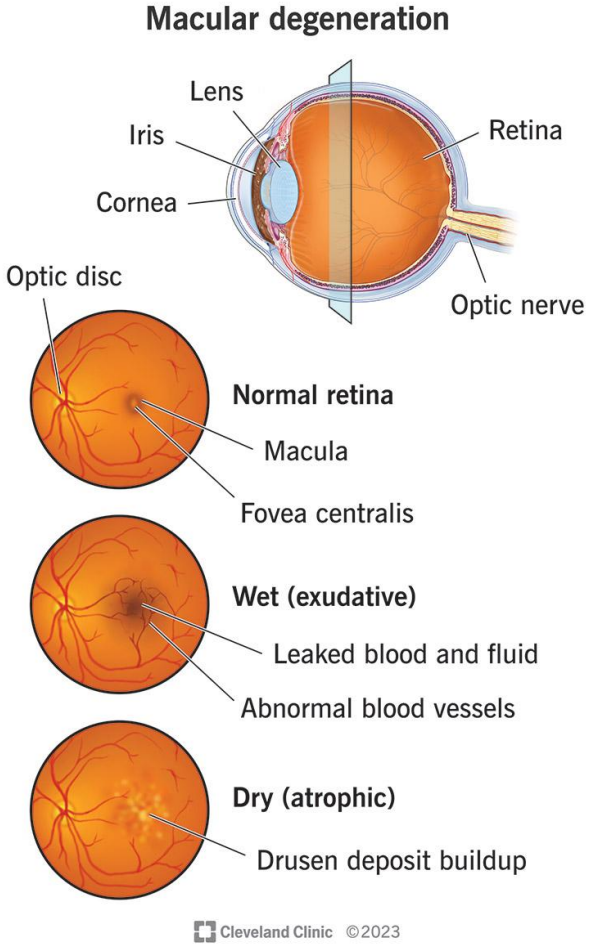


Image from:
https://myleemeowmorrow.blogspot.com/2022/05/describe-pathway-of-light-through-eye.html

Macular degeneration diagram

Image from:
https://my.clevelandclinic.org/health/diseases/15246-macular-degeneration?cvo_creative=060118%20macular



Cataract Diagram

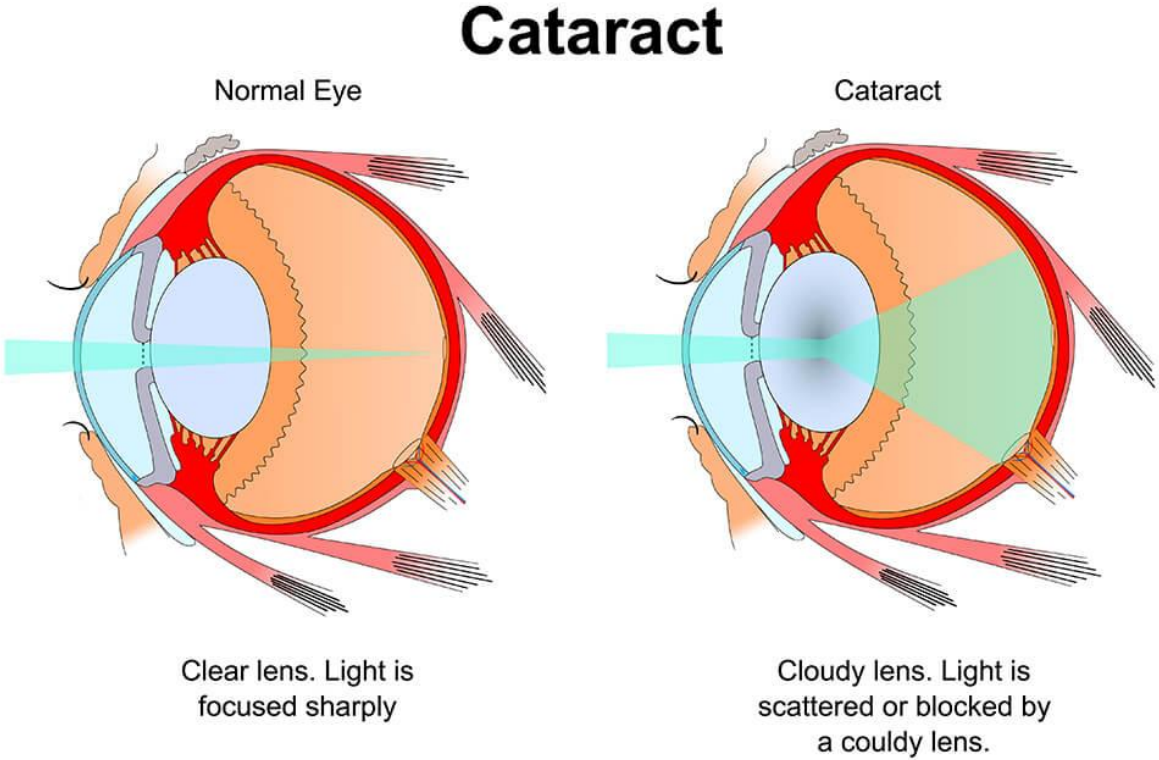
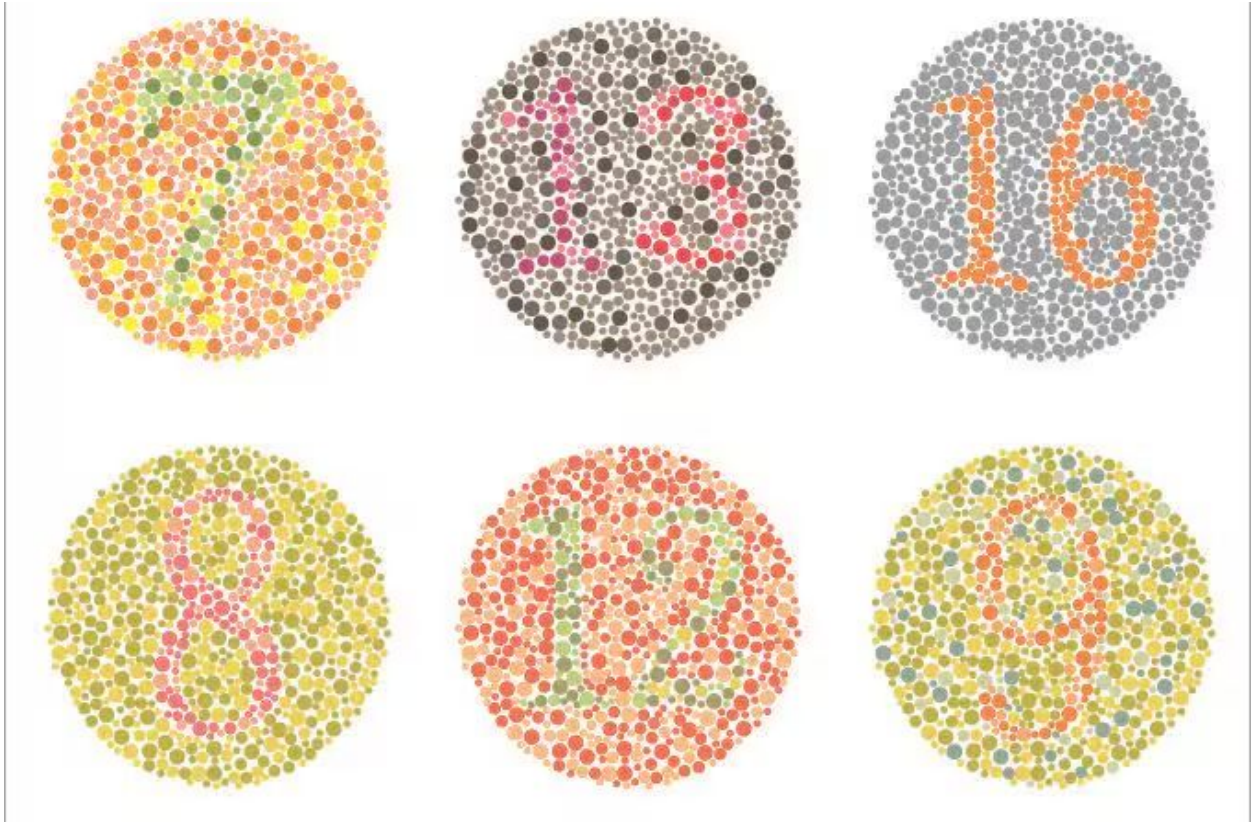


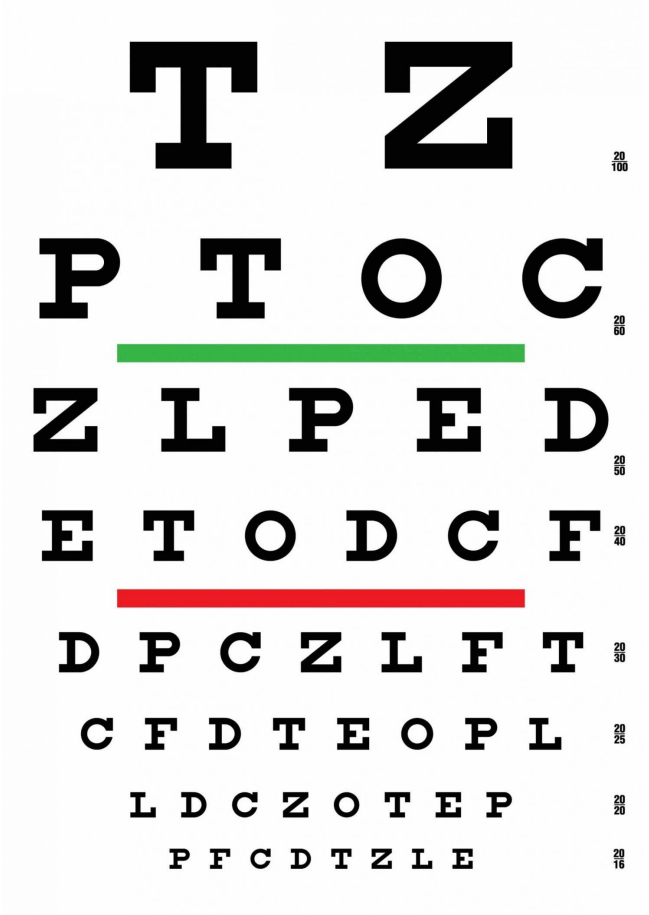
Image From: https://www.fichte.com/cataract-surgery-buffalo/what-are-cataracts/

Colour Blindness



Snellen eye chart

Image from:
https://precision-vision.com/products/vision-testing-aids/acuity-contrast-charts/snellen-eye-chart-for-visual-acuity-and-color-vision-test/



Docs - February 10, 13, 14, 16, 17, 18, 19, 23, 24

https://docs.google.com/document/d/1v2B1eH2V5z1XRBNT1DRHEKlBW73xryA88pVNBBzrEMA/edit?tab=t.0

Eye Exam - February 24

- Check your sight/health
- Not all alike depending on different diseases or health of eye
- Sometimes more specific
- General exam: happen regularly to check in on your eye health
- Follow up: like a general exam except they are to check in on a disease
- Emergency exams: happen when something that may be extreme such as vision loss

Steps of an Eye Exam - February 24

1. Visual activity: This checks how well your vision is most commonly using a snellen eye chart
2. Visual fields: checks each section in your field of vision making sure there are no blind spots that should not be there
3. Movement and alignment: checks if your eyes are aligned properly and if they move properly. It tests each eye individually and both together
4. Conjunctiva: checks your conjunctiva
5. Surrounding outer tissue: check the part of your face surrounding the eye that aren't the eye itself
6. Pupil and iris: checks how the pupil and iris respond to light

Steps of an Eye Exam - February 24

7. Intraocular pressure: this checks the pressure of your eye with a puff of air against the surface of your eye

- Slit lamps are used to look inside of your eye

8. Cornea: using a slit lamp checks if it is in good condition

9. Anterior chamber: using a slit lamp the pressure and structure of your anterior chamber

10. Lens: check the lenses clarity and structure

11. Optic nerve: check to see if the optic disc and physiologic cup are properly functioning

Steps of an Eye Exam - February 24

12. Retina: use a slit lamp to check for wrinkles and colour changes

13. Checks how your brain is functioning by asking simple questions such as ‘do you know where you are’ or ‘do you know what time and date it is’. Although they may seem pointless the function of the brain can contribute to eye health

Eye Exam - February 24

- You usually get your pupils dilated
- You need to bring on your current glasses/contacts/previous prescriptions
- You will get asked questions about changes on your vision and if you have had surgery recently how you are feeling after it
- After an exam you will get a prescription
- After an exam your optometrist will also tell you about how the exam went and when and if you need a follow up or surgery

Glaucoma - January 26 REPEAT

- This damages the optic nerve
- A common risk factor is pressure in the eye putting too much stress on the optic disc
- To much pressure on the cells near here can damage or kill them
- Those cells with never recover or come back so vision loss is permanent
- Pressure may never be the reason. You can get it with no pressure or not get it with lots of pressure
- IOP (intraocular pressure) is one of the most common risk factors. Lots of types of glaucoma happen because IOP gets too high
- Things like the size and thickness of the eye wall can also contribute to causing glaucoma
- IOP is the amount of outward stress coming from the fluids inside your eye on its internal walls. These are huge contributors to maintaining the shape of the eye.

Glaucoma - January 26, 27 REPEAT

- Eyes are filled with 2 types of fluid, the vitreous and aqueous fluids. They both provide nutrients to the eye
- The vitreous humor fills the vitreous cavity which is the space between the eye and the lens. It helps with eye shape and retina support
- The aqueous humor fills the anterior chamber which is between the cornea and iris. This stuff is constantly being produced. It flows in and out of the front of the eye refreshing itself
- If the aqueous humors ability to drain is slowed pressure can build up in the eye
- If a doctor measures IOP they are measuring the pressure of your aqueous humor

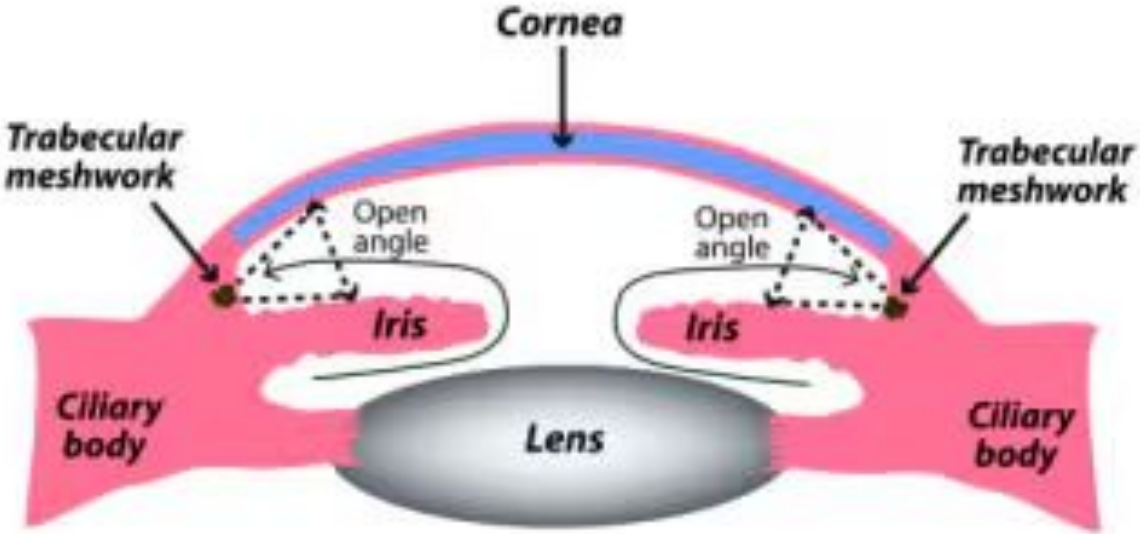
Glaucoma - January 27 REPEAT

- Open-angle glaucoma is where outflow problems are farther along the drainage pathway
- Narrow-angle glaucoma is when the drainage is either narrow or closed
- Normal tension glaucoma is when outflow is completely normal
- Secondary glaucoma can be open or narrow angle but is the result of a previous injury

Glaucoma - February 24

- The anterior segment consists of the iris, cornea, ciliary body, lens, and pupil
- The space inside of that segment that's between the cornea and lens is called the anterior chamber
- The ciliary body is a ring of tissue that connects to the back sides of the iris and the outside edges of your lens. It is what adjusts the shape of the lens and it produces the aqueous humor
- The aqueous humor goes through a path between the iris and lens and into the interior chamber through the pupil and leaves through the drainage angle

Anterior segment diagram



Citations

1. Brain anatomy and how the brain works. (2021). Retrieved from https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-the-brain#:~:text=The%20occipital%20lobe%20is%20the,that%20is%20involved%20with%20vision (Accessed November 13, 2024)
2. *How the eyes work* (no date a) *National Eye Institute*. Available at: https://www.nei.nih.gov/learn-about-eye-health/healthy-vision/how-eyes-work#:~:text=When%20light%20hits%20the%20retina,into%20the%20images%20you%20see (Accessed: 13 November 2024).
3. Optical, L. (2024) *Is it possible for your eyesight to improve with age?: Laurier Optical*, *Laurier Optical | Innes Eye Clinic*. Available at: https://www.inneseyeclinic.com/blog/is-it-possible-for-your-eyesight-to-improve-with-age/#:~:text=Generally%2C%20eyesight%20does%20not%20improve,with%20your%20eyes%20or%20health (Accessed: 13 November 2024).
4. Spilsbury, R. and Spilsbury, L. (2018) *The science of the Senses*. New York, NY: Gareth Stevens Publishing. (Accessed November 16, 2024)
5. Katz, S.B. (2024) *Seeing*. New York, NY: Children's Press, an imprint of Scholastic Inc. (Accessed November 16, December 14, 15 2024)
6. Habinger, E., Sebastián, S. and Schimel, L. (2023) *Your brain is amazing: How the human mind works*. Victoria, British Columbia: Orca Book Publishers. (Accessed November 16, 2024)
7. "Blue light negatively affects the survival of ARPE19 cells through an action on their mitochondria and blunted by red light - Núñez-Álvarez - 2019 - Acta Ophthalmologica - Wiley Online Library" by Unknown Author (Accessed December 7, 8, 10, 13, 14)
8. *Cataracts* (2023) *Mayo Clinic*. Available at: https://www.mayoclinic.org/diseases-conditions/cataracts/symptoms-causes/syc-20353790 (Accessed: November 19, 23, 26, 27, 29 2025).
9. *Types of diseases: Classification of diseases with questions and videos* (2019) *Toppr*. Available at: https://www.toppr.com/guides/biology/human-health-and-diseases/types-of-diseases/#:~:text=According%20to%20a%20very%20broad,diseases%2C%20self%2Dinflicted%20diseases (Accessed: 15, 16, 21, 27 2025).
10. *Orbital fractures* (2025) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/25075-orbital-fractures (Accessed: December 27 2024, February 19 2025).

Wink optometry (This is where I got the retinal scans from)

Some of this is my personal knowledge that I learned from family and school

Citations 2

1. *Hyperopia (are you farsighted?): Symptoms and treatment* (2019) *Hyperopia / Hypermetropia (Farsightedness): What is it?* Available at: https://www.allaboutvision.com/conditions/hyperopia/overview/ (Accessed: 27 December 2024).
2. *Your trusted resource for eye health & vision care* (no date) *All About Vision - Complete Guide To Vision and Eye Care*. Available at: https://www.allaboutvision.com/. (Accessed December 3, 4, 7, 27, 28 2024, January 26, 27, February 24 2025
3. c=AU; o=The State of Queensland; ou=Queensland Health; ou=; ou=; (2022a) *Brain map: Occipital lobes*, *Queensland Health*. Available at: http://www.health.qld.gov.au/abios/asp/boccipital#:~:text=Damage%20to%20the%20occipital%20lobe%20can%20include%3A&text=Visual%20illusions%20%2D%20inaccurately%20seeing%20objects,of%20an%20object%20(Movement%20Agnosia) (Accessed: 25 January 2025).
4. *Blindness (vision impairment): Types, causes and treatment* (2025) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/24446-blindness (Accessed: January 29, 30, 31).
5. *Do you have a Stye in your eye?* (2024) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/17658-stye (Accessed: 31 January February 1 2025).
6. *Color blindness: Types, causes & treatment* (no date) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/11604-color-blindness (Accessed: February 4, 5, 6, 7, 8 2025).
7. *Occipital lobe brain injury: Brain injuries* (2025) *Brain and Spinal Cord*. Available at: https://brainandspinalcord.org/occipital-lobe-brain-injury/#:~:text=As%20is%20the%20case%20with,that%20accompanies%20traumatic%20brain%20injuries (Accessed: 18 February 2025).
8. *Cataract surgery* (2023) *Mayo Clinic*. Available at: http://www.mayoclinic.org/tests-procedures/cataract-surgery/about/pac-20384765 (Accessed: 19 February 2025).
9. *Get macular degeneration treatment* (no date) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/services/macular-degeneration-treatment (Accessed: 19 February 2025).
10. *Thyroid eye disease* (no date) *Foundation Fighting Blindness*. Available at: https://www.fightingblindness.org/diseases/thyroid-eye-disease-ted#:~:text=Over%2Dthe%2Dcounter%20medications%20to%20treat%20TED&text=You%20should%20use%20the%20drops,inflammation%20levels%20in%20some%20cases. (Accessed: 19 February 2025).
11. *Farsightedness: Causes & symptoms* (no date) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/hyperopia-farsightedness (Accessed: 19 February 2025).
12. *Myopia means nearsightedness* (2024) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/8579-myopia-nearsightedness (Accessed: 19 February 2025).
13. *What is strabismus?* (2025) *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diseases/strabismus-eye-misalignment#management-and-treatment (Accessed: 19 February 2025).
14. professional, C.C. medical (2025) *Why do I need an eye exam?*, *Cleveland Clinic*. Available at: https://my.clevelandclinic.org/health/diagnostics/eye-exam (Accessed: 24 February 2025).

Modes of definition from across google (Throughout the course of my project)